

**Impact of COVID-19 on Maternal  
and Perinatal Care at Public  
Hospitals in the Sidama Region,  
Southern Ethiopia: A Mixed  
Methods Study**

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A thesis submitted in fulfilment of the requirements for  
the degree of

**Doctor of Philosophy**

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Date 20/12/2023

# **Certificate of original authorship**

I, Zemenu Yohannes Kassa, declare that this Thesis is submitted in fulfilment of the requirements for the award of Doctor of Philosophy in the Faculty of Health at the University of Technology Sydney.

This Thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the Thesis.

This document has not been submitted for qualifications at any other academic institution.

This research is supported by the Australian Government Research Training Program.

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## List of abbreviations

ANC	Antenatal Care
CI	Confidence Interval
DIC	Disseminated Intravascular Coagulation
EVD	Ebola Virus Disease
FGDs	Focus Group Discussions
FIGO	Federation of International Gynaecology and Obstetrics
HSDP	Health Sector Development Program
HSTP	Health Sector Transformation Plan
IDIs	In-Depth Interviews
MDG	Millennium Development Goal
MERS	Middle East Respiratory Syndrome
HMIS	Health Management Information System
MMR	Maternal Mortality Ratio
NICU	Neonatal Intensive Care Unit
PNC	Postnatal Care
SARS	Severe Acute Respiratory Syndrome
SDG	Sustainable Development Goal
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus 2
UTS	University of Technology Sydney
VHF	Viral Haemorrhagic Fever

WHO

World Health Organization

# Glossary of operational definitions and concepts

This glossary explains some of the terms used in this Thesis.

**Antenatal care 1 (ANC1) (booking)** refers to a pregnant woman who has had an initial contact with maternity care providers in a health facility.

**ANC4** refers to a pregnant woman who has had contact four times with maternity care providers in a health facility or facilities.

**COVID-19** is a highly contagious respiratory disease caused by SARS-CoV-2. SARS-CoV-2 spreads from person to person through droplets released when an infected person coughs, sneezes, or talks or by touching surfaces in contact with the virus and then touching one's mouth, nose, or eyes.

**Disrespectful care** refers to a woman receiving care during ANC, labour, and childbirth from healthcare personnel without respecting and preserving her dignity.

**Intrapartum care** is the care of a woman and her neonate from the onset of labour and immediately after birth by maternity care providers.

**Institutional maternal mortality ratio** describes the number of maternal deaths among 100,000 live births in health facilities.

**Institutional neonatal mortality rate** describes the number of neonatal deaths among 1,000 live births in health facilities.

**Institutional stillbirth rate** describes the number of stillbirths among 1,000 live births in health facilities.

**Mode of birth** refers to the way in which a woman gives birth, for example, a spontaneous vaginal birth, instrumental birth (vacuum or forceps birth) or caesarean birth.

**Instrumental birth** refers to a birth in which the maternity care provider uses forceps, a vacuum cup (ventouse), to assist the birth of the foetus from a woman's vagina.

**Caesarean birth** is a surgical procedure by which one or more babies are delivered through an incision of an intact woman's abdomen and uterus.

**Maternal and perinatal care access** refers to the 'degree of fit' between clients and the health system. The 'degree of fit' can be influenced by the availability, accessibility, affordability, accommodation, and acceptability of the services (Gulliford et al., 2002; Penchansky & Thomas, 1981). The community can also affect the acceptability of the services.

**Maternal and perinatal care provision** refers to the provision by health care professionals of evidence-based care for routine and/or complex management of pregnancy in women in maternity care facilities.

**Maternal and perinatal care uptake** refers to the number of women receiving evidence-based care for routine and/or complex management of pregnancy at maternity care facilities.

**The midwife** is recognised as a responsible and accountable professional who works in partnership with women to give the necessary support, care, and advice during preconception, pregnancy, labour, and the postpartum period, to conduct births as the midwife's own responsibility and to provide care for the newborn and the infant (International Confederation of Midwives (ICM), 2023).

**An integrated emergency surgical officer** refers to a person who has special training or acquired competency in providing emergency obstetric and surgical care to women during the preconception, pregnancy, childbirth, and postnatal phases and who has the skills to perform emergency interventions and caesarean births.

**An obstetrician** is a medical doctor who specialises in providing medical care to women during the preconception, pregnancy, childbirth, and postnatal phases, who has the skills to manage complex or high-risk pregnancies and birth and can perform surgeries related to labour and birth.

**Suboptimal care** is when a woman receives care from healthcare personnel that is not evidence-based during ANC, labour, and/or childbirth.

**Woman/women** are the terms used for the purpose of this study to refer to a childbearing woman/women.



## Abstract

**Background:** The novel coronavirus disease 2019 (COVID-19) continues to pose a global public health threat. This pandemic also presents a profound obstacle to implementing the recommended guidelines to improve maternal and perinatal care in maternal and perinatal health services in low- and middle-income countries, including Ethiopia.

**Aim:** The aim of this study is to explore the impact of the COVID-19 pandemic on antenatal care uptake, access, provision, and intrapartum care in public hospitals in the Sidama Region, Southern Ethiopia.

**Methods:** A concurrent mixed methods study was conducted at fifteen public hospitals in the Sidama region. Data were extracted from the hospital management information system before the pandemic, 12 months of data (March 2019-Feb 2020) and during the pandemic, six months of data, (March to August 2020). The data from all women and neonates who utilised the aforementioned health services from March 2019 to August 2020 were included in the quantitative component of this study. The Poisson regression model was used to estimate incidence rates of maternal and perinatal uptake before and during the pandemic. Qualitative data were derived from in-depth interviews with twenty-eight health professionals (midwives, integrated emergency surgical officers, obstetrics and gynaecology residents and obstetricians and gynaecologists) and seventeen women. The age range of the women participating in the qualitative study was 19 to 37, and 54.8% of them were gravida 1 or 2. Four focus group discussions (N=25) were conducted with women to build dynamic interactions among participants, leading to a more nuanced understanding of the topic and revealing aspects that might not surface in one-on-one interviews. Thematic analysis was applied to analyse qualitative data. The joint display technique was applied to integrate quantitative and qualitative data.

**Results:** This study demonstrated that maternal and perinatal care access, uptake and provision were affected by the pandemic, as explained in the qualitative results with the themes *'Delays in maternity care uptake during COVID-19'*, *'Shortage of resources during COVID-19'*, *'Barriers to maternity care uptake during COVID-19'*, and *'Mistreatment of women during maternity care during COVID-19'*. *'Discrimination'*, *'Delays in care'*, *'Disrespectful care'* and

*'Suboptimal care'* may have led to neonatal and maternal mortality during the COVID-19 pandemic.

**Conclusion:** It was evident from this study that maternity care was severely disrupted by the COVID-19 pandemic in 2020. Governments, hospitals and health care professionals were challenged in their provision of adequate maternity care, and at the community and individual level, women faced numerous challenges in accessing timely and adequate maternal health services. To restore disrupted services, government provision of supplies to fully equip antenatal care clinics and sufficient numbers of healthcare providers to staff clinics is vital. For hospitals, the implementation of obstetric triage systems and data management or ordering systems would enable workflow for timely care. On-site training for maternity care providers to offer respectful care and for women to receive a minimum standard of optimal care, would lead to ensuring a better outcome for women and perinatal care. Governments and other responsible stakeholders need to foreshadow how to address medical supply shortages and create health promotion messages that may ameliorate negative impacts on perinatal healthcare in future pandemics.

# **Chapter 1: Introduction**

## **1.1 Overview of the COVID-19 pandemic**

Coronavirus disease 2019 (COVID-19) presented an unprecedented global public health crisis and continues to pose a public health threat across the globe (Rothan & Byrareddy, 2020). It is a highly contagious viral pneumonia caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Sharma et al., 2020). Since the initial finding of the virus in Wuhan, China, in December 2019, millions of cases have been reported worldwide (WHO, 2023b). The World Health Organization (WHO) declared COVID-19 as public health emergency on 30, January 2020, and a pandemic on 11 March 2020 (WHO, 2020).

Despite the range of prevention strategies employed to contain the COVID-19 pandemic, over 771.5 million people have contracted the virus, and as of 25 October 2023, more than 6.97 million related deaths had been reported globally (WHO, 2023b). In low-and middle-income countries (LMICs), the low proportions of reported COVID-19 cases are likely to be a gross under-representation of the prevalence of COVID-19, especially in countries where mass testing has not yet been implemented (Etti et al., 2020; Kajal & Anam, 2020; Khalil et al., 2020). More than 9.55 million COVID-19 cases in Africa and more than 175,443 deaths had been reported as of 25 October 2023 (WHO, 2023b). In Ethiopia, at that date, 501,060 COVID-19 cases and 7,574 deaths related to COVID-19 had been reported (WHO, 2023b).

The COVID-19 pandemic has highlighted how a single viral disease can affect infected and non-infected individuals from all walks of life (Kajal & Anam, 2020). One of its effects was controlling non-essential movement within and between local areas and abroad for one year (Collins et al., 2020). Additionally, the world has focused on preventing the spread of COVID-19 and losing key workers through illness, death, or self-isolation following contact with infected people (Carter et al., 2020). This has affected health systems across low-, middle- and high-income countries (Carter et al., 2020).

## **1.2 The impact of COVID-19 on global maternal and perinatal health**

COVID-19 has significantly impacted the health of pregnant women and their unborn children globally (Twanow et al., 2022). A study from the United Kingdom (UK) showed that the rate of hospital admission due to COVID-19 was 4.9 (95% CI 4.5 to 5.4) per 1,000 pregnant women in the UK (Knight et al., 2020). A study in India also showed that 14.3% of pregnant women contracted the virus (Nayak et al., 2020). Another study revealed that in LMICs, stillbirth, ruptured ectopic pregnancies, maternal depression, and maternal deaths significantly increased during the pandemic (Chmielewska et al., 2021). In Kenya, Shikuku et al., (2021) showed that adolescent pregnancy, caesarean section, adolescent maternal deaths, and stillbirths increased during the pandemic.

Pregnancy-related physiological, immunological, anatomical, and hormonal changes make women more susceptible (Zhao et al., 2020) than the general population to emerging infectious diseases like the Zika virus, Middle East respiratory syndrome (MERS), Ebola virus disease (EVD), H1N1 pandemic influenza, severe acute respiratory syndrome (SARS) (Mehand et al., 2018), and SARS-CoV-2 (Jamieson & Rasmussen, 2022). These infections may result in complications during pregnancy and childbirth, such as renal failure, sepsis, disseminated intravascular coagulation (DIC), and death (Lam et al., 2004). Similar complications, for example, spontaneous abortion (Lyman et al., 2018), preterm birth and stillbirth (Payne et al., 2014; Pierce et al., 2011), intrauterine growth restriction (Wong et al., 2004), haemorrhage (Bebell et al., 2017), and microcephaly (Wen et al., 2017) can occur.

## **1.3 The global burden of maternal and neonatal mortality before COVID-19**

In order to reduce maternal mortality, there has been a growing emphasis on maternal health, with key strategies, including transferring women who give birth at home without skilled birth providers to hospitals, along with the provision of skilled caregivers, antibiotics, and blood transfusions (Douthard et al., 2021). In high-income countries, such interventions were implemented from the 1930s onwards to reduce maternal mortality (Fildes et al., 2013). However, it was not until the late 1970s that maternal mortality became a global priority for

LMICs (AbouZahr, 2003). Observable maternal deaths occurred at home during birth or in the postpartum period, but in facilities maternal mortality was not reported, rendering it 'invisible', which challenged the accurate estimation of the global burden. In addition, under-ascertainment of hospital level maternal and neonatal mortality data and issues within reporting systems have a range of consequences in the formulation of effective strategies, resources allocations, and decision making to address the challenges on hand (Melberg et al., 2019). It was not until 1985 that estimates of maternal mortality were finally made in LMICs (Rosenfield & Maine, 1985).

In nearly all high-income countries, a substantial reduction in maternal mortality began around 1935 and was largely achieved by the 1970s and 1980s (Goldenberg et al., 2018). However, in February 1987, the International Safe Motherhood Conference was held in Nairobi, Kenya, sponsored by three UN agencies: UNFPA, the World Bank, and WHO (Mahler, 1987). This conference marked the launch of a global initiative to reduce maternal mortality by 50% in a decade in LMICs (Mahler, 1987). The maternal health experts prioritised safe motherhood initiatives because women are more likely than men to spend their income enhancing family well-being, including providing additional food, healthcare, school supplies and clothing for young children. Motherless children are less likely to get healthcare and education as they grow up (Zhou et al., 2016), the majority of maternal morbidity and long-term disability can be effectively prevented through optimal ANC and intrapartum care, in a cost-effective way (Conable, 1987).

This global initiative identified several key focus areas: giving greater visibility to the hidden inequity of maternal ill health, putting maternal mortality at the forefront of international public health, risk assessment during pregnancy by a trained non-physician, the necessity of local maternal mortality data, empowering women and understanding the roots causes of the unacceptable toll of maternal mortality in low-income countries, and the availability and accessibility to first-referral level care for obstetric complications (AbouZahr, 2003; Conable, 1987; Mahler, 1987). Additionally, various factors were recognised as contributors to maternal mortality including poverty, unemployment, workload, culture, beliefs, social capital and literacy (Conable, 1987; Mahler, 1987).

Ten years after the launch of the Safe Motherhood Initiative in Nairobi, Kenya, a technical consultation was held in Colombo, Sri Lanka, in 1997 to review the initiative's progress (Kwast,

1998). At that time, maternal mortality remained unacceptably high. The technical consultation identified several key issues: maternal deaths were not predictable; major obstetric complications were not predictable; risk assessment has proven ineffective and, since every pregnant woman faces risk, ensuring a medically skilled attendant is present at every birth; some obstetric complications are not preventable; and the vast majority of maternal deaths are preventable by optimal care (Kasonde & Kamal, 1998).

During the technical consultation in Colombo in 1997, the global experience demonstrated the potential for reducing maternal morbidity and mortality. Existing knowledge and technology could achieve reductions in maternal mortality by recognising the need for increased access to family planning services, and improving the quality of antenatal and intrapartum care. Ensuring access to essential obstetric and midwifery care, training and deploying appropriate skilled health personnel who are connected by effective referral links and supported by adequate supplies, is instrumental in the development of health services that support women's reproductive health (Kasonde & Kamal, 1998).

In the context of this crucial efforts, Millennium Development Goal 5 (MDG 5) aimed to reduce the maternal mortality ratio by 75% between 1990 and 2015. The actual achievement was a 44% decrease between 1990 and 2015 (Alkema et al., 2016) and maternal mortality continues to be a major global public health issue (Geller et al., 2018). Maternal death is defined as a woman's death during pregnancy or within 42 days of termination of pregnancy, regardless of the duration and site of pregnancy, from any causes related to or aggravated by pregnancy or its management but not from accidental or incidental causes (WHO, 2019).

In 2017, 295,000 women died during and following pregnancy and childbirth across the globe. Sub-Saharan Africa and Southern Asia accounted for approximately 86% (254,000) of estimated global maternal deaths. Sub-Saharan Africa alone contributed to around 66% (196,000) of these deaths, while Southern Asia accounted for nearly 20% (58,000) (WHO, 2019). The global maternal mortality ratio in 2017 was estimated at 211 maternal deaths per 100,000 live births (WHO, 2019). This means 810 women dying from preventable causes linked to pregnancy and childbirth every day around the world. In addition, every 11 seconds, either a pregnant woman or a newborn die somewhere (WHO, 2019). LMICs continue to account for the majority of maternal and neonatal deaths globally, deaths which could be

prevented through adequate antenatal care, facility-based births, and postnatal care (Yaya & Ghose, 2019).

Sub-Saharan Africa is highly affected, with 66% of global maternal deaths occurring in this region in 2017, translating to an estimated 542 maternal deaths per 100,000 live births. In Ethiopia, for example, in 2017, there were 14,000 maternal deaths, with an estimated 401 maternal deaths per 100,000 live births (WHO, 2019). The primary complications accounting for nearly 75% of all maternal deaths were severe bleeding, infection (puerperal sepsis), high blood pressure during pregnancy (preeclampsia), pregnancy complications from birth, and unsafe abortion (WHO, 2019).

Factors contributing to maternal deaths in LMICs include poverty, long distances to health facilities, lack of information, inadequate quality of care, cultural beliefs and practices, and shortages of medical supplies and human resources in health facilities (Aden et al., 2019; Masaba et al., 2022; Tegegne et al., 2018; WHO, 2019). Emerging viral diseases are also becoming a direct and indirect cause of maternal and neonatal morbidity and mortality (Quaglio et al., 2019; Wilhelm & Helleringer, 2019).

Worldwide, there were 2.5 million neonatal deaths in 2018, equivalent to 7,000 neonatal deaths every day (UNICEF, 2019a). In 2018, the global average rate of neonatal deaths was 18 per 1,000 live births. Sub-Saharan Africa contributed the highest number of neonatal deaths, estimated at roughly 28 per 1,000 live births, closely followed by Southern Asia, where the rate was 25 neonatal deaths per 1,000 live births in 2018. Five countries have accounted for half of all neonatal deaths worldwide: India, Pakistan, Nigeria, the Democratic Republic of Congo and Ethiopia (UNICEF, 2019a). For example, in Ethiopia in 2016, there were 29 neonatal deaths per 1,000 live births (EPHI, 2019). In 2019, this number had increased slightly, to 30 neonate deaths per 1,000 live births. Preterm birth, intrapartum-related complications (such as birth asphyxia or inability to breathe at birth), infections, and congenital conditions were the leading causes of most neonatal deaths (UNICEF, 2019a).

## **1.4 Preventing maternal death through ANC and facility birth in LMICs**

Antenatal care (ANC) is defined as 'the care provided by skilled health care providers to pregnant women or adolescent girls to ensure the best health conditions for both woman and unborn baby during pregnancy' (WHO, 2016b). The key components of ANC include risk identification, prevention and management of pregnancy-related or existing diseases, health education, and health promotion (WHO, 2016b). In resource-constrained countries, improvements in access to ANC have substantially reduced rates of maternal and neonatal morbidity and mortality (Berhan & Berhan, 2014; Shiferaw et al., 2021). ANC is a healthcare program that optimises maternal and child health outcomes through regular pregnancy monitoring (Muluneh et al., 2021) and provides an essential opportunity to offer care to prevent and manage disease and the potential causes of maternal and neonatal illness (WHO, 2016b). However, the ongoing pandemic may reverse the marked progress made in increasing ANC uptake in LMICs prior to the pandemic. The pandemic has also presented a profound obstacle to implementing the recommended guidelines for improving ANC access, uptake, and provision (Menendez et al., 2020).

In 2016, the World Health Organization (WHO) recommended a minimum of eight ANC contacts for all pregnant women (WHO, 2016b). Although ANC utilisation had increased during the two decades preceding the pandemic (Duodu et al., 2022; Tsegaye et al., 2022), many countries had still not reached the WHO-recommended eight ANC contacts, and women in Ethiopia had fewer ANC contacts than in most other countries. Globally, 87% of pregnant women received at least one ANC contact (UNICEF, 2019b) (termed 'ANC1'), compared to only 74% in Ethiopia. In 2019, the percentage of pregnant women who received at least four ANC contacts (termed 'ANC4') was 66% globally, 54% in Eastern and Southern Africa (UNICEF, 2019b), and just 43% in Ethiopia (EPHI, 2019).

A skilled birth attendant plays a pivotal role in reducing maternal and neonatal mortality (WHO, 2018a). A skilled birth attendant is defined as 'an accredited health professional, for example, a midwife, doctor, nurse, or health officer who has been educated and trained to proficiency in skills needed to manage normal (i.e. uncomplicated) pregnancies and childbirth, the immediate postnatal period, and the identification, management and referral of women and neonates for complications' (WHO, 2018a).



Improving the quality and quantity of skilled birth attendants is a fundamental pillar in reducing maternal and newborn mortality (Zegeye et al., 2022). In LMICs, a range of multifaceted strategies have been employed to promote institutional childbirth and enhance access to skilled birth attendants (Zuñiga et al., 2021) including interventions to improve access to institutional birth (Dickson, 2021), deploying community health workers (Kachimanga et al., 2020), mass media campaigns (Negussie & Girma, 2017), and providing free healthcare for pregnant women (Camara et al., 2021; Zuñiga et al., 2021). Institutional childbirth is one of the main strategies to prevent and alleviate obstetric complications, maternal and neonatal illness, and death during childbirth in LMICs (UNICEF, 2019b).

Other strategies include building hospitals; scaling up the training of nurses, midwives, general practitioners, and obstetricians; and building their capacity through continuous professional development training (WHO, 2017; Zuñiga et al., 2021). Many women, however, still give birth without assistance from skilled healthcare providers (Doctor et al., 2018), and the quality of intrapartum care does not reach the desired level in LMICs (Munabi-Babigumira et al., 2017).

There is a global shortage of skilled birth attendants, with the State of the World's Midwifery report 2021 estimating a shortfall of 900,000 midwives (Nove et al. 2021). This shortage was especially acute in low-income countries in 2021 and worsened by COVID-19. Major shortages of midwives have been observed in Africa and Southeast Asia, which profoundly impacts maternal health care in these regions (Nove et al., 2021). In terms of obstetricians per 100,000 population in low-income countries, the ratio was 0.7 (IQR 0.5-1.9), compared with 5.5 low middle-income countries (1.8-28.2), 22.6 (11.6-56.7) in upper-middle-income countries, and 56.9 (32.0- 85.3) in high-income countries (Holmer et al., 2015).

Skilled birth attendants play an important part in tackling complications during the childbirth process (UNICEF, 2019b). Three-quarters of maternal deaths occur during childbirth and the immediate postnatal period. In 2019, 77% of pregnant women globally were assisted by skilled health personnel (doctor, nurse, or midwife). In Eastern and Southern Africa, 66% of pregnant women were assisted by skilled healthcare providers (UNICEF, 2019b) and in Ethiopia, 50% of pregnant women were assisted by skilled healthcare providers, with 48% giving birth at health facilities (EPHI, 2019).

## **1.5 The impact of COVID-19 on maternal and perinatal care in LMICs**

Over the past two decades, tremendous progress has been made in reducing maternal and neonatal mortality through interventions to improve service utilisation and access to quality maternity services (UNFPA, 2021). However, the COVID-19 pandemic has the potential to reverse this hard-won progress in reducing maternal and neonatal morbidity and mortality in LMICs. The COVID-19 pandemic also presents challenges in implementing the recommended guidelines for better maternal and perinatal care, having overwhelmed maternal and perinatal healthcare services (Comeau, 2020; Menendez et al., 2020).

Since the beginning of the COVID-19 pandemic, maternal and perinatal care has been significantly diminished in LMICs due to lockdowns, closure of health institutions, lack of transport, delay in healthcare-seeking, and fear of contracting the virus (Akaba et al., 2022; Aranda et al., 2022; Asuming et al., 2022; Babalola et al., 2022; Burt et al., 2021; das Neves Martins Pires et al., 2021; Goyal et al., 2021; Landrian et al., 2022; Leung et al., 2022; Watson et al., 2021). Consequently, stillbirths, maternal depression, and maternal deaths have all increased in LMICs (Chmielewska et al., 2021). Maternal deaths have increased during the pandemic because of pregnant women being more vulnerable to viral infection due to immunological changes and anatomical alteration (Liu et al., 2020; Schwartz, 2020).

Early in the pandemic, healthcare providers recommended that women decrease their face-to-face visits, and substitute appointments with telemedicine (Fryer et al., 2020) and virtual visits using phone and video calls, to reduce their chances of contracting the virus (Coxon et al., 2020; Poon et al., 2020). While remote consultations can be used to sustain maternal and perinatal care, in LMICs, unavailable infrastructure, low technological literacy, lack of non-verbal feedback and bonding, limited monitoring, and financial and language barriers made it challenging to implement telemedicine (Galle et al., 2021).

## **1.6 Structure of the Ethiopian health system**

In 1993, the Ethiopian government launched a health policy articulating its vision for improving the health sector. This policy has been focused on providing health promotion, disease prevention, and curative components of health care in an equitable and accessible

manner (Ethiopian Ministry of Health, 2015b). Since implementing this health policy, the Ethiopian government has significantly invested in health infrastructure. For example, the funding of public hospitals and health centres, as well as providing staffing and supplying medical needs at the health centres and public hospitals. This is facilitated through collaboration with the regional health bureau and the Ministry of Health. Over the last three decades, the Ethiopian government has successfully improved the accessibility of health facilities, as evidenced by the increase in the number of health centres, from 243 in 1996 to 3735 in 2020, and hospitals, from 87 to 353 in 2020 in the same period (Ethiopian Ministry of Health, 2021a). Furthermore, the healthcare workforce has grown significantly in the past few years, with 181,872 healthcare providers employed in public health facilities in 2020. The health professional-population ratio has experienced noteworthy changes between 2004 and 2020: the ratio of physicians to population improved, increasing from 1:38,619 to 1:9,979, while the ratio of nurses increased from 1:13,920 to 1:1,705, and similarly, the ratio of midwives moved from 1:53,238 to 1:5,491 (Ethiopian Ministry of Health, 2021a; Kifle et al., 2006). Despite these significant advances in the ratio of Ethiopia's health professionals to population in the past two decades, it is essential to note that these still fall below the WHO's thresholds (WHO, 2016a). In addition, the government has been working to address the shortage of skilled birth attendants by providing training. This includes training midwives at the diploma level at regional Health Science Colleges, as well as providing programs for Bachelor of Science and Master of Science in Clinical Midwifery level, in Medical Doctor (General practitioner), in Master of Science in Integrated Emergency Surgical Officers, Obstetricians, Gynecologists and other health professionals at medical colleges and universities across the country (Ethiopian Ministry of Health, 2016).

In the implementation of the Health Sector Transformation Plan (HSTP) in Ethiopia, maternal healthcare coverage has substantially increased; for example, between 2005 and 2019, ANC1 rose from 28% to 74%, ANC4 from 12% to 43%, and institutional births increased from 5% to 48%. The neonatal mortality rate has fallen from 39 to 30 deaths per 1,000 live births, and the maternal mortality ratio (MMR) has declined from 865 per 100,000 live births to 401 in the same period (EPHI, 2019).

Ethiopia has a three-tiered healthcare system comprising primary, secondary, and tertiary hospitals. This ranking is based on the type and scope of healthcare that can be provided to clients, and the referral system connects healthcare facilities at various levels. This study

includes eleven primary hospitals, three general hospitals (secondary), and one comprehensive specialised (tertiary) teaching hospital.

A primary hospital typically accommodates 25-50 inpatients, and each has 53 staff members to provide necessary services. The local community has access to health services at the primary hospital 24/7, including all maternity care, comprehensive emergency obstetric care, and other medical and surgical services. Each primary hospital serves 60,000–100,000 people (Mann et al., 2016; WHO, 2017). A secondary (general) hospital provides care to 1–1.5 million people and acts as a referral centre for primary hospitals. It also offers services 24/7 and has a minimum of 10 beds for each speciality, or at least 50 beds for inpatient services (WHO, 2017). A tertiary hospital has at least 10 beds for each specialty or 110 beds for inpatient care, and serves as a referral centre for general hospitals. It offers treatment and rehabilitative care to 3.5–5 million people (Ethiopian & Standards Agency, 2012) (Figure 1).

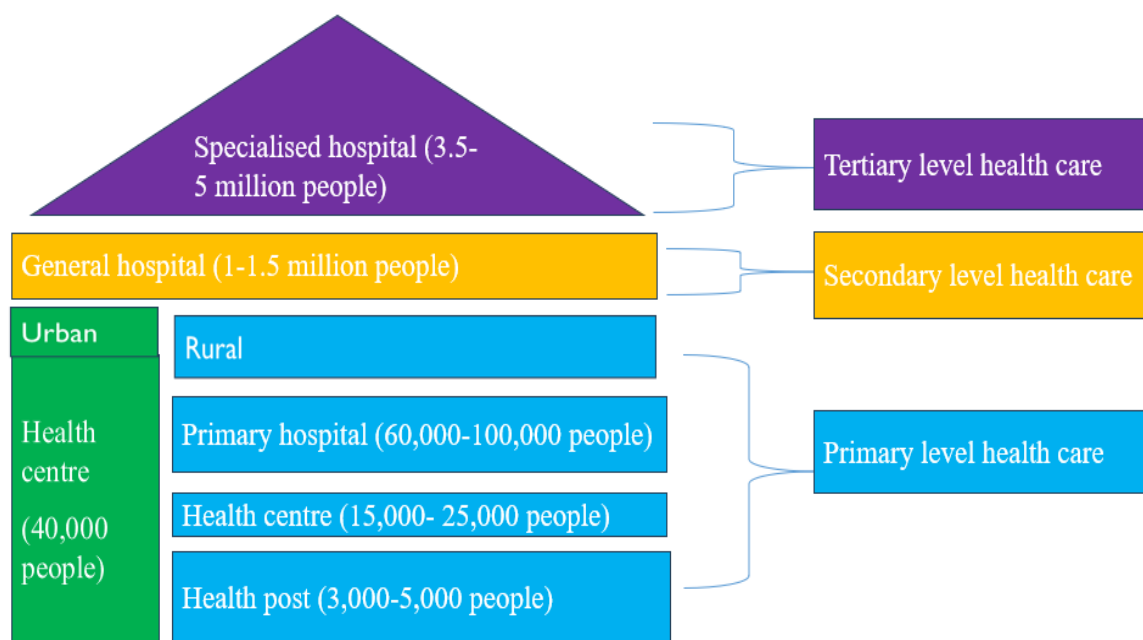


Figure 1: Health system structure in Ethiopia, adapted from the (Ethiopian & Standards Agency, 2012).

Improving maternal and neonatal health is a priority in Ethiopia, and the Health Sector Development Program (HSDP-IV) was targeted to reduce MMR from 590 to fewer than 267 deaths per 100,1000 live births by 2015 to achieve Millennium Development Goal 5 (MDG 5). However, in 2015, the MMR stood at 420 deaths per 100,1000 live births (Ethiopian Ministry of Health, 2015a). Similarly, although the Health Sector Transformation Plan's (HSTP-I) 2020

target was to reduce MMR from 420 to fewer than 199 deaths per 100,000 live births, by 2020, the MMR had only marginally fallen to 401 deaths per 100,000 live births. Neonatal mortality was targeted to fall from 28 to 10 deaths per 1,000 live births by 2020. However, the neonatal mortality rate recorded in 2020 was 30 deaths per 1000 live births (EPHI, 2019; Ethiopian Ministry of Health, 2021a). In this endeavour, the COVID-19 pandemic, drought, and instability have directly and indirectly disrupted the already fragile health system and hampered efforts to achieve the global target set by Sustainable Development Goal (SDG) 3.1 (Khetrapal & Bhatia, 2020) of less than 70 maternal deaths per 100,000 live births and less than 12 neonatal deaths per 1000 live births.

## **1.7 Problem statement**

Over the last two decades, maternal and perinatal care services have significantly expanded in LMICs, resulting in reduced maternal and neonatal mortality (WHO, 2019). Despite these positive developments, LMICs still experience a high incidence of maternal and neonatal deaths. The key to preventing these tragic losses lies in ensuring the provision of quality ANC and intrapartum care (Bauserman et al., 2020).

While considerable efforts have been made by the government of Ethiopia, rates of maternal and neonatal mortality remain among the highest in the world (Ayele et al., 2021). Ethiopia achieved 71% maternal mortality reduction in MDG5, which aimed to reduce maternal mortality by 75% (Tessema et al., 2017). Moreover, a modelling and prediction study found that the country would not achieve Sustainable Development Goal (SDG) 3.1, due to the impact of COVID-19, drought, and political instability, unless the government launched miraculous strategies (Ward et al., 2023).

The global effort to reduce maternal and neonatal mortality in LMICs faced a significant setback with the onset of COVID-19. Announced in early 2020, the outbreak of the virus would further compromise already overburdened health systems in LMICs (Ahmed et al., 2022). However, in the context of the COVID-19 pandemic, a new phenomenon has emerged that is affecting the global community through measures such as lockdowns and restrictions on movement within the country and abroad. These measures have had a direct and indirect impact on all facets of human life, including maternal and perinatal care.

Accordingly, the Ethiopian government and NGOs shifted their focus towards containing the spread of COVID-19 by implementing lockdown policies (Huluka et al., 2022) that encouraged people to stay at home. Consequently, the lockdown measures resulted in job losses for many (Angaw, 2021), restricted transport, and a continued increase in the COVID-19 death toll. These factors posed significant challenges to people's ability to fulfil their basic needs (Angaw, 2021). As a result of these combined forces, the provision of maternal and perinatal care has been and continues to be, impacted by the direct and indirect consequences of COVID-19 (Abagero et al., 2022).

Local and international maternal and neonatal health stakeholders faced enormous challenges during COVID-19. Due to resource constraints in low-income countries such as Ethiopia, health systems risked collapse. The paucity of studies on the impact of COVID-19 on maternal and perinatal access, uptake and provision in Ethiopia made it essential to conduct this study to estimate and explore the impact of COVID-19 on the country's maternal and perinatal access, uptake and provision. This study is, therefore, crucial for informing policy makers and stakeholders in the design of future interventions based on the relevant maternal and perinatal care indicators.

## **1.8 Rationale of the study and reflexivity statement**

Access to quality maternal and perinatal care can prevent maternal and neonatal mortality; however, the low coverage of these services poses a major challenge in low-resource settings, including Ethiopia. The quality and coverage of Ethiopia's maternal and perinatal care are notably low. COVID-19 has imposed a significant additional burden on already weak health systems. Infectious and emerging diseases can directly and indirectly affect the quality and coverage of maternal and perinatal care, ultimately resulting in increased maternal and neonatal mortality.

I have worked as a midwife in a maternity care ward in Ethiopia, where I frequently experienced the tragedy of maternal and neonatal deaths. Even as a clinical apprentice, I witnessed first-hand cases of maternal and neonatal morbidity and mortality which could have been prevented if women had sought early care at health facilities and received optimal ANC and intrapartum care. I also had the harrowing experience of witnessing a woman's death on the operating table. The pregnant woman, who had been bleeding at home for a day, went to

the primary hospital where she was admitted. However, after two days, the primary hospital referred her to a specialised hospital. She was already in a coma when she arrived at the specialised hospital. Initially, her family hesitated to consent to the necessary procedure and blood transfusion. It took an hour for the family to provide consent, and blood was finally obtained from the blood bank. Tragically, despite these efforts, the woman did not receive the optimal care she needed and died on the operating table. This is similar to stories of countless other women.

As I contemplated ways to contribute to improving maternal and perinatal care, much of my primary research focus has been on improving the understanding of maternity service delivery. Through my research activities, I have realised that maternal and neonatal mortality remains unacceptably high in Ethiopia despite the due attention of government and NGOs to reducing mortality. To address the issues, my aim was to examine hospital data and gather qualitative data from healthcare providers and women, to understand systemic drivers and make recommendations for restoring and improving services.

Limited studies have been conducted on the impact of COVID-19 on maternal and perinatal service delivery and care in Ethiopia. This is because COVID-19 is a newly emerging infectious disease; even existing studies are limited when it comes to estimating and exploring the impact of COVID-19 on maternal and perinatal access and uptake and the provision of care. While the existing studies in Ethiopia have attempted to reveal maternal care uptake during the pandemic, they have not compared it with maternal healthcare uptake in the period before the outbreak. This lack of comparison makes it challenging to determine whether COVID-19 or other factors have influenced trends. This study addresses the aforementioned issues using a mixed methods approach to estimate and explore maternal and perinatal care during the pandemic at a public hospital in the Sidama region. Furthermore, it explores health professionals' experiences and perceptions of maternal and perinatal care as well as pregnant women's experiences during the pandemic. Therefore, this study aims to explore the impact of COVID-19 on maternal uptake, access provision of perinatal care during the pandemic, which can provide valuable input for policymakers and the Ministry of Health to improve maternal and perinatal care indicators that have been affected during the pandemic.

## 1.9 Thesis structure

This thesis is structured as seven chapters. The current chapter has provided insight into the background to this study, and the local and global epidemiology of COVID-19 in the context of the direct and indirect impacts of emerging infectious diseases on human life, including COVID-19, on maternal and perinatal care in LMICs, explicitly focusing on Ethiopia. Chapter One has also described Ethiopia's healthcare system structure, the significant progress made over recent decades in maternal and perinatal care, and the coverage of maternal and perinatal care. Additionally, the existing knowledge gaps on the impact of COVID-19 on maternal and perinatal care in the study area were identified.

Chapter Two comprises a systematic review of three Ebola-affected West African countries, presenting the burden of emerging infectious diseases and their effects on maternal and perinatal care globally and in Ethiopia. The effects of the Ebola (EVD) outbreak and COVID-19 on maternal and perinatal care are discussed. The Ebola outbreak and its consequences for maternal health service utilisation and perinatal outcomes are explored as an example of the impacts of such an outbreak on maternal and perinatal care. Both the Ebola virus and COVID-19 are infectious diseases that have overwhelmed healthcare systems worldwide, with maternal and perinatal care especially affected by their spread. A review of the literature pertinent to the Ebola outbreak offers valuable knowledge and lessons learned that can contribute to a better understanding of and response to the challenges posed by the current pandemic. This systematic review examines the effect of EVD on maternal service utilisation and perinatal outcomes in three West African countries (Guinea, Liberia, and Sierra Leone). While Guinea, Liberia and Sierra Leone differ geographically from Ethiopia, these countries share significant demographic similarities, including their low-income country status, political instability, and high maternal and neonatal mortality rates. Furthermore, this chapter identifies the existing knowledge gaps concerning the impact of infectious disease on maternal and perinatal care access, uptake and provision.

Chapter Three details the theoretical frameworks and methodological approach of this study, including the study setting, data sources, source population, recruitment procedures, data collection, analytical process, and ethical consent of participants.



Chapter Four presents mixed methods findings on the impact of COVID-19 on ANC provision in the Sidama region of Ethiopia. This chapter describes the uptake of ANC before and during the pandemic and describes the barriers that arose to access, uptake, and provision of ANC with the onset of the pandemic.

Chapter Five presents mixed methods findings, exploring and determining the impact of COVID-19 on intrapartum care in the Sidama region of Ethiopia. It discusses intrapartum care and birth outcomes before and during the pandemic, the barriers to providing intrapartum care, delays in its provision, and the inadequacy of preventive measures for COVID-19.

Chapter Six is a qualitative study exploring women's views and experiences of receiving ANC and intrapartum care in the Sidama region of Ethiopia during the pandemic.

Chapter Seven synthesises the quantitative and qualitative findings to discuss key implications and recommendations for future research and clinical practice. The strengths and limitations of the study are also assessed.

## **Summary of background**

The preceding sections provided an overview of the COVID-19 pandemic and maternal and perinatal care in LMICs, and Ethiopia specifically. What is known about the impact of emerging viral infectious diseases on maternal and perinatal care in LMICs has been summarised. The problem statement and the rationale of the study were set out. The following sections present the literature review, which explores the impact of the Ebola virus outbreak and the COVID-19 pandemic on maternal and perinatal care.

## **Chapter 2: Literature Review**

### **2.1 Overview of emerging infectious diseases**

Infectious disease-related deaths have decreased significantly in high-income countries since the beginning of the 20<sup>th</sup> century and in LMICs over the past three decades (Elias et al., 2021). Investments in maternity and child healthcare have enabled reductions, and immunisation rates have reached 80% worldwide, lowering maternal and under-five-years' mortality rates by 50% (Elias et al., 2021; WHO, 2023a) and malaria mortality by 60%. There has been a more than 40% decline in HIV infection rates globally over the past three decades (Elias et al., 2021).

Despite increased access to healthcare, higher immunisation coverage, and improved sanitation, which have reduced the overall morbidity and mortality linked to infectious diseases, emerging and re-emerging infectious diseases remain a threat to global health security (Baker et al., 2022). Emerging infectious diseases are those that have been identified, introduced, or evolved, spreading quickly to new areas, and promptly changing incidence or coverage concerning hosts, geography, or vectors (Petersen et al., 2018). With the introduction of new infections to the host population, incidence and geographical coverage rise rapidly and pose a health threat (Mack et al., 2009). Infectious diseases, now regarded as 're-emerging' such as Ebola and Zika virus (Wang et al., 2021), originally referred to severe health issues in a specific area or globally, which then significantly decreased but are now emerging again as a threat to considerable numbers of the population (Spernovasilis et al., 2022). These diseases have made an overwhelming impact on lives and livelihoods around the world (Baker et al., 2022). Over 50 million people died during the 1918 influenza pandemic, the worst incident in recorded human history (Morens et al., 2020). More than 6.97 million deaths have been reported globally due to COVID-19 (WHO, 2023b). Since the 1970s, about 40 infectious diseases have been discovered, including SARS, MERS, Ebola, Chikungunya, avian flu, Swine flu, Zika and SARS-CoV-2 (Baylor College of Medicine, 2023).

The aim of this literature review is to describe the effect of the Ebola outbreak and COVID-19 on maternal healthcare uptake and perinatal outcomes. This serves as an example of the impact an epidemic can have on health infrastructure, particularly in relation to maternity services.

## **2.2 The effect of Ebola virus disease on maternal health service utilisation and perinatal outcomes in West Africa: a systematic review**

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### **Summary of findings**

Ebola virus disease (EVD) is an infectious haemorrhagic disease that has directly and indirectly affected health systems in Sub-Saharan countries, especially in three West African countries (Guinea, Liberia, and Sierra Leone).

ANC and institutional childbirth significantly decreased during the EVD epidemic, while it recovered after EVD. Stillbirth and neonatal death significantly increased, while maternal death decreased during EVD. Barriers to ANC attendance and institutional birth include community mistrust of healthcare providers, closure of health facilities, lockdowns, shortage of medical equipment, and lack of transport.

A review of the literature was conducted to assess the impact of the EVD epidemic on maternal and perinatal care, as an example of an epidemic affecting fragile health services. This review provides essential insights and lessons learned that can contribute to a better understanding of and response to the challenges posed by the current COVID-19 pandemic. While Guinea, Liberia and Sierra Leone differ geographically from Ethiopia, these countries share significant demographic similarities, including their low-income country status, political instability, and high maternal and neonatal mortality rates.

RESEARCH

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# The effect of Ebola virus disease on maternal health service utilisation and perinatal outcomes in West Africa: a systematic review



Zemenu Yohannes Kassa<sup>1,2\*</sup> Vanessa Scarf<sup>2</sup> and Deborah Fox<sup>2</sup>

## Abstract

**Background:** Ebola outbreaks pose a major threat to global public health, especially in Sub-Saharan Africa. These outbreaks disrupt the already fragile maternal health services in West Africa. The aims of this study is to assess the effect of Ebola virus disease (EVD) on maternal health service utilisation and perinatal outcomes.

**Methods:** This systematic review was conducted in West Africa, and the databases used were Medline, PubMed, CINAHL, Scopus, EMBASE and African journals online. Studies that reported the effect of the Ebola outbreak on maternal health services in West Africa were eligible for this systematic review. The search was limited to articles written in the English language only and published between 2013 and 2020. Three authors independently appraised the articles, and the data were extracted using a standardised data extraction format. The findings were synthesised using a narrative summary, tables, and figures.

**Results:** Twelve studies met the inclusion criteria and were used for this systematic review synthesis. The results showed that antenatal care significantly decreased during Ebola virus disease and strove to recover post-Ebola virus disease. Women were less likely to have institutional childbirth during Ebola virus disease and struggled to recover post-Ebola virus disease. In addition, this review revealed a substantially higher rate of maternal mortality post EVD than those observed before or during the outbreak.

**Conclusion:** Based on our findings, antenatal care, institutional childbirth, and postnatal care are attempting to recover post-Ebola virus disease. We recommended that responsible bodies and stakeholders need to prepare locally tailored interventions to increase the number of women attending ANC, institutional childbirth, and PNC services post-EVD and future outbreaks including COVID-19. In order to build trust, creating community networks between health care providers and trusted community leaders may increase the number of women attending antenatal care (ANC), institutional childbirth and postnatal care (PNC) post-EVD and during future outbreaks. Further studies are needed to examine health centre and hospital availability and accessibility, and capacity to deliver maternal health services post-Ebola virus disease and future outbreaks.

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### Plain Language Summary

Ebola virus disease (EVD) is a serious public health concern affecting the health of humans and other primates. These outbreaks disrupt the already fragile maternal health services in West Africa. There is limited data on the effect of EVD on maternal health service utilisation and perinatal outcomes in West Africa. This systematic review aims to synthesise evidence on maternal health service utilisation and perinatal outcomes before EVD, during EVD and post EVD.

This systematic review was conducted in West Africa, and the databases used were Medline, PubMed, CINAHL, Scopus, EMBASE and African journals online. Twelve studies met the inclusion criteria and were used for this systematic review synthesis. The results showed that antenatal care significantly decreased during the Ebola virus outbreak and strove to recover post-Ebola virus disease. This finding indicated that women were less likely to have an institutional birth during EVD and struggled to recover post-Ebola virus disease. Based on this finding, responsible bodies and stakeholders need to prepare locally tailored interventions to increase the number of women attending ANC, institutional childbirth, and PNC services post-EVD and future outbreaks.

**Keywords:** Ebola virus disease, Maternal health, West Africa

### Background

Ebola virus disease (EVD) is a serious public health concern affecting the health of humans and other primates [1]. The causative agent of Ebola is an RNA virus of the family Filoviridae, genus *Ebolavirus*. There are five known strains of the Ebola virus: Zaire Ebola virus (EBOV), Sudan Ebola virus (SUDV), Bundibugyo Ebola virus (BDBV), Forest Ebola virus (TAFV), and Reston Ebola virus (RESTV) [2–4]. Three of the above viruses are seriously pathogenic and lethal to humans. In contrast, the Reston virus is only pathogenic to non-human primates [5], and the natural reservoir of Ebola virus disease is in fruit bats [2, 6].

EVD is a virulent and extremely contagious viral haemorrhagic fever (VHF) [7], and its mode of transmission from person to person is via direct contact of the skin or mucous membranes with infected bodily fluids [1, 8, 9]. It was first discovered in 1976 in Zaire [10]. The 2014 Ebola outbreak posed a major threat to global public health, especially in West Africa. The first Zaire Ebola virus case was reported in December 2013 in Guinea, and it subsequently spread to Sierra Leone and Liberia [11]. The World Health Organization (WHO) declared the Ebola outbreak a public health emergency on August 8, 2014 [12]. From 2013 to 2016, 28,616 people had contracted EVD, and 11,310 people had died due to the Ebola virus disease in West Africa [13].

Similarly, maternal and neonatal deaths increased; directly by contracting the virus and indirectly through the overwhelming need for maternal health services [14]. In the last three decades, evidence showed that maternal mortality significantly decreased in three West African countries (Guinea, Liberia, and Sierra Leone) prior to EVD [15]. However, the EVD outbreak has reversed this tremendous progress in reducing maternal mortality [16–18]. Maternal and child health experts, policy-makers and governments have implemented different

intervention strategies to increase maternal health service utilisation in three West African countries before EVD (Guinea, Liberia, and Sierra Leone) [19]. These strategies include, for example, preparing maternal waiting rooms [20, 21], providing free health services [22], training and deploying midwives at health institutions [23], and community engagement in health [24].

Despite the above, interventions, maternal and neonatal morbidity and mortality are still high in these countries. In 2013, there were an estimated 650 maternal deaths per 100,000 live births recorded in Guinea, 640 maternal deaths per 100,000 live births recorded in Liberia, and 1100 maternal deaths per 100,000 live births recorded in Sierra Leone [25]. Furthermore, an estimated 30 perinatal deaths per 1000 live births occurred in Liberia in 2013 Demographic and Health Survey (DHS), and 39 perinatal deaths per 1000 live births occurred in Sierra Leone in 2013 DHS. The pooled estimated was 36 perinatal deaths per 1000 live births in West Africa [26].

Ebola virus disease has decreased institution-based childbirth [27, 28], devastating impact on the health system and health care providers [29, 30] and caused thousands of maternal and neonatal deaths. Due to these factors, there has also been an increase in maternal and neonatal morbidity and mortality through direct and indirect impacts on institutional childbirth [28, 31]. In 2014, the United Nations Population Fund projected that 120,000 maternal deaths could have occurred due to disruption of the Ebola outbreak if the necessary life-saving emergency obstetrics care had not been urgently deployed across Guinea, Sierra Leone, and Liberia [30].

The EVD outbreak disturbed the already weak maternal health services [32, 33] due to ignorance, lack of supplies, or the shifting of health staff, equipment from the maternal service to EVD management [34, 35] and shut down public health facilities [36]. Additionally, medical health care providers' deaths, the absence of health

care providers, the fear of being exposed to body fluids at health facilities [37, 38], and women's belief that health facilities could be a source of Ebola transmission [39, 40], along with a negative attitude about the staff [41], has disrupted maternal health service utilisation.

While some systematic reviews have focused on determining the impact of the Ebola virus disease outbreak on maternal health service utilisation [28], these have not shown the effect of the Ebola virus disease outbreak on perinatal outcomes. A previous systematic review focused on barriers to maternal health services during the Ebola virus disease outbreak [42]. Therefore, this systematic review aims to synthesise evidence of the effect of the Ebola virus disease outbreak on maternal health service utilisation and perinatal outcomes.

## Methods

### Bibliographic data bases search strategies

This systematic review was limited to peer-reviewed, published studies. The search strategy included the following databases: Medline, PubMed, CINAHL, Scopus, EMBASE and African journals online. Using special index search terms (medical subject headings (MeSH)) "Maternal health service" OR "reproductive health service" OR "maternal and new-born health service" OR "antenatal care" OR "postnatal care" OR "maternal primary care" OR "obstetrics care" OR "maternal-child health services" AND "Ebola" OR "haemorrhagic fever" AND "utilisation" OR "access" OR "uptake" OR "availability" AND "West Africa". In addition, additional articles were retrieved by using cross-referencing of references, titles, and abstracts. We registered our protocol with Prospero international register of systematic reviews (<http://www.crd.york.ac.uk/PROSPERO/>) in September 2020 (CRD42020202548). The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) checklist [43] was utilised to present the findings on the impact of Ebola on obstetric care in West Africa (Fig. 1).

### Inclusion and exclusion criteria

Studies that reported the impact of the Ebola outbreak on maternal health services in West Africa were eligible for this systematic review. The search was limited to English language articles only, and articles published between 2013 and 2020 were included. Quantitative studies of cross-sectional, ecological, retrospective cohort and prospective cohort study designs in West Africa were included, irrespective of whether the study was implemented in a health facility and/or in the community.

Review articles, notes, editorial letters, commentaries, studies where the participants were not human, case reports, conference abstracts and proceedings, articles with incomplete information, articles with

methodological problems or with full text not available and studies that reported the impact of Ebola on the health system without reporting its impact on maternal health services were excluded. When multiple publications of the same data exist, we used the most inclusive, comprehensive, and recent articles.

### Data quality appraisal

Three authors (ZYK, VS and DF) independently extracted data using a standardised data extraction format. The data extraction was performed using the Joanna Briggs Institute (JBI) critical appraisal checklist for simple prevalence, which contains nine checklist items. The tool contains nine criteria to assess the quality of the studies, such as the appropriateness of the sampling frame and sampling method; adequacy of the sample size; complete descriptions of the study setting and participants, data analysis, statistical analysis, and response rate; the validity of the methods used to identify the condition; and the reliability of measurements between study participants [44]. Based on the above criteria, three authors (ZYK, VS and DF) independently assessed the quality of the articles. Any disagreement was resolved through discussion and consensus among the three authors. The quality of the study was evaluated, and studies that scored  $\geq 5$  out of 9 were included in this systematic review. Finally, the selected articles that met the inclusion criteria were retained for the narrative synthesis.

### Data synthesis

We employed a narrative synthesis approach to present the findings of this systematic review [45]. We evaluated the impact of EVD on different maternal health services, including antenatal care [1–4], facility-based childbirth, caesarean section, and postnatal care, which are all part of the continuum of care [46]. Finally, summary tables were produced from the crude data demonstrating the impact of the Ebola outbreak on maternal health services (Table 1).

### Operational Definition

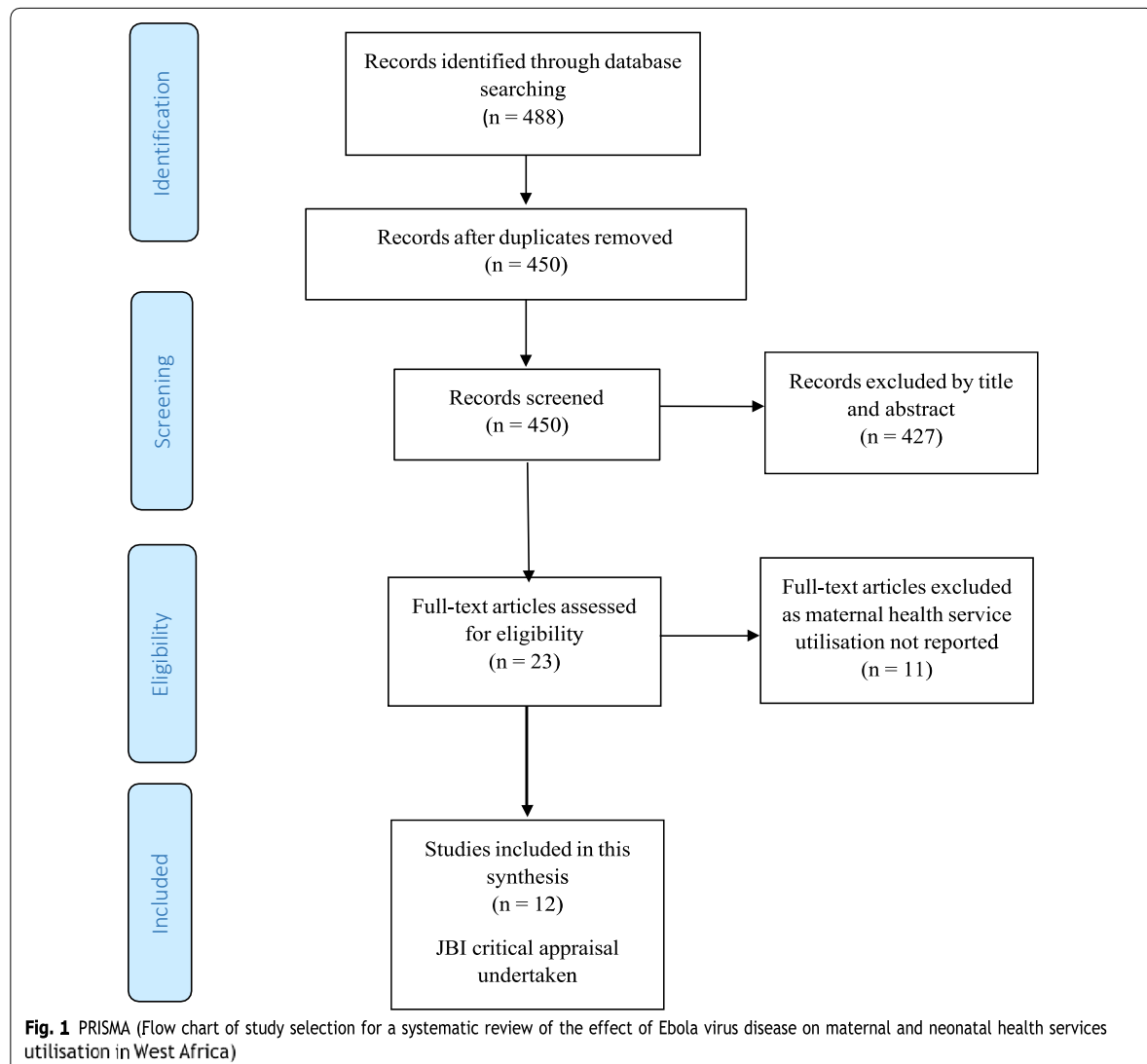
Maternal health services are those providing antenatal care, institutional childbirth, and postnatal care.

Antenatal care is the care received by women during pregnancy from skilled health care providers at least once at a health facility.

Institutional childbirth is childbirth attended by skilled health care providers at health facilities.

Postnatal care is received by women from skilled health care providers at health facilities from 48 hours to 6 weeks after childbirth.

Stillbirth is the death of a baby before or during birth after 28 weeks of gestation.



Neonatal death is the death of a baby within the first 28 days of life.

Perinatal mortality is stillbirth plus early (less than seven days) neonatal death.

## Results

Our search strategy retrieved 488 articles from the selected databases that were eligible for first-round screening of titles and abstracts. Thirty-eight articles were excluded due to duplication, 427 articles were excluded based on their titles and abstracts, and the remaining 23 articles were appraised with a full-text screening. Eleven articles were excluded after a full-text

review due to unreported maternal health service utilisation. Finally, 12 studies [16–18, 35, 39, 47–53] were included for this systematic review that met the critical appraisal checklists, irrespective of their study design (Fig. 1).

### Characteristics of the included studies

Two-thirds (8 studies) of the included articles were cross-sectional study designs, and the remaining articles were case series, ecological, retrospective cohort and prospective cohort studies. More than 40% (5 studies) of the included articles were published in 2017, one-fourth of the included articles were published in 2016, and

**Table 1** Evidence summary of a systematic review of the effect of the Ebola outbreak on maternal health services [16–18, 35, 39, 47–53]

Author, year Country	Study design	Study period	Study objective	Results	SQ
Brolin et al. 2016 [35] Sierra Leone	Cross-sectional study	From January 2014 to May 2015	To assess the potential impact of EVD on nationwide access to obstetric care	<ol style="list-style-type: none"> <li>1. Pre-Ebola virus disease (EVD) outbreak hospital childbirth was 394, and hospital childbirth decreased by 312 (– 21%) during the outbreak</li> <li>2. During EVD slow down hospital childbirth decreased by 283 (– 28%)</li> <li>3. Pre-EVD caesarean section birth was 112, and caesarean section birth decreased by 89(– 20%) during peak the outbreak</li> <li>4. During EVD slowdown caesarean section birth decreased by 89(-20%)</li> </ol>	8/9
Camara et al. 2017 [47] Guinea	Ecological study	Pre-Ebola (1 March 2013 to 28 February 2014), during Ebola (1 March 2014 to 28 February 2015) and post-Ebola (1 March to 31 July 2016)	To compare trends in family planning, antenatal care, and institutional deliveries over the period before, during and after the outbreak	<ol style="list-style-type: none"> <li>1. Pre-EVD average monthly ANC1 contact was 2053, and during EVD ANC1 contact declined by 59% (842) and similar trends ANC3 contact and above as ANC1 contact</li> <li>2. During post-Ebola average monthly ANC1 contact increased by 1260 and recovered by 63% (recovery gap was 37%, <math>p &lt; 0.001</math> before Ebola)</li> <li>3. Pre EVD average monthly institutional childbirth was 1223, during EVD institutional childbirth decreased by 62% (464) in October 2014 (during the peak EVD outbreak period)</li> <li>4. During post-EVD average monthly institutional childbirth was 792 (recovery gap was 33%, <math>p &lt; 0.001</math>)</li> <li>5. Caesarean section significantly decreased during the peak of the EVD outbreak</li> <li>6. A fully recovery was observed in post EVD caesarean section childbirth monthly mean caesarean section was (37, SD = 8) compared to the pre-Ebola level (38, SD = 7, <math>p = 0.692</math>)</li> <li>7. Maternal deaths were low and remained similar across the three periods (0.1–0.2%, <math>p &gt; 0.05</math>). Adverse new-born outcomes (deaths and stillbirths) were also low across the periods (range 1.1–1.7%) but were higher in the post-Ebola period compared to the pre-Ebola period (<math>p &lt; 0.01</math>)</li> </ol>	9/9



**Table 1** (continued)

Author, year Country	Study design	Study period	Study objective	Results	SQ
Caulker et al. [52] 2017 Sierra Leone	Cross-sectional study	From 2013 to 2015	To compare maternal health service utilization trends before, during, and after the Ebola outbreak (2014–2016)	<p>1. Pre-EVD outbreak monthly ANC1 contact was (<math>N = 1350 \pm 109</math>), and ANC1 contact did not significantly decrease during EVD (<math>N = 1329 \pm 159</math>, <math>p = 0.7</math>), and ANC1 contact did not increase during post EVD (<math>N = 1388 \pm 127</math>, <math>p = 0.9</math>).</p> <p>2. Pre-EVD outbreak monthly ANC4 contact was (<math>N = 1172 \pm 52</math>), and ANC4 significantly decreased during EVD outbreak (<math>N = 1115 \pm 76</math>, <math>p = 0.05</math>), and ANC4 significantly increased during post EVD (<math>N = 1131 \pm 46</math>, <math>p = 0.05</math>).</p> <p>3. Pre-EVD outbreak monthly institutional childbirth was (<math>N = 1109 \pm 65</math>), and institutional childbirth did not significantly decrease during EVD outbreak (<math>N = 1090 \pm 56</math>, <math>p = 0.5</math>), and institutional childbirth did not significantly increase during post-EVD (<math>N = 1127 \pm 72</math>, <math>p = 0.2</math>).</p> <p>4. Pre-EVD outbreak monthly maternal postnatal care was (<math>n = 1110 \pm 51</math>), and maternal postnatal care did not significantly decrease during EVD outbreak (<math>N = 1105 \pm 61</math>, <math>p = 0.8</math>), and maternal postnatal care did not significantly increase post-EVD (<math>n = 1165 \pm 87</math>, <math>p = 0.09</math>).</p> <p>5. Pre-EVD outbreak monthly neonatal postnatal care was (<math>N = 1028 \pm 41</math>), and neonatal postnatal care did not significantly decrease during EVD outbreak (<math>N = 1050 \pm 67</math>, <math>p = 0.4</math>), and neonatal postnatal care did not significantly increase post-EVD (<math>N = 1085 \pm 114</math>, <math>p = 0.3</math>).</p>	8/9

**Table 1** (continued)

Author, year Country	Study design	Study period	Study objective	Results	SQ
Delamou et al. 2017 [16] Guinea	Retrospective cohort study	Pre-Ebola virus disease epidemic (January 2013 to February 2014), during the epidemic (March 2014 to February 2015) and post epidemic (March 2015, to February 2016)	To examine monthly service use data for eight maternal and child health service indicators	<ol style="list-style-type: none"> <li>1. Pre-EVD ANC1 contact significantly increased by 9568 (9568, 95% CI 8941 to 10 195, <math>p &lt; 0.0001</math>), and ANC3 and above contact significantly increased 7555 (7555, 95% CI 7098 to 8012, <math>p &lt; 0.0001</math>)</li> <li>2. Pre-EVD ANC1 contact increased per month by 109 (109, 95% CI 54 to 164, <math>p &lt; 0.0005</math>), and ANC3 and above contact increased per month by 119 (95% CI 79 to 158, <math>p &lt; 0.0001</math>)</li> <li>3. During EVD ANC1 contact average monthly decreased by 923 (−923, 95% CI −1882 to 36, <math>p = 0.0585</math>), and ANC3 contact decreased per month by 624 (−624, 95% CI 1568 to 320, <math>p = 0.1834</math>)</li> <li>4. Trends changed during versus pre-EVD ANC1 contact significantly decreased by 418 (−418, 95% CI −535 to −300, <math>p &lt; 0.0001</math>), and ANC3 contact and above contacts significantly decreased by 363 (−363, 95% CI 485 to 242, <math>p &lt; 0.0001</math>)</li> <li>5. Pre-EVD institutional childbirth significantly increased by 3602 (3602, 95% CI 3345 to 3859, <math>p &lt; 0.0001</math>)</li> <li>6. Pre-EVD institutional childbirth increased per month by 61 (61, 95% CI 38 to 84, <math>p = 0.0001</math>)</li> <li>7. During EVD institutional childbirth decreased per month by 72 (72, 95% CI 333 to 476, <math>p = 0.7163</math>)</li> <li>8. During EVD institutional childbirth significantly decreased by 240 (−240, 95% CI −293 to −187, <math>p &lt; 0.0001</math>)</li> <li>9. Post-EVD average monthly ANC1 attendance increased by 1712 (1712, 95% CI 1357 to 3066, <math>p = 0.0157</math>), and ANC3 contacts and above increased per month by 103 (103, 95% CI 1385 to 1590, <math>p = 0.8871</math>)</li> <li>10. Post-EVD institutional childbirth increased per month by 982 (982, 95% CI 362 to 1602, <math>p = 0.0034</math>)</li> <li>11. Overall trend of post EVD ANC1 contact significantly declined by 136 (−136, 95% CI −231 to −40, <math>p = 0.0075</math>), and ANC3 contact and above did not significantly decline by 13 (13, 95% CI −409 to 134, <math>p = 0.8286</math>)</li> <li>12. Overall trend of institutional childbirth did not significantly decline by 30 (−30, 95% CI −80, to 20, <math>p = 0.2294</math>)</li> </ol>	7/9

**Table 1** (continued)

Author, year Country	Study design	Study period	Study objective	Results	SQ
Jones et al 2016 [17] Sierra Leone	Cross-sectional study	April 2013–January 2015	To determine the impact of the Ebola virus epidemic on routine maternity services	<ol style="list-style-type: none"> <li>1. ANC1 and above contact significantly decreased by 18% (IRR = 0.82, 95% CI 0.79 to 0.84, <math>p &lt; 0.001</math>) during the EVD outbreak</li> <li>2. Institutional childbirths significantly decreased by 11% (IRR = 0.89, 95% CI 0.87 to 0.91, <math>p &lt; 0.001</math>) during EVD outbreak</li> <li>3. Postnatal care significantly decreased 22% (IRR = 0.78, 95% CI 0.75 to 0.80; <math>p &lt; 0.001</math>) during the EVD outbreak</li> <li>4. Maternal mortality ratio at the health facilities significantly increased by 34% (IRR = 1.34, 95% CI 1.07 to 1.69, <math>p = 0.01</math>) during the EVD outbreak, and stillbirth rate significantly increased by 24% (IRR = 1.24, 95% CI 1.14 to 1.35, <math>p &lt; 0.001</math>) during the EVD outbreak</li> </ol>	8/9
Leno et al. 2018 [48] Guinea	Cross-sectional study	From January 1, 2013, to December 31, 2014	To compare PMTCT indicators before Ebola (2013) and during Ebola (2014)	<ol style="list-style-type: none"> <li>1. Pre-EVD the mean ANC1 and above contact was (1617 ± 53) in 2013 versus during EVD 1065 ± 29 in 2014, <math>p = 0.0004</math> EVD affected areas. ANC contact declined by 41%</li> <li>2. Pre-EVD the mean ANC1 and above contact was (1817 ± 331) in 2013 versus during EVD (1689 ± 280 in 2014, <math>p = 0.5696</math>) in EVD unaffected areas. ANC1 and above contact declined by 7% (1689 ± 280 in 2014, <math>p = 0.5696</math>) EVD unaffected areas</li> <li>3. The proportion of HIV pregnant women who gave birth at home increased significantly during the EVD (7% in 2013 versus 18% in 2014) EVD affected areas, <math>p &lt; 0.0001</math></li> <li>4. Pregnant women tested for HIV significantly decreased (1460 ± 266) in 2013 versus during EVD (717 ± 140 in 2014, <math>p = 0.000</math>) EVD affected areas. Pregnant women tested for HIV did not significantly decrease (1622 ± 247) in 2013 versus during EVD (1379 ± 212, <math>p = 0.1556</math>) in 2014 EVD unaffected areas</li> </ol>	7/9
Lori et al. 2015 [39] Liberia	Case series study	January 1–October 30, 2014	To determine women's maternal health service uptake between January 2012 and October 2014	<ol style="list-style-type: none"> <li>1. Pre-EVD, average monthly institutional births were 400–500</li> <li>2. In this study EVD cases increased while the institutional childbirths dramatically decreased by 113 in August 2014</li> </ol>	5/9
Ly et al. 2016 [18] Liberia	Cross-sectional study	The pre-EVD period (March 24, 2011–June 14, 2014) and EVD period (June 15, 2014–April 13, 2015)	To estimate the impact of the Ebola outbreak on facility-based birth	<ol style="list-style-type: none"> <li>1. Pre-EVD outbreak, 686 child births were reported and 212 during the outbreak</li> <li>2. During EVD outbreak institutional childbirths significantly declined by 30% (AOR = 0.70, 95% CI 0.50–0.98, <math>p = 0.037</math>) Women's belief that health facilities are or maybe a source of Ebola transmission (AOR = 0.59, 95% CI 0.36 to 0.97, <math>p = 0.038</math>)</li> </ol>	9/9

**Table 1** (continued)

Author, year Country	Study design	Study period	Study objective	Results	SQ
Quaglio et al. [53] 2019 Sierra Leone	Prospective observational study	From 2012 to 2018	To determine the trends concerning the utilization of maternal and child health (MCH) services before, during and after the Ebola outbreak	<ol style="list-style-type: none"> <li>1. Pre-Ebola monthly average ANC1 contact increased by 7 (7, 95% CI 4 to 10, <math>p &lt; 0.001</math>), and ANC4 contact increased by 6 (6, 95% CI 4 to 8, <math>p &lt; 0.001</math>) at community level</li> <li>2. Pre-Ebola monthly average institutional childbirth increased by 8 (8, 95% CI 6 to 10, <math>p &lt; 0.001</math>) at community level</li> <li>3. The trends pre-EVD versus during EVD significantly changed ANC1 contact by 74 (74, 95% CI 3 to 145, <math>p 0.042</math>) and ANC 4 contact by 80 (80, 95% CI 21 to 139, <math>p 0.008</math>) at community level</li> <li>4. The trends pre-EVD versus during EVD significantly changed institutional childbirths by 148 (148, 95% CI 99 to 196, <math>p &lt; 0.001</math>) at community level</li> <li>5. The trends pre-EVD versus post EVD significantly decreased ANC 1 contact by 6 ( - 6, 95% CI -10 to - 3, <math>p &lt; 0.001</math>), ANC 4 by 8 ( - 8, 95% CI -11 to 5, <math>p &lt; 0.001</math>) at community level</li> <li>6. The trends pre-EVD versus post EVD institutional childbirth significantly decreased ( - 7, 95% CI -10 to 4, <math>p &lt; 0.001</math>) at community level</li> <li>7. Pre-EVD institutional childbirth significantly increased by 11 (11, 95% CI 2 to 21, <math>p 0.02</math>) at hospital level</li> <li>8. The trends pre-EVD versus during EVD major obstetric complications significantly changed by 4 (4, 95% CI 1 to 7, <math>p 0.006</math>) at hospital level</li> <li>9. The trends pre-EVD versus during EVD institutional childbirth significantly changed by 4 (4, 95% CI 2 to 6, <math>p 0.001</math>) at hospital level</li> <li>10. The trends pre-EVD versus during EVD in the reduction of maternal deaths by 1 ( - 1, 95% CI -2 to 0, <math>p 0.042</math>) at hospital level</li> <li>11. The trends pre-EVD versus post EVD major obstetric complications significantly decreased by 4 ( - 4, 95% CI -7 to 1, <math>p 0.009</math>) at hospital level</li> <li>12. The trends pre-EVD versus post EVD institutional childbirth significantly decreased by 3 ( - 3, 95% CI -5 to 1, <math>p 0.001</math>) at hospital level</li> <li>13. The reduction of maternal deaths pre versus during EVD (-1, 95% CI -2 to 0, <math>p 0.042</math>) at hospital level</li> </ol>	9/9

**Table 1** (continued)

Author, year Country	Study design	Study period	Study objective	Results	SQ
Shannon et al. 2017 [49] Liberia	Cross-sectional study	Before (July–December 2013), during (July–December 2014) and after (July–December 2015) the EVD outbreak	To determine access to antenatal care (ANC), deliveries and their outcomes before, during and after the 2014–2015 Ebola outbreak	<ol style="list-style-type: none"> <li>1. ANC1 declined by 14%, and ANC4 and above also declined by 9% in 2014 compared with 2013</li> <li>2. During EVD, skilled birth attendance declined by 32%, unskilled birth attendance declined by 76%, and caesarean section declined by 60%</li> <li>3. Pre-Ebola, there were 538 stillbirths from 48,864 total births</li> <li>4. During Ebola, there were 328 stillbirths from 30,781 total births (RR = 0.61, 95% CI 0.53 to 0.70)</li> <li>5. Post-Ebola 504 stillbirths from 48,260 total births (RR = 0.60, 95% CI 0.53 to 0.68)</li> <li>6. Pre-Ebola, there were 276 neonatal deaths from 48,326 live births</li> <li>7. During Ebola, there were 98 neonatal deaths from 30,453 live births (RR = 0.56, 95% CI 0.45 to 0.71)</li> <li>8. Post-Ebola, there were 212 neonatal deaths from 47,765 live births (RR = 0.78, 95% CI 0.65 to 0.93)</li> <li>9. Pre-Ebola, there were 155 maternal deaths from 48,864 live births</li> <li>10. During Ebola, there were 73 maternal deaths from 30,781 live births (RR = 0.75, 95% CI 0.57 to 0.98)</li> <li>11. Post-Ebola, there were 130 maternal deaths from 48,260 live births (RR = 0.85, 95% CI 0.67 to 1.07)</li> </ol>	6/9
Sochas et al. 2017 [51] Sierra Leone	Cross-sectional study	From 2012 to 2015	To quantify the extent of the drop in utilization of essential reproductive, maternal, and neonatal health services	<ol style="list-style-type: none"> <li>1. Pre-Ebola ANC4 attendance was 74.2%, and during EVD ANC4 attendance decreased by 30.7%</li> <li>2. During post-EVD ANC4 attendance decreased by 22.2%</li> <li>3. Pre-Ebola institutional childbirth was 57.4% and during EVD declined by 13.0%</li> <li>4. During post-EVD institutional childbirth decreased by 8.7%</li> <li>5. Pre-Ebola PNC was 68.3%, and during EVD, it declined by 19.8%</li> <li>6. Post-Ebola PNC decreased by 13%</li> <li>7. Due to the decline of obstetric care, an additional 3593 maternal, neonatal and stillbirth deaths occurred in 2014–2015</li> </ol>	8/9

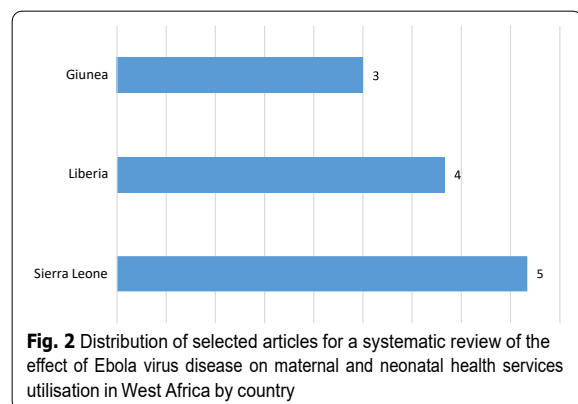
**Table 1** (continued)

Author, year Country	Study design	Study period	Study objective	Results	SQ
Wagenaar et al. 2018 [50] Liberia	Cross-sectional study	from 1 January 2010 to 31 December 2016	To estimate the immediate and lasting effects of the 2014–2015 Ebola virus disease (EVD) outbreak on public-sector primary healthcare delivery	<ol style="list-style-type: none"> <li>1. Pre-EVD ANC1 significantly decreased by 30.8% (-30.8, 95% CI - 38.4% to - 23.3%, p &lt; 0.001)</li> <li>2. Early EVD ANC1 contact significantly decreased by 35.2% ( -35.2, 95% CI -45.8% to 24.7%, p &lt; 0.001)</li> <li>3. Post EVD ANC1 contact decreased by 12,426 (-12,426, 95% CI -53,898 to 29,546, 0.558)</li> <li>4. Pre-EVD institutional births significantly increased by 91.6% ( 91.6%, 95% CI 95% CI 61.4% to 121.9%, p &lt; 0.001)</li> <li>5. During EVD Institutional births significantly decreased by 5122 ( 5122, 95% CI 8767 to -1234, p = 0.003)</li> <li>6. Post EVD institutional childbirth decreased by 1639 ( -1639, 95% CI -18,343 to +16,229, p = 804)</li> <li>7. Early EVD Postnatal care significantly lessened within 6 weeks of births by 17,191 ( -17,191, 95% CI -28,344 to 5,775, p 0.002)</li> <li>8. Post EVD PNC significantly declined by 15,144 ( - 15,144, 95% CI - 29,453 to - 787, p = 0.040)</li> </ol>	9/9

ANC1 1st Antenatal care visit (booking visit); ANC4 four Antenatal care visits; IRR incidence rate ratio; EVD Ebola Virus Disease; QS quality score

**Table 2** Characteristics of included studies for systematic review

Category	Subcategory	Frequency	Percent (%)
Study design	Cross sectional	8	66.7
	Ecological	1	8.3
	Case series	1	8.3
	Retrospective cohort	1	8.3
	Prospective cohort	1	8.3
Year of publication	2015	1	8.3
	2016	3	25
	2017	5	41.7
	2018	2	16.7
	2019	1	8.3



all included articles were published within 2015–2019 (Table 2). In addition, the included articles were from 3 West African countries (Guinea, Liberia, and Sierra Leone), 41.7% of the studies were from Sierra Leone [17, 35, 51–53], 33.3% were from Liberia [18, 39, 49, 50] and 25% were from Guinea [16, 47, 48] (Fig. 2).

### Antenatal care

Nine studies showed the effect of EVD on antenatal attendance [16, 17, 47–53] (Table 1). ANC attendance in Guinea, Sierra Leone and Liberia significantly decreased during the EVD outbreak. For example, a study conducted at Macenta district Guinea [47] showed that pre-EVD on average 2053 pregnant women attended per month for their first ANC, while pregnant women attendance for their first ANC declined on average per month by 59% (842) and similar trends have happened in ANC 3 and above during EVD outbreak. Post-EVD attending ANC1 increased 1260 per month and recovered by 63%. The recovery gap was (37%,  $p < 0.001$ ) compared with pre-EVD attending ANC1 (Table 1).

In addition, a study conducted at Forest region Guinea [16] revealed that pre-EVD on average attending ANC1

substantially increased per month by 109 (109, 95% CI 54 to 164,  $p = 0.0005$ ), and attending ANC3 and above also significantly increased by 119 (119, 95% CI 79 to 158,  $p < 0.0001$ ). However, attending ANC1 on average significantly decreased per month by 418 (– 418, 95% CI – 535 to – 300,  $p < 0.0001$ ), and attending ANC3 and above also significantly decreased by 363 (– 363, 95% CI – 485 to – 242,  $p < 0.0001$ ) during the EVD outbreak. The overall trend during versus post-EVD attending ANC1 on average significantly declined per month by 136 (– 136, 95% CI – 231 to – 40;  $p = 0.0075$ ), but the post-EVD attending ANC3 and above were not significantly different (13, 95% CI – 109 to 134,  $p = 0.8286$ ) (Table 1).

A similar study conducted in Guinea [48] revealed that, on average, 1617 women attended ANC at least once (ANC1) in 2013 ( $1617 \pm 53$ ), but on average, 1065 women attended ANC1 and above during the EVD outbreak in 2014 ( $1065 \pm 29$ ,  $p = 0.0004$ ) in EVD affected areas. It indicated that attending ANC1 and above significantly declined in Guinea Ebola-affected areas during the EVD outbreak. On average, 1817 women attended ANC1 and above in 2013 ( $1817 \pm 331$ ), but on average, 1689 women attended ANC1 and above during the EVD outbreak in 2014 ( $1689 \pm 280$ ,  $p = 0.5696$ ) in EVD unaffected areas. The study also showed that attendance at ANC1 and above did not significantly change in areas that were not affected by Ebola in Guinea (Table 1).

A study conducted in Liberia [50] showed that pre-EVD (January 2010–May 2014), attending ANC1 significantly decreased by 30.8% (95% CI – 38.4%, – 23.3%,  $p < 0.001$ ). During EVD, attending ANC1 also significantly decreased by 35.2% (95% CI – 45.8% to – 24.7%,  $p < 0.001$ ). Similarly, attending ANC1 and above significantly decreased by 18% (IRR = 0.82, 95% CI 0.79 to 0.84) in Sierra Leone [17] (Table 1). A study conducted at Pujehun district in Sierra Leone [53] showed that pre-EVD, attending ANC1 were on average seven times more likely to increase per month (7, 95% CI 4 to 10,  $p < 0.001$ ), and attending ANC4 were six times more likely to increase per month (6, 95% CI 4 to 8,  $p < 0.001$ ) at the community level. Whereas the trend pre-EVD versus post-EVD attending ANC1 were six times more likely to decrease per month (– 6, 95% CI – 10 to – 3,  $p < 0.001$ ), and attending ANC4 were eight times more likely to decrease (– 8, 95% CI – 11 to – 5,  $p < 0.001$ ) at the community level (Table 1).

### Institutional and mode of childbirth

Eleven studies reported the effect of EVD on institutional childbirth [16–18, 35, 39, 47, 49–53] (Table 1). Institutional childbirth in Guinea, Sierra Leone and

Liberia significantly decreased during the EVD outbreak compared with the same season pre-EVD. A nationwide study conducted in Sierra Leone [35] revealed that pre-EVD, the number of women attending institutional childbirth was 394. In contrast, institutional childbirth decreased by 28% (283) during EVD.

A study conducted in Sierra Leone [17] showed that institutional childbirth significantly decreased, by 11% (IRR = 0.89, 95% CI 0.87 to 0.91,  $p < 0.001$ ) during the EVD outbreak. A study conducted at Pujehun district in Sierra Leone [53] showed that pre-EVD, women were on average eight times more likely to attend institutional childbirth per month (8, 95% CI 6 to 10,  $p < 0.001$ ) at the community level. Post-EVD women were seven times less likely to attend institutional childbirth ( $-7$ , 95% CI  $-10$  to  $-4$ ,  $p < 0.001$ ) at the community level. Similarly, pre-EVD women were on average eleven times more likely to attend institutional childbirth per month (11, 95% CI 2 to 21,  $p = 0.02$ ) at the hospital level. Post-EVD, women were four times more likely to attend institutional childbirth (4, 95% CI 2 to 6,  $p = 0.001$ ) at the hospital level (Table 1).

A study conducted in Forest region Guinea [16] revealed that pre-EVD, institutional childbirth on average had significantly increased by 61 per month (61, 95% CI 38 to 84,  $p < 0.0001$ ). Institutional childbirth on average significantly decreased by 240 per month ( $-240$ , 95% CI  $-293$  to  $-187$ ;  $p < 0.0001$ ) during the EVD outbreak. The overall trend in institutional childbirth during EVD versus post EVD was not significantly different ( $-30$ , 95% CI  $-80$ , to 20,  $p = 0.2294$ ) (Table 1).

A study conducted in Rivercess County, Liberia [18] showed that institutional childbirth significantly decreased by 30% during EVD (AOR = 0.70, 95% CI 0.50–0.98,  $p = 0.037$ ). A nationwide study conducted in Liberia [49] revealed that pre-EVD 6468 births were attended by skilled health care providers, but only 4367 births were attended by skilled health care providers during EVD. These figures demonstrate that institutional childbirth decreased by 32% during EVD (Table 1).

Three studies reported the effect of EVD on caesarean section birth rates [35, 47, 49] (Table 1). Caesarean section childbirth in Guinea, Sierra Leone and Liberia significantly declined during the EVD outbreak. A nationwide study conducted in Sierra Leone [35] showed that pre-EVD caesarean section birth was 112 per week and that caesarean section birth rates decreased by 20% (89) during EVD. In Guinea [47] caesarean section birth rates significantly decreased during EVD. In contrast, full recovery has been noted in the post-Ebola monthly mean of caesarean section (37, SD = 8) compared to the pre-Ebola level (38, SD = 7,  $p = 0.692$ ). A nationwide study conducted in Liberia [49] revealed that pre-EVD

472 women gave birth by caesarean section while 191 women gave birth by caesarean section during EVD, indicating that caesarean section birth rates declined by 32% (Table 1).

Importantly, five studies reported the effect of EVD on maternal and neonatal mortality [17, 47, 49, 51, 53] (Table 1). Maternal and neonatal mortality rates in Guinea, Sierra Leone, and Liberia decreased during the EVD outbreak. A study conducted in Sierra Leone [17] showed that the maternal mortality ratio at the health facilities significantly increased by 34% (IRR = 1.34, 95% CI 1.07 to 1.69,  $p = 0.01$ ) during the EVD outbreak, and the stillbirth rate significantly increased by 24% (IRR = 1.24, 95% CI 1.14 to 1.35,  $p < 0.001$ ) during the EVD outbreak. Notably, a study conducted in Sierra Leone [53] revealed that pre-EVD maternal deaths significantly decreased by 1 ( $-1$ , 95% CI  $-2$  to 0,  $p = 0.042$ ) at the hospital level compared with EVD outbreak. Another study conducted in Sierra Leone [51] showed that an additional 3593 maternal deaths, neonatal deaths, and stillbirth occurred in 2014–2015 (Table 1).

Furthermore, a study conducted in Guinea [47] showed maternal deaths were low and remained similar across pre, during and post EVD (0.1–0.2%,  $p > 0.05$ ). Similarly, stillbirths were low and remained similar across pre, during and post-EVD. Neonatal deaths were also low pre and during (range 1.1–1.7%) but were higher in the post-Ebola period compared to the pre-Ebola period ( $p < 0.01$ ).

A study conducted in Liberia [49] revealed that maternal deaths decreased by 25% during EVD (RR = 0.75, 95% CI 0.57 to 0.98). Whereas post EVD maternal deaths increased by 15% (RR = 0.85, 95% CI 0.67 to 1.07) and similar with pre EVD. Stillbirth increased by 39% during EVD (RR = 0.61, 95% CI 0.53 to 0.70). Similarly, stillbirth increased by 40% post EVD (RR = 0.60, 95% CI 0.53 to 0.68). Neonatal deaths decreased by 44% during EVD (RR = 0.56, 95% CI 0.45 to 0.71), but neonatal deaths decreased by 22% post EVD (RR = 0.78, 95% CI 0.65 to 0.93) compared with pre-EVD. This number showed that neonatal deaths were lower during EVD than pre EVD and post EVD (Table 1).

### Postnatal care

Four studies reported the effect of EVD on institutional childbirth [17, 50–52] (Table 1). PNC in Sierra Leone and Liberia decreased during the EVD outbreak. A study conducted in Liberia [50] showed that during EVD, postnatal care significantly decreased within six weeks of births by 17,191 ( $-17,191$ , 95% CI  $-28,344$  to  $-5775$ ,  $p = 0.002$ ) and noticeably PNC significantly decreased post-EVD by 15,144 ( $-15,144$ , 95% CI  $-29,453$ ,  $-787$ ,  $p = 0.040$ ).

A study conducted in Sierra Leone [17] also revealed that attending PNC decreased by 22% during EVD



(IRR = 0.78, 95% CI 0.75 to 0.80). In Sierra Leone [51], a study showed that pre-EVD PNC utilisation was 68.3%. Whereas PNC decreased by 19.8% during the outbreak and recovered 13% post-EVD (Table 1).

## Discussion

The purpose of this systematic review was to identify, appraise and synthesise studies that reported the effect of EVD on maternal health service utilisation in West Africa. This systematic review showed that ante-natal care, institutional childbirth, and postnatal care significantly decreased during EVD in three countries (Guinea, Liberia, and Sierra Leone). This review included three articles from Guinea, four articles from Liberia, and five articles from Sierra Leone. Institutional childbirth was reported in eleven studies, caesarean section and postnatal care were each reported in three studies. Within countries, institutional childbirth was reported in five studies in Sierra Leone, ANC was reported in four studies in Sierra Leone, PNC was reported in three studies in Sierra Leone, and PNC wasn't reported in Guinea. Importantly, this systematic review presented maternal health services utilisation and perinatal outcomes pre-EVD, during EVD and post-EVD.

Among the findings, studies conducted in Guinea [16] and Sierra Leone [53] showed that pre-EVD, women were more likely to attend ANC1 and above. This finding is consistent with studies performed in Liberia [54], Sierra Leone [55], and Guinea [56]. Obstetric care providers, governments, maternal and child health advocates of these countries implemented effective interventions pre-EVD, for example, providing free health services [22] to improve ANC utilisation to reduce maternal and neonatal mortality [57].

The current review showed that in Guinea [16, 47] and Liberia [49, 50] showed significantly decreased in attending ANC1 and above during EVD, while one study in Sierra Leone [52] showed that attending ANC1 and above had no significant difference pre and during Ebola outbreak. This study was conducted in a rural district that experienced low Ebola cases than other areas. This finding is consistent with a study conducted in Taiwan [58] on SARS-1 and a review in West Africa [31], and a systematic review on Ebola [59]. The reduction of attending ANC 1 and above could be due to the absence of health care providers, a shortage of personal protective equipment, women beliefs that hospitals are exposure centres, the shutdown of some health institutions, the health care providers contracting Ebola virus and death [60], and/or distrust between health care providers and the community [61].

Notwithstanding, there was no significant change during EVD in the unaffected areas in Guinea [48]. Studies in Guinea [16, 47] and Sierra Leone [53] showed that ANC utilisation also significantly increased post-EVD but did not reach pre-EVD level. These findings suggest that EVD disturbed ANC services. To curb these problems, the international community, responsible bodies, and health care providers need to implement extraordinary interventions tailored to the local community to achieve Sustainable Development Goal 3 by 2030.

Institutional childbirth before EVD significantly increased in Guinea [16], Liberia [50], and Sierra Leone [53], while other studies in Guinea [47] and Liberia [18, 39] showed that institutional childbirth increased to some extent before EVD. These findings are similar to those of studies performed in Liberia [54], Sierra Leone [55], and Guinea [56]. In addition, studies conducted in Guinea [16], Liberia [18, 50], and Sierra Leone [17, 53] showed that women were less likely to have an institutional birth during EVD. These findings coincide with a study conducted in Taiwan [58], a study conducted in West Africa [14, 31] and a systematic review of the effect of Ebola on pregnancy and breast-feeding mothers [59]. These interruptions could be lack of transport due to lockdown, loss of income, lower health-seeking behaviour due to EVD, community mistrusted the health care providers and the health system [62] and shut down some health facilities [35].

Importantly, post-EVD women were more likely to have an institutional birth, indicating a recovery in Guinea [16, 47], Liberia [50] and Sierra Leone [53]. One study found the rate had returned to the pre-EVD period [16], while the others [47, 50, 53] had not fully recovered to the pre-EVD level of utilisation of institutional childbirth. The institutional childbirths could have recovered due to the resilience of the maternal health system, which is based on trust built between the community and health care providers, the capability of the healthcare facilities and deploying additional obstetric care providers in the highly EVD affected areas.

Caesarean section birth rates in Guinea [47], Sierra Leone [35] and Liberia [49] significantly declined during the EVD outbreak. In a nationwide study conducted in Sierra Leone, caesarean section decreased by 20% during EVD. Similarly, a nationwide study in Liberia showed that caesarean section decreased by 32% during EVD. Besides, a study conducted in Guinea showed that caesarean section births significantly decreased during EVD. In contrast, full recovery has been noted in the post-Ebola monthly mean of caesarean section (37, SD = 8) compared to the pre-Ebola level (38, SD = 7,  $p = 0.692$ ).

This finding is consistent with a study conducted in West Africa [14].

The current systematic review also showed that during EVD, there were higher rates of maternal mortality in Sierra Leone [17, 51], but during EVD, maternal mortality rates were lower than before EVD in Guinea [47] and Liberia [49]. Similarly, stillbirth and neonatal deaths were less likely to occur during EVD [49]. This decrease might be due to the shutdown of some health facilities, under-reporting or reporting errors, and increasing numbers of home birth. Moreover, this systematic review showed that during EVD, PNC also significantly decreased in studies performed in Liberia [50] and Sierra Leone [17]. Decrease in PNC might be due to fear of acquiring EVD by postpartum mothers, their family and health care providers' and a resulting pressure to discharge early. Contributing factors included economic recession, lack of transportation [62] and shutdown of health facilities [35] due to EVD.

This review has synthesised the current evidence of the effect of EVD on maternal health service utilisation and perinatal outcomes during EVD and post-EVD. Strengths of the study include that it systematically synthesised evidence on the effect of EVD on ANC, institutional childbirth, PNC, and perinatal outcomes. Data extraction and evidence synthesis were done by three reviewers, to strengthen the reliability of the study outcomes and minimise the subjectivity of evidence synthesis and interpretation. The quality of included studies was appraised using the Joanna Briggs Institute (JBI) validated quality appraisal method [44]. All studies included in this paper indexed in Medline, PubMed, CINAHL, Scopus, EMBASE and African journals online databases and published in English. Besides these strengths, the limitation of the systematic review a study focused on the access of ANC, institutional childbirth, PNC, and perinatal outcomes rather than on the quality of ANC, institutional childbirth, and PNC. Quality of ANC, institutional childbirth, and PNC are useful to consider, as access to poor quality services could increase maternal and perinatal morbidity and mortality. Data collection carried out after the outbreak ended is subject to social desirability and recall bias. Other limitations are lack of coverage of ANC, institutional childbirth, and PNC due to having no population-level denominators. Most of the data has been taken from records; there are under or overestimated data.

## Conclusion

Based on our findings, rates of antenatal care, institutional childbirth, and postnatal care were attempting to recover post-Ebola virus disease. We have three recommendations based on the synthesis of this review. Firstly, responsible bodies and stakeholders need to prepare

locally tailored interventions to increase the number of women attending ANC, institutional childbirth, and PNC services post-EVD and future outbreaks including COVID-19. Secondly, in order to build trust, creating community networks between health care providers and trusted community leaders may increase the number of women attending ANC, institutional childbirth, and PNC services post-EVD and during future outbreaks. Thirdly, governments and stakeholders need to establish a non-epidemic task force that provides equipment and monitors maternal health services to sustain services post-EVD and during future outbreaks. Further rigorous studies are needed to examine health centre and hospital availability, accessibility, and capacity to deliver maternal health services.

## Abbreviations

ANC: Antenatal care; EVD: Ebola virus disease; PNC: Postnatal care; WHO: World Health Organization.

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## Authors' contributions

ZYK developed the draft proposal under the supervision of DF and VS. All authors (ZYK, VS and DF) made a significant contribution to the conception and conceptualisation of the study protocol. All authors read and approved the final manuscript.

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## Availability of data and materials

Most of the data analysed during the systematic review are included in this manuscript.

## Declarations

### Ethics approval and consent to participate

Not applicable.

### Consent for publication

Not applicable.

### Competing interest

The authors declare that there are no competing interests.

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## **2.3 Impact of COVID-19 on maternal health service uptake and perinatal outcomes in Sub-Saharan Africa: a systematic review**

### **Summary of findings**

COVID-19 was first detected in Africa in Egypt, on February 14, 2020, and in Sub Saharan Africa in Nigeria, on 27 February 2020. Following that it spread to all African countries. More than 9.55 million COVID-19 cases in Africa and more than 175,443 deaths had been reported as of 25 October 2023.

This review's findings showed a significant decrease in ANC attendance and institutional birth during COVID-19. Furthermore, stillbirth and neonatal death increased during COVID-19. Barriers to ANC attendance and institutional birth included fear of contracting the virus, lockdowns, shortage of medical equipment, and lack of transport.

### **Background**

COVID-19 is a highly contagious viral pneumonia caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Chen et al., 2020). This is a rapidly spreading virus with cases found worldwide since its first identification in Wuhan, China, in December 2019 (Rasmussen et al., 2020; WHO, 2020). The pandemic has caused a significant global public health problem that has interrupted health system service delivery and infrastructure, most notably in LMICs (Kotlar et al., 2021).

A single disease, COVID-19 has shown how the daily lives of infected and non-infected people can be affected in many ways (Kajal & Anam, 2020; Shang et al., 2021). One of its effects was the restriction of non-essential movement between local areas and abroad for more than a year. Additionally, the world focused on preventing the spread of COVID-19, and the subsequent loss of key workers through illness, death, or self-isolation following contact with infected people (Carter et al., 2020) has impacted healthcare systems across LMICs.

Pregnant women have experienced the direct and indirect impact of COVID-19 on their health, and the pandemic has continued to negatively impact many pregnant women and their offspring (Papageorgiou et al., 2021). The physiological, immunological, anatomical, and hormonal changes that occur during pregnancy (Zhao et al., 2020) leave women more vulnerable than the general population to emerging infectious diseases. Past infectious diseases such as severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), Ebola virus disease (EVD), H1N1 pandemic influenza, and Zika virus (Mehand et al., 2018) have caused adverse pregnancy outcomes including renal failure, sepsis, disseminated intravascular coagulation (DIC), death (Lam et al., 2004), spontaneous abortion (Payne et al., 2014), preterm birth, stillbirth (Olgun, 2018), intrauterine growth restriction (Wong et al., 2004), preeclampsia (Villar et al., 2021), haemorrhage, and microcephaly (Butler, 2014; Rasmussen et al., 2016).

The pandemic affects the efficiency of the healthcare system in several ways when it comes to providing maternal and perinatal care (Sahoo et al., 2021). Limitations of infrastructure, human resources, supply chains, and financial resources compromise health system functions, making them less able to offer services and implement rapid adaptations in antenatal care and intrapartum care access, uptake, and provision (Ahmed et al., 2022). Already limited resources were shifted in resource-scarce countries to accommodate COVID-19 prevention and treatment (Ahmed et al., 2021), and non-emergency services may have been discontinued, affecting access and uptake of routine activities (Nakate et al., 2022). Barriers to accessing care and services include movement restrictions, lack of public transport, and fear of contracting COVID-19 in health facilities (Ahmed et al., 2021; Aranda et al., 2022).

According to initial findings, ANC and intrapartum care uptake in LMICs was disrupted (Bankar & Ghosh, 2022), and maternal and newborn mortality rates increased (Chmielewska et al., 2021; Kc et al., 2020). The pandemic has the potential to reverse the remarkable achievements made in reducing maternal and neonatal morbidity and mortality in resource-limited countries over the past two decades (WHO & UNDESA/Population Division, 2023). With these great strides, ANC and intrapartum care uptake and rates of maternal and neonatal mortality had steadily improved in low-income countries. It is challenging for these countries to attain the sustainable development goals (Ward et al., 2023), and extraordinary strategies have been employed to reach the desired level;

for maternal mortality, a ratio of < 70 maternal deaths per 100,000 live births and for neonatal mortality, < 12 neonatal deaths per 1000 live births is the goal (SDG 3.1) in every country by 2030.

This systematic review aimed to synthesise the available studies that have reported on the impact of COVID-19 on maternal health service uptake and perinatal outcomes in Sub-Saharan Africa and identify if the factors that contributed to disruptions of service and outcomes for women and babies have been addressed. Understanding the impact of COVID-19 on maternal health service uptake is pivotal to setting strategies for achieving SDG 3.1 and planning for future maternal health challenges.

## **Methods**

### **Search strategy**

Four databases were searched in August 2020 and the search was updated in March 2023: PubMed, Medline (Ovid), CINAHL (EBSCO hosted platform) and EMBASE (Ovid). Specifically, the focus was on articles that assessed the impact of COVID-19 on maternal health service uptake. For a search strategy, the combination of the following medical heading subject (MeSH) terms and keywords were used: "Maternal health service" OR "Reproductive health service" OR "Antenatal care" OR "Obstetrics health service" OR "Maternal and newborn health service" OR "Maternal primary care" OR "Postnatal care" OR "Maternal Health" OR "Maternal-child health services" AND "COVID-19" OR "SARS COV-2" AND "Utilisation/utilization" AND "Angola" OR "Benin" OR "Botswana" OR "Burkina Faso" OR "Burundi" OR "Cameroon" OR "Cape Verde" OR "Central African Republic" OR "Chad" OR "Comoros" OR "Republic of the Congo" OR "The Democratic Republic of the Congo" OR "Cote d'Ivoire" OR "Djibouti" OR "Equatorial Guinea" OR "Eritrea" OR "Ethiopia" OR "Gabon" OR "Gambia" OR "Ghana" OR "Guinea" OR "Guinea-Bissau" OR "Kenya" OR "Liberia" OR "Madagascar" OR "Malawi" OR "Mali" OR "Mauritania" OR "Mauritius" OR "Mozambique" OR "Namibia" OR "Niger" OR "Nigeria" OR "Rwanda" OR "Sao Tome and Principe" OR "Senegal" OR "Seychelles" OR "Sierra Leone" OR "Somalia" OR "South Africa" OR "South Sudan" OR "Sudan" OR "Swaziland" OR "Tanzania" OR "Togo" OR "Uganda" OR "Zambia" OR "Zimbabwe" OR Sub Saharan Africa". Hand searches of reference lists were carried out to identify other potential articles of interest. Included studies were limited

to English language and human studies only. The protocol was registered with the Prospero International Register of Systematic Reviews (<https://www.crd.york.ac.uk/PROSPERO>) in October 2020 (CRD42020208198). This section follows the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) checklist (Liberati et al., 2009) to present findings on the effect of COVID-19 on maternal health service utilisation (Figure 2).

## **Inclusion and exclusion criteria**

Studies assessing the impact of COVID-19 on ANC attendance, institutional birth and pregnancy outcomes were eligible for inclusion in this systematic review. Included studies were those who compared pre- and during COVID-19 maternal service uptake and were conducted with the following study designs: case series, observational studies (cross-sectional, case-control and cohort (prospective and retrospective study) and qualitative studies regardless of their study settings. Editorial letters, commentaries, review articles, articles that did not compare maternal health service uptake pre and during COVID-19, case reports with incomplete information, modelling studies, magazine articles and personal opinions were excluded. The most recent article was used when multiple publications of the same data were found.

## **Selection of studies and data extraction**

One reviewer (ZYG) ran the search strategy across the relevant databases and exported it to Endnote 20 to remove duplicate articles in the review. Four authors (ZYG, VS, ST, and DF) evaluated the articles based on their titles and abstracts for eligibility. These authors (ZYG, VS, ST, and DF) also extracted all the relevant data using a standardised Joanna Briggs Institute (JBI) data extraction format for the eligibility of articles, and any discrepancies were solved through discussion and consensus. The author's name, publication year, the purpose of the study, country, study design, response rate, utilisation of maternal health services, and outcome measures were extracted.

## **Assessment of quality of included studies**

The data quality was assessed using the Joanna Briggs Institute (JBI) (Moola et al., 2017) critical appraisal checklist for simple prevalence, containing nine checklist items and ten items for



qualitative studies. This tool lists the following criteria to assess the quality of studies: the sample frame must be appropriate to address the target population, the study participants must be sampled in an appropriate way, adequate sample size, the study subjects and the setting must be described in detail, the data analysis must be conducted with sufficient coverage of the identified sample, valid methods must be used for the identification of the condition, the condition must be measured in a standard, reliable way for all participants, an appropriate statistical analysis must be utilised, and the response rate must be adequate, and the low response rate must be managed appropriately (Moola et al., 2017). Studies that scored below five out of these nine points were considered low quality, while those with scores above five were deemed sufficient for inclusion in this review.

## **Results**

In this study, 829 studies were retrieved from four databases, 155 articles were removed due to duplication, and 603 articles were removed based on the title and abstract screening. Full-text screening of 71 articles was conducted, and studies were excluded if they did not compare and report maternal health services uptake and perinatal outcomes pre-COVID-19 and during the pandemic. Thirty-six studies were finally included in this systematic review. Figure 2 illustrates the process of screening and reviewing the articles.

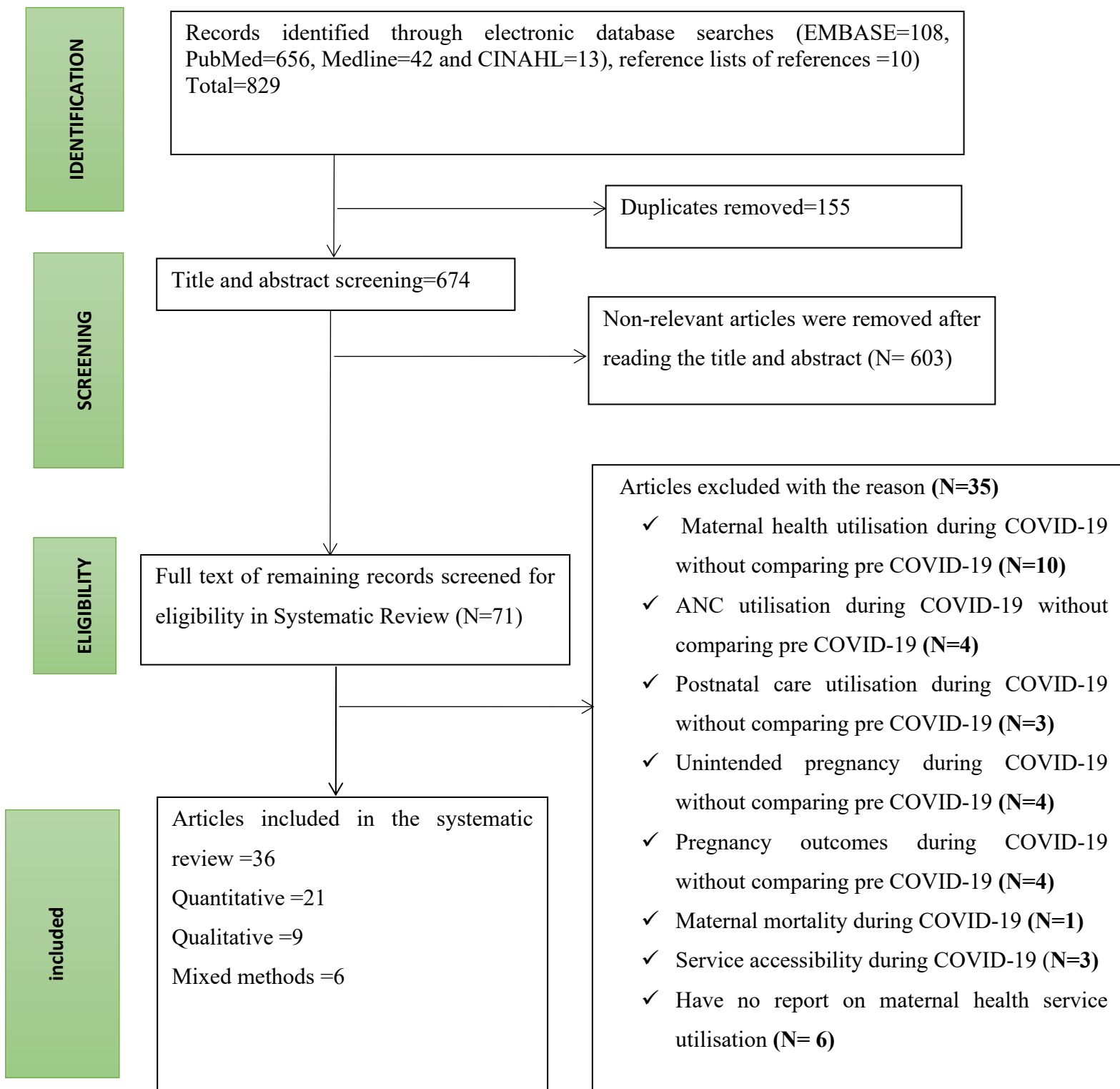


Figure 2: PRISMA (Flow chart of study selection for a systematic review of the effect of COVID-19 on maternal and perinatal care in Sub-Saharan Africa).

## Study characteristics

Articles included in this systematic review were from Ethiopia (n=9) (Bekele et al., 2022; Desta et al., 2021; Enbiale et al., 2021; Gebreegziabher et al., 2022; Hailemariam et al., 2021; Kassie et al., 2021; Quaglio et al., 2022; Tilahun et al., 2022; Zimmerman et al., 2021), Kenya (n=8) (Kiarie et al., 2022; Landrian et al., 2022; Lusambili et al., 2020; Oluoch-Aridi et al., 2020; Ombere, 2021; Onchonga et al., 2021; Shikuku et al., 2021; Wambua et al., 2022), Uganda (n=5) (Banke-Thomas et al., 2022; Burt et al., 2021; Kayiga et al., 2021; Nakate et al., 2022; Quaglio et al., 2022), Sierra Leone (n= 3) (Aranda et al., 2022; Quaglio et al., 2022; Sevalie et al., 2021), Nigeria (n=3) (Akaba et al., 2022; Banke-Thomas et al., 2022; Leung et al., 2022), the Democratic Republic of Congo (DRC) (n=2) (Arena et al., 2023; Hategeka et al., 2021), South Africa (n=2) (Jensen & McKerrow, 2020; Pillay et al., 2021), Mozambique (n=2) (das Neves Martins Pires et al., 2021; Lydon et al., 2022), Liberia (n=2) (Aranda et al., 2022; Babalola et al., 2022), Guinea (n=2) (Banke-Thomas et al., 2022; Kouyate et al., 2022), Tanzania (n=2) (Banke-Thomas et al., 2022; Quaglio et al., 2022), Rwanda (n=1) (Wanyana et al., 2021), Zimbabwe (n=1) (Shakespeare et al., 2021), Ghana (n=1) (Asuming et al., 2022), and Lesotho (n=1) (Aranda et al., 2022). Ten studies were a cross-sectional study design (Asuming et al., 2022; Enbiale et al., 2021; Gebreegziabher et al., 2022; Jensen & McKerrow, 2020; Kassie et al., 2021; Kouyate et al., 2022; Landrian et al., 2022; Pillay et al., 2021; Shikuku et al., 2021; Wanyana et al., 2021), nine studies were qualitative study design (Akaba et al., 2022; Hailemariam et al., 2021; Kayiga et al., 2021; Leung et al., 2022; Lusambili et al., 2020; Nakate et al., 2022; Oluoch-Aridi et al., 2020; Ombere, 2021; Onchonga et al., 2021), six studies were interrupted times series design (Aranda et al., 2022; Hategeka et al., 2021; Kiarie et al., 2022; Lydon et al., 2022; Quaglio et al., 2022; Wambua et al., 2022), six studies were mixed methods design (Babalola et al., 2022; Banke-Thomas et al., 2022; Bekele et al., 2022; das Neves Martins Pires et al., 2021; Sevalie et al., 2021; Tilahun et al., 2022) and two studies were pre-post study design (Desta et al., 2021; Zimmerman et al., 2021) (Table 1). This study included articles that used a minimum of two months pre-COVID-19 and two months during COVID-19. The maximum data used were 12 months pre-COVID-19 and 12 months during COVID-19 to assess the impact of COVID-19 on maternal health services uptake. Table 1 is a summary of the included studies.

Table 1: Summary of studies included in the systematic review in Sub-Saharan Africa and key findings.

Author, Year, Country	Study design	Study population (N)	Study objective	Outcome measures	Summary of findings	QS
Akaba (Akaba et al., 2022) Nigeria	Qualitative	IDIs=54 (Pregnant women, health care providers and policy makers)	To explore facilitators and barriers to accessing maternal and child health during the pandemic	Barriers to the uptake of maternal healthcare	<ul style="list-style-type: none"> <li>• Fear of contracting COVID-19, transport difficulties, stigmatisation of sick persons, lack of PPE, lack of medical commodities, long waiting times at hospitals, and shortage of human resources were barriers to accessing maternal health care.</li> </ul>	8/9
Aranda (Aranda et al., 2022) in African countries (Lesotho, Liberia, Malawi, Sierra Leone)	Interrupted time series	All pregnant women who registered in HMIS of 37 health facilities from 2016 to 2021	To assess the impact of COVID-19 on the use of maternal health services	Prevalence of ANC, institutional birth	<ul style="list-style-type: none"> <li>• ANC1 uptake significantly declined by 32% in Sierra Leone during the pandemic.</li> <li>• Institutional birth decreased in Lesotho, Liberia, and Sierra Leone.</li> </ul>	
Arena (Arena et al., 2023) DR Congo	Retrospective cohort study	N=14,300 (All women who have given birth and are	To compare adverse birth outcomes before and during the pandemic	Prevalence of preterm, low birth weight birth, and stillbirth	<ul style="list-style-type: none"> <li>• Around 22% of adverse birth outcomes were reported pre COVID-19. There was a notable reduction (to 14.3%) in adverse birth outcomes during COVID-19 compared with the pre COVID-19 period.</li> <li>• Preterm birth significantly decreased during</li> </ul>	9/9

Author, Year, Country	Study design	Study population (N)	Study objective	Outcome measures	Summary of findings	QS
		registered in HMIS)			COVID-19 compared with before COVID-19 (8.6% vs 11.5%, P<0001).	
Asuming (Asuming et al., 2022) Ghana	Cross-sectional	All pregnant women who have given birth (N= before COVID-19= 312 and during COVID-19 =223)	To estimate the impact of COVID-19 on ANC and institutional birth	Prevalence of ANC and institutional birth	<ul style="list-style-type: none"> <li>Women attending ANC4 more significantly decreased by 25%, and institutional birth significantly decreased by 23% during the pandemic.</li> </ul>	
Babalola (Babalola et al., 2022) Liberia	Mixed methods	All pregnant women who registered in HMIS and Total participants in FGDs = 292	To examine and explore the effects of COVID-19 on maternal healthcare	Prevalence of ANC and barriers to its uptake	<ul style="list-style-type: none"> <li>Women attending hospitals for ANC1 and ANC4 decreased by 25% and 28% during the pandemic.</li> <li>Institutional birth decreased by 5% during the pandemic.</li> <li>Fear of contracting COVID-19 infection, redeployment of staff to COVID-19 centres, restriction of movement due to lockdowns, lack of PPE, lack of drugs and vaccination supplies for clients, and partial closure of routine services were commonly disturbed maternal healthcare services.</li> </ul>	7/9

Author, Year, Country	Study design	Study population (N)	Study objective	Outcome measures	Summary of findings	QS
Banke-Thomas (Banke-Thomas et al., 2022) in four African countries (Nigeria, Tanzania, Uganda, and Guinea)	Mixed methods	All pregnant women who have given birth and are registered in HMIS and IDIs =50 (maternity care providers)	To assess the effect of COVID-19 on maternal health services utilisation	Prevalence of ANC, institutional birth, and barriers to uptake it	<ul style="list-style-type: none"> <li>ANC consultation decreased in Nigeria, Tanzania, Uganda, and Guinea during the first wave of the pandemic.</li> <li>Institutional birth decreased in Tanzania and Nigeria during the first wave of the pandemic.</li> <li>Fear of being infected in hospitals, lack of transport, high transport fees, and service closures affected maternal healthcare services during the first wave of the pandemic.</li> </ul>	9/9
Bekele (Bekele et al., 2022) Ethiopia	Mixed methods	All pregnant women who have given birth and are registered in HMIS from before COVID-19 March to August 2019,	To assess maternal, neonatal and child health services utilisation before and during the first six months of the pandemic	Prevalence of ANC and institutional birth Barriers to accessing maternal and child health services	<ul style="list-style-type: none"> <li>The utilisation of ANC1, ANC4 and institutional birth did not significantly differ before and during COVID-19.</li> <li>Fear of acquiring the virus, travel restrictions, increased cost of transport, lack of PPE and lack of transport were barriers to the uptake of maternal and child health services.</li> </ul>	9/9

Author, Year, Country	Study design	Study population (N)	Study objective	Outcome measures	Summary of findings	QS
		during COVID March to August 2020 and IDIs=91 (healthcare providers)				
Burt (Burt et al., 2021) Uganda	Retrospective observational study	All pregnant women who have given birth and are registered in HMIS from July 2019 to March 2020 Before COVID-19 and April 2020 to December 2020 during COVID-19	To describe the impact of COVID-19 on maternal, neonatal and child health outcomes	ANC, institutional birth, neonatal mortality	<p>ANC significantly decreased (<math>p=0.001</math>) during lockdowns.</p> <ul style="list-style-type: none"> <li>The median number of monthly institutional births was 1869 (IQR 1791–1924) before lockdowns.</li> <li>At early lockdowns, 320 institutional births (320, 95% CI; 199 to 441; <math>p=0.0002</math>).</li> <li>The trends of institutional births per month was 109 (109, 95% CI; 55 to 163; <math>p=0.002</math>) during lockdowns. Median trends of monthly institutional births significantly increased by 117 (117, 95% CI 54 to 180; <math>p=0.003</math>) after lockdowns.</li> <li>The low birth rates significantly increased by 70% (1.7, 95% CI: 0.6% to 2.7%; <math>p=0.011</math>) during lockdown.</li> <li>Stillbirth rates increased by 1% (1, 95% CI:</li> </ul>	9/9

Author, Year, Country	Study design	Study population (N)	Study objective	Outcome measures	Summary of findings	QS
					<p>-2% to 4%; p=0.58) post-lockdowns.</p> <ul style="list-style-type: none"> <li>• Preterm birth rates increased by 6% (6, 95% CI: -3% to 15%; p=0.22) post-lockdowns.</li> <li>• The median number of monthly neonatal admissions to the neonatal intensive care unit (NICU) was 700 (IQR 652–706), and the neonatal death rate was 39.6/1000 livebirths (IQR 34.6–50.7) prior to lockdowns.</li> <li>• During the lockdowns, neonatal admission increased by 5.6% (5.6, 95% CI: 0%–11%; p=0.06).</li> <li>• The neonatal mortality rate increased by ten deaths per 1000 live births/ month (IQR 2–10; p&lt;0.001) at the end of lockdown.</li> </ul>	QS
Das Neves (das Neves Martins Pires et al., 2021) Mozambique	Mixed methods	All pregnant women who have given birth and are registered in HMIS from March to May 2019	To assess the impact of COVID-19, government restrictions on access to maternal and child healthcare services	Prevalence of ANC, institutional birth, caesarean section birth	<p>During COVID-19:</p> <ul style="list-style-type: none"> <li>• ANC1 declined by 19% (P=0.327),</li> <li>• Institutional birth significantly decreased by 4% (p = 0.046)</li> <li>• Caesarean section dropped by 28% during COVID-19 (P=0.135), and</li> <li>• Home birth increased by 74% (P=0.074).</li> <li>• Women decreased uptake of the services due to fear of contamination and contracting the virus at the facilities.</li> </ul>	8/9



Author, Year, Country	Study design	Study population (N)	Study objective	Outcome measures	Summary of findings	QS
		before and March to May 2020 during COVID-19 IDIs=19				
Desta (Desta et al., 2021) Ethiopia	Pre-post study design	Pregnant women who have given birth and are registered in HMIS (N=47,896 before COVID-19 N= 50,327 during COVID-19)	To demonstrate the impact of COVID-19 on essential health services.	Pregnancy complications, mode of birth, maternal mortality, pregnancy loss, neonatal mortality	The study showed that during COVID-19: <ul style="list-style-type: none"> <li>ANC4 decreased by 2.83% (P= 0.5761)</li> <li>ANC1 slightly increased by 5.08% (P=0.0978)</li> <li>Institutional birth increased by 8.57% (P=0.0001)</li> <li>Caesarean birth increased by 28.05% (P=0.0040).</li> <li>The stillbirth rate also increased by 18.57% (P=0.0062)</li> <li>Institutional maternal deaths slightly decreased by 17 % (P=0.3173) and institutional neonatal death slightly decreased by 46.81(P=0.0733)</li> </ul>	8/9
Enbiale (Enbiale et al., 2021) Ethiopia	Comparative cross-sectional study	All pregnant women who have given birth and	To assess the effect of preventive COVID-19 measures on essential healthcare services	Prevalence of ANC and institutional birth	<ul style="list-style-type: none"> <li>ANC and institutional birth did not significantly decrease during COVID-19.</li> </ul>	6/9

Author, Year, Country	Study design	Study population (N)	Study objective	Outcome measures	Summary of findings	QS
		are registered in HMIS				
Gebreegiabher (Gebreegiabher et al., 2022) Ethiopia	Cross-sectional	All pregnant women who have given birth and are registered in HMIS	To evaluate the impact of COVID-19 on maternal and child health services	Trends of ANC, institutional birth, and PNC uptake	<ul style="list-style-type: none"> <li>Monthly ANC follow-up and institutional birth did not significantly differ before and during the pandemic.</li> </ul>	9/9
Hailemariam (Hailemariam et al., 2021) Ethiopia	Qualitative	FGD=44 pregnant women IDIs =9 health providers	To explore COVID-19-related factors influencing ANC service uptake in rural Ethiopia	Barriers to ANC utilisation	<ul style="list-style-type: none"> <li>Poor quality of care, shortage of logistic supplies, and decreased staff motivation due to lack of risk allowance, accommodation, and anxiety-related infection were barriers to the uptake of ANC during the pandemic.</li> </ul>	7/9
Hategeka (Hategeka et al., 2021) DR Congo	Interrupted time series	All pregnant women who have given birth and are registered in HMIS	To assess the utilisation of ANC1, the number of institutional births, and PNC2 before and during the national COVID-19	ANC1 utilisation and institutional birth before and during COVID-19 and lockdowns	<p>At the start of COVID -19 lockdowns:</p> <ul style="list-style-type: none"> <li>Institutional birth trends (P=0.51) did not significantly decrease</li> <li>Utilisation of ANC1 decreased by 43% during lockdowns (IRR:0.57, 95%CI: 0.35, 0.91, P= 0.02).</li> </ul> <p>Immediately post-lockdowns:</p> <ul style="list-style-type: none"> <li>ANC1 contact significantly increased by</li> </ul>	9/9

Author, Year, Country	Study design	Study population (N)	Study objective	Outcome measures	Summary of findings	QS
			lockdown in DR Congo		4% (1.04, 95% CI: 1.01 to 1.07, p=0.007) <ul style="list-style-type: none"> <li>Institutional birth significantly increased by 8% (1.08, 95% CI: 1.05 to 1.011, &lt;0.001).</li> </ul>	
Jensen (Jensen & McKerrow, 2020) South Africa	Cross-sectional	All neonates who registered in HMIS	To assess the impact of local COVID-19 upon routine child health services	The rate of neonatal death	<ul style="list-style-type: none"> <li>Institutional neonatal death significantly increased by 47% during COVID-19 (P=0.025).</li> </ul>	7/9
Kassie (Kassie et al., 2021) Ethiopia	Comparative cross-sectional study	Pregnant women who have given birth and are registered in HMIS (N=3773 before COVID-19 N=2739 during COVID-19)	To estimate the impact of COVID-19 on the utilisation of reproductive, maternal, and neonatal health services	ANC, institutional birth, caesarean section birth, stillbirth, neonatal intensive care admission, neonatal deaths, and PNC	<ul style="list-style-type: none"> <li>ANC1 (P=0.0001) and institutional birth (P=0.001) significantly decreased during COVID-19.</li> <li>Teenage pregnancy (P=0.0001), caesarean section birth (P=0.0001), stillbirth (P=0.0001), neonatal intensive care admission (P=0.0001), and neonatal deaths (P=0.0001) significantly increased during COVID-19.</li> </ul>	7/9
Kayiga (Kayiga et al., 2021) Uganda	Qualitative	IDIs=25 (healthcare providers)	To explore healthcare providers' experiences and perceptions of	To explore barriers to the provision of maternal health care	<ul style="list-style-type: none"> <li>Fear of contracting COVID-19, lack of transport, and burnout hindered the provision of maternal healthcare</li> </ul>	9/9

Author, Year, Country	Study design	Study population (N)	Study objective	Outcome measures	Summary of findings	QS
			maternal and neonatal health services during the pandemic			
Kiarie (Kiarie et al., 2022) Kenya	Interrupted time series	All pregnant women who have given birth and are registered in HMIS	To assess the effect of COVID-19 on essential healthcare services	Prevalence of ANC, institutional birth	<ul style="list-style-type: none"> <li>ANC and institutional birth did not significantly differ before and during COVID-19.</li> </ul>	9/9
Kouyate (Kouyate et al., 2022) Guinea	Cross-sectional	All pregnant women who have given birth and are registered in HMIS	To estimate the impact of COVID-19 on ANC and institutional birth	Prevalence of ANC and institutional birth	<p>During COVID-19:</p> <ul style="list-style-type: none"> <li>Women attending at associative health centres for ANC1 significantly declined (<math>\beta=-702</math>; 95%CI=-885, -520; P=0.001) and health centres (<math>\beta=-64</math>;95%CI=-137,9; P=0.082)</li> <li>Women attending at associative health centres for ANC4 significantly declined (<math>\beta=-1,015</math>; 95% CI=-1,146, -883; P=0.001) and health centres (<math>\beta=-794</math>; 95% CI=-909,678; P=0.001)</li> <li>Institutional birth significantly decreased at associative health centres (<math>\beta=-596</math>; 95%</li> </ul>	

Author, Year, Country	Study design	Study population (N)	Study objective	Outcome measures	Summary of findings	QS
					CI=-677, -516; P=0.001).	
Landrian (Landrian et al., 2022) Kenya	Cross-sectional	Women who gave birth before COVID-19=1189 and women who gave birth during COVID-19=540	To assess the effect of COVID-19 on ANC utilisation	Prevalence of ANC	<ul style="list-style-type: none"> <li>• Women who gave birth during COVID-19 had higher odds of delayed ANC initiation than those who gave birth before the pandemic.</li> <li>• The factors hindering early initiation of ANC were facility closed, fear of getting the virus, movement restrictions, inability to pay or lack of transport, and inability to afford care.</li> </ul>	9/9
Leung (Leung et al., 2022) Nigeria	Qualitative	IDIs=16 (maternity care providers)	To explore the perception and experiences of maternity care workers on maternal health care during COVID-19	Barriers to the provision of maternal health care	<ul style="list-style-type: none"> <li>• Fear of infection, burnout, transport difficulties, inadequate PPE, poverty, lockdown, and health system weakness were barriers to accessing maternity care.</li> </ul>	8/9
Lusambili (Lusambili et al., 2020) Kenya	Qualitative	IDIs=25 (pregnant women and maternity care providers)	To explore the impact of COVID-19 on women refugees' access to and utilisation of ANC, birth, and PNC	Barriers to utilisation of ANC, birth, and PNC during COVID-19	<ul style="list-style-type: none"> <li>• Women living in refugee communities increasingly preferred to give birth at home during COVID-19.</li> <li>• Delayed care, fear, and economic hardship and decreased facility-based births were barriers to utilisation of services by refugee women.</li> </ul>	7/9

Author, Year, Country	Study design	Study population (N)	Study objective	Outcome measures	Summary of findings	QS
Lydon (Lydon et al., 2022) Mozambique	Interrupted time series	All pregnant women who have given birth and are registered in HMIS	To assess the effect of COVID-19 on maternal and perinatal health services utilisations and outcomes	Prevalence of ANC, institutional birth, caesarean section birth and its outcomes	<ul style="list-style-type: none"> <li>ANC1 contact increased by 29.8% (95% CI 18.2 to 41.4%) per month before COVID-19 trends.</li> <li>ANC4 contacts did not significantly differ before and during COVID-19 0.5% (95% CI -8.8 to 9.9 (P=0.91).</li> <li>Institutional birth increased by 6.1% (95% CI 0.03 to 12.2%) per month above before COVID-19 trends.</li> <li>Caesarean birth decreased by 30.1% (95% CI -55.0 to -5.3%) per month above before COVID-19 trends.</li> <li>Uterine rupture decreased by 5.3% (95% CI -9.9 to -0.6%) per month above before COVID-19 trends.</li> <li>Stillbirth decreased by 19.2% (95% CI -33.8 to -4.6%) per month above before COVID-19 trends.</li> </ul>	9/9
Nakate (Nakate et al., 2022) Uganda	Qualitative	IDIs =14 (pregnant and postnatal women)	To explore women's experiences in the first 1000 days of post conceptions during the pandemic	To explore barriers to the uptake of maternal health care	<ul style="list-style-type: none"> <li>Distress situations, living in fear, making forced choices, and lack of access to expert care barrier to uptake maternal health care during the pandemic</li> </ul>	9/9

Author, Year, Country	Study design	Study population (N)	Study objective	Outcome measures	Summary of findings	QS
Oluoch-Aridi (Oluoch-Aridi et al., 2020) Kenya	Qualitative	IDIs=71 (postnatal women)	To investigate the effect of COVID-19 on access to maternal healthcare services in the informal settlement	To explore barriers to accessing maternal healthcare	<ul style="list-style-type: none"> <li>• Fear of infection and economic and food security challenges hindered access to health care during COVID-19.</li> </ul>	7/9
Ombere (Ombere, 2021) Kenya	Qualitative	IDIs =21 (pregnant, postnatal women and maternity care providers)	To explore the effect of COVID-19 on maternal service utilisation	Barriers to utilisation of maternal service utilisation during COVID-19	<ul style="list-style-type: none"> <li>• Pregnant women decreased their attendance at hospitals for perinatal care and institutional birth due to fear of infection.</li> <li>• Increase in home births and births assisted by the traditional birth attendant during COVID-19.</li> <li>• Lack of PPE</li> </ul>	7/9
Onchonga (Onchonga et al., 2021) Kenya	Qualitative	FGDs= 4 N=26 (pregnant women)	To explore women's understanding of health-seeking during the pandemic	Barriers to women's health-seeking during COVID-19	<ul style="list-style-type: none"> <li>• Fear of contracting the virus was the main factor hindering maternal health uptake during the pandemic.</li> </ul>	7/9
Pillay (Pillay et al., 2021) South Africa	Cross-sectional	All pregnant women who have given birth and are registered in HMIS	To determine the effect of COVID-19 and restrictions imposed on routine health services	Prevalence of ANC, institutional birth, neonatal death, and maternal deaths	<ul style="list-style-type: none"> <li>• ANC uptake significantly decrease during COVID-19.</li> <li>• Institutional birth increased during COVID-19.</li> <li>• Institutional neonatal and maternal mortality increased during COVID-19.</li> </ul>	

Author, Year, Country	Study design	Study population (N)	Study objective	Outcome measures	Summary of findings	QS
Quaglio (Quaglio et al., 2022) four African countries	Interrupted time series	All pregnant women who have given birth and are registered in HMIS	To examine the indirect effect of COVID-19 on maternal health services utilisation	Prevalence of ANC and institutional birth	<ul style="list-style-type: none"> <li>Monthly ANC visits (P=0.71) and institutional birth (P=0.14) did not significantly increase during COVID-19.</li> </ul>	8/9
Sevalie (Sevalie et al., 2021) Sierra Leone	Mixed methods	All pregnant women who have given birth and are registered in HMIS and IDIs=12 (Service users and maternity care providers)	To examine and explore the effects of COVID-19 on hospital utilisation	Facility-based birth. Caesarean birth and barriers to Uptake maternal health care	<ul style="list-style-type: none"> <li>Institutional birth significantly increased from 435 to 467, by a 7.5% increase (p=0.033) from the first quarter (Q1) to the second quarter; however, institutional birth significantly decreased by 10% from 435 Q1 388 in Q3 (p=0.007) during COVID-19.</li> <li>Caesarean section births significantly increased from 192 to 216, a 12.7% (p=0.014) from the first quarter to the second quarter.</li> <li>During COVID-19, there was no change in caesarean section births from Q1 to Q3.</li> <li>Decreased non-emergency services, delays in giving care, increased staff load, fear of contracting the virus and loss of income were barriers to the uptake of maternal healthcare.</li> </ul>	9/9



Author, Year, Country	Study design	Study population (N)	Study objective	Outcome measures	Summary of findings	QS
Shakespeare (Shakespeare et al., 2021) Zimbabwe	Retrospective observational study	All pregnant women who have given birth and are registered in HMIS	To examine the impact of COVID-19 on maternal and perinatal care and outcomes during the lockdown	ANC, institutional birth, caesarean section birth, stillbirth, and maternal mortality ratio	<ul style="list-style-type: none"> <li>• The mean monthly births reduced from 747 (SD±61.3) to 681 (SD±17.6) (P=0.2) during lockdowns.</li> <li>• The percentage of institutional births by women who booked in the hospital dropped from a mean of 41.6% (SD±1.1) to 35.8% (SD±4.3) (P=0.03) during lockdowns.</li> <li>• The percentage of institutional births by women who unbooked in the hospital increased from a mean of 4.4% (SD±0.6) to 8.0% (SD±2.5) (P=0.01) during lockdowns.</li> <li>• The rate of caesarean birth before COVID-19 was 29.8% (SD± 1.7) versus 28.0% (SD± 1.7) during COVID-19 (P=0.18).</li> <li>• Increase in the mean total number of early neonatal deaths (ENND) (mean 18.7 (SD±2.9) versus 24.0 (SD±4.6) (P=0.32) during lockdowns.</li> </ul>	9/9
Shikuku (Shikuku et al., 2021) Kenya	Cross-sectional	All pregnant women who have given birth and are	To assess the initial impact of the pandemic on reproductive, maternal, newborn, child, and adolescent health services	Prevalence of ANC, institutional birth, caesarean section birth, stillbirth, and maternal mortality ratio	<ul style="list-style-type: none"> <li>• Monthly utilisation of ANC (P=0.251) and institutional birth (P=0.736) did not significantly differ before and during COVID-19.</li> <li>• Adolescent pregnancy (P=0.0001), caesarean section birth (P=0.0001) and stillbirth (P=0.0066) significantly increased</li> </ul>	6/9

Author, Year, Country	Study design	Study population (N)	Study objective	Outcome measures	Summary of findings	QS
		registered in HMIS			<p>during COVID-19.</p> <ul style="list-style-type: none"> <li>The maternal mortality ratio did not significantly differ before and during COVID-19 (P=0.1023).</li> </ul>	
Tilahun (Tilahun et al., 2022) Ethiopia	Mixed methods	All pregnant women who have given birth and are registered in HMIS and IDIs=74 (women and healthcare providers)	To explore and examine the effect of COVID-19 on maternal and child health services	Prevalence of ANC and institutional birth Barriers to accessing maternal and child health services	<ul style="list-style-type: none"> <li>Utilisation rates of ANC1, ANC4 and institutional birth did not significantly differ before and during COVID-19.</li> <li>Fear of contracting COVID-19, imposed movement restriction, increased workload, and shortage of PPE were hindrances to accessing maternal and child health services.</li> </ul>	8/9
Wambua (Wambua et al., 2022) Kenya	Interrupted time series	All pregnant women who have given birth and are registered in HMIS	To quantify the indirect effect of the pandemic on the utilisation of outpatient services	Prevalence of ANC	<ul style="list-style-type: none"> <li>ANC4 significantly decreased during the pandemic. However, ANC1 did not significantly differ before and during the pandemic.</li> </ul>	9/9

Author, Year, Country	Study design	Study population (N)	Study objective	Outcome measures	Summary of findings	QS
Wanyana (Wanyana et al., 2021) Rwanda	Cross-sectional	Pregnant women N= 59,810 expected number before COVID-19 N= 61,205 expected number during COVID-19	To assess the change in utilising maternal and child health (MCH) services during the COVID-19 outbreak	ANC, institutional birth	<ul style="list-style-type: none"> <li>ANC1 (P= 0.042) and institutional birth (P=0.004) significantly declined during COVID-19.</li> <li>ANC4 (P=0.083) did not significantly differ before and during the pandemic.</li> </ul>	9/9
Zimmerman (Zimmerman et al., 2021) Ethiopia	Longitudinal data with a pre-post-study design	Pregnant women N= 2,537	To examine the effect of COVID-19 on health facility birth	Institutional birth	<ul style="list-style-type: none"> <li>Institutional birth in the hospital decreased by 77% in urban during COVID-19 (aRRR: 0.23, 95% CI: 0.07–0.71).</li> </ul>	9/9
<b>Abbreviations:</b> ANC: Antenatal care; ANC1: 1st Antenatal care visit (booking visit); ANC4: four Antenatal care visits; FDG: focus group discussions; HMIS: Hospital management information system; IDI: In-depth interviews; IRR: incidence rate ratio; PPE: Personal protective equipment; QS: Quality score.						

After reviewing and summarising the included studies, four main themes were identified: *Decrease in the number of women attending ANC; Impact of COVID-19 on institutional birth and mode of childbirth; Complications during childbirth and Barriers to the uptake of maternity care.* Table 2 represents the themes and papers associated with the particular theme.

Table 2: Main themes.

Themes	Study authors
Decrease in the number of women attending ANC	(Aranda et al., 2022; Asuming et al., 2022; Babalola et al., 2022; Banke-Thomas et al., 2022; Bekele et al., 2022; Burt et al., 2021; das Neves Martins Pires et al., 2021; Desta et al., 2021; Enbiale et al., 2021; Gebreegziabher et al., 2022; Hailemariam et al., 2021; Hategeka et al., 2021; Kassie et al., 2021; Kayiga et al., 2021; Kiarie et al., 2022; Kouyate et al., 2022; Landrian et al., 2022; Lydon et al., 2022; Ombere, 2021; Pillay et al., 2021; Quaglio et al., 2022; Shakespeare et al., 2021; Shikuku et al., 2021; Tilahun et al., 2022; Wambua et al., 2022; Wanyana et al., 2021)
Impact of COVID-19 on institutional birth and mode of birth	(Aranda et al., 2022; Asuming et al., 2022; Babalola et al., 2022; Bekele et al., 2022; Burt et al., 2021; das Neves Martins Pires et al., 2021; Desta et al., 2021; Gebreegziabher et al., 2022; Hategeka et al., 2021; Kassie et al., 2021; Kiarie et al., 2022; Kouyate et al., 2022; Lydon et al., 2022; Ombere, 2021; Pillay et al., 2021; Quaglio et al., 2022; Sevalie et al., 2021;

	Shakespeare et al., 2021; Shikuku et al., 2021; Tilahun et al., 2022; Wanyana et al., 2021; Zimmerman et al., 2021)
Complications during childbirth	(Arena et al., 2023; Burt et al., 2021; das Neves Martins Pires et al., 2021; Desta et al., 2021; Jensen & McKerrow, 2020; Kassie et al., 2021; Lusambili et al., 2020; Lydon et al., 2022; Ombere, 2021; Pillay et al., 2021; Sevalie et al., 2021; Shakespeare et al., 2021; Shikuku et al., 2021)
Barriers to the uptake of maternity care	(Akaba et al., 2022; Babalola et al., 2022; Banke-Thomas et al., 2022; Bekele et al., 2022; das Neves Martins Pires et al., 2021; Hailemariam et al., 2021; Kayiga et al., 2021; Leung et al., 2022; Lusambili et al., 2020; Nakate et al., 2022; Oluoch-Aridi et al., 2020; Ombere, 2021; Onchonga et al., 2021; Sevalie et al., 2021; Tilahun et al., 2022)

### **Decrease in the number of women attending ANC during COVID-19**

COVID-19 has, directly and indirectly, interrupted the health system in LMICs, particularly in Sub-Saharan Africa. Outpatient services are more affected due to the closure of non-emergency services, and ANC services were also disturbed in sub-Saharan countries during COVID-19 (Aranda et al., 2022). Evidence showed that ANC1 uptake significantly declined by 43% (IRR:0.57, 95%CI: 0.35, 0.91, P= 0.02) in DR Congo (Hategeka et al., 2021) and by 25% in Liberia during the lockdowns (Babalola et al., 2022). Similarly, ANC4 declined by 28% in Liberia (Table 1). Movement restrictions, lack of transport, increased transport fees, and closure of non-emergency services could all have contributed to the decline in ANC uptake during the lockdowns (Babalola et al., 2022).

ANC1 uptake significantly decreased in the South West region, Ethiopia ( $P < 0.0001$ ) (Kassie et al., 2021), Rwanda ( $P = 0.042$ ) (Wanyana et al., 2021), Liberia (Babalola et al., 2022), Guinea (Kouyate et al., 2022) and Sierra Leone (Aranda et al., 2022) during COVID-19. ANC4 significantly decreased in the Tigray region, Ethiopia (Desta et al., 2021), Kenya (Wambua et al., 2022), Ghana (Asuming et al., 2022), Liberia (Babalola et al., 2022), and Guinea ( $P < 0.001$ ) (Kouyate et al., 2022) during COVID-19. Reasons for these findings indicate that COVID-19 affected ANC uptake indirectly, with fear of contracting COVID-19 infection (Hailemariam et al., 2021), staff redeployment to COVID-19 centres (Babalola et al., 2022), restriction of movement due to lockdowns, lack of PPE (Ombere, 2021), shortages of medications and vaccine supplies for clients (Babalola et al., 2022), and a partial closure of routine services (Banke-Thomas et al., 2022) being common causes of the drop in ANC uptake during COVID-19 (Table 1). In DRC, immediately post-lockdowns, ANC1 contact significantly increased by 4% (1.04, 95% CI: 1.01 to 1.07,  $p = 0.007$ ). Meanwhile, this review showed that rates of ANC1 and above uptake in South Africa (Pillay et al., 2021), Ethiopia (Bekele et al., 2022; Enbiale et al., 2021; Gebreegziabher et al., 2022; Tilahun et al., 2022), Kenya (Kiarie et al., 2022; Shikuku et al., 2021), and Mozambique (das Neves Martins Pires et al., 2021; Lydon et al., 2022) did not significantly differ during COVID-19 compared with the pre-COVID-19 period (Table 1).

### **Impact of COVID-19 on institutional birth and mode of birth**

Studies showed that institutional birth rates significantly increased in the early stages of COVID-19 (Desta et al., 2021; Hategeka et al., 2021; Pillay et al., 2021; Sevalie et al., 2021). For example, the institutional birth rates significantly increased by 8.57 % ( $P = 0.0001$ ) in the Tigray region, Ethiopia (Desta et al., 2021). Immediately post-lockdowns, institutional births significantly increased by 8% (1.08, 95% CI: 1.05 to 1.011,  $< 0.001$ ) in DRC (Hategeka et al., 2021), and in South Africa (3.7%) in 2020 (Pillay et al., 2021). However, the incidence of institutional births did not significantly alter during the pandemic lockdowns compared to pre-COVID-19 in the Amhara region, Ethiopia (Enbiale et al., 2021), DRC (Hategeka et al., 2021) and Zimbabwe (Shakespeare et al., 2021).

Other studies in Mozambique, Sierra Leone, Guinea, Uganda, Rwanda and Ethiopia showed that during COVID-19, institutional births significantly decreased (Burt et al., 2021; das Neves Martins Pires et al., 2021; Kassie et al., 2021; Kouyate et al., 2022; Sevalie et al., 2021; Wanyana et al., 2021; Zimmerman et al., 2021). Hospital birth rates declined by 77% in urban

areas of Ethiopia, immediately after COVID-19 was reported there (aRRR: 0.23, 95% CI: 0.07–0.71) (Zimmerman et al., 2021). Similarly, in Mozambique, hospital births significantly decreased by 4% ( $p = 0.046$ ) (das Neves Martins Pires et al., 2021). At the same time, the study found that home births increased by 74% (das Neves Martins Pires et al., 2021), and in Kenya, home births also increased during COVID-19 (Lusambili et al., 2020; Ombere, 2021). Evidence showed that women preferred home birth due to fear of contracting the virus (Lusambili et al., 2020), delayed care, lack of money, perceived poor quality of care during COVID-19 (Hailemariam et al., 2021) and lack of transport due to lockdowns (Babalola et al., 2022; Banke-Thomas et al., 2022; Leung et al., 2022), leading to increased numbers of stillbirths and neonatal deaths during this period (Burt et al., 2021; Desta et al., 2021; Jensen & McKerrow, 2020; Kassie et al., 2021; Shikuku et al., 2021).

During COVID-19, caesarean section births significantly increased (Desta et al., 2021; Kassie et al., 2021; Shikuku et al., 2021). Caesarean-section births in Ethiopia (Desta et al., 2021) substantially increased by 28.05% ( $P=0.0040$ ), and in Kenya (Shikuku et al., 2021) caesarean birth increased from 14.6% to 15.8% ( $P<0.0001$ ) during COVID-19. However, other studies did not find a significant difference in the numbers of caesarean section births before and during COVID-19 in Mozambique (das Neves Martins Pires et al., 2021), Sierra Leone (Sevalie et al., 2021), and Zimbabwe (Shakespeare et al., 2021) (Table 1).

## **Complications during birth**

Quality ANC and intrapartum care are essential for early identification of complications, readiness for high-risk newborns, and prompt intervention (Desalew et al., 2020) that can reduce stillbirth and neonatal mortality. During COVID-19, ANC uptake and institutional birth declined in LMICs (Aranda et al., 2022). Studies in Ethiopia and Kenya (Desta et al., 2021; Kassie et al., 2021; Shikuku et al., 2021) found that stillbirths significantly increased during COVID-19, increasing by 7.6% ( $P=0.0062$ ) in the Tigray region, Ethiopia (Desta et al., 2021) (Table 1). Likewise, studies in Ethiopia, Uganda and South Africa showed that neonatal deaths significantly increased (Burt et al., 2021; Jensen & McKerrow, 2020; Kassie et al., 2021; Pillay et al., 2021) during COVID-19, for example, in South Africa, the neonatal death rate increased by 47% ( $p=0.025$ ) (Jensen & McKerrow, 2020). In Uganda, the neonatal mortality rate increased by ten neonatal deaths per 1000 live births/ month (IQR 2–10;  $p<0.001$ ) at the end of the lockdowns (Burt et al., 2021). Neonatal death rates did not, however, significantly differ

in Ethiopia and Zimbabwe (Desta et al., 2021; Shakespeare et al., 2021) before and during COVID-19. It is important to highlight that reporting of these deaths may be confounded by methods of reporting and systemic data collection issues.

## **Barriers to the uptake of maternity care**

Effective strategies to improve the accessibility and availability of maternal health care are essential to increasing its uptake. The pandemic has indirectly encumbered and overstretched the infrastructure (Kotlar et al., 2021) that had previously been in place to increase the uptake of maternity care. Fear of the virus, and lockdown measures to prevent the spread of COVID-19 meant that transport became more expensive and often unavailable (Leung et al., 2022), making it difficult for women to access maternity care (Table 1).

Studies conducted in Nigeria (Leung et al., 2022), Uganda (Kayiga et al., 2021), and Ethiopia (Bekele et al., 2022; Tilahun et al., 2022) found lack of transport and rising transport fees to be barriers to accessing maternity care during COVID-19. Evidence illustrates how fear of contracting the virus was a barrier to the uptake of maternity care in Sierra Leone (Sevalie et al., 2021), Guinea (Banke-Thomas et al., 2022), Nigeria (Akaba et al., 2022; Banke-Thomas et al., 2022; Leung et al., 2022), Tanzania (Banke-Thomas et al., 2022), Uganda (Banke-Thomas et al., 2022; Kayiga et al., 2021; Nakate et al., 2022), Kenya (Lusambili et al., 2020; Oluoch-Aridi et al., 2020; Onchonga et al., 2021) and Ethiopia (Bekele et al., 2022; Tilahun et al., 2022) during COVID-19 (Table 1). Similarly, shortages of medical supplies (Babalola et al., 2022; Hailemariam et al., 2021), lack of PPE (Bekele et al., 2022; Leung et al., 2022), shortage of human resources (Akaba et al., 2022), health staff burnout (Leung et al., 2022), lack of skilled workers (Nakate et al., 2022), the shift of healthcare providers to COVID-19 centres (Babalola et al., 2022) and closure of non-emergency services (Babalola et al., 2022; Banke-Thomas et al., 2022) were identified as barriers to accessing to maternity care during COVID-19 (Table 1).

## **Discussion**

Over the past two decades in Sub-Saharan African countries, improvements in the quality and availability of ANC and institutional birth have been made, leading to a substantial decline in maternal and neonatal mortality rates. In the 2000-2020 period, remarkable progress was made



in these countries in lowering maternal and newborn mortality (WHO, 2023a). Nonetheless, Sub-Saharan countries still experience a significant number of maternal and newborn deaths.

Findings show that in Sub-Saharan countries, ANC utilisation declined during the pandemic (Aranda et al., 2022; Asuming et al., 2022; Babalola et al., 2022; Banke-Thomas et al., 2022; Desta et al., 2021; Hategeka et al., 2021; Kassie et al., 2021; Kouyate et al., 2022; Pillay et al., 2021; Wambua et al., 2022; Wanyana et al., 2021). This finding coincides with studies conducted in India (Goyal et al., 2022), a systematic review of the impact of the Ebola virus on maternal and perinatal care in West Africa (Kassa et al., 2022) and a worldwide systematic review and meta-analysis which revealed significantly decreased ANC uptake during the pandemic (Townsend et al., 2021). The decline in ANC utilisation was as a consequence of a range of factors such as lockdowns (Goyal et al., 2022), fear of contracting the virus (Ulaganeethi et al., 2021), lack of transport (de Guzman & Banal-Silao, 2022), shortage of medical supplies (Landrian et al., 2022), and long waiting times (Akaba et al., 2022).

ANC contact can play a significant role in promoting and increasing institutional birth, which leads to a reduction in the number of neonatal and maternal deaths (Berhan & Berhan, 2014). ANC achieves this by preventing pregnancy-related complications through early identification and treatment of existing diseases (Rahman et al., 2022). Conversely, low engagement with ANC can decrease institutional birth rates, leading to increased neonatal and maternal mortality (Rahman et al., 2022).

In this review some studies demonstrate that the number of institutional births did not significantly alter during the pandemic compared to pre-COVID-19 in Ethiopia (Enbiale et al., 2021), DRC (Hategeka et al., 2021) and Zimbabwe (Shakespeare et al., 2021). This could be occurring because lower health facilities might be referring labouring women to hospital due to fear of contracting COVID-19 (Aranda et al., 2022).

This review demonstrates that institutional births (Asuming et al., 2022; das Neves Martins Pires et al., 2021; Kassie et al., 2021; Kouyate et al., 2022; Sevalie et al., 2021; Wanyana et al., 2021; Zimmerman et al., 2021) substantially decreased during the pandemic. This finding aligns with studies conducted in India (Goyal et al., 2021) and Nepal (Ashish et al., 2021; Kc et al., 2020) which indicated that institutional birth decreased by half during the COVID-19 lockdowns. This dramatic reduction in institutional births might be due to women's fears of contracting the virus (Akaba et al., 2022; Babalola et al., 2022; Bekele et al., 2022; Kayiga et

al., 2021; Landrian et al., 2022; Leung et al., 2022; Lusambili et al., 2020; Nakate et al., 2022; Oluoch-Aridi et al., 2020; Ombere, 2021; Tilahun et al., 2022), lack of transport availability during the lockdowns (Akaba et al., 2022; Babalola et al., 2022; Bekele et al., 2022; Kayiga et al., 2021; Landrian et al., 2022; Tilahun et al., 2022), financial hardship (Lusambili et al., 2020; Oluoch-Aridi et al., 2020), and health facilities becoming inaccessible (Babalola et al., 2022; Landrian et al., 2022; Leung et al., 2022). Consequently, women might prefer traditional birth attendants' home support (das Neves Martins Pires et al., 2021; Lusambili et al., 2020; Ombere, 2021).

Similarly, findings from this review showed an increase in caesarean section births during the pandemic (Desta et al., 2021; Kassie et al., 2021; Shikuku et al., 2021). The rise in birth by caesarean section could have been due to less maternal and fetal monitoring during labour (Kc et al., 2020), the restriction on companions attending births (Bohren et al., 2017), women choosing a caesarean section instead of waiting for spontaneous labour, due to fears of contracting the virus (Xue et al., 2022). The decline in accessing ANC follow-up can prevent women receiving early detection of pregnancy complications and health promotion counselling and can lead to an increase in home births (das Neves Martins Pires et al., 2021; Lusambili et al., 2020; Ombere, 2021) and obstetric complications (Burt et al., 2021; Shakespeare et al., 2021). These findings are consistent with a study conducted in LMICs (Naqvi et al., 2022) which explored the decrease in ANC and the rise in home births during the pandemic.

Findings demonstrate that during the pandemic, obstetric complications were more common, potentially leading to an increase in stillbirths (Desta et al., 2021; Kassie et al., 2021; Shikuku et al., 2021) and neonatal deaths (Burt et al., 2021; Jensen & McKerrow, 2020; Kassie et al., 2021; Pillay et al., 2021). These complications and consequences may have been due to lower ANC uptake and suboptimal care during the antenatal period that led to unidentified and untreated existing diseases such as preeclampsia, increasing the risk of stillbirth (Lavin & Pattinson, 2018) and neonatal deaths (Tolossa et al., 2020). In addition, suboptimal intrapartum care and home birth may have led to increased rates of stillbirth (Purbey et al., 2023) and neonatal deaths (Altman et al., 2017).

The synthesised evidence emerging from this systematic review of the impact of COVID-19 on maternal health service utilisation in Sub-Saharan Africa has implications for future responses to similar emergencies. From this evidence, policymakers and obstetric care

providers can gain insight into how the pandemic in Sub-Saharan Africa has affected the provision and uptake of maternal health services. In health facilities, the existing guidelines need to be adopted and implemented and the modification of maternal and neonatal safety guidelines should be a priority during any pandemic. Furthermore, this review provides an input and lessons learned that can serve as a touchstone for a better understanding of and response to the direct and indirect impact of future epidemics and pandemics.

Some potential limitations of this review are noted, including the small sample size of some studies, methodological differences, no population-level denominators, missing data, and lack of population level data collection methods in place. Moreover, all included studies did not specifically address the consequences of COVID-19 on access, uptake and provision of ANC and institutional birth. The results of this systematic review should be taken cautiously, given that the included studies represent only a few countries, and full-text language was restricted to English. Nevertheless, the results from this systematic review are a valuable input to designing policies for scaling up the coverage and quality of ANC and institutional birth through interventions that promote adopting and adapting safe maternity care guidelines in present and future pandemics (Benski et al., 2020; Poon et al., 2020).

**Conclusion:** The findings from this review showed a decrease in the number of women accessing ANC and institutional birth during the COVID-19 pandemic, and an increase in births by caesarean section and neonatal deaths. Based on these findings, it is recommended that stakeholders and healthcare providers act to reverse the decline of ANC and institutional uptake by collaborating on community mobilisation/involvement and building trust with the community on access to maternal healthcare services. Government needs to ensure the availability of essential medical supplies in hospitals during pandemics, while healthcare providers need to strictly monitor maternal and fetal health during labour to reduce the risk of institutional neonatal deaths. Rigorous studies are needed to examine both short- and long-term impacts of COVID-19 on maternal and perinatal outcomes.

### **Summary gaps in the existing literature**

This thesis aims to assess the impact of COVID-19 on maternal and perinatal uptake, access and provision of care in Ethiopia in 2020. This chapter has presented the results of a systematic literature review that explored the effects of the Ebola and COVID-19 outbreaks on maternal

and perinatal care in various countries. A review of the literature on the Ebola outbreak can offer insightful analysis and lessons learned from previous infectious disease outbreaks, which helps to understand better the problems posed by the present pandemic and guide future responses.

However, existing studies in Ethiopia on the impact of the COVID-19 pandemic have not rigorously explored its effects on maternity care services, specifically ANC, intrapartum care access, uptake, and provision. Additionally, while the studies in Ethiopia have described the impact of COVID-19 on maternal and perinatal care, none of them have data from care providers' and women's voices, to explain the impact on their experiences and to tell the full story of what the data is suggesting. The integration of different data collection methods aims to provide a rich and deep understanding of maternity care access, uptake, and provision.

Therefore, this study provides essential information, data, and understanding of the impact of COVID-19 on maternal and perinatal care service provision and uptake at public hospitals in the Sidama region of Ethiopia. The following chapter details the study design, methodology, and methods used to collect and analyse the data.

## **Chapter 3: Methodology**

### **3.1 Introduction**

This chapter presents the theoretical underpinning and research methods that were used to address the research questions. The study settings, population, participant recruitment procedures, analytical process and ethical considerations are detailed below.

The research objectives were specified based on the research questions identified through Chapter Two's systematic review.

The following research questions guided the thesis:

1. What impact has the COVID-19 pandemic had on women's attendance for antenatal care, and how do maternity care providers' experiences with women's attendance at hospitals for antenatal care during the COVID-19 pandemic, compare to the period before COVID-19?
2. What impact has the COVID-19 pandemic had on women's utilisation of intrapartum care, and how do maternity care providers' experiences with women's utilisation of intrapartum care during the COVID-19 pandemic, compare to the period before COVID-19?
3. What are women's experiences of receiving antenatal and intrapartum care during COVID-19?

### **3.2 Aim and Objectives of the Study**

#### **3.2.1 Aim**

This study aims to assess the impact of COVID-19 on maternal and perinatal care during the pandemic at fifteen public hospitals in Sidama Region, Ethiopia.

### **3.2.2. Research objectives**

To assess and explore the impact of COVID-19 on maternal and perinatal care during the pandemic at fifteen public hospitals in Sidama Region, Ethiopia.

Study 1: Impact of COVID-19 on antenatal care provision at public hospitals in Sidama Region, Ethiopia has two specific objectives:

- To determine the impact of COVID-19 on antenatal uptake, access, and provision of care at public hospitals in Ethiopia by comparing two timeframes: March 2019 to February 2020; and March to August 2020 - and
- To explore the impact of COVID-19 on antenatal uptake, access, and provision of care at public hospitals in Ethiopia between March 2019 to February 2020; and March to August 2020, from maternity care providers' perspectives.

Study 2: Impact of COVID-19 on intrapartum care at public hospitals in Sidama region, Ethiopia has two specific objectives:

- To determine the impact of COVID-19 on intrapartum care at public hospitals in Ethiopia by comparing two timeframes: March 2019 to February 2020; and March to August 2020, and
- To explore the impact of COVID-19 on intrapartum care at public hospitals in Ethiopia between March 2019 to February 2020; and March to August 2020, from maternity care providers' perspectives.

Study 3: Women's experiences receiving antenatal and intrapartum care during COVID-19 at public hospitals in Ethiopia has one specific objective:

- To explore women's experiences of receiving antenatal and intrapartum care during COVID-19 at public hospitals in Ethiopia.

## **3.3 Overview of theoretical perspectives underpinning the study**

A paradigm is a philosophical assumption or core belief that guides the actions and defines the researcher's worldview (Mertens, 2019). The paradigm types of epistemology, ontology, methodology, and axiology underpin a researcher's selected interpretive frameworks (Crotty,

1998; Mertens, 2019). The selection of philosophical assumptions is essential since it promotes transparency and affects the research process. Philosophical debates and distinctive epistemological positions about knowledge exist across various disciplines (Crotty, 1998). Epistemology provides a philosophical basis for deciding what types of knowledge are conceivable and how we can ensure that they are both adequate and legitimate (Crotty, 1998). According to objectivist epistemologies, it is possible to gain knowledge about reality independently from a person who knows or seeks to understand that existing reality (Biesta, 2010). Subjectivist epistemologies claim that knowledge can be acquired through subjectivity; the individual who knows or seeks to understand reality contributes to producing the knowledge (Biesta, 2010). A pragmatic view of knowledge proposes a balance of objectivity and subjectivity between these two typical views. Pragmatism is a philosophical orientation that can combine positivist/post positivism and constructivist perspectives within the scope of single research according to the nature of the research question (Creswell & Creswell, 2018). Positivism is a philosophical approach that states knowledge can be gained and verified through scientific methods such as observation, experimentation, and mathematical or logical proof (Creswell & Creswell, 2018). For example, this study attempted to estimate the ANC uptake, institutional birth, mode of birth, stillbirth, neonatal death, maternal death, and availability of essential medicine in hospitals before and during the pandemic. Meanwhile, a constructivist perspective is a philosophical perspective that posits human knowledge of the world is constructed through societal influence, and knowledge is acquired from individuals using qualitative methods such as participant observations and unstructured interviews to analyse human behaviour and society (Creswell & Creswell, 2018). This study is positioned within a pragmatic (mixed methods) epistemological worldview or philosophy.

A pragmatic worldview approach uses multiple theoretical perspectives to guide research approaches and engage in methodological eclecticism (selecting and integrating appropriate techniques). Paradigm pluralism encourages the coexistence of a range of world views, rather than privileging one over the other, to address the research questions posed (Teddlie & Tashakkori, 2012). A pragmatic worldview offers chances to use multiple methods, assumptions, and data collection and analysis methods. By integrating these diverse approaches, it provides more opportunities for a comprehensive understanding of a research problem than either approach alone (Creswell, 2014b; Creswell & Creswell, 2018; Kelle,

2006). The pragmatic worldview is thus a distinct paradigm from the constructivist and postpositivist paradigms (Creswell & Creswell, 2018).

### **3.4 Theoretical framework**

Theories, models, and conceptual frameworks have a crucial role in research, providing a method to explain and interpret the phenomenon under study (Nilsen, 2015). Various theoretical frameworks are utilised to explain and enhance a better understanding of maternal and perinatal care (Sudhinaraset et al., 2017). When selecting a theoretical framework or model for a study, it is essential to consider its applicability and relevance in light of the study's objectives (Ezeanolue et al., 2019). This decision should consider its potential impact on shaping practices and producing insight for policy (Duffey & Muhlenkamp, 1974). The Three Delay Model, and the Social-Ecological Model that underpin this study are described below.

#### **3.4.1 Three Delay Model**

The “Three Delay Model”, a conceptual framework developed by Thaddeus and Maine, is used to understand, and assess the factors contributing to maternal death in limited resource settings (Thaddeus & Maine, 1994). This framework identifies three critical components that can have direct consequences for the survival of women and newborns: delay in the decision to seek care (First Delay), delay in identifying and reaching the health facility (Second Delay), and delay in receiving optimal care at the health facility (Third Delay) (Thaddeus & Maine, 1994). This model has been useful in implementing strategies and interventions to reduce maternal mortality ratio in resource-limited settings. Furthermore, the Three Delay Model helps researchers and policymakers in identifying specific bottlenecks within the health system and women’s health-seeking behaviors that contribute to delays in accessing emergency maternity care. It provides a framework for designing context-specific interventions to address the barriers in each stage. A model serves as a conduit for monitoring and evaluating the effectiveness of interventions on maternal healthcare outcomes (Actis Danna et al., 2020). The Three Delay Model primarily focuses on individual and facility-related factors, which can result in missing the influence of broader societal, community, and environmental factors on health behaviours and outcomes (Vidler et al., 2023).



### **3.4.2 Social-Ecological Model**

The Social-Ecological Model (CDC, 2016) emphasises the complex interplay among individual, relationship, community and societal factors that influence maternal healthcare. The Social-Ecological perspective (CDC, 2016) is a valuable framework for understanding the factors affecting health and well-being. It is a model that can aid in offering a complete perspective of the factors that affect specific health behaviours, including the social determinants of health. Social-Ecological Model can be used to integrate components of other theories and models, such as Three Delay Models (Akaba et al., 2020; Kaiser et al., 2019).

The Three Delays Framework (Thaddeus & Maine, 1994) and the Social Ecological Framework (Sword, 1999) are two distinct approaches that are used in maternal and perinatal healthcare. Integrating the Three Delay Model with the Social-Ecological Model can provide a more nuanced understanding of maternal health care, thereby understanding systemic factors of maternal healthcare, informing key recommendations (Akaba et al., 2020). The Three Delays Framework helps identify the challenges in seeking, reaching, and receiving maternity care (Thaddeus & Maine, 1994). The Social Ecological Framework provides a holistic understanding of health and social issues. The framework demonstrate that human behaviours are influenced by factors at multiple levels, including individual, family, community, health facility and government (McLeroy et al., 1988).

The Three Delays Framework and Social-Ecological Framework can coexist and complement each other by incorporating the concepts of Three Delays into the Social Ecological Framework. In this approach (to be known herein as the Hybrid Framework), the two frameworks combine to help identify and address delays at each level of influence such as individual, family, community resources and factors, health facility and policy barriers. This study is underpinned the Hybrid Framework.

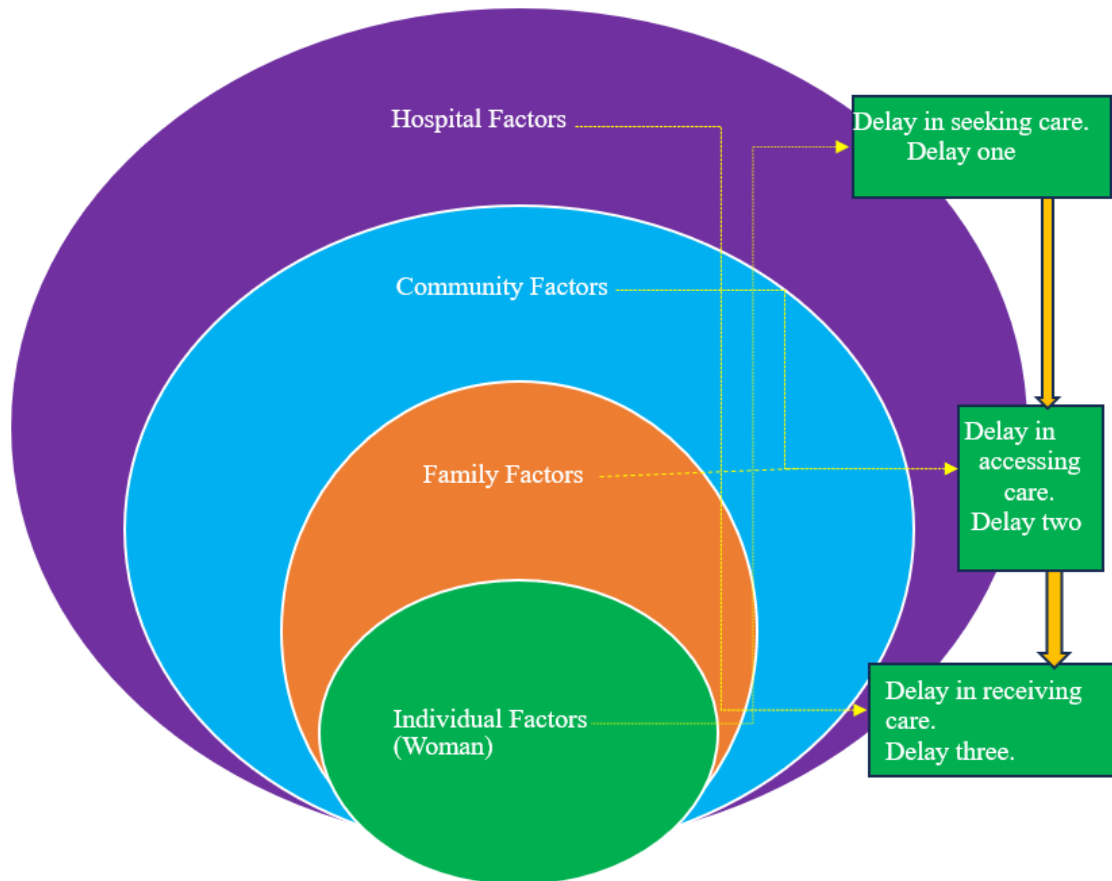


Figure 3: Visual representation of the Hybrid Framework in relation to the impact of COVID-19 on maternal and perinatal care in LMICs, adapted from Akaba et al. (2020), and Kaiser et al. (2019).

### 3.5 Methodology

This study applied a mixed methods approach, integrating quantitative and qualitative research methods for a more nuanced understanding of the research problem than could be achieved by either approach alone (Creswell, 2014b; Kelle, 2006). The objective of mixed methods research is not to replace either quantitative or qualitative approaches but rather to draw from the strengths and reduce the weaknesses of both in single studies and across studies (Johnson & Onwuegbuzie, 2004). A particular research method is chosen based on the issue or topic being addressed, the researcher's prior experiences, and the study's participants (Creswell, 2008, 2014a). There are six mixed-methods design types: concurrent, explanatory sequential, exploratory sequential, embedded, transformative and multiphase mixed methods approach (Haq, 2015). This study employed a concurrent mixed methods study (Figure 4). A concurrent

mixed methods design involves collecting and analysing quantitative and qualitative data, which are subsequently merged to compare whether one set of results with the other is confirmed or disconfirmed by using a joint display technique (Creswell, 2014a).

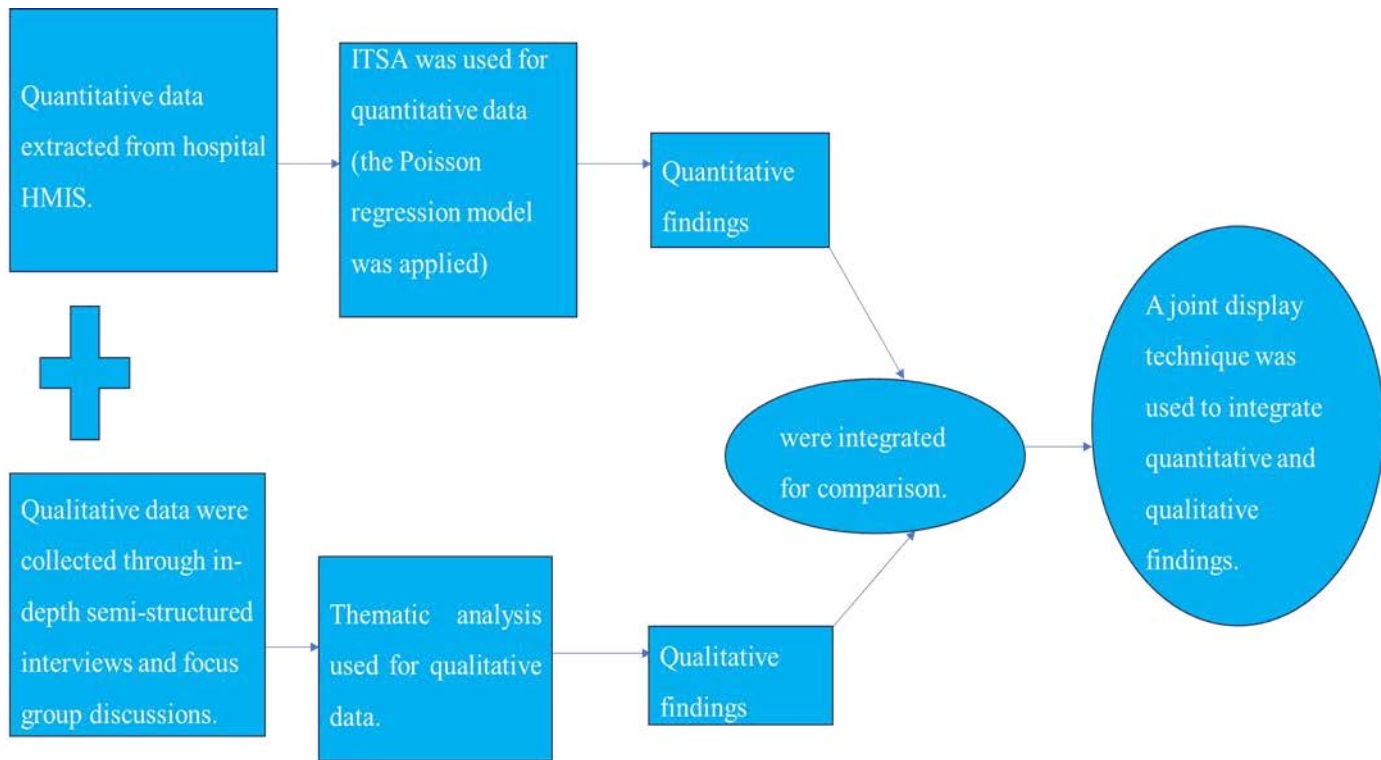


Figure 4: Concurrent mixed methods research on the impact of COVID-19 on maternal and perinatal care, adapted from (Creswell, 2014a).

In this thesis, a concurrent mixed methods approach was used with the aim of integrating quantitative and qualitative data to capture a broader and deeper understanding of the research questions regarding the impact of COVID-19 on maternal and perinatal care. The quantitative study focused on estimating monthly trends in maternal and perinatal care before and during COVID-19. Meanwhile, the qualitative study explored the perceptions and experiences of maternity care providers and women in relation to ANC access, uptake and provision, and intrapartum care and its outcomes, before and during COVID-19.

### Study setting

The setting of this study is Ethiopia (Sidama region), located in the Horn of Africa (Figure 5). Eritrea borders Ethiopia to the North, Djibouti and Somalia to the East, South Sudan and Sudan to the West, and Kenya to the South. As Africa's second most populous country, after Nigeria,

Ethiopia had a population of 117,876,226 in 2021. The country is divided into eleven administrative regions and two administrative cities (Figure 5). Sidama is the 10<sup>th</sup> newly established region in Ethiopia and is located in the southern part of the country. The region is currently divided into five city administrations and 31 administrative divisions called ‘*Woredas*’ (Figure 5). The region's total population was 3,983,969, with 1,974,455 males and 2,009,514 females in 2019/2020. Sidama has 928,265 women of reproductive age (15–49), and 137,845 gave birth in 2019/2020. Regarding health provision, the region has 14 primary hospitals, three general hospitals, one comprehensive specialised teaching hospital, 123 public health centres, 526 health posts, and over 108 private clinics. Comprehensive obstetric care was available in 15 hospitals in Sidama region during 2020.



Figure 5: Maps of the study area where the studies were conducted (adapted from Wikipedia and (Beyene et al., 2018)).

## **3.6 Methods**

A concurrent mixed methods approach (Creswell, 2014a) made the research process more efficient by collecting quantitative and qualitative data concurrently, saving time and resources compared with sequential approaches. In this thesis, both quantitative and qualitative data were collected simultaneously. However, as displayed in Figure 4, the analysis was conducted separately, and subsequently the findings of both methods were compared. The quantitative and qualitative data integration was carried out using a joint display technique (Creswell, 2014a) as shown in the results section of chapters 4 and 5. The quantitative results were first reported, followed by the qualitative results. The integration of these results corroborated or disconfirmed the findings in mixed-methods meta-inferences in Tables 5 and 7.

The following sections elaborate on the quantitative and qualitative components of the study.

## **3.7 Quantitative methods**

### **3.7.1 Study population**

The study population included data on all pregnant women who received antenatal care and gave birth in fifteen public hospitals in the Sidama region and all neonates who received neonatal intensive care at public hospitals in the Sidama region during two time periods: pre-COVID-19 (twelve months of data from March 2019 to February 2020), and during COVID-19 (six months of data from March to August 2020).

### **3.7.2 Study design**

An interrupted time series (ITS) study design was used to estimate the average changes in maternal and perinatal care during the first six months of the pandemic (March to August 2020) at fifteen public hospitals in the Sidama region.

### **3.7.3 Quantitative data collection**

Monthly aggregated data were retrospectively collected from all 15 public hospitals that provided comprehensive emergency obstetric care in the Sidama region at the time of the study. A free, open-source software platform called District Health Information Software 2 (DHIS2)

is currently used by all healthcare facilities in Ethiopia for data collection, reporting, analysis, and dissemination at both the aggregate and individual levels. According to Arsenault et al., (2021), two-thirds of Ethiopia's health institutions use the Health Management Information Systems (HMIS) to report on institutional births.

Ethical approval was granted from Internal Research Institutional Review Board (IRB) by the College of Medicine and Health Sciences Hawassa University and UTS Medical Health Research Ethics Committee. Then, the thesis proposal and ethical approval letter were submitted to the Sidama region Public Health Institute, Research and Technology Transfer Directorate. After reviewing the proposal and ethical approval letter, the institute issued a supportive letter to extract the data from HMIS and conduct the study at each of the 15 hospitals. Following all ethical approvals, the PhD candidate and research assistant submitted a letter of support to the Chief Executive Officer and Medical Director of each hospital.

Upon receiving the letter of support, the hospital officials signed, and the PhD candidate provided the letter to the HMIS office. The PhD candidate then explained the study outcome variables such as ANC1, ANC4, mode of birth, stillbirth, neonatal admission, neonatal deaths, maternal deaths, and essential medicines to the HMIS officers in each hospital. The data was obtained from the HMIS office at each hospital in spreadsheet Excel form. Data on maternal and perinatal care spanning 18 months (March 2019 to August 2020) were collected from the HMIS of all 15 hospitals and were merged into an Excel spreadsheet.

Maternal and perinatal care data collection takes place on a daily basis in the antenatal clinics and labour wards using paper-based methods. The data collected include rates of ANC attendance, number of women admitted as inpatients, antepartum haemorrhage, postpartum haemorrhage, mode of birth, neonatal weight, gestational age, number of neonatal admissions, stillbirth, neonatal deaths, maternal deaths and availability of medicine. The maternity care head compiles this data and subsequently forwards it to the HMIS office on a monthly basis, where it is entered into the electronic HMIS. Then, the data becomes accessible online for authorised personnel from health centres, public hospitals, regional health bureaus, and the Ministry of Health.

**Outcome variables:** The recommended number of ANC visits in the antenatal care participant cohort was four. ANC1 and ANC4 were used as indicators of ANC uptake, facility birth, mode of birth, stillbirth, neonatal death, and maternal death. Availability of essential medication (Iron

folic acid tablets, fluids, oxytocin, ceftriaxone, magnesium sulphate, calcium gluconate, and hydralazine) in hospitals were extracted from each HMIS for the period from March 2019 to February 2020 (twelve months of data) before COVID-19 and from March to August 2020 (six months of data) during COVID-19.

**Independent variable:** COVID-19

### 3.7.4 Data processing and analysis

Monthly data were extracted relating to hospital-based maternity and neonatal care from the HMISs of fifteen hospitals during the period from March 2019 to August 2020. After screening the data, any clarity-related questions were resolved by revisiting the hospitals and regional health HMIS offices. Data were exported from Microsoft Excel into STATA V.17 for analysis.

An interrupted time series analysis (ITSA) can evaluate the impact of population-level interventions, including policy changes and infection prevention programmes, implemented at a clearly defined time (Bernal et al., 2017). The first official COVID-19 case in Ethiopia was reported on 13 March 2020, so this date was used to mark the start of the intervention period. The mean monthly incidence rate ratio (IRR) of ANC uptake was calculated with a 95% confidence interval (CI), using a Poisson regression model (Imrey, 2000; Linden, 2015) with pre-COVID-19 data as the reference. A Poisson regression model was suitable because the monthly reports of ANC provision comprised count data (non-negative integer values). In ITSA, a Poisson regression model performs better than an autoregressive integrated moving average (ARIMA) model, which is more conventionally used for real-valued time series data (Quddus, 2008). Differences are considered statistically significant at a p-value of less than 0.05 ( $p < 0.05$ ).

A single-group ITSA was employed for this study (Linden, 2015).

$$Y_t = \beta_0 + \beta_1 T_t + \beta_2 X_t + \beta_3 X_t T_t + \beta_m \text{month} + \epsilon_t$$

Where  $Y_t$  is the aggregated outcome;  $\beta_0$  estimates the maternity care uptake number before COVID-19;  $\beta_1$  estimates the average monthly change in maternity care uptake before COVID-19;  $T_t$  is the time since the start of the study;  $\beta_2$  represents the change in maternity care uptake occurring within three months of the pandemic (designated by  $X_t T_t$ );  $\beta_3$  denotes the difference between the trends in maternity care uptake before and during COVID-19 (overall: objective

six months); and  $\beta_m$  represents the month and  $\epsilon_t$  the random error. In this model, time is measured as a dummy variable, taking the value 0 for the period before COVID-19 and 1 for the period during COVID-19 (the intervention period) (Delamou et al., 2017; Linden, 2015).

## **3.8 Qualitative methods**

### **3.8.1 Study population**

Purposive sampling methods were used to select study participants among women aged at least 18 years of age who gave birth at public hospitals in the Sidama region during the pandemic. Women were purposively selected based on the following inclusion criteria: at least 18 years of age, availability, informed consent to participate, and recently having given birth in hospital in the Sidama region during the COVID-19 pandemic. The study participants were recruited from postnatal wards, postnatal clinics, and immunisation clinics. All participating hospitals provide comprehensive emergency maternity care. Women were informed about the purpose of the study in detail, and those interested in participating were asked to provide written informed consent. Health care providers were purposively selected from those who provided maternity care services at public hospitals in the Sidama region before and during the pandemic.

### **3.8.2 Study design**

There are various approaches in qualitative studies, for example exploratory study design, case study design, phenomenological study design, grounded theory study design and ethnographic study design (Creswell & Poth, 2016). The selection of a qualitative study approach is influenced by a range of factors, including the researcher's experience, existing knowledge associated with the research topic, research questions, goals, available resources, time, and the nature of the phenomena under investigation (Opoku et al., 2016).

Using exploratory study design is crucial for providing a broader understanding of a research topic, for example impact of COVID-19 on maternal and perinatal, especially when the existing knowledge is limited. This approach is useful for generating initial insights and hypotheses for further investigation (Bradshaw et al., 2017). Whereas phenomenological approach delves into lived experiences to uncover the essence of subjective experience, while ethnographic approaches seek to understand cultural practices and beliefs. Grounded theory approaches are



employed to develop theoretical models that explain a specific phenomenon (Creswell & Poth, 2016).

Given the limited knowledge on the impact of COVID-19 on maternal and perinatal care due to COVID-19 is a new disease, an exploratory study design is deemed suitable for exploring impact of COVID-19 on maternal and perinatal care in this study. Therefore, an exploratory qualitative approach provides the opportunity for researchers to acquire information about phenomena where little is known (Bradshaw et al., 2017).

An exploratory study design (Colorafi & Evans, 2016) was adopted to investigate maternity care providers and women's views on and experiences of the impact of COVID-19 on maternal and perinatal care in the Sidama region. IDIs were conducted with maternity care providers (midwives, obstetric/gynaecology residents, integrated emergency surgical officers [IESOs] and obstetricians) in private duty rooms or offices in the region's public hospitals. In addition, IDIs and FGDs were carried out with women in meeting rooms in the region's public hospitals.

The qualitative part of the study explored the views and experiences of women and maternity care providers to strengthen our understanding of any gaps in healthcare services during the pandemic (Colorafi & Evans, 2016). In the qualitative component of the study, in-depth interviews (IDIs) were conducted with maternity care providers and women. The interviewer applied the following skills: flexibility and responsiveness, open-mindedness, good listening, patience, and observance during IDIs (Polit & Beck, 2017). Four focus group discussions (FGDs) with women were conducted to obtain rich information and insights from them. Study participants who had recently given birth in the hospital were purposively selected based on demographic characteristics, availability, and willingness to participate, creating a homogenous group to promote a comfortable group dynamic. The FGD data collection was checked by brainstorming, sequencing the questioning, phrasing the questions, estimating the time of each question, obtaining feedback from others, revising the questions, and testing the questions (Polit & Beck, 2017).

Four public hospitals (including two primary hospitals, one general hospital and one specialised hospital) were chosen based on the caseload maternity care services provided and the order in which COVID-19 cases were initially reported in the Sidama region. Three different types of hospitals were selected: primary, general, and specialised. Furthermore, the selected specialised hospital served as a referral centre for the Sidama region and the surrounding

population in the Oromia region. This selection allowed for a nuanced understanding of the impact of the pandemic on various tiers of hospitals and their preparedness, response efficiency and the challenges they faced.

### **3.8.3 Study participant recruitment and sampling technique**

Two research assistants, who hold an MSc in clinical midwifery and worked at Hawassa University, recruited study participants for the IDIs and FGDs. Payment was made on a per diem basis to the research assistants during the data collection period. The study's purpose was explained to the hospital medical director, chief executive director, and maternity care head, seeking their permission to conduct the research. The research assistants invited women to participate in IDIs or FGDs when they attended for care in postnatal wards, postnatal clinics, and immunisation clinics in the hospital. Using research assistants for recruiting study participants can help minimise researcher influence and enhance the objectivity of recruitment process. A detailed explanation of the study's purpose was given to maternity care providers and women who volunteered to be interviewed. Purposive sampling was used to recruit staff who had experience in providing maternity care before and during the pandemic. Similarly, women who had given birth during the pandemic were also recruited to attend IDIs or FGDs using a purposive sample technique based on the inclusion criteria stated above. All participants provided written informed consent prior to being interviewed. Data saturation appeared to be reached after 24 IDIs with maternity care providers as no new insights arose, and the information was repeated. Four additional IDIs were then conducted to verify data saturation. Similarly, data saturation appeared to be reached after 15 IDIs with women as no new insights arose. Two additional IDIs were then conducted to verify data saturation. Four FGDs were conducted with women, each containing 6 or 7 women.

### **3.8.4 Data collection tools and procedure**

A semi-structured interview guide was developed by the PhD candidate comprising open-ended questions concerning the following factors: availability of and access to maternal and perinatal care; availability of adopted maternal and perinatal care guidelines related to COVID-19; availability of medical supplies and skilled healthcare personnel; and how challenges were overcome. This interview guide was prepared after reviewing different literature on the impact of the Ebola virus disease epidemic and the COVID-19 pandemic on maternal and perinatal

care. The interview guide was prepared in English and translated it into Amharic, the official language of Ethiopia. In-depth face-to-face interviews and FGDs were carried out in Amharic by the PhD candidate, who is fluent in Amharic and English. All IDIs and FGDs were digitally audio-recorded. The interview guide was piloted with midwives whose data were not included in this study. Each interview was conducted in private duty rooms or offices when participants were not on duty in the region's public hospitals. In addition, IDIs and FGDs were carried out with women in meeting rooms at the same public hospitals. As these activities were being conducted during the active phase of the pandemic, the Ethiopian government's COVID-19 prevention policy was fully adhered to. Between 14 February and 10 May 2022, a total of 28 interviews were conducted with maternity care providers, 17 interviews with women and four FGDs with women. The IDIs lasted an average of 30 minutes, while the FGDs lasted an average of 60 minutes.

### **3.8.5 Data processing and analysis**

The audio recordings of interviews were transcribed into Amharic and translated into English by bilingual research assistants. This process was repeated by the PhD candidate who also transcribed them into Amharic and translated them into English to check for consistency. In case doubts arose between a bilingual researcher and the candidate, the candidate verified the results with the bilingual researchers to ensure consistency. The transcriptions were imported into NVivo software (QSR international, version 12 plus) to manage the overall data analysis. Thematic analysis (Clarke & Braun, 2021) was employed to identify, analyse, and report themes and subthemes. Inductive analysis was used and followed six phases: phase 1—data familiarisation and writing familiarisation notes; phase 2—systematic coding; phase 3—generating initial themes from coded data; phase four—developing and reviewing themes; phase 5—refining, defining, and naming themes; and phase 6—writing the report (Clarke & Braun, 2021). The PhD candidate and supervisors reviewed the themes and subthemes in each analysis phase and approved the final themes. This study is reported according to the Standards for Reporting Qualitative Research (O'Brien et al., 2014) to ensure that the essential parts are reported and the quality of thematic analysis assessed (Braun & Clarke, 2021).

### **3.9 Integration of data**

In a mixed methods study, the integration of quantitative and qualitative research occurs at multiple stages, including design, data collection, analysis, reporting, and interpretation. This integration process aims to provide a more comprehensive understanding of research problems than what could be achieved by either approach alone (Creswell & Clark, 2017). Moreover, integration can take place in various sections, including methods, reporting and interpretation stages. Depending on the mixed methods approach chosen, the integration involves connection or building, merging, and embedding quantitative and qualitative data (Creswell & Creswell, 2018; Guetterman et al., 2015). These methods include sequential mixed methods, which connect or build on data in a sequential manner; concurrent mixed methods, which merge quantitative and qualitative data parallelly; and embedded mixed methods, which embed both types of data.

In a concurrent mixed methods approach such as was used in this thesis, three types of data merging can be applied: data transformation, side-by-side comparison or the joint display techniques that were used in this thesis (Creswell & Creswell, 2018; Fetters et al., 2013). To present findings, a joint display technique was employed using a single table or figure during the interpretation or reporting stage (Skamagki et al., 2022). In chapters 4 and 5 in this thesis, quantitative and qualitative findings were presented in Tables 5 and 7. The joint display technique presents both quantitative findings and qualitative findings (constructed in themes and subthemes). This allows the synthesis of mixed meta-inferences in a single table or figure, and to identify whether the quantitative findings align with or contradict the qualitative findings (Younas & Durante, 2023). This visual representation is presented in a single table or figure, facilitating a comprehensive understanding of the integrated data.

The purpose of using a concurrent mixed methods approach in this thesis is to compare different perspectives drawn from quantitative and qualitative data. This approach allowed us to find whether qualitative data perspectives explained the quantitative data and allowed for a deeper understanding of the systemic drivers of the findings (confirmed or disconfirmed one another), ultimately enhancing our better understanding of how COVID-19 impacted maternal and perinatal care.

### **3.10 Reporting mixed methods research**

The approach of O'Cathain et al. (2008) was applied to guide mixed methods reporting in this study. Accordingly, the following checklist was used: 1) the justification for using a mixed methods approach to the research questions, as addressed in the methodology and method sections in this thesis; 2) describe the design in terms of the purpose, priority, and sequence of methods, as elaborated in the methodology and method sections in this thesis; 3) describe each method in terms of sampling, data collection and analysis, as detailed in the quantitative and qualitative methods sections of this chapter; 4) describe where integration has occurred, how it has occurred and who has participated in it, as addressed in the integration section; 5) describe the limitations of one method associated with the presence of the other methods, as explained in the methodology section; 6) and describe any insights gained from mixing or integrating methods, as described in the method section of this chapter.

### **3.11 Ethics approval and consent to participate**

An internal research institutional review board (IRB) at the College of Medicine and Health Sciences Hawassa University granted ethical clearance (IRB/029/14), and the University of Technology Sydney Human Research Ethics Committee approved the study (ETH22-7567). Prior to beginning the data collection process in the qualitative component, each study participant provided written informed consent. Study participants were also informed of their full right to decline or withdraw from the study at any time. All processes were carried out in accordance with the standards and laws outlined in the Declaration of Helsinki.

### **Summary**

This chapter has provided an overview of the methodology and method of the study and study setting. The following chapters present the findings of the thesis.

## **Chapter 4: Impact of COVID-19 on antenatal care provision at public hospitals in Sidama Region, Ethiopia**

This chapter focuses on the impact of COVID-19 on ANC provision at public hospitals in the Sidama region of Southern Ethiopia. This mixed methods study found that the rates of monthly provision of ANC significantly decreased during the pandemic. The themes identified were *'Barriers to ANC access during COVID-19'*, *'Barriers to ANC uptake during COVID-19'*, and *'Barriers to ANC provision during COVID-19'*. The results in this chapter provide evidence for the health bureau, healthcare providers and policymakers to improve ANC access, uptake, and provision in the current and future pandemics by supporting the resilience of ANC services.

### **4.1 Introduction**

Over the past two decades, improvements in access to ANC have substantially reduced maternal and neonatal morbidity and mortality in resource-constrained countries (Berhan & Berhan, 2014; Shiferaw et al., 2021). ANC optimises maternal and child health outcomes through regular pregnancy monitoring (Muluneh et al., 2021) and provides opportunities to offer care to prevent and manage existing health conditions and potential causes of maternal and neonatal illness (Konje et al., 2018). However, the COVID-19 pandemic may have reversed improvements in ANC utilisation in LMICs. The pandemic also presents a profound obstacle to implementing the recommended guidelines for improving ANC health service utilisation (Menendez et al., 2020).

In 2016, the World Health Organization (WHO) recommended a minimum of eight ANC contacts for all pregnant women (WHO, 2016b). Although ANC utilisation had increased during the two decades preceding the pandemic (Duodu et al., 2022; Tsegaye et al., 2022), many countries had still not reached the WHO-recommended eight ANC contacts. A multi country study across 15 countries showed that 13% of women had 8 and more ANC contacts (Ekholuenetale, 2021). However, Ethiopia, has recently endorsed a minimum of eight ANC contacts for all pregnant women and had fewer ANC contacts than in most other countries.

Since the beginning of the pandemic, ANC utilisation has significantly decreased in LMICs (Aranda et al., 2022; Asuming et al., 2022; Doubova et al., 2021; Landrian et al., 2022) owing to fear of contracting the virus (das Neves Martins Pires et al., 2021; Landrian et al., 2022;

Watson et al., 2021), lockdown policy (Burt et al., 2021; Goyal et al., 2021), closure of health institutions (Babalola et al., 2022), lack of transport (Akaba et al., 2022), community fear of health institutions and delay in healthcare-seeking (Goyal et al., 2021; Leung et al., 2022). Consequently, stillbirths, maternal depression, and maternal deaths have all increased (Chmielewska et al., 2021).

Existing studies from Ethiopia have focused on describing the impact of COVID-19 on maternal health-service utilisation (Kassie et al., 2021; Shuka et al., 2022). These studies have not, however, explored the barriers to ANC care access, uptake, and provision during COVID-19. Therefore, this is an essential study for any assessment and exploration of the barriers to ANC access, uptake, and provision during the pandemic.

## **4.2 Quantitative results: Trends in antenatal care provision in fifteen hospitals**

In the 12 months preceding the pandemic, from March 2019 to February 2020, the monthly data from public hospitals in the Sidama region showed a significant increase in uptake of ANC1 and ANC4. Specifically, the monthly estimated incidence rate ratio increased by 1% for ANC1 uptake (IRR = 1.011, 95% CI [1.007, 1.016];  $p < 0.0001$ ) and by 2.6% for ANC4 uptake (IRR = 1.026, 95% CI [1.019, 1.033];  $p < 0.0001$ ) (Table 3 and Figure 6).

In the first three months of the COVID-19 pandemic, when it was at its peak, the monthly estimated incidence of ANC1 uptake decreased by 14% (IRR 0.863, 95%CI 0.812 to 0.918;  $P < 0.0001$ ), and ANC4 uptake decreased by 14% (IRR 0.858, 95%CI 0.782 to 0.942;  $P < 0.001$ ) (Table 3 and Figure 6). Overall trends during the initial six months of the COVID-19 pandemic revealed that ANC1 uptake significantly decreased by 0.7% (IRR 0.993, 95%CI 0.990 to 0.997;  $P < 0.001$ ) (N=15,150), and ANC4 uptake significantly decreased by 1.8% (IRR 0.982, 95%CI 0.976 to 0.987;  $P < 0.0001$ ) (N=5850) (Table 3 and Figure 6).

Table 3: Trends of ANC provision and availability of essential medications before and during COVID-19 at public hospitals in the Sidama region, March 2019 - August 2020.

Trends of ANC provision and availability of essential medication in the hospitals	Monthly incidence rate before COVID-19 as an estimated IRR 95% CI	P value	Monthly incidence rate immediately during the COVID-19 as an estimated IRR 95% CI	P value	Monthly incidence rate before COVID-19 compared with during COVID-19 as an estimated IRR 95% CI.	P value
ANC1	1.011(1.007-1.016) ***	0.0001	0.863 (0.812- 0.918) ***	0.0001	0.993 (0.990-0.997) ***	0.001
ANC4	1.026 (1.019- 1.033) ***	0.0001	0.86 (0.78 - 0.94) ***	0.001	0.982 (0.976- 0.987) ***	0.0001
Overall availability of essential medication in the hospitals	1.00 (0.987-0.1.013)	0.970	1.001 (0.837-1.98)	0.985	0.987(0.0.948-1.029)	0.565
Iron-folic acid tablet (Fefol)	1.207 (0.654–2.229)	0.547	1.006 (0.958–1.056)	0.814	1.003 (0.875– 1.148)	0.971
Magnesium sulfate	0.96 (0.54– 1.73)	0.899	0.99 (0.95–1.038)	0.782	0.99 (0.869– 1.136)	0.925
Oxytocin	1.084 (0.611–1.922)	0.782	1.002 (0.960–1.047)	0.904	0.978 (0.858–1.15)	0.735
Ceftriaxone	1.208 (0.664–2.197)	0.536	1.017 (0.972–1.064)	0.461	0.969 (0.846–1.109)	0.645
Normal saline	1.248 (0.970–2.225)	0.453	1.013 (0.969–1.060)	0.561	0.977 (0.859–1.13)	0.729

Note: \*= Significant 0.05; \*\*= Significant at 0.01; \*\*\*=Significant at 0.001, IRR=Incidence rate ratio



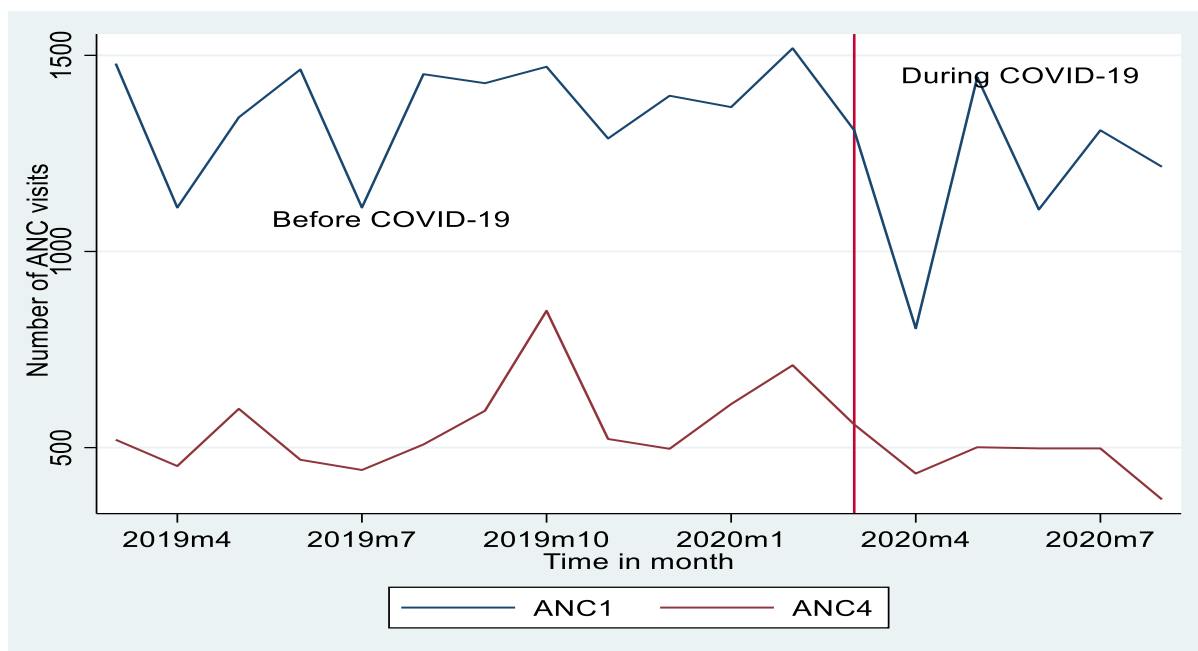


Figure 6: Mean trends of ANC uptake at the public hospitals in the Sidama region, Ethiopia, March 2019 -August 2020.

### 4.3 Qualitative results: Clinicians views and experiences of the impact of COVID-19 on antenatal care provision

In total, 28 maternity care providers were interviewed face to face: 15 midwives, 2 IESOs, 4 obstetric/gynaecology residents, and 7 obstetricians (Table 4). Three themes were constructed from analysis of the data, ‘Barriers to ANC access during the COVID-19’, ‘Barriers to ANC uptake during COVID-19’, and ‘Barriers to ANC provision during the COVID-19’ (Figure 7).

Table 4: Sociodemographic characteristics of study participants (N=28).

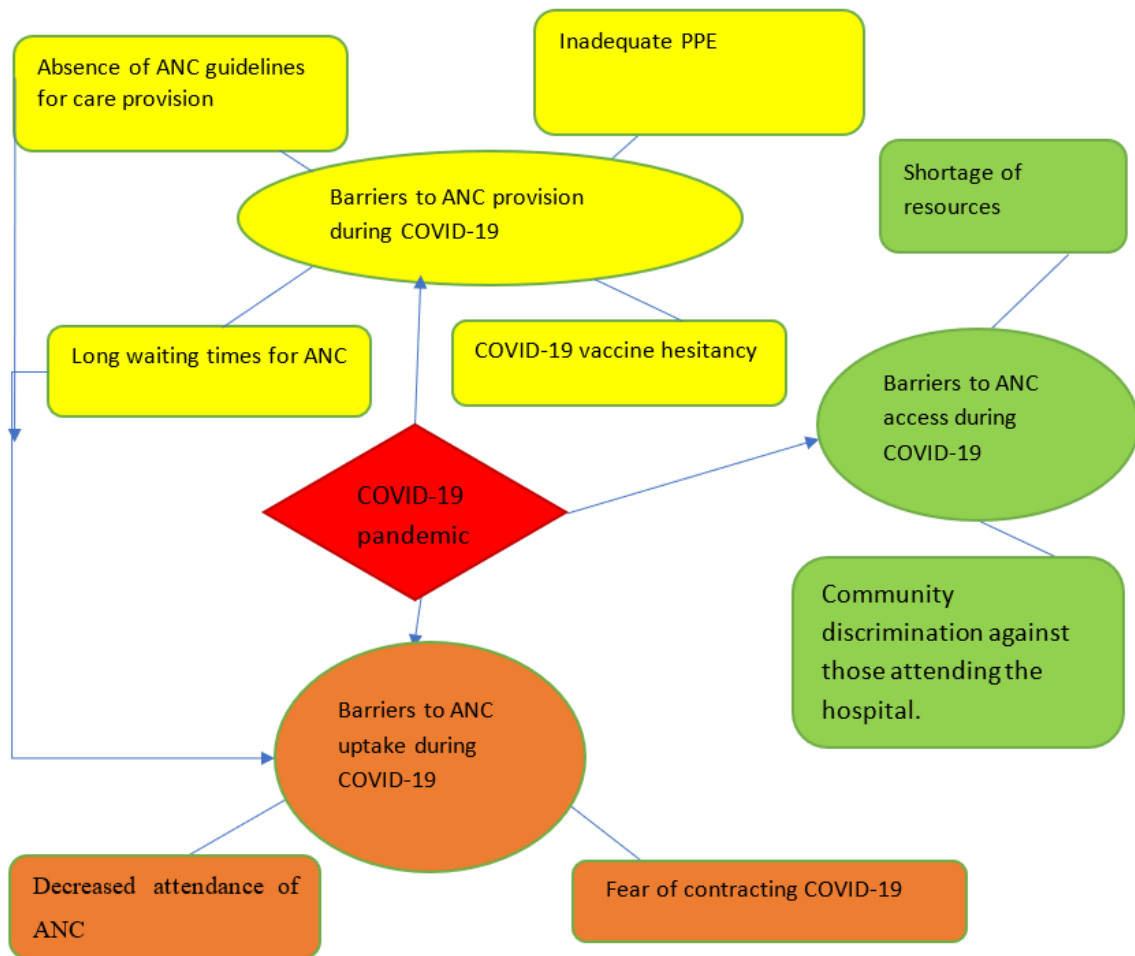
No	Sex	Age in years	Qualification	Work experience in years
1	Female	26	BSc midwife	4
2	Female	30	BSc midwife	8
3	Female	26	BSc midwife	8

4	Female	26	BSc midwife	5
5	Female	28	BSc midwife	7
6	Female	28	BSc midwife	5.7
7	Female	29	BSc midwife	4
8	Female	34	BSc midwife	9
9	Female	34	BSc midwife	12
10	Female	35	BSc midwife	10
11	Female	25	Diploma midwife	4
12	Female	27	Diploma midwife	5.8
13	Female	45	BSc midwife	12
14	Male	25	BSc midwife	4
15	Female	28	BSc midwife	5
16	Male	34	IESO	5
17	Male	33	IESO	4
18	Female	28	Obs/Gyn R3	3
18	Male	31	Obs/Gyn R4	2
20	Male	36	Obs/Gyn R4	1
21	Male	33	Obs/Gyn R4	2
22	Male	32	Obstetrician/gynaecologist	2.5
23	Male	32	Obstetrician/gynaecologist	3

24	Male	32	Obstetrician/gynaecologist	3
25	Male	30	Obstetrician/gynaecologist	0.6
26	Male	33	Obstetrician/gynaecologists	4
27	Male	34	Obstetrician/gynaecologist	4
28	Male	45	Obstetrician/gynaecologist	20

NB: IESO: Integrated emergency surgical officer.

Three themes were identified, namely, *'Barriers to ANC access during COVID-19'*, *'Barriers to ANC uptake during COVID-19'*, and *'Barriers to ANC provision during COVID-19'*, as displayed in Figure 7. Within these themes, eight subthemes were identified. In the theme of *'Barriers to ANC access during COVID-19'*, two subthemes were identified *'Shortage of resources'*, and *'Community discrimination against those attending hospital'*. Meanwhile in the theme *'Barriers to ANC uptake during COVID-19'*, two subthemes included *'Fear of contracting COVID-19'*, and *'Decreased attendance of ANC'*. Lastly four subthemes were identified in the theme, *'Barriers to ANC provision during COVID-19'*, including *'Absence of ANC guidelines for care provision'*, *'Inadequate personal protective equipment (PPE)'*, *'COVID-19 vaccine hesitancy'* and *'Long waiting times for ANC'*. The explanations of each theme and subtheme are supported by direct quotes from study participants.



Legends

Themes 

Subthemes 


Relationship 

Figure 7: Visual representation of thematic analysis.

#### 4.4 Barriers to ANC access during COVID-19

Two subthemes emerged from our analysis of interview responses relevant to ANC access during COVID-19: *‘Shortage of resources’* and *‘Community discrimination against those attending hospital’*.

## **Shortage of resources**

Participants indicated that a lack of resources during COVID-19 affected women's access to ANC. In particular, women's incomes declined, and public transport became more limited and doubled in cost. Increasing public transport fees could have a profound impact on women who rely on this mode transport to accessing maternity care in other towns, as evidenced by the following quote:

*'The taxi cost increased during COVID-19, and the women who live in rural areas did not come to the hospital due to transport costs. For example, a woman who came from another city paid double, and she might not come to the hospital [again]'* (Midwife RMP6).

Maternity care providers described how the price of medical supplies substantially increased due to shortages, to the extent that it was impossible for most women to buy them. The combination of Ethiopia's socio-political situation and the COVID-19 pandemic prevented the government and foreign aid from funding public hospitals, as illustrated by the following quote:

*'Medical supplies were tough [expensive]; for example, one glove was sold for up to 100 Ethiopian birr [\$2 USD]. Foreign aid has decreased due to COVID-19 and the ongoing war in the country; they almost neglected this area. The NGOs donated a lot of supplies [for women's use] before COVID-19. NGOs ceased contributing medical supplies, and now there are no medical supplies in the hospital. Due to the economic crisis, women cannot afford to pay [\$2USD] for a single glove'* (IESO ALTP14).

## **Community discrimination against those attending the hospital.**

Discrimination by the community against individuals attending the hospital had a detrimental impact on women's ability to access ANC during COVID-19. Midwives stated that the community discriminated against those who attended hospitals, including both providers and receivers of care. Many community members believed the hospital to be a source of the virus. This discrimination also affected healthcare providers, as they could not meet with their families or maintain their daily routines. The discrimination against maternity care providers is illustrated in the following quote:

*'We [health care providers] could not find food to eat or meet basic needs because of discrimination us in the town. Women and families discriminated against healthcare providers; they did not want us to live with them as we were involved in providing care in the hospital; they believed we could bring COVID-19 to the community, and they think COVID-19 is a killer'* (Midwife MALTP17).

*'It was a tough time; in my residential area, nurses and physicians could not obtain basic necessities and could not rent a place as a result of discrimination'* (Midwife WR1).

Discrimination resulted in a decline in social capital between healthcare providers and the community. As a consequence, COVID-19 further damaged cultural cohesiveness between the community and healthcare providers, as exemplified by the following quote:

*'Social cohesion between healthcare providers and the community has broken down during COVID-19; for example, we [healthcare providers] could not attend funeral ceremonies. We are confined in the home. We live in a small town; everyone knows the healthcare providers, and they discriminated against us'* (Midwife MLP5).

Midwives reported similar discrimination against women who received care in hospitals. The community discriminated against these women because they believed hospitals were a source of COVID-19 and that anyone visiting them would contract the virus and spread it around. As one midwife highlighted,

*'Pregnant women's rapport with neighbours was affected when they came to [access] care in the hospital during COVID-19. After a [pregnant] woman returned home, her neighbours discriminated against her since she was [accessing] care in the hospital, and her [neighbours] believed she had contracted COVID-19'* (Midwife MAP14).

## **4.5 Barriers to ANC uptake during COVID-19**

Two subthemes were identified within '*Barriers to ANC uptake during COVID-19*' theme: '*Fear of contracting COVID-19*' and '*Decreased attendance of ANC*'.

## **Fear of contracting COVID-19**

The midwives highlighted that a significant number of women did not attend hospitals because they feared contracting COVID-19. Due to this fear, even women who attended and received care kept their distance from maternity care providers, believing that *'the hospital was the epicentre of the virus'* (Midwife MRP1). Other midwives concurred:

*'Women came to [uptake] care in the hospital with fear. They feared healthcare providers. They considered healthcare providers to be a source of COVID-19, ha ha ha'* (Midwife MALTP16).

*'The women were afraid; as I told you before, they believed that if they came to the hospital for ANC, they would catch COVID-19'* (Midwife MLP5).

Midwives explained that pregnant women's fear of contracting COVID-19 considerably affected practitioner–client communication during care provision. Maternity care providers felt that this fear prevented them from developing a strong rapport with women or spending sufficient time in consultations. Physical-distance policies stipulated that individuals must remain at least 1.5 metres apart. In addition, because of the perceived risk to their privacy resulting from physical distancing and weakened communication, women were reluctant to disclose their medical information to maternity care providers when attending the hospital. One midwife has the following explanation:

*'During the pandemic, fear reduced women's communication with midwives. Women needed to discuss their private [sexual] issues by approaching us [healthcare providers], but distance made it impossible. When women came, we comforted them by touching their shoulders, but now it is not easy. It reduces something that we have had. Furthermore, we would keep our distance from them'* (Midwife MAP12).

Obstetricians and obstetric/gynaecology residents also described how the pandemic disrupted their relationships and communication with women. For fear of spreading the infection, at the peak of COVID-19, none would even touch a woman's medical chart, and the fetal heartbeat was checked using a Doppler rather than a Pinard fetoscope. One resident commented:

*'The rapport between women and physicians clearly declined [during COVID-19]. You could not even touch a medical chart when COVID-19 was at its peak because of the news from Italy that physicians had contracted and died from COVID-19. The disease is transmitted by touching a medical chart. There was a great distance. As a result, there was a decline in the rapport between women and physicians. If physicians were doing these things, you might assume other healthcare providers were as well, and many things were missed in giving care'* (Resident 4 RRP10).

*'Maternity care providers' rapport with women substantially decreased. For example, before the pandemic, we used Pinard fetoscope to check the fetal heartbeat. Nevertheless, there were numerous concerns about using a Pinard fetoscope to check a fetal heartbeat during the pandemic, so we switched to a Doppler to check the heartbeat. The maternity care providers believed that women with a cough had COVID-19, and so were unwilling to care for them'* (Obstetrician SRP19).

### **Decreased attendance of ANC**

Reporting that ANC attendance decreased during COVID-19, participants noted that the reasons included a *'a lack of transport or an increase in the fee for using public transport'* (Midwife MRP2) and recommendations to stay at home, as noted in the following quote:

*'After Ethiopia reported the first COVID-19 case, maternal health services significantly decreased, and the number of women who came to the hospital, especially for their ANC follow-up, decreased because they were listening to other news about COVID-19 through various media outlets. Many women were staying at home because they feared COVID-19. They believed that the hospital was not providing the services and did not take their needs into consideration when they came'* (IESO ALTP15).

Due to population growth, ANC attendance is expected to grow from one year to the next. However, during COVID-19, obstetricians reported declining daily ANC attendance: *'women did not come on their appointment day'* (Obstetrician SAP22). One obstetrician expressed an opinion that the decline in ANC attendance was in part due to the messages recommending the community stay at home, and the fact that women were not encouraged to access the services



by medical and midwifery staff at the hospital. Further evidence is provided by the following quote:

*‘Before COVID-19, there were around ten women [per day], but during COVID-19, it was around five to seven women. Our population is increasing, but the number of women attending decreased during COVID-19. They came, we treated them, sent them home, and made predictions. As I had predicted, fewer people attended hospitals. According to my predictions, these decreases resulted from the fact that we did not encourage women to attend the hospital, there was a lack of public transport, we recommended women stay at home, and there was a lack of maternity care providers in this hospital’* (Obstetrician SRP24).

## **4.6 Barriers to ANC provision during COVID-19**

Four subthemes were identified within the theme ‘*Barriers to ANC provision during COVID-19*’: ‘*Absence of ANC guidelines for care provision*’, ‘*Inadequate PPE*’, ‘*COVID-19 vaccine hesitancy*’, and ‘*Long waiting times for ANC*’.

### **Absence of ANC guidelines for care provision**

Participants acknowledged that the availability of ANC guidelines is crucial for providing high-quality care and evidence-based care. Most study participants reported that there were no COVID-19-related ANC guidelines in the hospitals. One obstetrician said, ‘*We did not have any protocol... We continued to use the previous obstetric care guidelines*’ (Obstetrician SRP 23). While there was some guidance from the WHO on emergency infection prevention, there was no specific protocol for the management of pregnancy care:

*‘There is no unique protocol or approach that we adapted or adopted. The hospital got some aid from the regional health bureau and gave us essential personal protection equipment like gloves, masks, and sanitiser. Using this equipment, we admitted the women who came to the service. However, we did not prepare any COVID-19 protocol or design any strategies at the curriculum level’* (IESO ALTP15).

*‘The WHO developed the guideline and then nationally adopted it. By chance, we have one guideline that was adopted and updated from the previous national*

*guideline in obstetrics in 2020. However, the guideline was not related to COVID-19. Meanwhile, there is a protocol for emergency infection prevention and COVID-19 prevention protocol. It is used for all, including pregnant women. However, specifically, there is no guideline for pregnancy-related care during COVID-19' (Resident 4 RRP 10).*

### **Inadequate PPE**

Midwives indicated that inadequate supplies of COVID-19 PPE were a common problem in hospitals during the pandemic. Maternity care providers noted an imbalance between demand and supply of PPE in the hospitals. The scarcity of *'facemasks, face shields, shoes and other PPE'* (Midwife MAP 13), perhaps due to increased use of infection control supplies. The following quotes are illustrative:

*'Five masks were given to each healthcare provider per week, and one sanitiser was given to many healthcare providers, but it was not given individually. [Later] the number of masks was reduced from five to four per week' (Midwife MALTP17).*

*'Women bought a mask and used it together; when someone left the hospital, they handed it over to another person' (Midwife MLP5).*

### **COVID-19 vaccine hesitancy**

At the time of data collection, only 9 of the 28 participating maternity care providers had received two doses of the COVID-19 vaccination. Some mentioned that they doubted the vaccine's efficacy or believed that the infection was a punishment for disobeying God's commandments. Several participants expressed their view that the vaccine causes various diseases, including clotting disorders, as exemplified in the following quote:

*'I have chosen not to get vaccinated. I do not believe in it, and I do not want the vaccine. My belief is that the outbreak of COVID-19 may be a consequence of our sins was caused by our sins and evil actions. I consider COVID-19 to be a form of divine punishment for our transgressions. Therefore, I believe we should fast and pray in an attempt to avoid this disease' (Midwife MAP13).*

## Long waiting times for ANC

Waiting times for ANC provision were longer than usual during COVID-19. Priority was given to women wearing facemasks; hence, those without facemasks had to wait longer. As one midwife commented, *'The women who wear facemasks get [to access] the service first; those who do not wear facemasks do not get [access to] care'* (Midwife MALTP17). Moreover, fear of contracting COVID-19 led maternity care providers to delay providing care in hospitals without PPE. Women who did not wear facemasks were not permitted to enter ANC clinics or receive immediate care. Despite the decline in ANC attendance, those women who did attend were met with delays in receiving care due to lack of staff, as illustrated by the following quote:

*'We were nagging patients who did not wear masks, we ordered a woman to wear a mask, and we left the room if she did not wear a facemask. However, we offered ANC during COVID-19 in a manner similar to that before the pandemic; all ANC components were offered during [COVID-19]. Although we performed complete physical examinations...comparable to those performed before COVID-19, the facemask did not bring comfort to women or those who provide maternity care and had a terrible effect during physical examinations'* (Midwife MALTP16).

*'Many women were waiting [to access] the services, crowded on ANC waiting chairs, and the waiting time was long because [only] one or two maternity care providers gave services. Women were desperate to get [access to] the service, and they [sometimes] returned to their homes without getting healthcare. We [used to provide] ultrasounds for all women during each visit. During COVID-19, we [only] performed ultrasounds for selected women'* (Obstetrician SRP23).

## 4.7 Integrating quantitative and qualitative data with joint display technique

In the quantitative analysis, monthly trends of ANC attendance and the availability of essential drugs in hospitals were assessed before and during the pandemic. Simultaneously, three themes and eight subthemes were also identified in the qualitative data to explore whether the qualitative findings confirmed or disconfirmed the quantitative findings.

For ANC1 and ANC4 attendance, the quantitative findings revealed decreasing trends during the pandemic, and the qualitative study corroborated these declines, providing evidence that stay-at-home recommendations, lack of (and more expensive) transport, and fear of contracting the virus contributed to reducing the number of women attending hospitals for ANC (Table 5). As one participant commented, *'the uptake of ANC4 declined due to fear of contracting the virus during COVID-19'* (Midwife MLP5).

By contrast, the quantitative and qualitative findings on essential drug availability were contradictory (Table 5). The quantitative analysis showed no significant difference in the availability of essential drugs in hospitals before and during the pandemic. However, access was impacted for women by the cost, and according to staff, by supply shortages, as the following quote demonstrates, *'medical supplies decreased in the hospital, and the cost of medical supplies increased. All things were going up during the COVID-19 pandemic'* (IESO ALTP14). The same discrepancy was found for iron and folic acid availability, which did not significantly differ between before and during the pandemic according to the quantitative analysis but notably declined according to the qualitative analysis: *'pregnant women faced challenges in accessing and taking iron-folic acid supplement appropriately during the pandemic'* (Midwife MALTP18). These inconsistencies could be explained by inadequacies in the HMIS inventory. The binary nature of data in the HMIS form means that responses are limited to 'available' or 'unavailable', with no space to include details of the quantities of essential drugs. Hence, the HMIS data do not adequately represent the scenario on the ground at the hospital pharmacy level (Table 5).

There is a lack of data to demonstrate quantitatively whether ANC guidelines are in place, the amount of PPE equipment available or vaccine rates to confirm qualitative findings. Additionally, there is no data to determine wait times for ANC, presence and severity of fear of contracting COVID-19, or measures of discrimination from the community. This information reported by care providers is similarly reported in the literature for other comparable countries, and by interview data from the women included in this study (Table 5).

Table 5: Joint display of quantitative and qualitative findings for each theme and subtheme on impact of COVID-19 on ANC access, uptake and provision, and mixed-methods meta-inferences.

Theme	Subtheme	Quantitative findings	Qualitative findings	Mixed-methods meta-inference
Barriers to ANC access during COVID-19	Shortage of resources during the pandemic	Overall trends of availability of essential drugs before and during COVID-19 showed no significant change (IRR = 0.987, 95% CI [0.948, 1.029]; $p = 0.565$ )	<p>Maternity care providers demonstrated a shortage of resources, and the women could not afford to buy medical supplies in the hospital while consistently lacking essential medical supplies. The quote below illustrates:</p> <p><i>‘There was a shortage of medical supplies during COVID-19; for example, in ANC clinics, iron folic acid and TT vaccine were unavailable’ (IESO ALTP 15).</i></p>	<p>Contradiction: the discrepancy between quantitative and qualitative findings could be explained by the binary responses (i.e., available or unavailable) in the HMIS form, providing no insight into the exact quantities of essential drugs. By contrast, the qualitative findings explored maternity care providers’ day-to-day experiences of access to essential medical supplies in the hospital. The shortage of essential drugs, such as iron</p>

Theme	Subtheme	Quantitative findings	Qualitative findings	Mixed-methods meta-inference
				and folic acid, may have caused difficulty for women in accessing ANC.
	Community discrimination against those attending the hospital	None	<p>Maternity care providers reported that women who sought care at a hospital during the pandemic often faced discrimination from the community, which hampered women access to ANC. The quote below illustrates:</p> <p><i>‘There is discrimination. If women went to the hospital, the community assumed they would come back with COVID-19. Women may have been psychologically let down because there was no longer the same social cohesion as before COVID-19. Because of this, COVID-19 reduced access to ANC’</i> (Midwife MAP14).</p>	The qualitative findings demonstrate that discrimination contributed to reducing ANC access. With a decline in social cohesion, pregnant women feared facing community discrimination after visiting hospital, thus affecting ANC access during COVID-19.

Theme	Subtheme	Quantitative findings	Qualitative findings	Mixed-methods meta-inference
Barriers to ANC uptake during COVID-19	Fear of contracting COVID-19	None	<p>Fear of contracting COVID-19 was mentioned as a barrier to the uptake of ANC by maternity care providers. The following quote observes:</p> <p><i>'The outpatient department was not as crowded during COVID-19 as it was before COVID-19 because people stayed home due to fear of contracting the virus, and ANC follow-up also decreased'</i> (Midwife WR1).</p>	The qualitative findings indicated that fear of contracting COVID-19 contributed to reducing ANC uptake. Many pregnant women were more afraid of contracting COVID-19 disease than of suffering pregnancy-related complications, leading to a decline in ANC uptake during the pandemic.
	Decreased attendance of ANC	Overall trends before and during COVID-19 showed significant reduction of 0.7% in ANC1 provision (IRR = 0.993, 95% CI	<p>Maternity care providers described a decline in ANC attendance during COVID-19.</p> <p><i>'Pregnant women did not come to their appointments for ANC follow-up. We tried to reinstate ANC follow-up before COVID-19, but they stayed at home; we tried to provide</i></p>	Corroboration: the qualitative and quantitative findings indicate that recommendations to stay at home, fear of contracting the virus, and lack of transport

Theme	Subtheme	Quantitative findings	Qualitative findings	Mixed-methods meta-inference
		[0.990, 0.997]; $p < 0.001$ ), and significant decrease of 1.7% in ANC4 provision (IRR = 0.982, 95% CI [0.976, 0.987]; $p < 0.0001$ )	<i>care to them via phone, but it was challenging</i> ' (Obstetrician SAP22).	led to pregnant women postponing or cancelling ANC appointments, this reducing ANC uptake during the pandemic.
Barriers to ANC provision during COVID-19	Absence of guidelines for ANC provision during COVID-19	None	Maternity care providers reported that no guidelines were introduced for maternal care during the pandemic, notwithstanding ANC appointment changes made by the health bureau.  <i>'There were no maternal care guidelines related to COVID-19. Meanwhile, appointment intervals were changed by the health bureau'</i> (Midwife RMP221).	The qualitative findings indicate that the absence of ANC guidelines during COVID-19 reduced the provision of ANC and that the quality of care provision was suboptimal.



Theme	Subtheme	Quantitative findings	Qualitative findings	Mixed-methods meta-inference
	Inadequate PPE	None	<p>Maternity care providers reported that women and healthcare providers used inadequate COVID-19 PPE.</p> <p><i>‘There was a shortage of materials used to prevent COVID-19, for example, soap, hand sanitiser, and masks’ (Midwife MLP5).</i></p>	<p>The qualitative findings illustrate that inadequate PPE was a barrier to ANC provision. Maternity care providers could not provide optimal ANC without adequate PPE.</p>
	COVID-19 vaccine hesitancy	None	<p>Some maternity care providers mentioned doubts over the efficacy of COVID-19 vaccines, and beliefs that the infection had come to punish humans for disobeying God’s commandments. They also thought that vaccines were causing various diseases, including clotting disorders.</p> <p><i>‘It causes blood clotting, cancer, and other issues. There are no diseases more dangerous and fatal than</i></p>	<p>The qualitative findings demonstrate that COVID-19 vaccine hesitancy impacted ANC provision. Such hesitancy in maternity care providers could have increased the reluctance of pregnant women to be vaccinated, since the providers would not attempt to persuade</p>

Theme	Subtheme	Quantitative findings	Qualitative findings	Mixed-methods meta-inference
			<p><i>cancer than blood clotting and cancer’ (Midwife MAP14).</i></p>	<p>them of the vaccine’s benefits during pregnancy.</p> <p>Furthermore, vaccine-hesitant maternity care providers’ fear of contracting the virus when providing ANC could have further reduced ANC provision.</p>
	<p>Long waiting times for ANC provision</p>	<p>None</p>	<p>Maternity care providers commented that women faced long waiting times for ANC during the pandemic, especially if they did not wear a mask.</p> <p><i>‘The women who wear facemasks get [to access] the service first; those who do not wear facemasks do not get [to access] care until they bought and wore a mask’ (Midwife MALTP17).</i></p>	<p>The qualitative findings illustrate that long waiting times hindered ANC provision during COVID-19. Maternity care providers could not allow care to pregnant women until they wore a facemask, leading to reduced ANC provision during the pandemic.</p>

This chapter described the results of the impact of COVID-19 on the access, uptake and on ANC provision at public hospitals in the Sidama region of Southern Ethiopia. The mixed methods result indicated a significant decrease in the rates of monthly attendance of women to the health facilities for ANC. The themes that were identified from the data collected from health professionals suggest a complex interplay of reasons for this decline. These themes describe: *'Barriers to ANC access during COVID-19'*, *'Barriers to ANC uptake during COVID-19'*, and *'Barriers to ANC provision during COVID-19'*. The following chapter outlines the impact of COVID-19 on intrapartum care at public hospitals in the Sidama region of Ethiopia.

## **Chapter 5: Impact of COVID-19 on intrapartum care at public hospitals in Sidama region, Ethiopia.**

This chapter examines the impact of COVID-19 on intrapartum care at public hospitals in the Sidama region of Southern Ethiopia. This mixed methods study revealed that the incidence of caesarean and instrumental vaginal births significantly increased during the pandemic and that a considerable number of maternal and neonatal deaths occurred in the hospital during the pandemic. *'Barriers to providing intrapartum care during COVID-19'*, *'Delays to provision of intrapartum care during COVID-19'*, and *'Inadequate COVID-19 preventive measures'* were the related themes that emerged in this study. These findings provide evidence for stakeholders and policymakers that maintaining and rebuilding intrapartum care will help ensure better care during present and future pandemics.

### **5.1 Introduction**

The provision of quality intrapartum care is pivotal to lowering the maternal death rate (Yaya & Ghose, 2019); hence, where women give birth in a health facility or assisted by healthcare providers, childbirth-related maternal and neonatal mortality is typically lower (Hasan et al., 2021; Khanam et al., 2018). To illustrate, a study in 37 sub-Saharan African and South Asian countries showed that institutional childbirth substantially decreased neonatal deaths (Gage et al., 2021).

Globally, COVID-19 has disrupted health systems and services (Filip et al., 2022), especially in LMICs (Blanchet et al., 2020). According to studies in these countries, institutional births declined during the pandemic (Aranda et al., 2022; Kc et al., 2020), while caesarean sections increased in Africa (Desta et al., 2021; Sevalie et al., 2021). However, home births also increased in Africa (Naqvi et al., 2022) due to fear of contracting the virus, delays in receiving care, and poor coordination in the referral system (Babalola et al., 2022; Sacks et al., 2021). A study in Ethiopia also reported that lack of essential drugs, poor quality of care (Hailemariam et al., 2021), and lack of transport due to lockdowns led to delays in receiving care during the pandemic. Consequently, the pandemic significantly increased maternal and neonatal deaths in LMICs (Chmielewska et al., 2021).

COVID-19 has made it more challenging to implement and maintain proven strategies for improving institutional births and the quality of intrapartum care in resource-scarce countries such as Ethiopia (WHO, 2021). Consequently, an overwhelming number of countries seem unlikely to meet their targets of lowering maternal mortality to below 70 per 100,000 live births and neonatal mortality to below 12 per 1,000 live births by 2030 (WHO, 2022).

To the best of my knowledge, this study is the first to use joint display methods to examine how COVID-19 impacted intrapartum care in Ethiopia. It is crucial to quantify and explore barriers to institutional childbirth and intrapartum care uptake and provision during the pandemic, thereby contributing to the design of evidence-based interventions.

## **5.2 Quantitative results: Trends in intrapartum care and its outcome in fifteen hospitals during the pandemic**

In the Sidama region, the monthly estimated incidence rate ratio of institutional childbirth decreased by 1.4% in the 12 months before the pandemic (IRR = 0.986, 95% CI [0.982, 0.989];  $p = 0.0001$ ) and declined more dramatically during the first three months of the pandemic, dropping by a further 7.8% (IRR = 0.922, 95% CI [0.879, 0.968];  $p = 0.001$ ). However, overall trends of institutional childbirth in the first six months of the pandemic did not significantly differ between before and during the pandemic ( $p = 0.277$ ) (Table 6 and Figure 8). The monthly estimated incidence rate ratio of assisted vaginal birth (forceps or vacuum) significantly decreased in the first 12 months before the pandemic (from March 2019 to February 2020) by 7.6% (IRR = 0.924, 95% CI [0.910, 0.938];  $p = 0.001$ ) then dropped massively during the first three months of the pandemic, with a 54.4% decline (IRR = 0.456, 95% CI [0.368, 0.566];  $p = 0.001$ ). However, overall trends of assisted vaginal childbirth showed a significant increase of 10.6% during the first six months of the pandemic compared to the 12 preceding months (IRR = 1.106, 95% CI [1.052, 1.164];  $p = 0.001$ ) (Table 6 and Figure 8). Similar patterns were found for caesarean births: the monthly estimated incidence rate ratio significantly decreased before the pandemic by 2.1% (IRR = 0.979, 95% CI [0.970, 0.987];  $p = 0.001$ ) and declined further by 15.4% during the first three months of the pandemic (IRR = 0.846, 95% CI [0.756, 0.947];  $p = 0.004$ ), but overall trends during the first six months of the pandemic showed a significant rise of 5.9% in caesarean births from before to during the pandemic (IRR = 1.059, 95% CI [1.033, 1.086];  $p = 0.001$ ) (Table 6 and Figure 8).

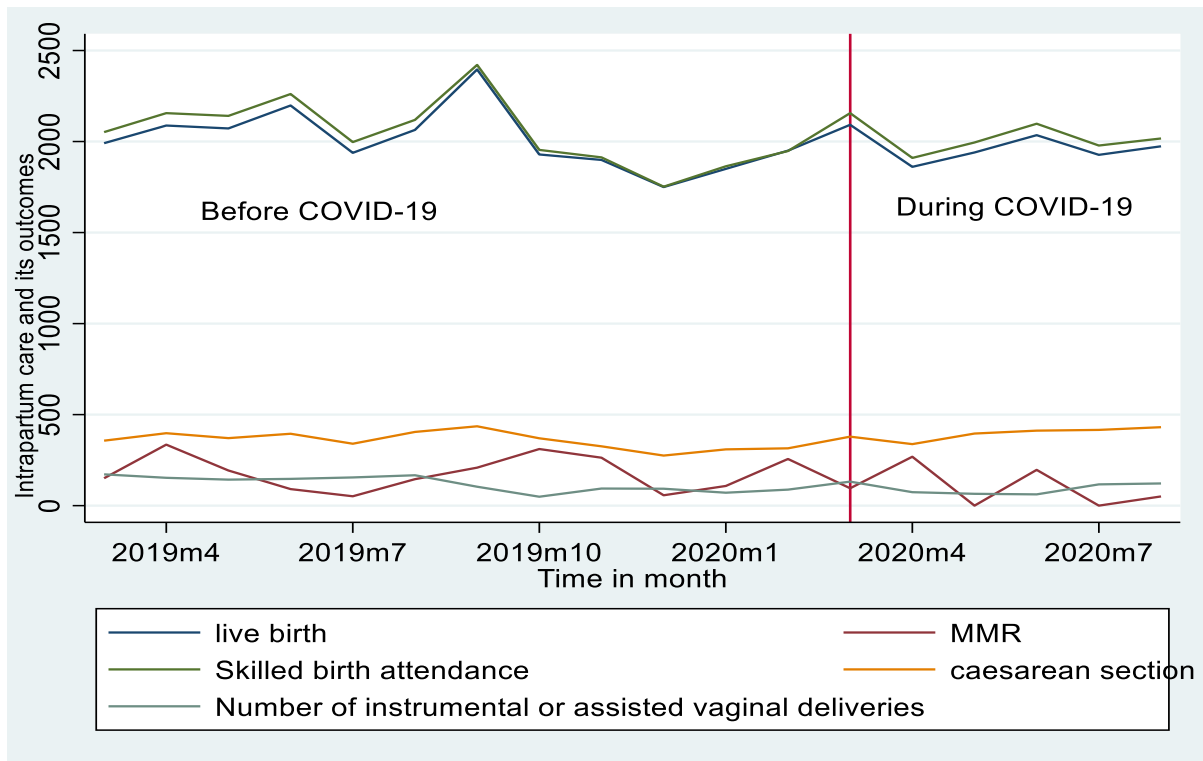


Figure 8: Mean trends of intrapartum care and its outcomes at public hospitals in the Sidama region, Ethiopia, March 2019 – August 2020.

In terms of the monthly estimated incidence rate ratio, stillbirths significantly decreased by 4.9% in the 12 months before the pandemic (IRR = 0.951, 95% CI [0.921, 0.982];  $p = 0.003$ ), but did not significantly change during the first three months of pandemic (IRR = 0.890, 95% CI [0.594, 1.333];  $p = 0.573$ ). In terms of overall trends in the first six months of the pandemic, there was no significant difference in stillbirths between the periods before and during the pandemic (IRR = 1.006, 95% CI [0.915, 1.107];  $p = 0.889$ ) (Table 6 and Figure 9).

The monthly estimated incidence rate ratio of neonatal deaths significantly decreased by 9.1% in the 12 months before the pandemic (IRR = 0.909, 95% CI [0.833, 0.991];  $p = 0.032$ ). However, during the first three months of the pandemic, the monthly estimated incidence rate ratio of neonatal deaths did not significantly change (IRR = 0.253, 95% CI [0.062, 1.031];  $p = 0.055$ ). There was also no significant difference between before and during the pandemic in overall trends during the first six months of the pandemic neonatal deaths (IRR = 1.187, 95% CI [0.856, 1.647];  $p = 0.302$ ) (Table 6 and Figure 9).

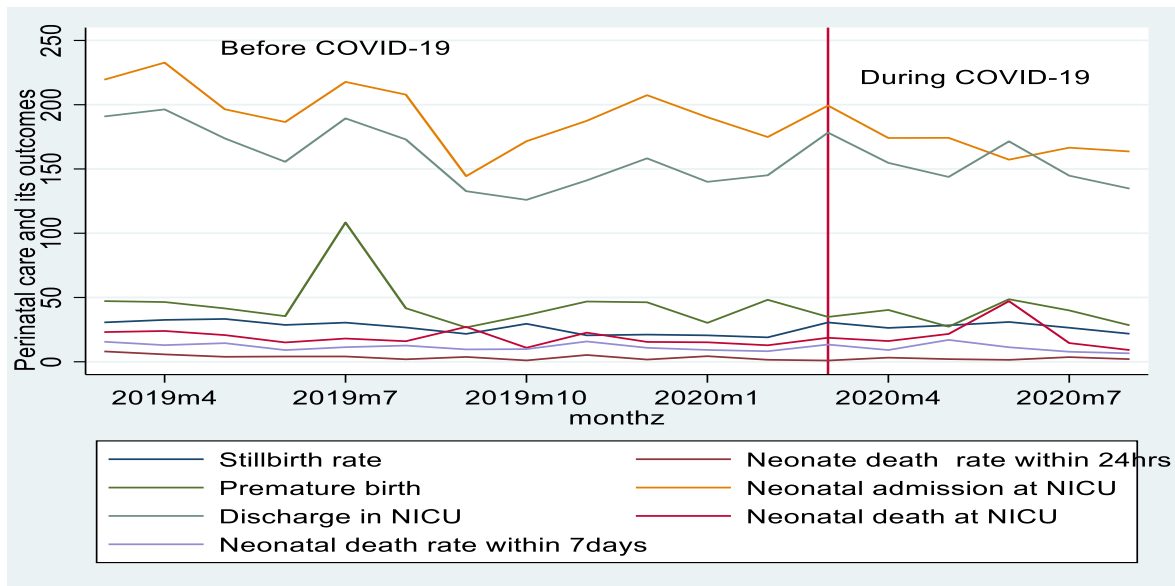


Figure 9: Mean trends of perinatal care and its outcomes at public hospitals in the Sidama region, Ethiopia, March 2019 – August 2020.

Overall, the quantitative findings demonstrate that instrumental vaginal births and caesarean births significantly increased during the first six months of the pandemic (Table 6 and Figure 8). By contrast, institutional births, stillbirths, and neonatal deaths did not significantly differ between the 12 months before and the first 6 months during the pandemic (Table 6 and Figure 8 and 9).

Table 6: Trends of intrapartum care and maternal and perinatal outcomes before and during COVID-19 at public hospitals in the Sidama region (March 2019 – August 2020).

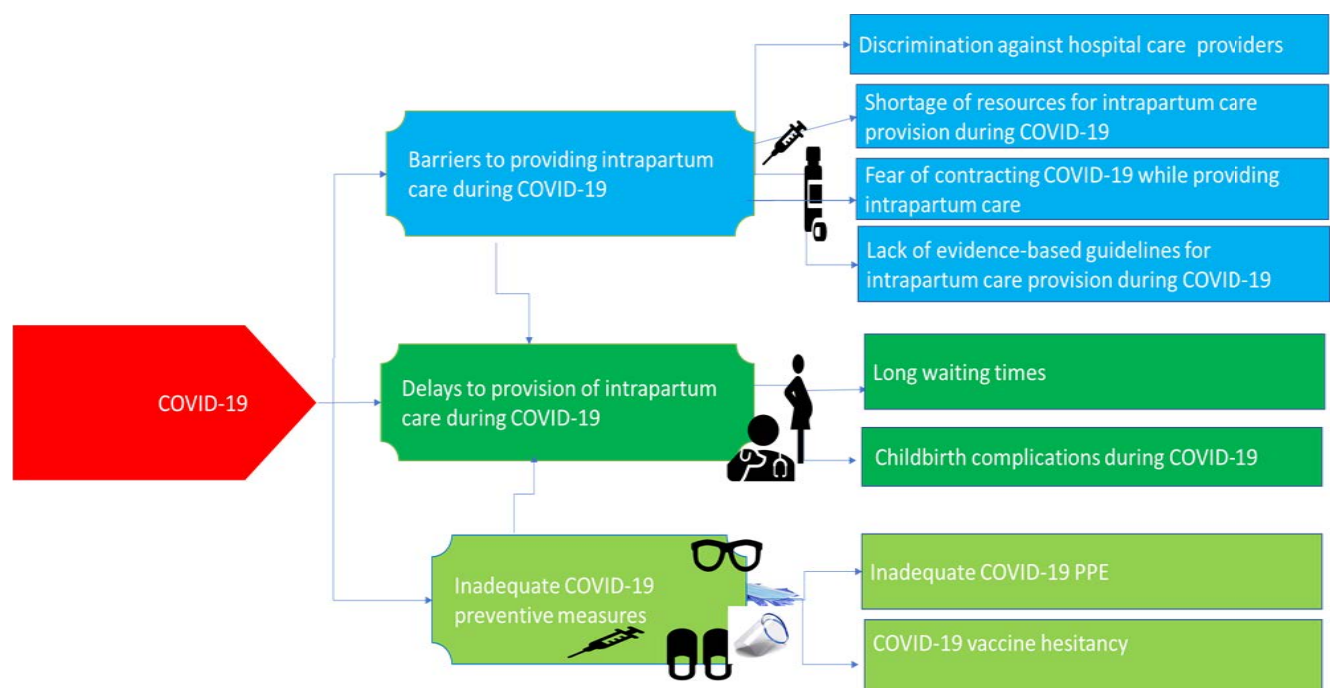
Trends in intrapartum care and maternal and perinatal outcomes	Monthly incidence rate before COVID-19 as an estimated IRR 95% CI	P value	Monthly incidence rate immediately during the COVID-19 as an estimated IRR 95% CI	P value	Monthly incidence rate before COVID-19 compared with during COVID-19 as an estimated IRR 95% CI.	P value
Institutional birth	0.986 (0.982–0.989) ***	<b>0.0001</b>	0.922 (0.879–0.968) ***	<b>0.001</b>	1.008 (0.997–1.019)	0.277
Caesarean section	0.979 (0.970–0.987) ***	<b>0.0001</b>	0.846 (0.756–0.947) **	<b>0.004</b>	1.059 (1.033– 1.086) ***	<b>0.0001</b>
Instrumental childbirth	0.924 (0.910– 0.938) ***	<b>0.0001</b>	0.456 (0.368–0.566) ***	<b>0.0001</b>	1.106 (1.052– 1.164) ***	<b>0.0001</b>
Maternal mortality	0.997 (0.985–1.009)	0.688	1.189 (0.990–1.427)	0.063	0.786 (0.748–0.827) ***	<b>0.0001</b>
Stillbirth	0.951 (0.921–0.982) **	<b>0.003</b>	0.890 (0.594–1.333)	0.573	1.006 (0.915–1.107)	0.889
Neonatal death within 24 hours	0.909(0.833–0.991) *	<b>0.032</b>	0.253 (0.062–1.031)	0.055	1.187 (0.856–1.647)	0.302
Neonatal death within seven days	0.966 (0.920–1.013)	0.163	1.107 (0.597–2.052)	0.745	0.921 (0.791–1.072)	0.292
Neonatal admission to NICU	0.982 (0.970–0.993) **	<b>0.003</b>	0.895 (0.763–1.050)	0.174	0.981 (0.945–1.019)	0.340
Neonatal discharge from NICU	0.969 (0.956–0.982) ***	<b>0.0001</b>	0.912 (0.770–1.081)	0.290	0.990 (0.951–1.030)	0.638
Availability of essential drugs	1.00 (0.987-0.1.013)	0.970	1.001 (0.837-1.98)	0.985	0.987(0.0.948-1.029)	0.565

Note: \*= Significant 0.05; \*\*= Significant at 0.01; \*\*\*=Significant at 0.001, IRR=Incidence rate ratio



### 5.3 Qualitative results: Views and experiences of maternity care providers of the impact of COVID-19 on the provision of intrapartum care in the Sidama region of Ethiopia.

Face-to-face interviews were performed with 28 maternity care providers, comprising 15 midwives, 2 IESOs, 4 obstetric/gynaecology residents, and 7 obstetricians/gynaecologists. The inductive thematic analysis of the interview data led to the emergence of three themes: *'Barriers to providing intrapartum care during COVID-19'*, *'Delays to provision of intrapartum care during COVID-19'*, and *'Inadequate COVID-19 preventive measures'* (Figure 10).



Legends

Themes 

Subthemes 


Relationship 

Figure 10: Visual representation of themes.

## 5.4 Barriers to providing intrapartum care during COVID-19

Maternity care providers noted various obstacles to providing intrapartum care. These barriers were categorised into four subthemes, *'Discrimination against hospital care providers'*, *'Shortage of resources for intrapartum care provision during COVID-19'*, *'Fear of contracting COVID-19 while providing intrapartum care'*, and *'Lack of evidence-based guidelines for intrapartum care provision during COVID-19'*.

### Discrimination against hospital care providers

Maternity care providers reported that they faced discrimination for providing services in hospitals. Some community members perceived that healthcare providers were a source of COVID-19, due to the high risk of infection in their workplace. For instance, discrimination arose after a COVID-19 case was reported in a particular hospital. The existence of discrimination within the community against healthcare providers has posed challenges for healthcare providers in the provision of services. This discrimination has impeded the provision of optimal care during COVID-19 within the community:

*'They [the community] consider COVID-19 to be living in the hospital, so they discriminated against healthcare providers... House owners ordered healthcare providers not to contact their children... There were healthcare providers who were ordered to leave their rented houses. There was a considerable divide between the healthcare providers and the community' (IESO ALTP15).*

One midwife reported that after she contracted and recovered from the virus, her landlord displayed a negative attitude towards her family and forbade the midwife's child from playing with other children in the compound:

*'The landlord of my home did not have a good attitude towards me; I had not been feeling well when I returned home. I was frightened to meet the community and neighbours. After I contracted and recovered from COVID-19, my child also did not play with the neighbours' children, and they isolated him; all these things were too challenging at that time for me' (Midwife RMP221).*

## Shortage of resources for the provision of intrapartum care during COVID-19

Participants frequently reported shortages of beds and medical equipment, such as surgical and disposable gloves, oxytocin, PPE, and essential drugs such as antibiotics and normal saline. One midwife stated that *'medications like Pitocin (oxytocin) ran out in this hospital'* (Midwife MALTP17). Similarly, an IESO recounted,

*'There was a shortage of gloves and antibiotics such as ceftriaxone and metronidazole in the hospital during the pandemic. Furthermore, there was a shortage of other essential drugs, such as ergometrine and misoprostol, used to manage postpartum haemorrhage'* (IESO ALTP14).

Another midwife reported a lack of beds and operating tables in hospitals. Isolating women was impossible, and often, more than three women were put in the same room to labour:

*'We had shortages of beds in the labour ward. No more than three women were allowed in one room during COVID-19, but it was impossible to implement that. So, we were admitting the women without considering the standards of the COVID-19 prevention policy'* (Midwife MRP11).

Essential suturing materials for caesarean section and episiotomy, along with anaesthetic drugs, were unavailable in hospitals, compelling women to buy equipment (e.g. gloves) and drugs from elsewhere. This was described by one midwife as follows:

*'We were experiencing shortages in our pharmacy services and laboratory supplies. Specifically, we faced challenges in obtaining essential items, such as catgut 0, Vicryl number 2 and 3, and general anaesthesia medicine [Vecuronium bromide]. At night, when an emergency caesarean section occurred, they bought Vicryl from outside; gloves were not available in the hospital for a month, and patients bought [gloves] from a private pharmacy for about 40 Ethiopian birr [\$1USD] for one glove'* (Midwife MRP213).

Reported reasons for such lack of medical equipment included *'the budget was being transferred to the COVID-19 centre'* (Midwife MRP2) and *'caesarean sections also increased'* (Midwife MRP3). Another midwife stated:

*'The majority of medicines could not be found in the hospital, so women had to buy them elsewhere. For example, ampicillin, ceftriaxone, and normal saline might be available one day but not the next' (Midwife MRP6).*

Obstetricians noted that medical equipment shortages disturbed their operating theatre schedules. A shortage of blood products was compounded by uncertainty over whether COVID-19 could spread through blood transfusion. Screening for COVID-19 was also challenging as potential donors were reluctant to be tested, and the testing processes were limited. One obstetrician reported that:

*'In the labour ward, we needed oxygen for resuscitation; at that time, since there was high oxygen consumption, we had a shortage...there was [also] a shortage of blood. In blood donation, it was not a settled issue whether COVID-19 was transmitted through blood transfusion or not...Second, the blood donor should be screened for COVID-19, and people were [reluctant] to screen for COVID-19' (Obstetrician SRP19).*

The lack of equipment and drugs exposed women to higher risks of morbidity and mortality, as one obstetrician described:

*'The general anaesthetic medicine [vecuronium bromide] was unavailable in the hospital and the city. I do not know whether this was because of the country's situation [war] or COVID-19...we did procedures without gloves. There were no medicines; one woman died due to the absence of general anaesthetic in the hospital and the city. If general anaesthetic had been given to that woman, she could have been saved...ICU beds and mechanical ventilators were filled. There were no extra ventilators in the ICU. COVID-19 brought resource limitations' (Obstetrician SRP21).*

### **Fear of contracting COVID-19 while providing intrapartum care**

Maternity care providers highlighted their own fear of contracting the virus and described the challenge this posed to caring for women in labour. In particular, it was difficult for them to communicate with women in the labour ward, a situation compounded by the lack of PPE. One midwife explained as follows:

*'Communication between women and midwives decreased due to fear of the virus. Since I was closest to the COVID-19-suspected woman, counting her contractions was challenging for me. We lacked enough gloves; we simply wore a mask while we cared for the woman. I feared...the virus could transmit through personal contact' (Midwife MAP12).*

Likewise, most midwives feared caring for and approaching labouring women, even if those women wore facemasks. They observed distress in labouring women due to the discomfort of wearing a mask while in labour and their fear of transmitting the virus to their newborns. One midwife said:

*'Even if healthcare providers fear [COVID-19], it is the hardest thing to provide care when a woman is giving birth while wearing a facemask. [The women] were uncomfortable and distressed due to wearing masks during labour. They feared whether COVID-19 could transmit to the new baby through breathing' (Midwife MAP14).*

Midwives also noticed that women regarded hospitals as a source of the COVID-19 virus, and so were afraid to attend to utilise maternity services, even if they experienced complications. There were examples of women refusing to be admitted, not complying with the treatment, and even leaving the hospital after being referred from other health facilities. A midwife explained that:

*'The community perceived the hospital as an epicentre of COVID-19 and believed that all people who attended/worked at the hospital contracted COVID-19. Women were forced to come to this hospital by being referred from other hospitals, against their choice. This indicated women's fear of coming here' (Midwife MRP1).*

Similarly, IESOs, residents and obstetricians shared their experiences of fear while caring for and treating women during the peak of COVID-19. As one resident observed, *'When the woman came with complications, maternity care providers feared performing a caesarean section and handed over [her care] to other maternity care providers'* (Resident RPP9). Similarly, an obstetrician recalled:

*'I remember one woman came because she was labouring. Only some healthcare providers volunteered to participate in the [caesarean] surgery' (Obstetrician SAP22).*

### **Lack of evidence-based guidelines for intrapartum care provision during COVID-19**

Maternity care providers cited the absence of evidence-based guidelines for providing intrapartum care in the context of COVID-19. They endeavoured to remain updated by consulting other sources, including other health professionals and, *'Ministry of Health platforms on social media such as Telegram channels'* (Obstetrician SRP22). During the pandemic, there were no specific hospital guidelines for intrapartum care. Only COVID-19 prevention guidelines for the general population were displayed on the walls, as illustrated below:

*'I did not know...whether the guidelines were available in the hospital [at the senior level]. Our hospital had no guidelines at the bottom [ward level], but brochures and pamphlets cautioning about COVID-19 symptoms were posted on the wall. Nevertheless, we asked the women about fever and cough, measured their temperature, and, if they were suspected of having COVID-19, we isolated them. There were no unique guidelines' (Resident RPP7).*

The lack of hospital infection-control protocols specific to COVID-19 resulted in COVID-19-suspected women being treated in the same operating room as other women—a mix that endangered patients:

*'There was no specific guideline prepared in this hospital. Nevertheless, for COVID-19-suspected or -infected women, operations were done in the same operating theatre used for non-infected women' (Obstetrician SAP21).*

## **5.5 Delays to provision of intrapartum care during COVID-19**

Within this theme, two subthemes emerged from the qualitative analysis of interviews: *'Long waiting times'* and *'Childbirth complications during COVID-19'*.

## Long waiting times

The lack of PPE during COVID-19 caused delays in triage procedures for women. Because women could not be seen and evaluated immediately, more severe obstetric complications may have resulted. As one midwife stated:

*'When I was working in triage, one woman arrived in need of immediate attention, and there was a shortage of gloves; then, we had to wait until the family bought gloves; we were observing the woman. Her breathing rate was very high; she had an antepartum haemorrhage'* (Midwife MAP12).

Most maternity care providers indicated that if a woman had the virus and/or COVID-19 symptoms, she was not attended to immediately. Women were sent from one hospital to another to receive care, which sometimes cost them their lives. One midwife illustrated this problem:

*'Let me tell you about one COVID-19-suspected woman; she visited different hospitals and was referred to the COVID-19 centre. The COVID-19 operating theatre was not working, and she was referred [to our hospital]. The woman waited a long time in the emergency room and passed away [in this hospital] while in the operating theatre. When we received her COVID-19 result, it was negative. She was neglected in a different hospital and lost her life'* (Midwife MRP3).

Similarly, an obstetrician reported that a woman had the virus and had symptoms, but nurses and midwives had not measured her vital signs nor administered medication on time. the obstetrician stated,

*'Due to COVID-19, nurses and midwives did not administer medication on time or closely monitor the neonates. I performed a caesarean section without the woman's vital signs being measured. Convincing them to comply caused a delay from the decision to the operating time, which resulted in a negative outcome for the neonate'* (Obstetrician SAP20).

Delays could quickly become life threatening situations, as the following quote illustrates.

*'We prescribed and told a family to buy vecuronium bromide (general anaesthesia). However, the family could not find the drug...Private hospitals might have had it on hand, but they did not sell it because it was unavailable in the city and used in their hospitals. We performed surgery [a caesarean section] under spinal anaesthesia because the patient was bleeding, the fetal heart rate became too slow, the fetus was distressed, and surgery was urgently needed. The family could bring the drug from other cities if surgery were postponed for 3–4 hours, but it would be impossible to postpone the surgery owing to bleeding and fetal distress. While she was in labour and bleeding, we waited for the family to get the drug for 30 minutes, but they did not get the medicine. There was no way to wait any longer; the issue required immediate attention'* (Obstetrician SRP21).

Another obstetrician cited a case in which lack of PPE caused a 2-hour postponement to surgery: *'a woman with an antepartum haemorrhage stayed for about 8 hours without being evaluated'* (Obstetrician SRP19), potentially leading to maternal morbidity or mortality. A further troubling incident was recalled by an obstetrician:

*'A COVID-19-suspected woman was admitted here while I was on duty, and there was no one to help her. Since I took responsibility and gave the medication, I did the nurses' tasks. Finally, we decided to operate, and needed PPE to do the procedure...they brought two set of PPE with masks; when we entered, who would wear PPE? Because the anaesthetist should wear it, and the nurse, the operating surgeon [me], the midwife, and the recovery midwife should all wear PPE. We were debating who should wear PPE; after two hours, two extra sets of PPE were brought to us. We did the surgery without sufficient PPE. In the end, her COVID-19 result was negative'* (Obstetrician SAP20).

### **Childbirth complications during COVID-19**

Participants reported that neonatal and maternal mortality substantially increased during COVID-19, attributing this to increased births outside facilities. Maternity care providers explained how pregnancy and childbirth complications occurred at home because many women did not attend hospitals during COVID-19: for example, *'there were sometimes home births that came with retained placenta'*, which resulted in *'maternal and neonatal death'* (Resident RRP7). The situation was described by a midwife as follows:



*'Homebirths increased, leading to more complications and maternal deaths during COVID-19. Many women had preeclampsia and did not come and manage it early in the hospital due to COVID-19...Last year [2021], at least 6–7 women died due to eclampsia in this hospital, and they had no follow-up, so this is the effect of COVID-19'* (Midwife MRP1).

Obstetricians noted that it could be challenging to identify the cause of non-reassuring fetal heart rate patterns in labouring women. There was uncertainty over whether COVID-19 caused fetal distress. Another challenge was a woman arriving at hospital with complications such as *'uterine rupture'* (Obstetrician SAP22), leading to maternal death. One early neonatal death occurred because *'the scrub nurse and anaesthetist delayed coming to the operating theatre after the decision was made to perform [a caesarean section]. The neonate could have been saved if the surgery had been done within 30 minutes'* (Obstetrician SRP21). Another obstetrician recalled a different challenging case:

*'It was a fetal heartbeat abnormality in a woman with confirmed COVID-19. We were confused about whether the abnormality was due to COVID-19 or not and could not prove it. It was hard to decide on doing the surgery. There were more complications with COVID-19-confirmed pregnant women than for other women'* (Obstetrician SAP20).

*'Women came for only emergencies and labour. It affects labour and birth outcomes, which could result in gross post-term with meconium, asphyxia and neonatal death during the pandemic'* (Resident RPP 10).

## **5.6 Inadequate COVID-19 preventive measures**

Two subthemes emerged within this theme: *'Inadequate COVID-19 PPE'* and *'COVID-19 vaccine hesitancy'*. Maternity care providers complained that inadequate COVID-19 preventive measures were a persistent problem.

### **Inadequate COVID-19 PPE**

Participants underscored the challenges of promptly providing optimal care while adhering to COVID-19 prevention protocols. These challenges stem from a shortage of PPE and inadequate implementation of COVID-19 prevention measures. Obstetricians noted that *'a shortage of*

*PPE, gloves, and sanitisers and other physical barriers were widespread in the hospital during COVID-19* (Obstetrician SRP23). Another illustrated how a lack of PPE could hinder care:

*'Most of the time, we worked without maintaining COVID-19 prevention protocol. We could not get PPE, so how could we keep to the protocol without PPE? Most of the time, we used only facemasks and gloves'* (Obstetrician SRP22).

Additionally, women and their companions often failed to follow the COVID-19 prevention policy and wore facemasks incorrectly, as illustrated by a midwife and an obstetric/gynaecology resident:

*'The healthcare providers advised women and their companions to avoid the crowded waiting area, respect physical distancing, and wear masks, but they neglected the COVID-19 prevention protocol'* (Midwife MLP5).

*'It was not only a problem for our hospital but for all of our country's public hospitals. There were no gloves, masks (given with limited numbers), or sanitisers; these resources are minimal requirements'* (Resident RPP7).

### **COVID-19 vaccine hesitancy**

Some participants lacked confidence in the efficacy of the COVID-19 vaccine and thought there was no need for vaccination if someone had been infected and recovered. Obstetric /gynaecology residents indicated that they did not get COVID-19 vaccination due to their concern about the vaccine's effectiveness. The following quotes illustrate these attitudes:

*'I did not get the vaccination; I did not believe in it because I already contracted and recovered from it. Second, according to a rumour, the vaccine offered protection for a year, and that time had already passed'* (Resident RPP10).

*'I did not get the vaccine because no vaccine is accepted uniformly across the globe. The origin of the virus and its source are still unknown. The vaccine administered in our country has an effectiveness rate of 60–70%'* (Resident RPP9).

## 5.7 Integrating quantitative and qualitative data with joint display methods

Using a joint display approach, the quantitative and qualitative findings were integrated (Creswell & Creswell, 2018). According to the quantitative data, the monthly supply of essential drugs did not significantly differ in the 12 months before and the first six months during the pandemic. By contrast, the qualitative responses revealed a general shortage of medical supplies during the pandemic. Regarding artificial oxytocics, the quantitative data suggest no significant difference in availability between before and during the pandemic, whereas interviewed healthcare providers perceived that the supply completely ran out. Most participants described how a lack of essential medical supplies—including oxytocin, parenteral antibiotics, disposable and surgical gloves, general anaesthesia medicine, blood and blood products, and PPE—resulted in the provision of inadequate care from obstetric triage to the labour ward. They also highlighted that the lack of medical supplies during the pandemic contributed to delays in care provision that may have contributed to maternal morbidity and mortality. The ability for data to be entered only as binary responses (i.e., available or unavailable) in the HMIS form and a lack of complete details regarding quantities of essential drugs may have led to inaccurate reporting of medication supply that rendered the quantitative findings unreliable (Table 7).

Both quantitative and qualitative findings indicate that the likelihood of women giving birth in an institutional setting did not significantly differ between before and during the pandemic. There was no statistically significant difference in mean monthly institutional birth rates between the two periods ( $p = 0.277$ ), and maternity care providers reported no change in the volume of women attending the hospital to give birth. Interestingly, though, home births did increase during the pandemic, thought to be because of a lack of labour ward beds, fears of contracting the virus, lack of transport, and a shortage and inflated costs of medicines (Table 7). The stable rates in hospital births were thought to be due to a rise in primary health centres sending labouring women to hospitals, due to primary health care providers' fear of contracting the virus. In this study, data were not collected on birth rates at primary health centres and so this cannot be confirmed statistically.

Caesarean birth rates significantly increased in the first six months of the pandemic, according to both quantitative and qualitative findings. The latter provided evidence that suboptimal care

was associated with fear of contracting the virus and inadequate preventive measures for COVID-19. This fear was believed to have led to decisions to shorten labour by performing interventions without indication, such as amniotomy, induction, augmentation, and instrumental and caesarean births (Table 7). The quantitative data confirmed this, demonstrating that caesarean births significantly increased by 5.9% in the first six months of the pandemic (IRR = 1.059, 95% CI [1.033, 0 1.086];  $p = 0.001$ ).

The quantitative and qualitative findings were contradictory regarding institutional maternal deaths. The former suggest that rates of institutional maternal deaths significantly reduced during the pandemic, with a decrease of 21.4% ( $p = 0.0001$ ). However, interviewees reported an increase in maternal deaths in hospital settings. The discrepancy could be attributable to the reduction of human resources due to illness and a decrease in meetings such as maternal and perinatal death surveillance and report (MPDSR) and HMIS. The decreased volume of meetings may have led to further challenges in discussing the causes of maternal death and reporting during the peak of COVID-19, ultimately resulting in underreporting of maternal deaths (Table 7). In addition, at the peak of COVID-19, The HMIS unit may have faced a shortage of human resources and a lack of supervision leading to the underreporting of maternal deaths (Table 7).

Inconsistencies were found between quantitative and qualitative findings on institutional neonatal deaths. According to statistical data, neonatal deaths did not significantly differ before and during the pandemic but were perceived to have increased by participant interviewees. Again, these inconsistencies could have arisen from underreporting as a result of non-essential services being closed, shortage of human resources, and lack of supervision in the HMIS unit during the COVID-19 peak (Table 7).

There were no quantitative data available to corroborate or contradict qualitative findings on *'Fear of contracting COVID-19 while providing intrapartum care'*, *'Lack of evidence-based guidelines for intrapartum care provision during COVID-19'*, *'Discrimination against hospital care providers'*, *'Long waiting times'*, *'Inadequate COVID-19 PPE'*, and *'COVID-19 vaccine hesitancy'*, which were all reported by participants as interfering with the provision of intrapartum care (Table 7).

Table 7: Joint display of quantitative and qualitative findings for each theme and subtheme on impact of COVID-19 on intrapartum care, and mixed-methods meta-inferences.

Theme	Subtheme	Quantitative findings	Qualitative findings	Mixed-methods meta-inference
Barriers to providing intrapartum care during COVID-19	Discrimination against hospital care providers	None	<p>Maternity care providers reported that they experienced community discrimination, which may have impacted childbirth outcomes.</p> <p><i>'The community discriminated against healthcare providers and avoided coming to the hospital even when they felt sick; if they came to the hospital, they kept far away from healthcare providers' (Midwife MLP5).</i></p>	<p>The qualitative findings showed that discrimination could affect access to intrapartum care during COVID-19. Community discrimination could have been detrimental to effective communication and rapport between women and healthcare providers, which may have affected decision-making during intrapartum care.</p>

Theme	Subtheme	Quantitative findings	Qualitative findings	Mixed-methods meta-inference
	Shortage of resources for intrapartum care provision during COVID-19	Overall trends of essential drug availability did not significantly differ between before and during the pandemic (IRR = 0.987, 95% CI [0.948, 1.029]; $p = 0.565$ )	<p>Maternity care providers reported that the pandemic decreased availability of resources in the hospital.</p> <p><i>‘The country faced a shortage of funds to buy essential medical supplies for the operation, including suture materials, masks, and disposable gloves, which were unavailable during COVID-19’ (Obstetrician SAP 20).</i></p>	<p>Contradiction: the quantitative findings are inconsistent with the qualitative findings. This might be explained by the richer insights from interviews with maternity care providers, who shared their experiences of the day-to-day challenges of limited medical supplies during COVID-19. By contrast, data from the HMIS could be underreporting due to the reduction of human resources in non-essential services when the pandemic</p>

Theme	Subtheme	Quantitative findings	Qualitative findings	Mixed-methods meta-inference
				peaked, leading to a lack of supervision and workforce reduction in the HMIS unit.
	Fear of contracting COVID-19 while providing intrapartum care	None	<p>Maternity care providers reported that fear of contracting COVID-19 was a barrier to accessing intrapartum care.</p> <p><i>‘People were not coming to the hospital because of COVID-19 fear; even when experiencing labour pains, they were not interested in coming to the hospital. Even they arrived at the hospital after giving birth, resulting in a reduced number of attending women during childbirth’ (Resident RRP7).</i></p>	The qualitative findings demonstrate that fear of contracting COVID-19 hindered access to intrapartum care during the pandemic. Women who feared contracting the virus may have forgone maternity care to avoid infection, resulting in more women deciding to give birth at home.

Theme	Subtheme	Quantitative findings	Qualitative findings	Mixed-methods meta-inference
	Lack of evidence-based guidelines for intrapartum care provision during COVID-19	None	<p>Providers emphasised that there were no guidelines for providing maternity care in the context of the pandemic. They instead used guidelines from other sources in an ad hoc manner.</p> <p><i>‘We did not have guidelines in the hospital, but we obtained them from websites and social media channels. Using these methods, we could provide the service’ (Obstetrician SRP23).</i></p>	The qualitative findings demonstrated that the lack of guidelines for providing maternity care during the pandemic led to suboptimal intrapartum care.
Delays to provision of intrapartum care during COVID-19	Long waiting times	None	Maternity care providers observed poor birth outcomes due to intrapartum care delays.	The qualitative findings indicate that delays in intrapartum care impacted negatively on maternal and neonatal health. Such delays



Theme	Subtheme	Quantitative findings	Qualitative findings	Mixed-methods meta-inference
			<p><i>‘There was a delay in making a decision to perform surgery. From the decision to perform surgery to birth, there was a delay. Even after the neonate was delivered, only some healthcare providers strictly followed up with the woman and her neonate’ (Obstetrician SAP20).</i></p>	<p>may have led to increased maternal and neonatal complications and deaths.</p>
	<p>Childbirth complications during COVID-19</p>	<p>Overall trends of hospital childbirth did not significantly differ between before and during the pandemic (IRR = 1.006, 95% CI [0.995, 1.017]; <math>p = 0.735</math>)</p>	<p>Maternity care providers highlighted that while there was no decline in hospital births during COVID-19, home births did increase.</p> <p><i>‘The community believed childbirth should take place in the</i></p>	<p>Corroboration: the qualitative and quantitative findings indicate that the volume of hospital births was similar before and during the pandemic because primary health</p>

Theme	Subtheme	Quantitative findings	Qualitative findings	Mixed-methods meta-inference
			<p><i>hospital, but fear of COVID-19 led to many women delivering at home. Nonetheless, many women came to the hospital even during COVID-19. I do not think that the patient flow declined: there were a lot of patients, and they used our services. Based on the report of a hospital, though, home deliveries increased' (Midwife MRP11).</i></p>	<p>centres sent labouring women to hospitals due to primary health care providers' fear of the virus. At the same time, home births increased because of a lack of labour ward beds, fear of contracting the virus, lack of transport, and limited medications that were more expensive.</p>
		<p>Overall trends revealed that instrumental vaginal childbirth significantly increased by 10.6% in the first six months of the pandemic (IRR = 1.106,</p>	<p>None</p>	<p>The significant increase in instrumental vaginal childbirth during the pandemic could be attributable to several impacts upon pregnant</p>

Theme	Subtheme	Quantitative findings	Qualitative findings	Mixed-methods meta-inference
		95% CI [1.052, 0 1.164]; <i>p</i> = 0.0001).		women and maternity care providers. Women may have experienced fear, anxiety, and stress over the risk of contracting the virus. Moreover, breathing through an N-95 mask can impede gaseous exchange and increase the workload of the metabolic systems, making it difficult for pregnant women to push during the second stage of labour; prolonged labour can cause fetal distress. For maternity care providers, fear of contracting the virus may have caused them to

Theme	Subtheme	Quantitative findings	Qualitative findings	Mixed-methods meta-inference
		<p>Overall trends revealed that caesarean births significantly increased by 5.9% in the first six months of the pandemic (IRR = 1.059, 95% CI [1.033, 1.086]; <math>p = 0.001</math>).</p>	<p>Maternity care providers indicated an increase in caesarean sections during the pandemic.</p> <p><i>‘Caesarean-section childbirths increased during COVID-19. Some women had a caesarean section without taking a COVID-19 test. Labour is an emergency, so caesareans were done without testing for COVID-19. The operating theatre is too busy’ (Midwife MRP3).</i></p>	<p>intervene, for example, through instrumental birth without indication to shorten labour.</p> <p>Corroboration: the qualitative and quantitative findings indicate that suboptimal care was associated with fear of contracting the virus and inadequate preventive measures for COVID-19, leading to interventions without indication to shorten labour, such as amniotomy, induction, augmentation,</p>

Theme	Subtheme	Quantitative findings	Qualitative findings	Mixed-methods meta-inference
				instrumental births, and caesarean births.
		Overall trends revealed that maternal deaths in hospitals significantly decreased by 21.4% in the first six months of the pandemic (IRR = 0.786, 95% CI [0.748, 0.827]; $p = 0.0001$ ).	Maternity care providers reported increased complications and maternal deaths during COVID-19.  <i>'There were two maternal deaths due to the shortage of mechanical ventilators in the ICU in this hospital during the pandemic' (Midwife MRP2).</i>	Contradiction: The quantitative and qualitative findings regarding maternal deaths during COVID-19 were not aligned. According to the qualitative findings, birth complications like eclampsia, uterine rupture, and retained placenta increased, leading to a rise in maternal deaths. Plausibly, the closure of non-essential services could have led to a shortage of human resources and a lack

Theme	Subtheme	Quantitative findings	Qualitative findings	Mixed-methods meta-inference
				of supervision in the MPDSR and HMIS at the peak of COVID-19, resulting in underreporting of maternal deaths.
		Overall trends revealed that neonatal deaths in hospitals did not significantly differ between before and during the pandemic (IRR = 1.187, 95% CI [0.856, 1.647]; $p = 0.302$ ).	Maternity care providers reported that delays to caesarean-section births resulted in increased early neonatal death.  <i>‘Women were labouring at home during COVID-19, so there were complications. Pregnancy-related complications such as birth trauma, PPH, stillbirth, and neonatal death due to prolonged labour were linked to</i>	Contradiction: the quantitative findings show that neonatal deaths in hospitals did not significantly change, whereas the qualitative findings indicate that delayed intrapartum care resulted in neonatal deaths. These inconsistencies could again be explained by quantitative underreporting

Theme	Subtheme	Quantitative findings	Qualitative findings	Mixed-methods meta-inference
			<p><i>cephalopelvic disproportion</i>' (Resident RPP 9).</p>	<p>due to the closure of non-essential services, human resource shortages, and a lack of supervision in the HMIS unit at the peak of the pandemic.</p>
<p>Inadequate COVID-19 preventive measures</p>	<p>Inadequate COVID-19 PPE</p>	<p>None</p>	<p>Maternity care providers complained about insufficient COVID-19 PPE supplies during the pandemic.</p> <p><i>'I was in the labour ward for two years; there was no water. There were no clothes (PPE) in the labour ward, and there was a problem with isolating COVID-19-suspected women'</i> (Midwife MRP1).</p>	<p>The qualitative findings show that inadequate COVID-19 PPE disrupted intrapartum care. Maternity care providers could not provide optimal intrapartum care without suitable PPE.</p>

Theme	Subtheme	Quantitative findings	Qualitative findings	Mixed-methods meta-inference
	COVID-19 vaccine hesitancy	None	<p>Some participants believed there was no need for vaccination if someone had been infected with the virus and recovered, while others doubted the COVID-19 vaccine's efficacy.</p> <p><i>'The vaccination makes the virus mild, not severe, but cannot protect against contracting it. Moreover, no one gives precise information about the COVID-19 vaccination'</i> (Midwife MRP6).</p>	<p>The qualitative findings demonstrate that some healthcare providers were reluctant to be vaccinated, and were therefore unlikely to promote the vaccine to pregnant women.</p>



This chapter described the findings of the impact of COVID-19 on the uptake, access and provision of intrapartum care at public hospitals in the Sidama region of Southern Ethiopia. The mixed methods findings demonstrated a significant increase in the rates of monthly instrumental and caesarean birth in the public hospitals. The qualitative findings from health professionals described why this was the case through the following themes: *'Barriers to providing intrapartum care during COVID-19'*, *'Delays to provision of intrapartum care during COVID-19'*, and *'Inadequate COVID-19 preventive measures'*. The following chapter outlines women's experiences receiving ANC and intrapartum care during COVID-19 at public hospitals in the Sidama region of Ethiopia.

## **Chapter 6: Women’s experiences of receiving antenatal and intrapartum care during COVID-19 at public hospitals in Sidama region, Ethiopia**

This chapter describes women's experiences of receiving antenatal and intrapartum care during COVID-19 at public hospitals in the Sidama region of Southern Ethiopia. This qualitative study explored barriers to access and uptake of ANC and intrapartum care at public hospitals during the pandemic’s peak period in Ethiopia. Barriers to the provision of optimal ANC and intrapartum care perceived by study participants included *‘Fear of contracting COVID-19’*, *‘People in the hospital neglect COVID-19 prevention’*, *‘Women losing their jobs during COVID-19’*, *‘Shortage of beds in the labour wards’*, and *‘Shortage of medical supplies’* leading to *‘Disrespect’*, and *‘Suboptimal care’*. The findings of this study provide first-hand evidence that may inform health policy decision-making in future pandemics. Policymakers need to prioritise the availability of essential material and human resources for ANC and intrapartum care during current and future pandemics. Healthcare providers need these supports if they are to maintain respectful and optimal care during situations that similarly threaten the community’s health and safety.

### **6.1 Introduction**

Ethiopia has prioritised the enhancement and expansion of ANC coverage, leading to a significant reduction in maternal and newborn mortality, largely attributed to the increased presence of skilled birth attendants throughout the country (EPHI, 2019). Considerable work is still required to meet the relevant SDG targets by 2030 (Ayele et al., 2021). Early detection and management of pre-existing pregnancy-related complications is essential for reducing maternal and neonatal morbidity and mortality (Black et al., 2016; Landrian et al., 2022). This requires providing all pregnant women with high-quality ANC and skilled birth attendants (Konje et al., 2018; Solnes Miltenburg et al., 2017).

In combination, the COVID-19 pandemic, drought, and internal conflict have worsened Ethiopia’s already weak healthcare system (Harris et al., 2021). In the early stage of the pandemic, the Ethiopian government’s emphasis was placed on containing the spread of the virus by implementing measures such as school closures, reducing passengers on public

transport by half, lockdowns, recommending the population to stay at home and closing non-essential services (Harris et al., 2021), which considerably impacted on the provision of ANC and skilled attendants at birth (Kassie et al., 2021). Early evidence indicates that COVID-19 interrupted the uptake of ANC and skilled birth attendants in LMICs (Aranda et al., 2022).

Existing qualitative studies provide little information on women’s experiences and perceptions of antenatal and intrapartum care during COVID-19 in Ethiopia. The insights from the qualitative findings in this study may inform the restructuring, adjusting, and restoring of services in present and future pandemics, seeking to fill the existing research gap.

## 6.2 Results

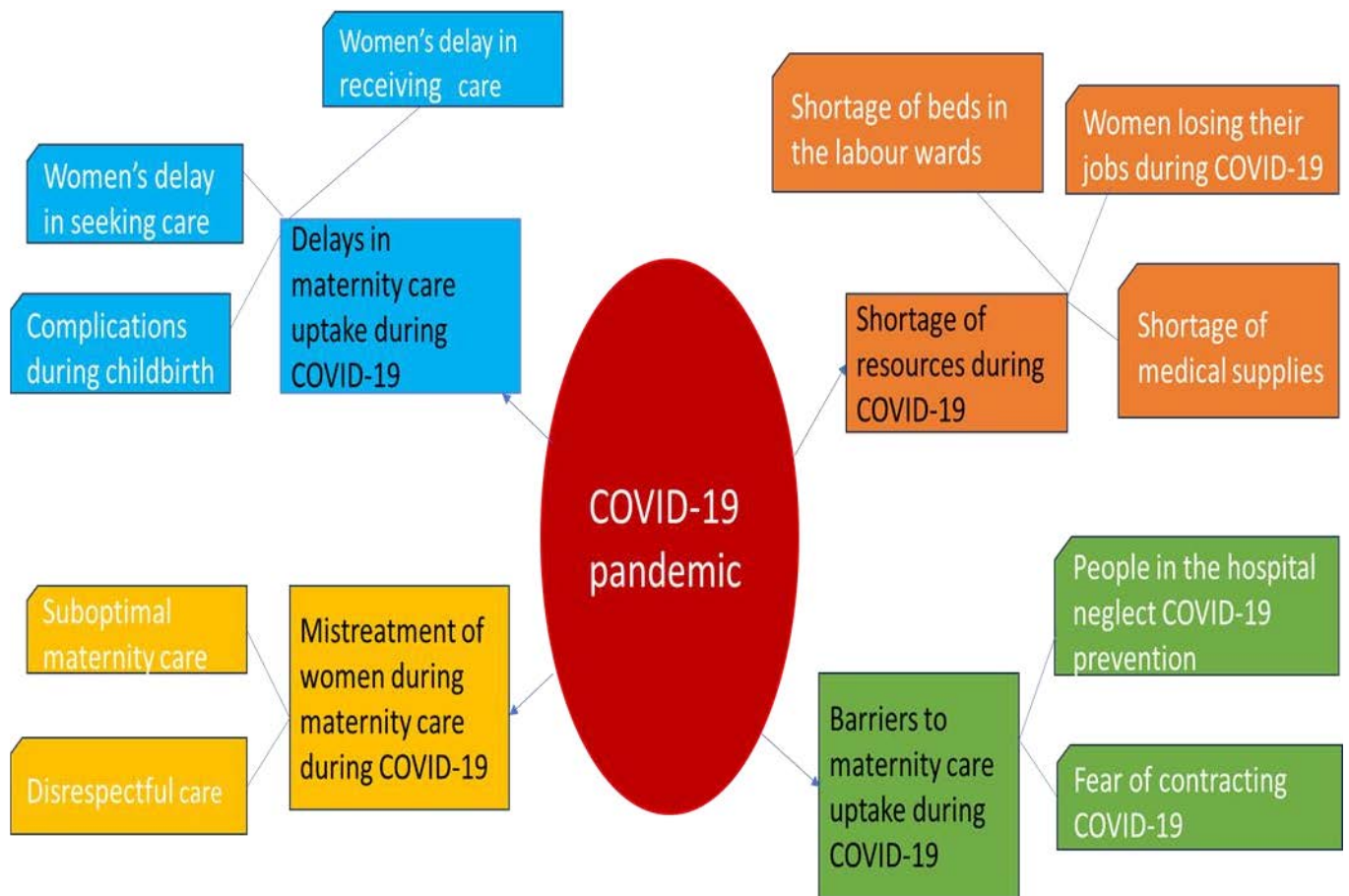
The minimum and maximum ages of study participants were 19 and 37, respectively; over half were aged 25 to 34. One-third of the participants had completed secondary education, and over half were housewives (Table 8).

Table 8: Sociodemographic characteristics of study participants (N=42).

Variables	Subgroups	Number	Per cent
Age	19-24	12	28.57
	25-34	25	59.52
	35-44	5	11.90
Education	Non-formal education	3	7.14
	Primary education	13	30.95
	Secondary education	14	33.33
	College and above	12	28.57
Occupation	Housewife	24	57.14

	Employee	12	28.57
	Student	6	14.28
Gravidity	1-2	23	54.76
	3-4	19	45.23
Parity	1-2	23	54.76
	2-4	19	45.23

Four themes were constructed from the thematic analysis, and these are displayed in Figure 11: *‘Barriers to maternity care uptake during COVID-19’*, *‘Shortage of resources during COVID-19’*, *‘Delays in maternity care uptake during COVID-19’*, and *‘Mistreatment of women during maternity care during COVID-19’*. Within these themes, ten subthemes were identified: *‘Fear of contracting COVID-19’*, and *‘People in the hospital neglect COVID-19 prevention’* are subthemes under the theme, *‘Barriers to maternity care uptake during COVID-19’*. *‘Shortage of beds in labour wards’*, *‘Shortage of medical supplies’*, and *‘Women losing their jobs during COVID-19’* are subthemes under the theme *‘Shortage of resources during COVID-19’*. *‘Women’s delay in seeking care’*, *‘Women’s delay in receiving care’*, and *‘Complications during childbirth’* are subthemes under the theme, *‘Delays in maternity care uptake during COVID-19’*. *‘Disrespectful care’*, and *‘Suboptimal maternity care’* are subthemes under *‘Mistreatment of women during maternity care during COVID-19’* (Figure 11).



Legends

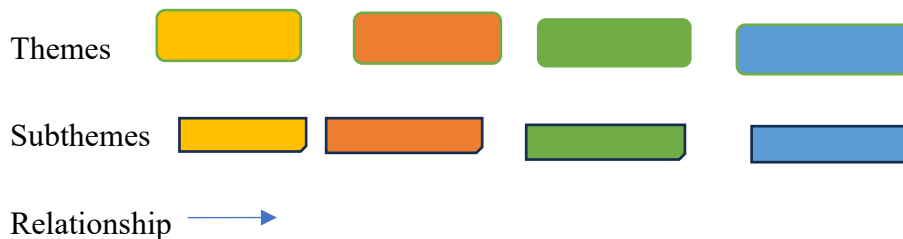


Figure 11: Visual representation of thematic analysis.

### 6.3 Barriers to maternity care uptake during COVID-19

This theme incorporates women's experiences of barriers to ANC during COVID-19 and the effects on their ANC follow-up. Two subthemes were identified: '*Fear of contracting COVID-19*' and '*People in the hospital neglect COVID-19 prevention*'.

## **Fear of contracting COVID-19**

Participants raised the issue of how COVID-19 fear affected their uptake of ANC. They were reporting their own activities, which included missed ANC appointments and leaving the hospital without receiving the necessary care. Women were concerned that they would catch the virus via physical contact with healthcare providers while being assessed in the hospital. Similarly, participants reported not using public transport to travel to the hospital for ANC follow-up due to fear of contracting the virus. These issues are exemplified by the following quotes:

*'After completing the morning's scheduled ANC booking, I arrived at the ANC clinic. Based on the order of arrival, healthcare providers allocated numbers to the women for ANC appointments that afternoon. Healthcare providers asked to measure my vital signs; however, I declined and went home to avoid getting the virus in the clinic. Due to my fear of COVID-19, I frequently skipped ANC follow-up visits. COVID-19 terrified me. I was fearful of it at the time. I did not wear a mask during labour, but the healthcare providers did'* (Woman F2R1).

*'I used to wear a mask when I was pregnant during COVID-19 because I feared getting close to people, like in a taxi, to prevent contracting the virus. To maintain physical distance, I walked rather than travel by taxi to a health facility for an ANC follow-up. After I gave birth, people were afraid to visit me. It all passed, thanks to God'* (Woman WAD4).

Participants also reported 'living like prisoners' and having no interactions with their neighbours; some did not leave their homes for any reason, including ANC follow-up, during the peak of the pandemic. As one woman recalled:

*'We could not go out anywhere because we were afraid and lived like prisoners. I closed my door and prayed to God. We did not go to the others' homes, and others did not come to our homes. With God's blessing, all these problems passed'* (Woman F4R5).

## **People in the hospital neglect COVID-19 prevention**

Participants expressed concerns about the hospitals' lack of adherence to COVID-19 prevention measures during the pandemic. They reported that many women and over half of the healthcare providers they encountered were not wearing facemasks, especially in the medical records storage unit. Participants also noted that the postnatal waiting area was frequently overcrowded with women and their companions, creating an environment in which the virus could easily spread from person to person. As a result of these conditions, women were hesitant to seek maternity care during COVID-19. The following quotes are illustrative:

*'More than half of healthcare providers who worked in the medical record storage unit were not wearing facemasks while it was crowded with people getting medical record folders. Some healthcare providers only wore facemasks themselves, instead of instructing patients to use facemasks' (Woman F1R6).*

*'The room I stayed in before going to the delivery room was good for COVID-19 prevention, but things did not go well after I left this room. The delivery room did not receive adequate attention to COVID-19 prevention measures. The number of clients was high, and none were using hand sanitiser or facemasks, and the room was not clean' (Woman WAD5).*

Participants emphasised the difficulties in obtaining their (hard copy) medical record folder from the storage unit to schedule antenatal and intrapartum care. Staff and women in the unit failed to comply with the COVID-19 prevention policy, which led to some women leaving the public hospital to explore alternative options during the peak of COVID-19: *'I started ANC follow-up in the private hospital because there were no crowds' (Women WR2).* Another woman stated:

*'When COVID-19 peaked in 2020, obtaining a medical record folder from the storage unit for ANC follow-up and intrapartum care was difficult due to neglect and a sizeable crowd of women queuing to collect their records. This was not novel for me. We did not maintain physical distance when seated in the waiting area. Moreover, some women did not wear masks' (Woman F1R4).*

## 6.4 Shortage of resources during COVID-19

This theme encapsulates women's experiences of intrapartum care during COVID-19 and the effects on their maternity care. Three subthemes were identified: '*Shortage of beds in labour wards*', '*Shortage of medical supplies*', and '*Women losing their jobs during COVID-19*'.

### Shortage of beds in the labour wards

Most IDI and FGD participants raised significant concerns over the shortage of beds in labour wards during COVID-19. This shortage may have been a consequence of hospitals implementing the COVID-19 prevention strategies at COVID-19 peak, such as reserving rooms for isolating suspected cases and limiting the number of women per room. As a result, women had to spend much time travelling from hospital to hospital searching for available beds, which was especially difficult for those in labour, particularly if experiencing leakage of amniotic fluid. Two women described their experiences as follows:

*'When I arrived at this hospital with my husband by Bajaj (mini-taxi), there was a heavy leakage of amniotic fluid due to a membrane rupture. When I entered, they never helped me. I shouted at them, "Please help me!" Then they responded, "We do not have a bed, so you should go to another hospital." I asked how I could go to another hospital in this condition. They responded again, "We told you we do not have a bed; you must go to another hospital." Then, I said, "So give me an ambulance to go there." They said, "If we provide you with an ambulance, they will send you back, so you had better use a Bajaj." I went to another hospital by Bajaj and gave birth. Thanks to God'* (Woman F4R1).

*'The response from the healthcare providers regarding this service was not good. I phoned my catchment area hospital to request a bed and another hospital, and they both replied that no beds were available, so I called a third hospital; again, there was no bed. I was sad. Then, I went to the second hospital and confirmed there was no bed. Healthcare providers checked me by sonography for a long time, and I was afraid because they stayed so long. I was assigned one healthcare provider and given a bed; I gave birth at the hospital. Thanks to God'* (Woman WR6).



Similarly, participants recalled that despite the government announcing free maternal healthcare services in hospitals and that ambulances were readily available at any time, healthcare providers often told them that no beds were available and referred them to another hospital while in labour. In some cases, despite ambulances being available, hospitals refused to provide them to transport labouring women to another hospital. One woman described her distress:

*'Oh my God, it is difficult to explain the situation. I cannot easily express the experience in words. I went to this hospital with my friend 15 days ago. She lost her strength as a result of three days of labour pain. Afterwards, to our shock, healthcare providers said that she could not undergo the procedure [caesarean section] and they had no beds, so they ordered us to transport her to another hospital. Even though this hospital sent her to another hospital, they did not provide any ambulance transport, despite three ambulances being available at that time. If a woman is unable to pay for transport, she may be condemning their newborn to death. So, it is challenging without the financial means to pay for transport costs'* (Woman F1R5).

### **Shortage of medical supplies**

Most participants in the FGDs and IDIs reported that they had purchased their own essential medical supplies for birth. Before COVID-19, hospitals had provided all necessary medical supplies for labouring women, including those undergoing caesarean section. Participants mentioned that they were not informed about the need to purchase medical supplies for labour, and believed that the hospitals would continue to provide all necessary supplies free of charge. The following experiences are illustrative:

*'I gave birth to my first child via surgery [caesarean section] and did not buy anything. However, during COVID-19, we purchased everything ourselves. For example, I paid 100 Ethiopian birr [\$2USD] for a single pair of gloves, whereas during my first birth on 21 September 2017, I only bought one medicine that was unavailable in the hospital. I bought that medicine in collaboration with my family. What would have happened if a labouring woman came to the hospital with bare hands (no cash)? She might have died. So, these things were not good for us'* (Woman F4R6).

*'In this hospital, there were no medical supplies. I even purchased sutures and gloves, and we had to purchase all the medicines. Although maternal healthcare was free of charge previously, this was not the case in this hospital. I did not know the reason; I spent over 4,000 Ethiopian birr [\$80USD] to buy medicine during this birth' (Woman WALT19).*

Participants mentioned that healthcare providers even instructed them to buy several medical items that were not necessary during birth, causing them to incur large expenses. Specifically, women described the following:

*'Formerly, the hospital provided free gloves to labouring women; however, healthcare providers ordered us to purchase gloves elsewhere during COVID-19. Interestingly, healthcare providers did not inform us that pregnant women needed to bring their own gloves when giving birth at a hospital' (Woman F1R6).*

*'A healthcare provider ordered me to buy medicine, and my family purchased the necessary medical supplies for my birth from a pharmacy outside the hospital. Healthcare providers took my drugs without my consent; when I asked them about it, they denied doing so. It was unacceptable to take my expensive medication' (Woman WAD10).*

*'Healthcare providers ordered my husband to buy different medical supplies, and he bought them. I gave birth immediately and arrived at the hospital. We left a lot of medical supplies there because they ordered unnecessary medical supplies for my birth' (Woman F4R5).*

### **Women losing their jobs during COVID-19**

Participants indicated that travel restrictions and business suspensions during COVID-19 caused many women to lose their jobs, especially in hotels, cafes, and grocery stores where they worked as managers, cashiers, and hostesses. This impacted their ability to meet daily financial demands, such as transport expenses for follow-up appointments and the cost of meeting their children's basic nutritional needs. Women explained their circumstances:

*'COVID-19 made us jobless, especially those who worked in hotels as managers, cashiers, hostesses, etc. Our jobs were suspended for about six months. Therefore, COVID-19 impacted our lives, jobs, and social interactions'* (Woman F3R1).

*'It was difficult for us during COVID-19. It restricted people's interaction with colleagues, especially given the challenges of finding employment. We were unable to feed our children. We could not find work, and our children's schools were closed'* (Woman F2R5).

In addition, participants stated that the pandemic affected their lives in various ways, one woman described the situation, saying *'losing our job and spending the whole time inside the home, and my husband was a mason, so there was no work for him'* (Woman F2R4). These challenges disrupted their daily routines and posed difficulties in accessing public transport during emergencies. Women explored these impacts:

*'I had to leave my job because my employer terminated my employment. There was no person-to-person interaction with the community. Thank you, God, it passed'* (Woman F2R2).

*'Even if the labour pain is complex and needs transport, it was difficult for labouring women to access transport such as mini-taxi and Bajaj during COVID-19. Hence, it was extremely challenging to find transport at that time. Besides, if you begged neighbours who had cars, they said, "We have no fuel"'* (Woman F2R6).

## **6.5 Delays in maternity care uptake during COVID-19**

This theme incorporates women's experiences of antenatal and intrapartum care during COVID-19 and the effects on their maternity care. Within this theme, three subthemes were identified: *'Women's delay in seeking care'*, *'Women's delay in receiving care'*, and *'Complications during childbirth'*.

### **Women's delay in seeking care**

Participants acknowledged the importance of scheduling ANC appointments within three months of becoming pregnant, but many of them also disclosed that they postponed initiating their ANC follow-up and delayed appointments during the COVID-19 pandemic. One woman

said, 'I started the follow-up after five months and 15 days of conception/pregnancy because I was afraid of COVID-19' (Woman WAD3). Such concerns led to lower ANC uptake during COVID-19. Other women reported similar issues:

*'I did not have the confidence to go to the hospital at the beginning of my pregnancy for an ANC check-up, worried if would catch [the virus] from physical contact with healthcare providers. Finally, the health extension worker encouraged me to go. After four months, I agreed and went to the hospital'* (Woman WR6).

*'I put off obtaining my ANC follow-up for three months after the pregnancy was confirmed because it was too terrible to go to the hospital. People then pressured me to double-check because I had already confirmed my pregnancy when I started my follow-up, and it was a terrible time because of COVID-19'* (Woman F2R2).

*'I asked my sister since I had a different feeling. She suggested I go to a hospital for a check-up after assuming I was pregnant. I said no because I was not interested in having a baby now. I finally went to the hospital and discovered I was eight months pregnant. I immediately started follow-ups. At nine months, I gave birth'* (Woman WR22).

Likewise, participants reported calling for an ambulance long after the start of labour pain, leading to some giving birth in the ambulance en route to a hospital. On arrival, women were met with expressions of disappointment from healthcare providers that they had not come sooner. Women illustrated this experience as follows:

*'We called an ambulance for me, but it took longer than expected to arrive, so we found alternative transport to the hospital. As a result, my husband pleaded with his colleague to give us a car, and during the trip, I gave birth, and my colleague received the baby by her clothes. Upon arriving at the hospital, the healthcare providers brought a delivery set and cut the umbilical cord in the hospital parking area'* (Woman F3R2).

## **Women's delay in receiving care**

Most participants complained that staff at the medical records storage unit did not provide a prompt service in transferring their records, preventing women from accessing antenatal and intrapartum care on time. As one woman recalled:

*'The problem was in the medical records storage unit; they did not deal with us quickly. When I went there during my ANC appointment, they were not interested in acting quickly. In short, there was a delay in transferring my medical records to the ANC clinic'* (Woman F2R3).

Participants also complained that when healthcare providers prescribed ultrasound scanning for their pregnancies, these scans were not checked at the requested time:

*'My physician told me to have an ultrasound scan to check the fetus's health. But I did not get an ultrasound until the five-month mark. I begged a healthcare provider who performs ultrasounds in the hospital, but he said, "I am tired." Again, I begged him, but he insulted me and left the office without performing the ultrasound. "I cannot check it right now," he said. Fortunately, I got this service after a week'* (Woman WR6).

Study participants commented that healthcare providers did not offer appropriate care during intrapartum care and, without careful examination, referred them to another hospital, risking COVID-19 infection. A woman told how

*'Healthcare providers neglected us, and my labour pain was too hard for me. The hospital referred me to another hospital. So, I was in trouble and suffered from my labour pain. Healthcare providers did not frequently check and give care. They ignored me, and I suffered a lot. My life was saved with the help of God. Healthcare providers were unlike the previous ones before COVID-19. With the will of God, I gave birth'* (Woman F4R2).

Women reported experiencing long waiting times for care, largely due to delays related to administrative steps in their visit. Women would arrive at a hospital in the morning and not being seen until the evening. This was particularly challenging for government employees, as they had to take time off work to attend appointments:

*'I am a government employee, so having to spend a long time waiting for my medical records so I can receive care has a negative effect on my work' (Woman WR2).*

Participants reported spending a lot of time waiting for services, often in areas with limited seating, which was difficult for those who experienced groin pain when standing for long periods. The worst problems were encountered when dealing with the medical records storage unit and ultrasound services:

*'I used to wait a long time to get the service, especially during ANC follow-ups. This problem was most often in the medical records storage unit. I had tension during this pregnancy. The policy allows priority care for pregnant women, but this was not practised on the ground. I told them, "Please prioritise women," as I could not stand for a long time due to groin pain' (Woman WAD9).*

*'I went to this hospital for six consecutive days but could not get the service. They would give me an appointment for tomorrow. When I came that day, they postponed it to the next day. Because of this, I could not get an ultrasound scan during my pregnancy. I will never forget that situation' (Woman WAD10).*

In addition, participants complained that healthcare providers failed to properly examine women on their arrival at the hospital and wrote referral letters for labouring women without carefully examining them. A woman told this story:

*'I gave birth while they were in the process of writing a referral letter to another hospital. They unknowingly stressed me by not conducting a careful examination. My blood pressure increased, and I was afraid because I had given birth to my first child in a normal position. Healthcare providers did not examine the unborn baby's position as carefully; I do not know whether it was boring for them' (Woman F2R6).*

### **Complications during childbirth**

Participants indicated that a lack of beds in labour wards led to women having to give birth on a metal floor outside the ward and receiving suboptimal care. This made it more challenging to actively manage the third stage of labour and raised the risk of incomplete birth of the

placenta, leading to heavy bleeding. Participants also encountered difficulty obtaining blood for transfusion, as there was no blood in the hospital or blood bank during COVID-19. Women described the consequences:

*'I stayed for one week because the healthcare providers did not help me at the right time during childbirth; because of this, I had lost a lot of blood from my body, and the healthcare providers said that I needed blood. Furthermore, since my blood type is O+, I suffered a lot until I got the transfusion. I was even convulsing. Finding this blood was difficult; they looked for it in different hospitals'* (Woman F4R3).

*'She took me to one room and found that I was about to deliver. She made me run to another room. Upon arrival there, I gave birth on a metal floor, then slept for many hours. There was excessive bleeding. Then, another female healthcare provider came and checked me. She examined me and noticed that half of the placenta was left in the uterus. She was shocked...She searched for it, and finally removed it. After all these issues, I was very sick, but now I am healthy'* (Woman WAD4).

## **6.6 Mistreatment of women during maternity care during COVID-19**

The final theme incorporates women's experiences of mistreatment during maternity care during COVID-19. Two subthemes were identified: *'Disrespectful care'* and *'Suboptimal maternity care'*.

### **Disrespectful care**

Participants noted that healthcare providers only offered ANC follow-up to pregnant women who lived close to the hospital, refused to provide services to residents of other areas, and did not give care to pregnant women based on their order of arrival. Moreover, healthcare providers appeared to offer care based on their relationships with pregnant women, rather than who had been waiting longest. This caused some women to leave the public hospital and turn to private healthcare for ANC follow-up. Women told how they were affected by this behaviour:

*'I came from another town to this hospital to start the follow-up, but a healthcare provider told me to return to "that town" for an ANC follow-up. She told us (there were other pregnant women with me) that they did not provide ANC to those who came from different areas because of COVID-19. I told them there was no medical equipment at "that town health centre" as they had been stolen. She did not listen to us. Then, we left this hospital, went to the private health centre, and started the follow-up there' (Woman WAD10).*

*'...if a woman sat beside me and had a relationship with healthcare providers, she might take her medical record folder without respecting the terms of who arrived first. The maternity care unit staff exhibit ugly behaviours; they do not treat all women equally, and they prioritise according to their relationships with women. So, it was said that by building a relationship with healthcare providers, you could get the service immediately' (Woman F1R5).*

Participants also reported being mistreated when receiving intrapartum care: healthcare providers insulted them, used abusive language, and abandoned women in the labour ward. The following examples are illustrative:

*'I want to say that women were mistreated at the hospital where I gave birth. Healthcare providers should treat women ethically, since women in the hospital seek relief from their concerns. Though they do not provide medication, they should at least treat and speak to women appropriately. I heard healthcare providers saying, "Go away, woman, we do not have a bed." Such women may lose hope and stop going to the hospital' (Woman WAD4).*

*'There were problems. Sometimes, healthcare providers leave us alone. For example, when I was in the waiting room with a labouring woman, we spent a night alone. No healthcare providers were attending. This should not happen. What if we had experienced symptoms of a serious health problem? They should have been there to encourage us. For example, it was my first pregnancy, so I needed an assistant around me, but they were not there. In addition, they left a newborn alone. Again, what if that baby had suffered a complication? I observed such problems. These practices should be improved' (Woman WALT21).*



On arrival at the hospital, some women were met with aggression from the healthcare staff and experiencing disrespectful care:

*'The healthcare providers were accusatory, asking me, "Are you waiting until your stomach explodes? Since you had surgery twice, why did you stay at home?" The healthcare provider pushed me. I was confused for some time; they immediately ordered me to enter the surgery room. I was fearful and told them not to touch me, and the healthcare provider stood up and hit me' (Woman F1R1).*

### **Suboptimal maternity care**

Participants well understood that the health of a pregnant woman and her unborn baby depends on optimal maternity care. They complained that healthcare providers repeatedly conducted digital examinations and ruptured amniotic fluid, causing distress to the fetus. Participants also noted that healthcare providers did not pay sufficient attention during procedures to avoid unforeseen outcomes during those procedures. Examples of their experiences are as follows:

*'What can I tell you about healthcare providers? They are careless. During my birth, they counted down the number of minutes remaining, commenting on whether the labour was long or short. However, they were not concerned about whether all my amniotic fluid had leaked due to repeated digital examinations, meaning the fetus could not move back. While this was happening, and I was in labour, they only in and out of the room' (Woman WAD10).*

*'Healthcare providers talked and laughed with one another in person and on the phone while doing surgery. I was upset about their activities because I was semiconscious when they operated. They should respect women and avoid phone calls and laughter when performing surgery. They should feel responsible while carrying out this work: human life is in their hands' (Woman WAD5).*

Another woman felt that the carelessness of some staff with equipment demonstrated disrespect towards their profession, and being allowed a family member to be present might have helped protect her:

*'One family member should be allowed to enter the delivery room, but this was not there for me and others. It would be good if they introduced one family member. For*

*example, in case healthcare providers may use the equipment for more than one woman if they do not respect their profession. So, the family member may help to control this' (Woman WAD11).*

Participants highlighted the importance of healthcare providers maintaining COVID-19 and infection prevention strategies to reduce hospital-acquired diseases. Some claimed that when they underwent physical examinations and gave birth, the hospital did not clean beds ready for them. Reported experiences include the following:

*'When I went to the hospital to give birth to my baby, the cleaner was not around in the labour ward, and I encountered a challenge because the bed was not ready. A woman had given birth on that bed, so it needed to be cleaned promptly; otherwise, another bed needed to be prepared for a labouring woman. I was angry when they gave me the bed without cleaning it' (Woman F1R5).*

*'During ultrasound scanning, healthcare providers did not use hand rubs and sanitiser before touching a woman's abdomen. Healthcare providers did not rub the examination bed with sanitiser before the woman laid down and ordered women to wear a face mask during childbirth. So, these things disappointed me' (Woman WR1).*

According to participants, healthcare staff pressured women to use family planning before discharge and refused to provide discharge letters unless they agreed:

*'After the women gave birth, healthcare providers told them to get discharge papers from the hospital; it is mandatory to take contraceptives. Giving a contraceptive to a woman who has a newborn is not good because it might impact her breast milk production and her health. It might be suitable for some women but not others' (Woman F4R5).*

For another woman, her experience characterised “*the era of COVID-19*”:

*'While blood sample collecting, he could not find a blood vessel. He simply pricked my hand, and I was angry. I told him not to prick me because it might cause an infection. When I went out of the blood sample collection room and got annoyed, one healthcare provider came in another blood sample collection room, and she*

*told him he should not have done that. However, they should teach students before allowing them to perform the procedure. He pricked me many times because he could not find a blood vessel. I then decided to go to a private hospital, and the healthcare provider found a blood vessel within a minute. This sums up the era of COVID-19' (Woman F1R4).*

Finally, participants asserted that healthcare providers should always obtain consent before drawing blood samples and performing an episiotomy. Women complained that inexperienced *first-round apprenticeship students [intern]* should not be permitted to undertake any procedure related to birthing. A woman voiced her indignation:

*'Inexperienced first-round apprenticeship students [intern] should not be allowed to apply stitches and do other activities with women. They might hurt women when suturing. For example, when one of them tried to take blood from me, he struggled a lot to find a vein, even though it was clearly visible. Finally, someone else took the blood' (Woman WAD11).*

This chapter has described women's experiences of pregnancy and birth care in the Sidama region of Ethiopia during the COVID-19 pandemic. Qualitative results indicated that the following themes emerged: *'Barriers to maternity care uptake during COVID-19'*, *'Shortage of resources during COVID-19'*, *'Delays in maternity care uptake during COVID-19'*, and *'Mistreatment of women during maternity care during COVID-19'*. The following chapter presents the discussion of the mixed method results of this study, aligning them with relevant literature.

## **Chapter 7: Discussion**

### **7.1 Overview of the Chapter**

The purpose of this chapter is to discuss the main findings of this thesis and align them with current literature, highlighting new insights relevant to the aim of the thesis and the research questions it posed. This contribution is pertinent to understanding the impact of the COVID-19 pandemic on maternal and perinatal care in Ethiopia, and possibly other low- and middle-income countries. The studies comprising the thesis examine ANC and intrapartum care access, uptake, and care provision in the Sidama region of Ethiopia during the time of the pandemic.

This chapter also presents recommendations for enhancing access to, and uptake and provision of, maternal and perinatal care during current and future pandemics. These recommendations can assist in designing and implementing context-specific maternal and perinatal care.

The limitations of the present study and future research directions will be summarised. The findings of this study may benefit maternity care providers and policymakers, offering a fuller understanding of the context of women's experiences of local barriers to safe access, uptake, and provision of ANC and intrapartum care during COVID-19. These findings also support recommendations for designing interventions to restore interrupted maternity care services in future pandemics.

The following research questions guided the study:

1. What impact has the COVID-19 pandemic had on women's attendance for antenatal care, and how do maternity care providers' experiences with women's attendance at hospitals for antenatal care during the COVID-19 pandemic, compare to the period before COVID-19?
2. What impact has the COVID-19 pandemic had on women's utilisation of intrapartum care, and how do maternity care providers' experiences with women's utilisation of intrapartum care during the COVID-19 pandemic, compare to the period before COVID-19?

3. What are women's experiences of receiving antenatal and intrapartum care during COVID-19?

## **7.2 Key findings**

This study adopted a concurrent mixed methods design to examine and explore the impact of COVID-19 on maternal and perinatal care at public hospitals in the Sidama region of southern Ethiopia. Quantitative data were collected for a 12-month period (March 2019 to February 2020) before the pandemic and a 6-month period (March 2020 to August 2020) during the pandemic from the HMIS of 15 public hospitals in Ethiopia, and monthly incidence rates for multiple variables before and during the pandemic were compared.

The published systematic review contained in Chapter 2 of this thesis focused on the impact of an Ebola outbreak on maternity care services in West Africa. The purpose of this review was to provide insights into the disruption a population-based event such as an infection outbreak can make on already fragile maternity care services. Key findings included maternal and perinatal access and uptake significantly declined during the Ebola outbreak. Barriers to maternal and perinatal access and uptake include community mistrust of healthcare providers, closure of health facilities, lockdowns, shortage of medical equipment, and lack of transport. The findings of this review aligned with the findings of a literature review conducted in three countries in West Africa (Guinea, Sierra Leone, and Liberia) (Yerger et al., 2020). Yerger and colleagues found that maternal health service access and uptake significantly decreased during the Ebola outbreak. Similarly, the findings of this review were consistent with a systematic review on the indirect impacts of the Ebola outbreak on health systems in the DRC, Guinea, Sierra Leone, and Liberia (Mulenga-Cilundika et al., 2022). Mulenga and colleagues found that ANC1, ANC4, institutional births, and caesarean births significantly decreased during the Ebola outbreak but recovered somewhat since the epidemic. Maternal and perinatal care was influenced during Ebola by individual factors, family factors, community, hospital factors and government policies. These factors included facility closures, transport problems brought about by lockdowns, staff shortages due to illness and relocation to Ebola centres, lack of PPE, mistrust between the community and healthcare workers, and unemployment of women (Merrell & Blackstone, 2020; Yerger et al., 2020).

The review on the impact of COVID-19 maternal and perinatal care in Sub-Saharan Africa, also contained in Chapter 2 of this thesis, highlighted that ANC attendance and institutional birth significantly decreased during the pandemic. This finding is consistent with studies in 18 LMICs and 8 sub-Saharan countries (Ahmed et al., 2022; Shapira et al., 2021) that. Several factors were attributed to this decline, including the fear of contracting the virus, lockdown measures, a shortage of medical equipment, and transport limitations (Akaba et al., 2022).

The key findings of this thesis indicated that the mean monthly ANC1 and ANC4 uptake rates significantly decreased during the first six months of the pandemic, mean monthly instrumental and caesarean births rose substantially during the first six months of the pandemic, and the institutional maternal mortality ratio (MMR) significantly declined during the pandemic. Hospital-based data collections provide detailed clinical medical records, cost and administrative data, however, it relies on the accurate and contemporaneous data entry at the facility point of care. This could lead to underreporting and lack of socioeconomic data, including access to healthcare and social support, that cannot be generalised to the entire population in LMICs (Mgawadere et al., 2017). Whilst population-level data provides a broader understanding of socioeconomic factors, it is expensive, time-consuming, and may lack detailed clinical information, posing challenges in understanding the medical aspects of maternal deaths (Mgawadere et al., 2017).

Maternity care providers reported a decline in the number of women attending hospitals for ANC follow-ups during the COVID-19 pandemic. While maternal mortality significantly decreased during COVID-19, there remains a notable occurrence of maternal and neonatal mortality attributed to an increase in caesarean births, home births, and complications during birth. Furthermore, in the qualitative study, maternity care providers reported that a high number of maternal deaths occurred in the hospital during the pandemic. Women reported delaying their initial ANC booking, rescheduling ANC appointments, or even cancelling their ANC visits due to the pandemic. They also described experiencing greater levels of mistreatment and a shortage of beds and medical supplies in hospitals when they gave birth.

The visual presentation of findings on maternal and perinatal care access, uptake and provision during the pandemic is depicted in Figure 12, using the Hybrid Framework described in the Methodology Chapter 3.

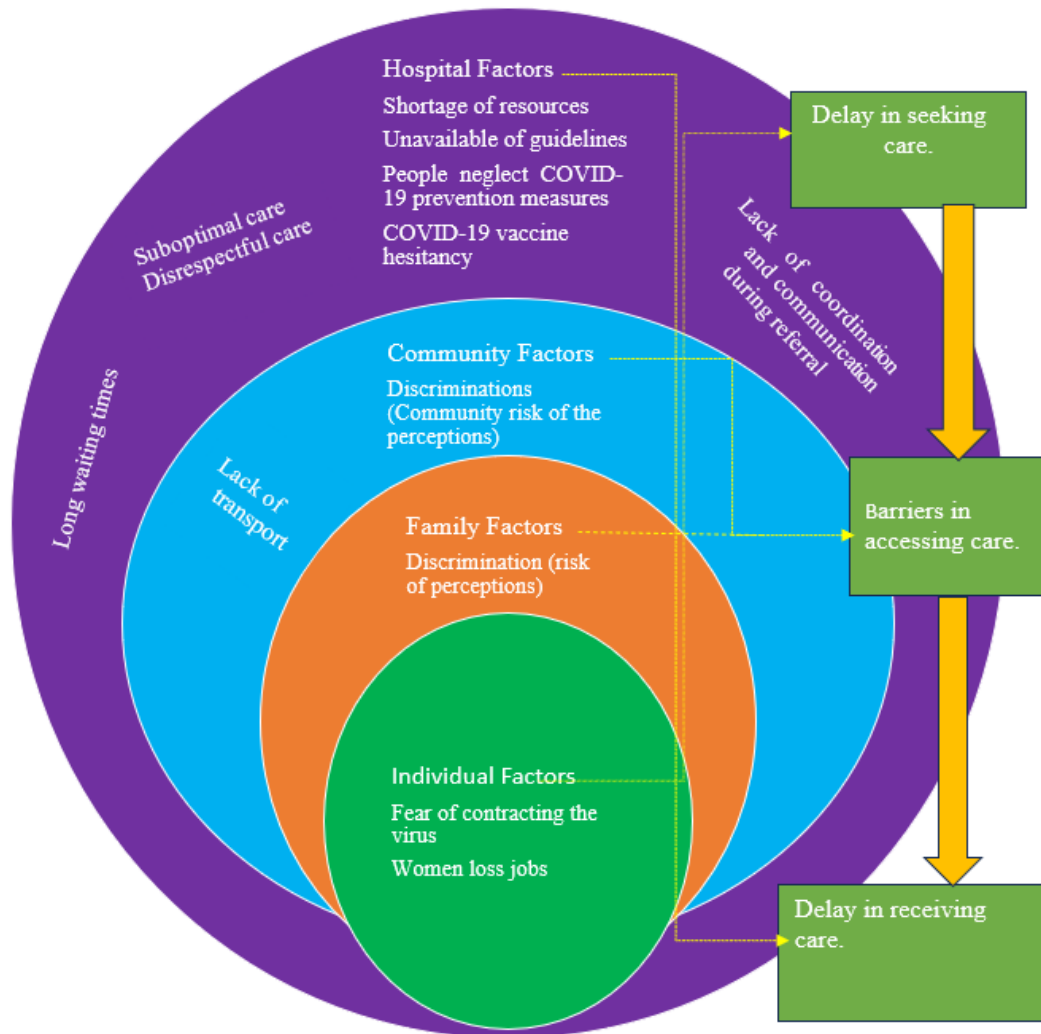


Figure 12: Visual presentations of findings in the Hybrid Framework, adapted from Akaba et al. (2020), and Kaiser et al. (2019).

### 7.3 ANC Access during the pandemic

Understanding the difficulties of access to ANC during any disease outbreak is essential to ensuring and sustaining ANC services (Bankar & Ghosh, 2022). This understanding aids in the identification of specific barriers within both the community and the healthcare system during a crisis, offering opportunities to mitigate their indirect consequences. This study demonstrated that the pandemic disrupted ANC access on both supply and demand sides. Seeking essential ANC, pregnant women faced discrimination from the community when returning to the hospital for ANC follow-ups and from the healthcare providers themselves. These barriers may have contributed to an increase in adverse pregnancy outcomes. These findings are consistent

with those of the systematic review in Chapter 2, conducted in three West African countries during the Ebola outbreak, showing that disruption to ANC access during the Ebola outbreak was the result of community mistrust of the health facilities and discrimination against those who attended and provided ANC in the health facilities. Such disruptions could lead to a weakened coherence between the community and healthcare providers. A qualitative study in rural India based on in-depth telephone interviews with twelve pregnant women and seventeen frontline health workers in the community also found that ANC access was limited in the first wave of COVID-19 by lockdown restrictions and a prevailing sense of mistrust in the public health system and its functioning (Bankar & Ghosh, 2022). Evidence suggests that access to ANC during a pandemic or disease outbreak is hindered by the mistrust between the community and healthcare providers, cultivated primarily by the universal fear of contracting the virus (Massaquoi et al., 2021; Palo et al., 2022).

Quantitative results in this thesis showed that the availability of essential medical supplies before and during COVID-19 remained stable. The qualitative study, however, revealed that most study participants (women and maternity care providers) observed a shortage of essential medical supplies, from PPE to iron and folic acid supplements. This discrepancy may have been due to inaccuracies in the HMIS data collection, supported by a study in two regions in Ethiopia (Estifanos et al., 2022), which explored the system's focus on numbers that lead to increased data falsification in HMISs. This study found that the government's transferring resources to COVID-19 centres, along with NGOs' withdrawal from supporting the maternal healthcare system, could have led to shortages of medical supplies. Before COVID-19, women and maternity care providers reported that all pregnant women received care without any charge and were supplied with essential supplements. For over a decade, a pillar of the Ethiopian government's programme to reduce maternal and neonatal mortality rates was the provision of free care to pregnant women and newborns in public health facilities. This had made a significant impact in lowering maternal and neonatal mortality, but the additional burden of COVID-19 is a possible threat to the free care that supported this progress. The burden on the health system resulting from the pandemic might raise the costs and demand for medical supplies, for example, increased usage of PPE, gloves, essential drugs, and increased prices, triggering an economic downturn that could continue to affect ANC access (Hailemariam et al., 2021; Kayiga et al., 2021).



To contain the spread of COVID-19, the Ethiopian government implemented various measures, including lockdowns, reducing the passenger capacity of public transport by half, and closing grocery outlets and public recreation areas (Huluka et al., 2022). In this thesis, women reported how ANC access was negatively affected by limited public transport, doubled charges for alternative transport, and financial hardship due to women's unemployment, a finding which aligns with a study in Ethiopia, and another from Indonesia (Anggraeni et al., 2023; Hailemariam et al., 2021). Similarly, a mixed methods study in India (Ulaganeethi et al., 2021) found that obstacles to accessing ANC during the pandemic included lack of transport and economic hardship following job losses. As illustrated in the Hybrid Framework in Figure 12, this study found that access to ANC is not solely an individual decision in seeking care, but it also depends on other complex interactions such as individual unemployment, lack of public transport, or cost of transport, and COVID-19 lockdowns. The Hybrid Framework developed in this thesis provides a multifaceted approach to understanding the interplay of support networks that may influence seeking and reaching care, from the proximal (individual attributes) to the distal (community, health facilities, and government policy) factors when the health system is under stress.

## **7.4 ANC uptake during the pandemic**

ANC encompasses health promotion, counselling, disease identification and treatment, and the provision of iron folic acid and anti-parasitic medication, all of which play a crucial role in reducing the risk of adverse pregnancy outcomes (Lattof et al., 2020). The challenges of accessing ANC during the pandemic resulted in decreased uptake, consequently reducing the proportion of women obtaining at least a minimal level of evidence-based, routine ANC and management of complications during ANC at healthcare facilities. In 2016, the WHO recommended that pregnant women have at least eight ANC contacts with maternity care providers throughout their pregnancy (WHO, 2016b). Prior to the pandemic, Ethiopia had only recently implemented this guideline and was struggling to increase ANC4 coverage. The unprecedented impact of COVID-19 has placed a double burden on the country's maternal healthcare system, directly and indirectly affecting ANC uptake.

This thesis found that during the first six months of the pandemic, mean monthly incidence rates of ANC1 and ANC4 uptake declined considerably. These quantitative findings were corroborated by the qualitative findings. According to maternity care providers, women's

attendance for ANC follow-up fell at the COVID-19 peak. Women mentioned that they had delayed initiating their ANC follow-up and postponed or cancelled their visits. These findings coincide with the results from the systematic reviews in Chapter 2 related to both the Ebola and COVID-19 outbreaks, that ANC uptake decreased during both the Ebola outbreak and the pandemic. However, these findings do not align with other studies conducted in Ethiopia (Bekele et al., 2022; Gebreegziabher et al., 2022), which found no significant difference in ANC uptake before and during COVID-19. The cause of the inconsistency could be in the method of analysis: the latter two studies used a two-tailed independent sample t-test, while in this thesis, interrupted time series analysis was used, particularly Poisson regression, for count data and controlled for seasonal effects and other factors. Interrupted time series analysis (ITSA) is recommended (Bernal et al., 2017) to estimate the effect of interventions in a time-point interval. Bernal and colleagues found that using the ITSA can be more effective than a two-tailed independent sample t-test to control seasonal variations and understanding the impact of intervention on a time series dataset. Two other studies from Uganda and Mexico (Burt et al., 2021; Doubova et al., 2021), exploring ANC uptake during the pandemic, used ITSA methods and produced results consistent with this thesis.

Maternity care providers and women referred to their fear of contracting COVID-19 as being a significant barrier to the uptake of ANC during the pandemic. This finding coincides with the findings of the systematic reviews in Chapter 2, which demonstrated that women's fears of contracting either virus were a barrier to ANC uptake. These findings also align with a literature review from three West African countries (Yerger et al., 2020), and a qualitative study exploring how the fear of contracting Ebola (Massaquoi et al., 2021) hindered the uptake of ANC.

## **7.5 ANC provision during the pandemic**

Providing evidence-based and woman-centred ANC at a minimum standard for both low-risk and high-risk women tailored to the right woman, time, and place is essential to preventing maternal and neonatal mortality (Topcu et al., 2022). Maternity care guidelines at health facilities provide clear guidance on performing a procedure or carrying out a task in response to unanticipated circumstances. The availability and implementation of national and international guidelines for ANC are crucial to providing optimal care and reducing the risk of adverse birth outcomes.

Furthermore, it is noteworthy that the WHO's ANC guidelines (WHO, 2016b) significantly improved the quality of care and decreased maternal and newborn morbidity and mortality. The guidelines covered aspects of maternity care for providers, including health promotion, disease prevention, screening, and diagnosis for women during ANC follow-up.

In the qualitative component of this study, maternity care providers explained that during the pandemic, there were no guidelines adapted to the provision of ANC and intrapartum care in hospitals during COVID-19. However, revised guidelines for the national comprehensive COVID-19 clinical management handbook (Ethiopian Ministry of Health, 2020) were issued in 2020. This updated protocol placed more emphasis on the management of COVID-19-suspected and confirmed pregnant women during ANC and intrapartum care. The maternity care providers might not have been familiar with the COVID-19 maternity care guidelines issued by the Ministry of Health in 2020. This lack of familiarity could likely be attributed to the limited public dissemination and training at the hospital level, which did not reach a wide range of maternity care providers.

In 2021, the Ethiopian Ministry of Health revised and updated the existing obstetric management protocol guidelines for hospitals (Ethiopian Ministry of Health, 2021b). While these updated hospital protocols cover aspects of ANC and intrapartum care, they do not make explicit recommendations for service delivery during a pandemic. The findings of this thesis are inconsistent with a study that showed how ANC guidelines were adopted and locally tailored for familiarisation by maternity care providers to preserve and improve the provision of ANC during COVID-19 in LMICs (Aranda et al., 2022). However, another global cross-sectional study of 714 maternal and neonatal professionals, 39% of whom were in LMICs, found that 53% of study participants did not receive updated guidelines during the pandemic (Semaan et al., 2020). Delays in the provision of care (delay 3) are not only influenced by the activities within the hospital but also by numerous external factors. These external factors include the adaptation of guidelines for the responsible stakeholders. These guidelines may or may not be readily available to the hospital and may not be familiar to healthcare providers that led to delay in providing care. These barriers were found by using the Hybrid Framework to analyse barriers to care (Akaba et al., 2020; Kaiser et al., 2019).

The lack of proper PPE use highlighted in this study is evidence of the inconsistent implementation of COVID-19 prevention measures by maternity care providers, which

affected ANC services. This finding coincides with a study in Nepal (Thapaliya et al., 2023) found that lack of PPE affected ANC provision. Importantly availability, proper use, and wearing of PPE are vital to safety during ANC visits at healthcare facilities. The Federation of International Gynaecology and Obstetrics (FIGO) and allied partners recommend that women and maternity care providers properly use and wear PPE during ANC to prevent the virus from spreading (Poon et al., 2020). The findings on PPE in this thesis are also confirmed by a global cross-sectional study, with a large component of participants from LMICs, in which shortages of gloves, masks and aprons during the pandemic were reported by 68% of participants (Semaan et al., 2020). A mixed methods study also found that in six hospitals in four Sub Saharan African (SSA) countries, a lack of PPE impacted ANC provision during the pandemic (Semaan et al., 2022). The reasons for PPE shortages could include a rapid increase in demand, increased manufacturing costs related to inflated transport costs, disruptions in the global supply chain, and reduction of aid to low-income countries with the onset of the pandemic (Mahmood et al., 2020).

Compliance with COVID-19 preventive measures is critical to ensuring the safe provision of ANC. In the qualitative component of the study, participating women noted that some healthcare providers and pregnant women did not adhere to COVID-19 preventive measures when respectively providing and receiving ANC. Low adherence to infection protocols during the pandemic was also found in a cross-sectional study of pregnant women at ANC clinics in Ghana (Apanga & Kumbeni, 2021).

Vaccine hesitancy among healthcare providers is a factor in preventing greater coverage of population immunity and affecting the provision of ANC. Mistrust of the COVID-19 vaccine was expressed by maternity care providers in this study. A cross-sectional study conducted in Nigeria (Amuzie et al., 2021) and Egypt (El-Sokkary et al., 2021) showed that respectively, 50.5% and 42% of healthcare workers exhibited vaccine hesitancy. Vaccine hesitancy may have been related to healthcare providers' fears of adverse effects in their future pregnancies and other medical complications, efficacy uncertainty, inadequate vaccine trials prior to human administration, doubts about vaccine benefits, misinformation and disinformation about the vaccine's side effects (Hossain et al., 2022).

The fact that pregnant women are required to spend long waiting times at ANC clinics posed a significant barrier to the provision of ANC during the pandemic (Abdus-Salam et al., 2021). In

this thesis, women and maternity care providers related their experiences of frequent and long waits – sometimes from morning until evening – for ANC, a problem often attributed to inefficiency in the medical records and ultrasound units. A qualitative study in Nigeria consisting of 54 in-depth telephone interviews with women, healthcare providers, and policymakers similarly demonstrated that long waiting times during the pandemic were barriers to providing ANC (Akaba et al., 2022). A mixed methods study from India (Ulaganeethi et al., 2021) found that booking for ANC at tertiary hospitals involved a long waiting period during the pandemic due to phone connection issues, possibly because of staff shortages (Akaba et al., 2022), which were a consequence of health care providers being exposed to COVID-19 leading to self-isolation or quarantine, and human resource shifting to COVID-19 centres (Kayiga et al., 2021). As emphasised in the Hybrid Framework, unprecedented incidents, such as a pandemic, can have a significant impact on delays in receiving care. This delay in receiving care arises from a shortage of human resources, as healthcare providers may need to self-isolate due to suspected virus exposure and human resources shift to control the pandemic (Akaba et al., 2020).

The WHO recommends that pregnant women have an ultrasound scan before 24 weeks to estimate gestational age, for early diagnosis of fetal anomalies and multiple pregnancies, to prevent the need for labour induction in post-term pregnancies, and to improve women's experiences of pregnancy (WHO, 2016b). However, evidence also demonstrates that frequent ultrasound scanning of low-risk pregnant women is not beneficial for either women's or neonates' outcomes (Bricker et al., 2015; Henrichs et al., 2019). Based on such evidence, healthcare providers should counsel low-risk pregnant women about the timing and frequency of ultrasound scans. Counselling can address women's concerns about needing an ultrasound at every contact and reduce unnecessary waiting times, especially when health systems are in crisis. In this study, maternity care providers demonstrated that an ultrasound service was provided for selected women during the pandemic. Similarly, women complained about waiting a day or longer to receive ultrasound services and then not receiving the services at public hospitals. Aligning with this finding, a prospective observational study in India on 1,374 pregnant women showed that 48.7% experienced difficulty obtaining ultrasound services due to COVID-related restrictions imposed during the pandemic (Goyal et al., 2022).

## 7.6 Institutional childbirth

ANC and institutional birth are proven health system interventions for women's and newborns' survival in LMICs. Receiving ANC boosts the uptake of institutional births, a study in Ethiopia has shown that these interventions (ANC and institutional birth) can significantly lower maternal and newborn mortality (Fekadu et al., 2018). Conversely, studies from low-income countries and India found that increasing the rate of institutional births did not significantly reduce the risks of newborn mortality or postnatal complications. This was observed regardless of whether the birth took place in a public or private facility by skilled health personnel, with the authors instead concluding that a significant factor in improving maternal and newborn outcomes is the quality of institutional birth (Fink et al., 2015; Shajarizadeh & Grépin, 2022).

In this thesis, no statistically significant difference was found between the numbers of institutional births before and during the pandemic. This finding was corroborated by the qualitative component of the study, based on maternity care providers' experiences of attending a high number of institutional births in hospitals. This finding is, however, inconsistent with findings in the Chapter 2 systematic reviews of the literature on the impact of the Ebola outbreak in three Ebola-affected West African countries and of COVID-19 on maternal health service utilisation in Sub-Saharan countries, which found institutional birth declined during both the Ebola outbreak and COVID-19. In Mexico, mean monthly institutional births significantly decreased by 10% (Doubova et al., 2021); in Nepal, the mean weekly institutional births significantly decreased during lockdowns (Kc et al., 2020), and a study exploring the impact of the pandemic in seven LMICs, including Mexico, Haiti, Lesotho, and Sierra Leone, also found significant decreases in institutional birth rates (Fejfar et al., 2023). In this thesis, the lack of discernible difference between institutional birth rates in volume before and during COVID-19 could have been due to increased numbers of health centres referring women to public hospitals during the COVID-19 peak.

In addition, findings from this thesis that the rate of institutional births remained relatively stable could be attributed to the Ethiopian Ministry of Health's implementation of strategies to ensure the maintenance of essential services through non closure of healthcare facilities. This included establishing a non-COVID-19 taskforce to promote and maintain institutional birth (Ethiopian Ministry of Health, 2020 ). The local health administration in the Sidama region and hospital officials made home-to-home visits and phone calls to pregnant women with registered

phone numbers in order to improve and maintain institutional birth rates during the pandemic. The qualitative findings demonstrated, however, that women experienced distress due to crowded hospitals and being turned away, which led to a perceived increase in home birth during the peak of COVID-19.

Birth outcomes can be affected either by overusing or underusing obstetric interventions (Miller et al., 2016). Obstetric interventions such as instrumental and caesarean section births, without indication, can contribute to maternal and newborn morbidity and mortality. When performed for medical indications, however, these procedures can also effectively reduce maternal and neonatal morbidity and mortality (WHO, 2018b). The findings from this study indicated that mean monthly instrumental and caesarean section birth rates in the first six months of the pandemic significantly increased.

Similar to a study conducted in the Dominican Republic looking at instrumental birth (Requena-Mullor et al., 2022), this study revealed a significant increase during the pandemic of this intervention. Another study argues that high-risk nulliparous women and a prolonged second stage of labour are risk factors that may have contributed to the rise in instrumental births during the pandemic (Justman et al., 2020).

Studies from Ethiopia (Desta et al., 2021; Kassie et al., 2021), Kenya (Shikuku et al., 2021), Sierra Leone (Sevalie et al., 2021), Iran (Gharacheh et al., 2023) and the Republic of the Dominican (Requena-Mullor et al., 2022) accord with the finding that caesarean birth rates significantly increased during the pandemic. An increase in caesarean birth rates during the COVID-19 may be as a result of a demand from women to shorten or avoid waiting for a spontaneous onset of labour, due to fear of contracting the virus (Gharacheh et al., 2023; Xue et al., 2022). To minimise waiting times and potential risk of exposure to infection in the hospital environment during the pandemic, women and healthcare providers may have either intentionally or unintentionally favoured caesarean birth. Wearing a mask while in labour can impede gaseous exchange and create additional load on the metabolic system (Tong et al., 2015). It also makes it difficult for labouring women to express their emotions. Compromised communication with providers may result in discomfort and difficulty in giving birth, which could lead to interventions such as instrumental and caesarean birth. The significant rise in the rate of caesarean birth in public hospitals during the pandemic may also be attributed to the lower admissions of labouring women to private health facilities and to the closure of those

facilities during the peak of the pandemic (Sevalie et al., 2021). Further research should explore the factors responsible for the rise in instrumental and caesarean section birth rates, given that there is no evidence to demonstrate reasons for a rise in medical indications.

Moreover, along with delays in seeking ANC due to the fear of contracting the virus at the hospital, delays in receiving care due to transport problems during lockdowns (Sevalie et al., 2021) led to a reluctance to make timely referrals to maternity emergency care units (Gharacheh et al., 2023). Reduced maternal and fetal monitoring (Kc et al., 2020) and restrictions on birth companions during the pandemic (Lalor et al., 2021) resulted in an increase in pregnancy complications, for which caesarean section was often the resultant mode of birth. As illustrated in Figure 12, the Hybrid Framework depicts a multifaceted interaction that substantially impacts the individual seeking care during COVID-19. This interaction includes fear of contracting the virus, challenges in accessing care due to limited and lack of transport, and difficulties in receiving care because of reduced monitoring and restriction of companions due to COVID-19. As a result, there has been an increase in the rate of caesarean births during COVID-19.

Over the past two decades, LMICs, including Ethiopia, have demonstrated how strategies to improve access to quality intrapartum care have greatly improved the safety of pregnancy and birth (Zuñiga et al., 2021). In this thesis, maternity care providers described how community discrimination suffered by hospital healthcare providers became a barrier to providing quality intrapartum care during the pandemic. This aligns with findings from the systematic review in Chapter 2, which explored the effect on intrapartum care of community mistrust of healthcare facilities during an Ebola outbreak in West Africa. A cross-sectional study from Canada (Fahim et al., 2023) also found that healthcare workers in Canada were also targets of community discrimination during the pandemic. The Hybrid Framework highlights that women receiving care are influenced by community factors, for example, discrimination towards healthcare providers in the community. This discrimination led to negative impacts on healthcare providers' communication with women and their ability to provide quality care. During the pandemic, various stakeholders-initiated guidelines for the management of ANC, intrapartum care and PNC. FIGO, for example, adapted guidelines for the management of pregnancy in four settings: ambulatory ANC in outpatient clinics, management in the settings of obstetric triage, intrapartum management, and postpartum management (Poon et al., 2020). Similarly, WHO recommends that all pregnant women and their newborns, including those suspected or



confirmed to have COVID-19 infections, have the right to receive high quality care before, during and after birth. This care should include mental health care, respectful care, the presence of a chosen companion during birth, clear communication by maternity staff, appropriate pain relief strategies, mobility in labour when possible and the choice of birth position (WHO, 2022).

Evidence-based intrapartum care during the pandemic depended on guidelines being available and accessible. The guidelines were adopted in some countries but inconsistently across countries (Benski et al., 2020); and the shock delivered by the pandemic to the health systems in LMICs made adaption to and familiarisation with guidelines challenging.

Maternity care providers participating in the qualitative component of this study indicated that there were no intrapartum care guidelines provided to them that related to COVID-19. However, revised guidelines for the national comprehensive COVID-19 clinical management handbook (Ethiopian Ministry of Health, 2020) were issued in 2020. This updated protocol placed more emphasis on the management of COVID-19-suspected and confirmed pregnant women during ANC and intrapartum care. In addition, in 2021, a guideline for the obstetric management protocol was revised (Ethiopian Ministry of Health, 2021b); it did not include COVID-19-related management of ANC and intrapartum care.

This thesis finding was not confined to Ethiopia. A mixed methods study conducted in four Sub-Saharan countries (Semaan et al., 2022) on the availability of guidelines for care when COVID-19 cases were suspected or confirmed in the labour ward, found a similar lack of guidance, resulting in the compromised health of many people. A contrary finding from a mixed methods study conducted in 37 healthcare facilities in six LMICs (Aranda et al., 2022) argued that national guidelines for safe maternity care were adopted during the pandemic. In the 37 health facilities studied, guidelines could be practically adopted and applied mainly because they had retained the financial support and human resources of international non-governmental health organisation partners (Aranda et al., 2022).

### **7.6.1 Availability of resources for intrapartum care provision during the pandemic**

To provide quality intrapartum care, hospitals are expected to have enough rooms, labour beds, and necessary medicines such as parenteral oxytocin, antibiotics, parenteral anticonvulsants

and anaesthesia drugs (WHO, 2021). In addition, equipment such as syringes, needles, surgical blades, clean and surgical gloves, foley catheters, urine bags, infusion sets, intravenous fluids, delivery sets, antibiotics, dexamethasone or betamethasone, glucose 40%, oxytocin, magnesium sulphate, ergometrine, hydralazine, adrenaline, calcium gluconate and anaesthesia drugs should be readily available for routine care and the management of complications during pregnancy and childbirth in the hospitals (Ethiopian Ministry of Health, 2021b). The Ministry of Health in Ethiopia funds public hospitals to procure the aforementioned medical supplies preceding the pandemic. In this study, women complained that healthcare providers were instructing them to buy a range of medical items that were not necessary during birth, causing them to incur large expenses during the pandemic. The reallocation of financial resources to COVID-19 prevention, economic crisis, and political unrest in the country may have led to an acute shortage of hard currency that affected procurement of essential drugs from abroad, in turn leading to shortages of urgent medical supplies on hospitals (Mekonnen et al., 2023; Melaku et al., 2023).

The findings of this thesis revealed no significant variations in the availability of essential medicines before and during the pandemic, according to the quantitative data obtained from the HMIS. However, the qualitative data collected from health personnel showed that necessary medicines, such as parenteral oxytocin, antibiotics, fluids, and gloves, were in scarce supply. Women were often forced to buy drugs and equipment (PPE) before admission to hospital; however, prices significantly increased, which led to difficulties for women accessing intrapartum care. Maternity care providers faced challenges in providing optimal care during the pandemic. These findings are consistent with views expressed in a qualitative study based on IDIs with healthcare providers and FGDs with women in Ethiopia (Hailemariam et al., 2021) exploring the shortage of logistic supplies. Similarly, a qualitative study in Nigeria (Akaba et al., 2022) that assessed the availability of medical commodities, and a mixed methods study from Liberia (Babalola et al., 2022) found the lack of drugs to be a barrier to the provision of quality intrapartum during the pandemic.

The quality of intrapartum care also depended on the availability and use of PPE in the hospital during the pandemic. Qualitative findings here demonstrated that a shortage of PPE and vaccine hesitancy were common problems. PPE shortages during the pandemic were reported in a number of other studies, including two mixed methods studies from Ethiopia (Bekele et al., 2022; Tilahun et al., 2022), a qualitative study from Kenya and Nigeria (Akaba et al., 2022;

Ombere, 2021), mixed methods studies from Liberia (Babalola et al., 2022), four Sub-Saharan countries (Semaan et al., 2022), and a qualitative study from the city of London (Grailey et al., 2021). All these studies concluded that inadequate supplies of PPE reduced the quality of intrapartum care during the pandemic. Furthermore, inadequate supplies of PPE in hospitals in LMICs contributed to the long waiting times for women seeking intrapartum care during the pandemic.

### **7.6.2 Delays in seeking and receiving intrapartum care during the pandemic**

In LMICs, delays in seeking care, accessing transport, and receiving intrapartum care indirectly contribute to obstetric complications, leading to increase maternal and newborn morbidity and mortality (Actis Danna et al., 2020). The qualitative component of this study found that women were arriving at a hospital later than they would have before the pandemic, often after developing obstetric complications such as haemorrhage, preeclampsia, or uterine rupture, which endanger the lives of women and their babies and may ultimately result in loss of life. Upon arrival at the hospital, women were often unable to receive timely care, even in the event of an emergency. A qualitative study in Nigeria similarly identified these three forms of delay (seeking, reaching, and receiving care) in accessing maternal, neonatal, and child healthcare during the pandemic (Akaba et al., 2022). Further, a qualitative ethnographic study in India (Manna & Basu, 2023) identified three delays (delay 1 (seeking care), delay 2 (reaching health facility) and delay 3 (receiving care)) and community (interpersonal) barriers to accessing maternal and child healthcare during the pandemic. Contributing factors could include economic hardship, fear of contracting the virus, lockdown restrictions, shortages of human resources and medical supplies (Akaba et al., 2022), and decreased fetal monitoring (Kc et al., 2020). Delays in seeking and receiving care can be affected by numerous complex factors at the individual, community, and hospital levels. These factors include unemployment, fear of acquiring the virus, and unavailability of medical supplies, as displayed in the Hybrid Framework in Figure 12.

## **7.7 Childbirth complications during COVID-19**

Evidence from Sub-Saharan African countries and Bangladesh (Ijdi et al., 2022; Serbanescu et al., 2022) demonstrates that quality ANC and intrapartum care can contribute to lowering

maternal and neonatal morbidity and mortality rates. Findings from these countries also show that expanded ANC and institutional birth coverage do not necessarily guarantee a corresponding decrease in maternal and neonatal mortality. There is evidence that seven out of ten maternal deaths in Ethiopia occur in healthcare facilities, and of those deaths, obstetric haemorrhage accounted for 48.9% of cases between 2013 and 2020 (Tesfay et al., 2023). Both quantitative and qualitative analyses revealed that a large proportion of the institutional maternal and neonatal deaths recorded in hospitals during the pandemic resulted from preventable obstetric complications such as preeclampsia and haemorrhage. These outcomes could have been averted by maintaining standardised provision of high-quality ANC and intrapartum care.

The quantitative component of this study shows a considerable decline in mean monthly maternal deaths in the first six months of the pandemic. The qualitative findings discounted such a decline, however, with maternity care providers reporting that a substantial number of maternal deaths occurred in hospitals during the pandemic, consistent with a global systematic review and meta-analysis which demonstrates that the incidence of maternal deaths increased in LMICs during the pandemic (Chmielewska et al., 2021).

The decrease in maternal mortality during the pandemic reported in the HMIS could be explained by several factors. These include maternal death logs being unavailable around maternity wards in the hospital, reporting errors, confusion among facility staff about the reporting process, high staff turnover, fear of legal consequences, and missing causes of maternal death (Hadush et al., 2020). The redeployment of healthcare staff to COVID-19 centres and prevention efforts posed a significant challenge to maternal and perinatal death surveillance response (MPDSR) systems (Blackburn et al., 2022), possibly presenting an incomplete picture of the true impact. MPDSR review committee meetings were postponed, and their frequency was reduced; fewer meetings may have affected weekly reporting of maternal deaths to HMISs, which could have resulted in an inaccurately reported decrease in maternal mortality during the peak of the COVID-19 pandemic.

Maternal mortality is a key indicator of health system performance at all health system levels. Given the critical situation of hospitals during the pandemic, maternal deaths could readily have gone unreported and hidden due to forgetfulness, work overload, limited knowledge of the reporting procedures, and death logs not being at hand in maternity wards. Furthermore,

reporting maternal death might be perceived to lead to blame, and affect evaluations of healthcare providers' performance, with consequences for their career development and educational opportunities (Melberg et al., 2019). Thus, there may have been a tendency to attribute generic causes of death, such as infections and multi-organ failure, rather than obstetric-specific causes, such as puerperal sepsis and postpartum haemorrhage, potentially as a way to avoid accountability (Melberg et al., 2019; Willcox et al., 2023).

In relation to perinatal outcomes, the quantitative findings in this thesis showed that the number of stillbirths and neonatal deaths did not significantly differ before and during the pandemic; again, this was qualitatively disconfirmed. In the qualitative study, maternity care providers reported a considerable number of institutional stillbirths and neonatal deaths that occurred during the pandemic because of delayed intrapartum care associated with fear of contracting COVID-19.

The quantitative finding is also inconsistent with studies conducted in Ethiopia (Kassie et al., 2021), Uganda (Burt et al., 2021), and South Africa (Jensen & McKerrow, 2020), which found significant increases in neonatal mortality during the pandemic. A possible explanation could be the difference in data collection and analysis methods. In the study in Ethiopia, data for the four months before the pandemic (March-June 2019) and four early months of the pandemic (March-June 2020) were extracted from HMISs (Kassie et al., 2021). These inconsistent findings might be used in different models for analysis. For example, this study employed interrupted time series analysis, while the study by Kassie et al., used a paired independent t-test, that did not control for seasonal variations. The existing evidence recommends using interrupted time series analysis to estimate the impact of interventions within a point time interval (Bernal et al., 2017).

In this thesis, women and maternity care providers reported that severe shortages of blood products were common during the pandemic, especially when lockdowns prevented blood donation. The shortage of blood products is a common problem in limited-resource countries, as many do not have established cultures of blood donation (Allain, 2019). The pandemic aggravated already insufficient blood supplies, which could have contributed to an increase in maternal deaths related to obstetric haemorrhage (Nieto-Calvache et al., 2020). Other studies, one from Latin America (Nieto-Calvache et al., 2020) and another in the Eastern Mediterranean region (Al-Riyami et al., 2021), also reported insufficient blood supplies during the pandemic.

The shortage of blood products in LMICs severely affects intrapartum care and leads to increased maternal morbidity and mortality caused by obstetric haemorrhage (Raykar et al., 2021). This is another example of how the already fragile health system in Ethiopia was profoundly affected by COVID-19, with a catastrophic cost to the women giving birth during this time.

The quality of the obstetric triage process (Naz et al., 2022) is crucial in minimising delays in hospital care and lowering maternal and newborn morbidity and mortality in LMICs. This study demonstrated that a common challenge in the obstetric triage system was the inadequacy of medical supplies, rooms, beds, and lack of trained staff, as well as delays in receiving COVID-19 test results, all of which could have contributed to increased maternal mortality during the pandemic. A mixed methods study conducted in Sierra Leone (Sevalie et al., 2021) showed impact of implementing COVID-19 control measures. For example, performing COVID-19 tests on suspected cases and waiting 2 to 3 days, resulted in an unmanageable triage system, ultimately resulting in loss of lives due to the delay without care. It would be better to use a rapid COVID-19 test for emergency cases and prioritise the management of such cases. A study in Iran (Rashidi Fakari & Simbar, 2020) explored the most fundamental challenges in the obstetric triage system, and found a lack of guidelines, equipment, physical space, human resources and obstetric triage system. Delays in receiving care in the obstetric triage system can be hampered by a range of complex factors at the community and hospital levels. These barriers were the absence of an evidence-based obstetric triage system, lack of essential drugs, and shortage of manpower during COVID-19, as presented in the Hybrid Framework.

Access to ambulances for women, along with effective coordination and communication within referral systems in healthcare facilities, are crucial components of obstetric care that help lower women's and newborns' morbidity and mortality in countries with limited resources (Daniels & Abuosi, 2020). Women's narratives underscored the challenges that labouring women encountered during the pandemic, including the scarcity of ambulances and issues related to coordination and communication within healthcare facility referral systems. An illustrative study conducted in a tertiary referral hospital (Chaurasia et al., 2023) indicated a significant increase in obstetric referrals and a decrease in the quality of referrals during the pandemic, contributing to an increased maternal mortality caused by complications like uterine rupture, primary postpartum haemorrhage and preeclampsia. Delays in reaching care can be impeded by various complex factors at the community and hospital levels. These complex factors were

a lack of coordination and communication within hospitals, issues within referral systems, and unavailability of ambulances during COVID-19, which were a consequence of obstetric complications, as shown in the Hybrid Framework.

## **7.8 Mistreatment during maternity care during the Pandemic**

The quality of ANC and intrapartum care was significantly compromised across the globe during the pandemic and was often characterised by the mistreatment of women requiring maternity care (Adu-Bonsaffoh et al., 2022). Qualitative findings in this thesis showed that women experienced disrespectful care; examples were given of healthcare staff insulting women, using abusive language, and abandoning women in the labour ward. A study in Palestine (Me Abu-Rmeileh et al., 2022) revealed that during the COVID-19 emergency, women experienced physical abuse, verbal abuse, non-consented episiotomy, non-consented vaginal examinations, and abandonment during birth. These behaviours by health workers are not new, and the movement towards respectful maternity care is gathering support from many nations (Bohren et al., 2019). What it does highlight is that during times of extreme pressure on the system and on the individual health workers, the provision of respectful maternity care may tend to be neglected.

## **7.9 Strengths and limitations of the study**

One of the strengths of this study is its mixed-methods design, which combined quantitative and qualitative findings related to maternal and perinatal care during COVID-19 and compared their dimensions with those from the period prior to its onset to provide a comprehensive understanding of the impact of the pandemic. The study assessed all public hospitals in the Sidama region in Ethiopia that provide caesarean birth to comprehensively understand maternal and perinatal care before and during the pandemic. Qualitative methods, IDIs and FGDs were used to explore maternity care providers' and women's experiences with maternal and perinatal care during the pandemic. To evaluate the impact of the pandemic, quantitative assessment and qualitative methods based on the experiences of women, midwives, obstetric/gynaecology residents, integrated emergency surgical officers, and obstetricians were employed. Another strength of this study is its use of a joint display technique to integrate quantitative and qualitative studies.

Besides these strengths, the study has limitations. The data were obtained from HMIS administrative data sources that could have been prone to omissions and inaccuracies, resulting in overestimation or underreporting of data. The impact of the COVID-19 pandemic on hospitals might have affected the accuracy of the HMIS reporting; further, HMIS data have no population-level denominators. The study was conducted at public hospitals and did not include any information about the experiences of women who gave birth at home or received their maternity and newborn care at private health facilities or primary health centres.

## **7.10 Implications of the study**

This study aimed to provide a comprehensive understanding of the impact of the pandemic on maternal and perinatal care in the Sidama region of Ethiopia. This nuanced understanding, supported by the first-hand experiences of women and healthcare providers, can contribute to future policy formulation. Policymakers such as the Federal Democratic Republic of Ethiopia's Ministry of Health and partner organisations can use the findings of this study to inform decisions about the management of maternal and perinatal health and safety in future disease outbreaks. These stakeholders may apply the study's insights into the disruption of the quality of ANC and intrapartum care and the barriers to accessing quality care to develop interventions to address the impacts of the COVID-19 health crisis.

COVID-19 led to a lack of medical supplies, which increased demand- and supply-side needs due to dwindling aid and logistic disruptions. The lack of sufficient medical supplies detrimentally impacted access to maternal and perinatal care. To mitigate this effect and improve maternal and perinatal care access, stakeholders and the Ministry of Health need to ensure the supply of medical needs for ANC clinics, labour wards, and obstetric triage systems. This proactive approach will help build resilience in maternal and perinatal care for better management in times of unforeseen shocks.

The provision, implementation, and application of context-specific guidelines in health facilities, coupled with tailored training for maternity care providers at the grassroots level, are crucial supports for these healthcare professionals to deliver quality maternal and perinatal care. These measures can effectively ensure the provision of optimal care within the evolving healthcare system, especially during crises such as the current pandemic.



It is important that COVID-19 preventative measures be implemented in healthcare facilities to reassure both women and the community about the safety of pregnant women during maternal and perinatal care services in present and future pandemics. It is essential to reduce complacency about infection prevention measures in health facilities, especially within medical record units, which, in turn, should ensure the continuous support and provision of maternal and perinatal care in present and future pandemics.

Maternity care providers advocate respectful maternity care while providing optimal care that underlines the imperative of maintaining a positive and respectful environment for women, especially in times of crisis. Effective communication and coordination within hospitals in referral systems are crucial to avoid unnecessary delays. This is essential for ensuring seamless care and timely referrals, even in times of crisis.

There are several further measures that need to be implemented to improve maternal and perinatal access, uptake, and provision in the hospitals during present and future outbreaks. These measures include adopting guidelines, offering training, and ensuring that medical supplies, rooms, and beds are available to labouring women to reduce the needless loss of women and newborns during the pandemic.

The HMIS platform, especially in terms of maternal and perinatal care, needs to include all indicators that are available in the ANC and delivery logbook. These indicators can comprehensively reflect factors on ANC, intrapartum care, and birth outcomes. In addition, the reporting system could be paid due attention, by taking measures such as supervision, providing training and familiarisation with the platform to relevant workers, and modifying the indicators in a measurable way, rather than relying on yes/no responses. For example, this could involve assessing the availability of essential drugs. These measures could encompass the integration of all ANC and delivery logbook indicators into the HMIS platform, providing training for healthcare providers and HMIS officers and establishing a process for supervising and evaluating the quality of data.

## **7.11 Recommendations and future research directions**

The following recommendations are suggested for this thesis.

### **1. Recommendations for the Ministry of Health in Ethiopia, and other LMICs**

This study recommends that, when establishing epidemic/pandemic taskforces during epidemic/pandemic, the Ministry of Health simultaneously establishes non-epidemic/pandemic taskforces to sustain and improve optimal maternal and perinatal care access, uptake and provision, especially during the outbreak. The pandemic has disrupted both the global supply chain system (Ullrich et al., 2020) and the distribution of foreign aid, leading to a shortage of essential medical supplies in LMICs like Ethiopia. To address this issue, it is important for the Ministry of Health explore alternative supply options, including investing in and supporting local manufacturing of medical supplies. This approach would aim to build self-reliance and sustain the provision of essential medical supplies for health facilities, which is vital to improve and sustain access to quality maternal and perinatal care during the pandemic. This study recommends that the Ministry of Health to fully equip ANC clinics, labour wards and obstetric triage systems to restore access to maternal and perinatal care disrupted by the current pandemic.

This study suggests that the Ministry of Health update and promptly distribute guidelines for ANC and intrapartum care to healthcare facilities at the grassroots level during health system crises like the pandemic. By doing so, clinicians would have greater clarity and understanding of how to continue to provide care safely, not only in the present pandemic, but also in future outbreaks.

### **2. Service level recommendations**

Healthcare facilities recognise the importance of prioritising health services for pregnant women during the pandemic. Their focus needs to include addressing pregnant women's fears of contracting the virus by disseminating maternal health information via different media outlets and community health workers, ensuring easy access and provision of ANC and intrapartum care, and assuring women optimal care to improve and maintain their uptake of maternal and perinatal care during present and future pandemics. Pregnant women should have access to timely care from maternity care providers in order to maintain at least a minimum standard of care. This study recommends that healthcare providers and communities would be

supported by health authorities so that they can ensure respectful and optimal care even in challenging situations. Health facilities can rebuild trust between healthcare providers and the community by creating community networks to maintain and enhance access to ANC and intrapartum care during and during future pandemics.

This study recommends addressing the existing challenges in the HMIS inventory to enhance the accuracy and comprehensiveness of the data. The binary nature of data in the HMIS form means that responses are limited to 'available' or 'unavailable', with no space to include details such as the quantities of essential drugs. To improve the representation of the actual scenario at the hospital pharmacy level, revising the HMIS system to allow for a more nuanced and informative reporting structure deserves consideration. This adjustment would contribute to a more reliable and insightful understanding of inventory dynamics.

### **3. Community level recommendations**

This study suggests that pregnant women undertake ANC and intrapartum care in compliance with the COVID-19 prevention policy in the hospital to ensure they are safe from contracting the virus. Additionally, it is essential to preserve the connective social fabric of a community while ensuring the confidence of women attending hospitals for ANC and intrapartum care. Community consultation and education alongside the provision of respectful maternity care and the support of healthcare providers, is crucial for providing optimal maternal and perinatal care during present and future pandemics.

### **4. Recommendations for future research**

Numerous opportunities exist for future research, such as in assessing the quality of HMIS data for maternal and neonatal outcomes. It would be beneficial to examine the consistency of HMIS reports with facility source documents and collect data using verbal autopsies in the community.

Additional research is warranted to better understand and explore the factors responsible for the rise in instrumental and caesarean section birth rates during the pandemic.

Implementation research could benefit obstetric triage procedures and referral systems in the study area since these have a vital role in preventing unnecessary delays in receiving timely care and reducing the incidence of consequences like maternal and neonatal deaths.

Finally, further research is needed to understand the short- and long-term impacts of COVID-19 on maternal and perinatal care in Ethiopia. It would be additionally useful to assess the impact of the pandemic along with the impact of the ongoing internal conflicts in the country on maternal and perinatal care experiences and outcomes.

## **7.12 Conclusion**

This study is the first to estimate and explore women's experiences of maternity care after the onset of COVID-19 and to compare the quality of care during that time with the period prior to the pandemic in Ethiopia's Sidama region. The systematic review of the effects of the Ebola virus in Sub-Saharan African countries highlighted attempts to recover rates of antenatal care and institutional births post-Ebola. The empirical study showed how ANC access, uptake and provision were affected during the first six months of the pandemic. Evidence emerged from this study of shortages of rooms and beds for labouring women, and lack of essential medical supplies, that made the provision of quality ANC and intrapartum care particularly challenging during the pandemic. The impact of this poses a threat to the progress made in maternal and perinatal health in the years leading up to the outbreak. In addition, the qualitative component of this study identified how aspects of suboptimal care, which included mistreatment of women, lack of equipment in the triage system, poor referral communication and coordination systems in hospitals, and shortage of blood supplies, compounded or contributed to increases in obstetric complications and their consequences during the time of the pandemic. In future epidemics/pandemics, maternal and perinatal care must be prioritised as the epidemics/pandemics evolve and new strategies and interventions are adapted and adopted. This is essential for enhancing and sustaining optimal maternal and perinatal care in the health system's time of crisis, contributing to reducing the direct and indirect causes of maternal and perinatal morbidity and mortality.

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## Appendices

### Appendix 1: A summary method based on study objectives.

No	Objectives	Study design	Study subjects	Data collection	Data analysis
1	To determine the impact of COVID-19 on antenatal uptake, access, and provision of care at public hospitals in Ethiopia by comparing two timeframes: March 2019 to February 2020; and March to August 2020 - and To explore the impact of COVID-19 on antenatal uptake, access, and provision of care at public hospitals in Ethiopia between March 2019 to February 2020; and March to August 2020, from maternity care providers' perspectives.	Interrupted time series and in-depth interview	Pregnant women and maternity care providers	HMIS and in-depth interviews	Descriptive analysis (text, table, and graph) Poisson regression of the impact of COVID-19 on ANC contact and thematic analysis
2	To determine the impact of COVID-19 on intrapartum care at public hospitals in Ethiopia by comparing two timeframes: March 2019 to February 2020; and March to August 2020, and To explore the impact of COVID-19 on intrapartum care at public hospitals in Ethiopia between March 2019 to February 2020; and March to August 2020, from maternity care providers' perspectives.	Interrupted time series and in-depth interview	Women and newborns and maternity care providers	HMIS and in-depth interviews	Descriptive analysis (text, table, and graph) Poisson regression of the impact of COVID-19 on the mode of childbirth, maternal mortality, stillbirth and thematic analysis
3	To explore women's experiences receiving antenatal and intrapartum care during COVID-19 at public hospitals in Ethiopia in 2022.	In-depth interview and focus group discussion	Pregnant women, woman who gave birth during COVID-19, obstetric care providers	In-depth interviews and focus group discussions	Qualitative analysis (code, themes and data entry), thematic analysis

## Appendix 2: Consent forms

Greetings!

My Name is \_\_\_\_\_, and a PhD student at the University of Technology Sydney. I am a part of the team doing a project to assess the impact of COVID-19 on maternal and perinatal care and outcomes. Based on the findings, forward possible interventions.

**Title of the research:** Effect of COVID-19 on maternal and perinatal care at public health hospitals in the Sidama region, Southern Ethiopia: A mixed method study

Name and of researcher applicant: Zemenu Yohannes Kassa

Affiliations: College of Medicine and Health Sciences Hawassa University and Faculty of the Health University of Technology Sydney.

### **Purpose of the research**

This study aims to assess the impact of COVID-19 on maternity care before and during the pandemic at public hospitals in Ethiopia in 2020. Time to this research will also explore the impact of COVID-19 on maternal health services for maternity care providers and women's perspectives. We are interested in discussing with women/obstetric care providers, so you are invited to participate in a focus group discussion. The findings from this research will be used to make a recommendation to improve the quality of maternal, neonatal and child health.

### **Procedures:**

You have been purposefully selected to participate in this interview /FGD. If you accept, you will be asked some questions about the impact of COVID-19 on maternal health services. I will record your answers to these questions on a tape recorder and into this guide form (interview guide). This is done so that I may remember everything you told me. However, it is essential for the researcher to answer all questions; if you do not wish to answer any of the questions included in the interview, you may ask to move on to the following questions.

The recorded information will be confidential; no one except the study investigators will see your response.

Expected duration of the research and participants' involvement: we expected to be involved for five months. However, the expected time of the interview is about 60-90 minutes.

**Risk and discomfort:** There is no risk associated with answering these questions. It would not affect your work or promotion.

**Cost to participate:** Your participation in this research will not cost you anything.

**Benefits:** There are no direct benefits to you personally. The information you share will inform the development of recommendations to improve maternal, neonatal and child health quality.

**Confidentiality:** The information you provide will be kept confidential and only be used for this study. No personal identifying information will be recorded. The discussion will be audio-recorded so as not to miss what you have to say, but the audio recording will be kept secure throughout the period, and authorised persons may only access it.

**Voluntariness:** Your participation in this research is entirely voluntary.

**Alternative to participate:** This will not affect you if you choose not to participate.

**Incentives:** You will not be incentivised to participate in the research.

**Right to refuse or withdraw** you do not take part in this research; if you do not wish to do so or refuse to participate, this will not affect you in any way. You may stop participating in the interview any time you wish, and you will have no negative consequences. Please note that some of the information that has been obtained about you before you chose to withdraw may have been modified or used in reports and publications. These cannot be removed anymore. However, the researcher promises to make a good faith effort to comply with your wishes as much as practicable.

### **Statement of a person giving consent**

I have read the description of the research. I have also talked it over with others to my satisfaction. I understand that my participation is voluntary. I know the purpose of the study, methods, risks and benefits of research to judge that I want to participate in it. I understand that I may freely stop being part of this study at any time. I have received a copy of this consent form and an additional information sheet to keep for myself.

## **Appendix 3: PARTICIPANT INFORMATION SHEET- FOCUS GROUP: Women**

[UTS HREC REF NO. ETH22-7567]

### **The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia: A Mixed-Methods Study**

#### **WHO IS CONDUCTING THIS RESEARCH?**

I am Zemenu Yohannes Kassa, a PhD student at the University of Technology Sydney. I also work with the College of Medicine and Health Sciences at Hawassa University, Hawassa, Ethiopia. I am a part of the team conducting a study to assess the Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia. My primary academic supervisor is Dr Deborah Fox: [Deborah.Fox@uts.edu.au](mailto:Deborah.Fox@uts.edu.au)

#### **WHAT IS THE RESEARCH ABOUT?**

This research is about the effect of the COVID-19 pandemic on maternal and perinatal care in the Sidama region. You have been invited to participate in this study because you gave birth during the COVID-19 pandemic and utilised maternity care. A better understanding of the effect of COVID-19 on maternal and perinatal care in the Sidama region will be essential to improve maternity care in the future. We hope this study assists in maternity service planning in different parts of Ethiopia. Your views on maternal and perinatal care during the COVID-19 pandemic are crucial to assessing maternity care.

#### **WHY HAVE I BEEN INVITED?**

You have been invited to participate in this study because you are a woman who has had a baby recently in the Sidama region, Ethiopia. If you accept, you will be invited to participate in this study to discuss your perceptions of the effect of COVID-19 on maternity services at the hospital in the Sidama region. I will audio-record the responses and transcribe them immediately for analysis. The recorded information will be confidential; no one except the study investigators will see your responses. The interview will last approximately 60 minutes.

### WHAT DOES MY PARTICIPATION INVOLVE?

You will be asked to join 6 to 8 women to participate in a focus group discussion at a mutually convenient time and place. The discussion will be recorded using a voice recorder. The expected duration of the discussion will be approximately 60 minutes.

### ARE THERE ANY RISKS/INCONVENIENCES?

There is minimal risk to you associated with answering these questions, apart from the inconvenience of your time spent participating, that you might become distressed by talking about your experience or hearing about the experiences of others. If you feel distressed, the focus group discussion will be paused, and I will provide you with support. If further support is needed, I will refer you to a mental health professional at no cost to you.

It will not affect your work or promotion. Other study participants who will participate in the discussion might be disclosed your feeling if you feel distressed. Your participation in this study will not cost you anything. There are also no direct benefits to you personally. The information you share is crucial for developing recommendations to improve Ethiopia's maternal, neonatal, and child health care.

### DO I HAVE TO TAKE PART IN THIS RESEARCH PROJECT?

Participation in this study is voluntary. It is entirely up to you whether you decide to participate.

### WHAT IF I WITHDRAW FROM THIS RESEARCH PROJECT?

If you wish to withdraw from the study once it has started, you can do so at any time without giving a reason. Indicating that you do not want to participate in this study will not affect you in any way. You may stop participating in the interview anytime you want to, and there will be no negative consequences for you. However, it may not be possible to withdraw your data from the study findings if you have already removed your identifying details. If you decide to leave or withdraw from the study, we will not collect additional personal information from you (e.g. name, address, date of birth etc.). Already collected personal information will be retained to ensure that the study findings can be appropriately measured and comply with the law. You should be aware that data collected up to the time you withdraw may form part of the study findings in de-identified form. If you do not want me to do this, you must tell me before joining the study. Suppose you decide not to participate or withdraw from the study. In that case, it



will not affect the relationship with the hospital or your employer and has no impact on the relationship with the researcher or the University of Technology Sydney.

#### WHAT WILL HAPPEN TO INFORMATION ABOUT ME?

By signing the consent form, you consent to the study team collecting and using personal information about you for the study. All this information will be treated confidentially. The information you provide will be kept confidential and only used for this study. The interview will be audio-recorded to avoid missing what you have to say. However, the audio recording will be kept secure throughout the period, and the authorised person may only access it. It is anticipated that the findings of this study will be published and/or presented in a variety of forums. In any publication and/or presentation, information will be provided in such a way that you cannot be identified except with your permission. In accordance with relevant Australian and/or NSW privacy laws, you have the right to request access to the information about you that is collected and stored by the study team. You also have the right to request that any information you disagree with be corrected. Please inform the study team member named at this document's end if you want to access your data.

The results of this study may also be shared through open-access (public) scientific databases, including internet databases. These will enable other researchers to use the data to investigate other essential study questions. The findings shared in this way will always be de-identified by removing all personal information (e.g. name, address, date of birth etc.).

#### WHAT IF I HAVE CONCERNS OR A COMPLAINT?

If you have concerns about this study that you think my supervisor or I can help you with, please feel free to contact me (Zemenu Yohannes Kassa) [ZemenuYohannes.Kassa@student.uts.edu.au](mailto:ZemenuYohannes.Kassa@student.uts.edu.au) or my supervisor Dr Deborah Fox: [Deborah.Fox@uts.edu.au](mailto:Deborah.Fox@uts.edu.au)

#### NOTE:

This study has been approved in line with the University of Technology Sydney Human Research Ethics Committee [UTS HREC] guidelines. If you have any concerns or complaints about any aspect of the conduct of this research, please contact the Ethics Secretariat on ph.: +61 2 9514 2478 or email: [Research.Ethics@uts.edu.au](mailto:Research.Ethics@uts.edu.au) and quote the UTS HREC reference number. Any matter raised will be treated confidentially and investigated, and you will be informed of the outcome.

**CONSENT FORM: Focus group women**

**[UTS HREC REF NO. ETH22-7567]**

**The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia: A Mixed-Methods Study**

I \_\_\_\_\_ agree to participate in this study being conducted by Zemenu Yohannes Kassa, a PhD student at the University of Technology Sydney, Faculty of Health, [ZemenuYohannes.Kassa@student.uts.edu.au](mailto:ZemenuYohannes.Kassa@student.uts.edu.au), +251 \_\_\_\_\_.

I have read the participant information sheet, or someone has read it to me in a language I understand.

I understand the study's purposes, procedures and risks as described in the Participant Information Sheet.

I have had an opportunity to ask questions and am satisfied with my answers.

I freely agree to participate in this study as described and understand that I am free to withdraw at any time without affecting my relationship with the researchers or my organisation/school.

I understand that I will be given a signed copy of this document to keep.

I agree to be audio recorded.

I acknowledge that the study data gathered from this project will not identify me in any way.

I am aware that I can contact [ZemenuYohannes.Kassa@student.uts.edu.au](mailto:ZemenuYohannes.Kassa@student.uts.edu.au), +251 \_\_\_\_\_ or [Deborah.Fox@uts.edu.au](mailto:Deborah.Fox@uts.edu.au) if I have any concerns about this study.

\_\_\_\_\_

\_\_\_\_/\_\_\_\_/\_\_\_\_

Signature [participant]

Date

\_\_\_\_\_

\_\_\_\_/\_\_\_\_/\_\_\_\_

Name and Signature [researcher]

Date

## **Appendix 4: PARTICIPANT INFORMATION SHEET: INTERVIEWS: Women**

### **The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia: A Mixed-Methods Study**

#### **WHO IS CONDUCTING THIS RESEARCH?**

I am Zemenu Yohannes Kassa, a PhD student at the University of Technology Sydney. I also work with the College of Medicine and Health Sciences at Hawassa University, Hawassa, Ethiopia. I am a part of the team conducting a study to assess the Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia. My primary academic supervisor is Dr Deborah Fox: [Deborah.Fox@uts.edu.au](mailto:Deborah.Fox@uts.edu.au).

#### **WHAT IS THE RESEARCH ABOUT?**

This research is about the effect of the COVID-19 pandemic on maternal and perinatal care in the Sidama region. A better understanding of the effect of COVID-19 on maternal and perinatal care in the Sidama region will be essential to improve maternity care in the future. We hope this study assists in maternity service planning in different parts of Ethiopia. Your views on maternal and perinatal care during the COVID-19 pandemic are crucial to assessing maternity care.

#### **WHY HAVE I BEEN INVITED?**

You have been invited to participate in this study because you recently had a baby at the hospital in the Sidama Region. If you accept, you will be requested to participate in this study to discuss your perceptions of the effect of COVID-19 on maternal and perinatal health care in the Sidama Region. I will audio-record your responses and transcribe them immediately for analysis. The recorded information will be confidential; no one except the study investigators will see your responses.

#### **WHAT DOES MY PARTICIPATION INVOLVE?**

The in-depth interview will be conducted at a mutually convenient time, in a quiet location in the hospital. The interview will last approximately 30 minutes.

### ARE THERE ANY RISKS/INCONVENIENCES?

There is minimal risk associated with answering these questions, apart from the inconvenience of your time spent participating and the risk that you may become distressed when recalling events surrounding giving birth. If you feel distressed during the interview, the interview will cease; I will assess your health condition and link you with a mental health professional. Your participation in this study will not cost you anything. There are also no direct benefits to you personally. The information you share is crucial for developing recommendations to improve Ethiopia's maternal, neonatal, and child health care.

### DO I HAVE TO TAKE PART IN THIS RESEARCH PROJECT?

Participation in this study is voluntary. It is entirely up to you whether you decide to participate.

### WHAT IF I WITHDRAW FROM THIS RESEARCH PROJECT?

If you wish to withdraw from the study once it has started, you can do so at any time without giving a reason. Indicating that you do not wish to participate in this study will not affect you in any way. You may stop participating in the interview anytime you want to, and there will be no negative consequences for you. However, it may not be possible to withdraw your data from the study findings if you have already removed your identifying details. If you decide to leave or withdraw from the study, we will not collect additional personal information from you (e.g. name, address, date of birth etc.). Already collected personal information will be retained to ensure those study findings can be appropriately measured and comply with the law. You should be aware that data collected up to the time you withdraw may form part of the study findings in de-identified form. If you do not want me to do this, you must tell me before joining the study. Suppose you decide not to participate or withdraw from the study. In that case, it will not affect the relationship with the hospital or your employer and has no impact on the relationship with the researcher or the University of Technology Sydney.

### WHAT WILL HAPPEN TO INFORMATION ABOUT ME?

By signing the consent form, you consent to the study team collecting and using personal information about you for the study. All this information will be treated confidentially. The information you provide will be confidential and only used for this study. No personal identifying information will be recorded. The interview will be audio-recorded so as not to miss what you have to say, but the audio recording will be kept secure throughout the period,

and the authorised person may only access it. It is anticipated that the findings of this study will be published and/or presented in a variety of forums. In any publication and/or presentation, information will be provided in such a way that you cannot be identified except with your permission. In accordance with relevant Australian and/or NSW privacy laws, you have the right to request access to the information about you that is collected and stored by the study team. You also have the right to request that any information with which you disagree be corrected. Please inform the study team member named at this document's end if you want to access your data.

The findings of this study may also be shared through open-access (public) scientific databases, including internet databases. This will enable other researchers to use the data to investigate further essential research questions. The findings shared in this way will always be de-identified by removing all personal information (e.g. name, address, date of birth etc.).

#### WHAT IF I HAVE CONCERNS OR A COMPLAINT?

If you have concerns about the study that you think my supervisor or I can help you with, please feel free to contact me (Zemenu Yohannes Kassa) at [ZemenuYohannes.Kassa@student.uts.edu.au](mailto:ZemenuYohannes.Kassa@student.uts.edu.au) or my supervisor Dr Deborah Fox: [Deborah.Fox@uts.edu.au](mailto:Deborah.Fox@uts.edu.au).

#### NOTE:

This study has been approved in line with the University of Technology Sydney Human Research Ethics Committee [UTS HREC] guidelines. If you have any concerns or complaints about any aspect of the conduct of this research, please contact the Ethics Secretariat on ph.: +61 2 9514 2478 or email: [Research.Ethics@uts.edu.au](mailto:Research.Ethics@uts.edu.au)] and quote the UTS HREC reference number. Any matter raised will be treated confidentially and investigated, and you will be informed of the outcome.

**CONSENT FORM: Women**

**[UTS HREC REF NO. ETH22-7567]**

**The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in Sidama Region, Southern Ethiopia: A Mixed-Methods Study**

I \_\_\_\_\_ agree to participate in this study being conducted by Zemenu Yohannes Kassa, a PhD student at the University of Technology Sydney, Faculty of Health, [ZemenuYohannes.Kassa@student.uts.edu.au](mailto:ZemenuYohannes.Kassa@student.uts.edu.au), +251 \_\_\_\_\_.

I have read the Participant Information Sheet, or someone has read it to me in a language that I understand.

I understand the study's purposes, procedures and risks as described in the Participant Information Sheet.

I have had an opportunity to ask questions and am satisfied with my answers.

I freely agree to participate in this study as described and understand that I am free to withdraw at any time without affecting my relationship with the researchers or my organisation/school.

I understand that I will be given a signed copy of this document to keep.

I agree to be audio recorded.

I acknowledge that the study data gathered from this project will not identify me in any way.

I know I can contact [ZemenuYohannes.Kassa@student.uts.edu.au](mailto:ZemenuYohannes.Kassa@student.uts.edu.au), +251 \_\_\_\_\_ or [Deborah.Fox@uts.edu.au](mailto:Deborah.Fox@uts.edu.au) if I have any concerns about the research.

\_\_\_\_\_ / /

Signature [participant]

Date

\_\_\_\_\_ / / Name and

Signature [researcher]

Date

## **Appendix 5: PARTICIPANT INFORMATION SHEET INTERVIEWS WITH HEALTH PROFESSIONALS**

[UTS HREC REF NO. ETH22-7567]

### **The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia: A Mixed-Methods Study**

#### **WHO IS CONDUCTING THIS RESEARCH?**

My name is Zemenu Yohannes Kassa, and I am a PhD student at the University of Technology Sydney. I also work with the College of Medicine and Health Sciences at Hawassa University, Hawassa, Ethiopia. I am a part of the team conducting a study to assess the Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia. My primary academic supervisor is Dr Deborah Fox: [Deborah.Fox@uts.edu.au](mailto:Deborah.Fox@uts.edu.au).

#### **WHAT IS THE RESEARCH ABOUT?**

This research is about the effect of the COVID-19 pandemic on maternal and perinatal care in the Sidama region. A better understanding of the effect of COVID-19 on maternal and perinatal care in the Sidama region will be essential to improve maternity care in the future. We hope this study assists in maternity service planning in different parts of Ethiopia. Your views on maternal and perinatal care during the COVID-19 pandemic are crucial to assessing maternity care.

#### **WHY HAVE I BEEN INVITED?**

You have been invited to participate in this study because you are a healthcare provider who works in maternity care in the Sidama region, Ethiopia. If you accept, you will be requested to participate in this study to discuss your perceptions of the effect of COVID-19 on maternal and perinatal health care at the hospital in the Sidama region. I will audio-record your responses and transcribe them immediately for analysis. The recorded information will be confidential; no one except the study investigators will see your responses.

#### **WHAT DOES MY PARTICIPATION INVOLVE?**

The in-depth interview will be conducted at a mutually convenient time, in a quiet location in the hospital. The interview will last approximately 30 minutes.

#### ARE THERE ANY RISKS/INCONVENIENCES?

There is minimal risk to you associated with answering these questions; apart from the inconvenience of your time spent participating, you might become distressed by talking about your experience. If you feel distressed, the interview will be paused, and support will be provided to you by myself. If further support is needed, I will refer you to a mental health professional at no cost to you.

It will not affect your work or promotion. Your participation in this study will not cost you anything. There are also no direct benefits to you personally. The information you share is crucial for developing recommendations to improve Ethiopia's maternal, neonatal, and child health care.

#### DO I HAVE TO TAKE PART IN THIS RESEARCH PROJECT?

Participation in this study is voluntary. It is entirely up to you whether you decide to participate.

#### WHAT IF I WITHDRAW FROM THIS RESEARCH PROJECT?

If you wish to withdraw from the study once it has started, you can do so at any time without giving a reason. Indicating that you do not want to participate in this study will not affect you in any way. You may stop participating in the interview anytime you want to, and there will be no negative consequences for you. However, it may not be possible to withdraw your data from the study findings if you have already removed your identifying details. If you decide to leave or withdraw from the study, we will not collect additional personal information from you (e.g. name, address, date of birth etc.). Already collected personal information will be retained to ensure that the study findings can be appropriately measured and comply with the law. You should be aware that data collected up to the time you withdraw may form part of the study findings in de-identified form. If you do not want me to do this, you must tell me before joining the study. Suppose you decide not to participate or withdraw from the study. In that case, it will not affect the relationship with the hospital or your employer and has no impact on the relationship with the researcher or the University of Technology Sydney.

#### WHAT WILL HAPPEN TO INFORMATION ABOUT ME?



By signing the consent form, you consent to the study team collecting and using personal information about you for this study. All this information will be treated confidentially. The information you provide will be kept confidential and only used for this study. No personal identifying information will be recorded. The interview will be audio-recorded not to miss what you have to say, but the audio recording will be kept secure throughout the period, and the authorised person may only access it. It is anticipated that the findings of this study will be published and/or presented in various forums. In any publication and/or presentation, information will be provided in such a way that you cannot be identified except with your permission. In accordance with relevant Australian and/or NSW privacy laws, you have the right to request access to the information about you that is collected and stored by the research team. You also have the right to request that any data with which you disagree be corrected. Please inform the research team member named at the end of this document if you would like to access your information.

The findings of this study may also be shared through open-access (public) scientific databases, including internet databases. These will enable other researchers to use the data to investigate other important research questions. The findings shared in this way will always be de-identified by removing all personal information (e.g. name, address, date of birth etc.).

#### WHAT IF I HAVE CONCERNS OR A COMPLAINT?

If you have concerns about this study that you think my supervisor or I can help you with, please feel free to contact me (Zemenu Yohannes Kassa) [ZemenuYohannes.Kassa@student.uts.edu.au](mailto:ZemenuYohannes.Kassa@student.uts.edu.au) or my supervisor Dr Deborah Fox: [Deborah.Fox@uts.edu.au](mailto:Deborah.Fox@uts.edu.au).

#### NOTE:

This study has been approved in line with the University of Technology Sydney Human Research Ethics Committee [UTS HREC] guidelines. If you have any concerns or complaints about any aspect of the conduct of this research, please contact the Ethics Secretariat on ph.: +61 2 9514 2478 or email: [Research.Ethics@uts.edu.au](mailto:Research.Ethics@uts.edu.au)] and quote the UTS HREC reference number. Any matter raised will be treated confidentially and investigated, and you will be informed of the outcome.

**CONSENT FORM: Health professionals**

[UTS HREC REF NO. ETH22-7567]

**The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in Sidama Region, Southern Ethiopia: A Mixed-Methods Study**

I \_\_\_\_\_ agree to participate in this study being conducted by Zemenu Yohannes Kassa, a PhD student at the University of Technology Sydney, Faculty of Health, [ZemenuYohannes.Kassa@student.uts.edu.au](mailto:ZemenuYohannes.Kassa@student.uts.edu.au), +251 \_\_\_\_\_.

I have read the Participant Information Sheet, or someone has read it to me in a language I understand.

I understand the study's purposes, procedures and risks as described in the Participant Information Sheet.

I have had an opportunity to ask questions, and I am satisfied with my answers.

I freely agree to participate in this study as described and understand that I am free to withdraw at any time without affecting my relationship with the researchers or my organisation/school.

I understand that I will be given a signed copy of this document to keep.

I agree to be audio recorded.

I acknowledge that the study data gathered from this project will not identify me in any way.

I know I can contact [ZemenuYohannes.Kassa@student.uts.edu.au](mailto:ZemenuYohannes.Kassa@student.uts.edu.au), +251 \_\_\_\_\_ or [Deborah.Fox@uts.edu.au](mailto:Deborah.Fox@uts.edu.au) if I have any concerns about the research.

\_\_\_\_\_ / / \_\_\_\_\_

Signature [participant]

Date

\_\_\_\_\_ / / \_\_\_\_\_

Name and Signature [researcher]

Date

## Appendix 6: VERBAL CONSENT SCRIPT

[UTS HREC REF NO. ETH22-7567]

### The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia: A Mixed-Methods Study

Interview no:	
Date:	
Time:	
Interviewer:	Zemenu Yohannes Kassa

Thank you for agreeing to speak with me today about the effect of COVID-19 on maternal and perinatal care. Understanding the effect of COVID-19 on maternal and perinatal care is essential for future maternity care improvement. This might be a sensitive issue, so we can stop at any time if you feel distressed or need a break. The interview will take approximately 60 minutes. If you feel that you would instead not go on with the interview, that is fine too.

*[Wait for the participant to confirm they are happy to continue, otherwise, thank them for their time.]*

Thank you. I need to confirm some information about you, and I will start the *audio* recording. These will help us accurately record your experience of maternal and perinatal health service utilisation during the COVID-19 pandemic, but all this information will remain confidential. Is that OK?

First, I need to ask you some questions to confirm that you consent to participate. Remember, even after you've answered these questions, you can withdraw your consent anytime during the interview. However, it may not be possible to withdraw your data from the study results if you have already had your identifying details removed.

The consent questions are:

Question	Yes	No
Have you read the information in the participant information sheet, or had it read to you in a language you understand?		
Have you had an opportunity to ask questions, and are you satisfied with the answers you have received?		
Do you understand that there may be risks of distress when you might remember events experienced during childbirth?		
Do you understand that the research will produce reports and academic work presented in different research forums and articles published in peer-reviewed journals		
Do you freely agree to participate in this study, understanding that you may withdraw at any time?		
Do you agree to have this interview audio-recorded and transcribed?		

(If you answered NO to any of these – clarify and discontinue the interview)

If you have any concerns about the research, you can contact (Zemenu Yohannes Kassa)

If the participant declines to provide verbal consent: *Thank her for her time and discontinue the interview.*

If the participant agrees to provide verbal consent:

If you would like to talk to someone who is not connected with the research, you may contact the

Research Ethics Officer on 02 9514 9772 or [Research.ethics@uts.edu.au](mailto:Research.ethics@uts.edu.au) and quote this number.

## **Appendix 7: DISTRESS PROTOCOL**

[UTS HREC REF NO. ETH22-7567]

### **The Effect of COVID-19 on Maternal and Perinatal Care at Public Health Hospitals in the Sidama Region, Southern Ethiopia: A Mixed-Methods Study**

#### **Strategies to assist those distressed during an interview.**

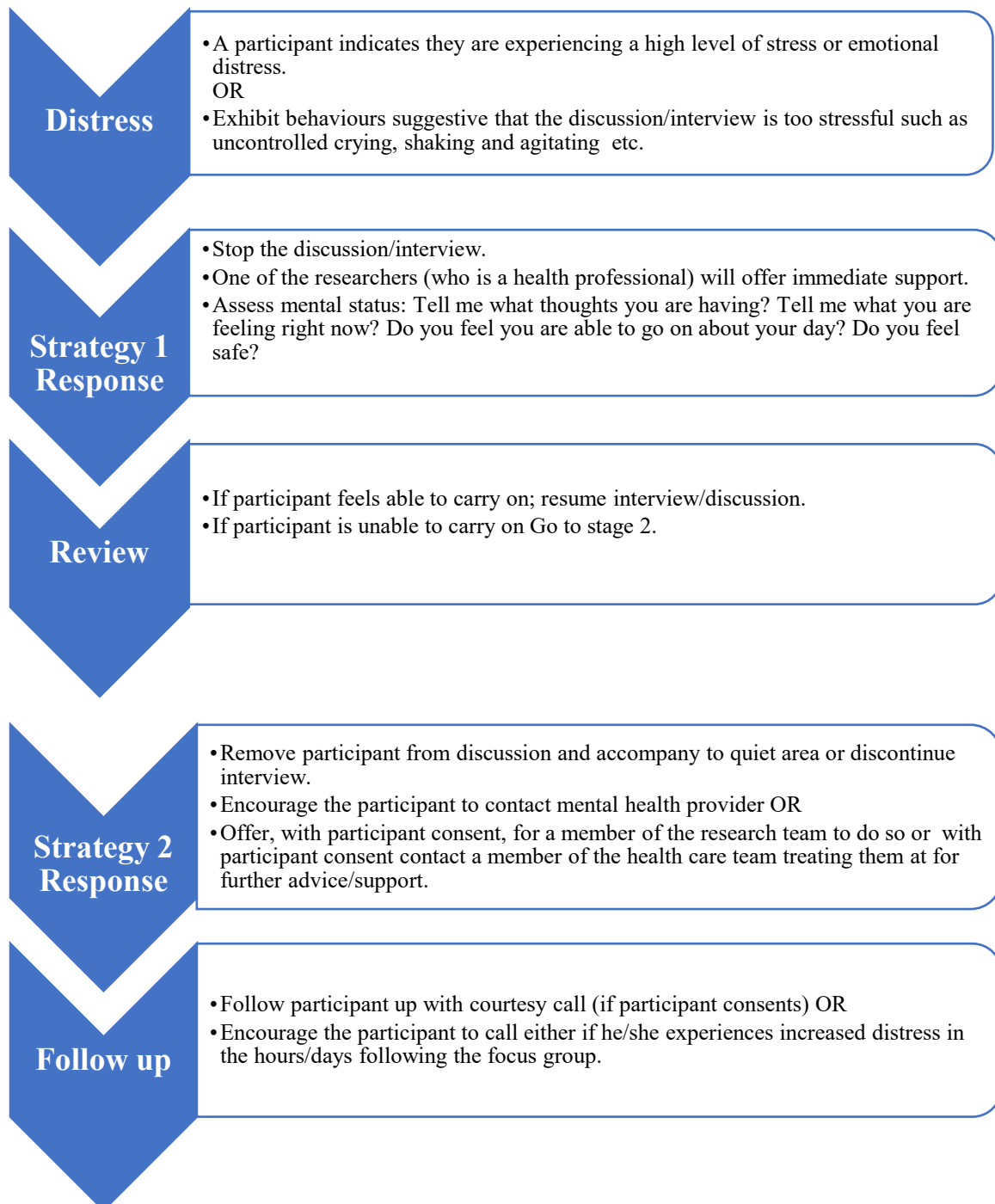
Prior to the commencement of any data collection or interview, the researcher will provide sufficient information regarding the risks and benefits of the research so that individuals may freely accept or decline participation. This information will also be given to those participants should they become distressed during the study.

#### **Participants' Safety & Distress Protocol**

Should a participant become distressed during participation, the following processes should be followed.

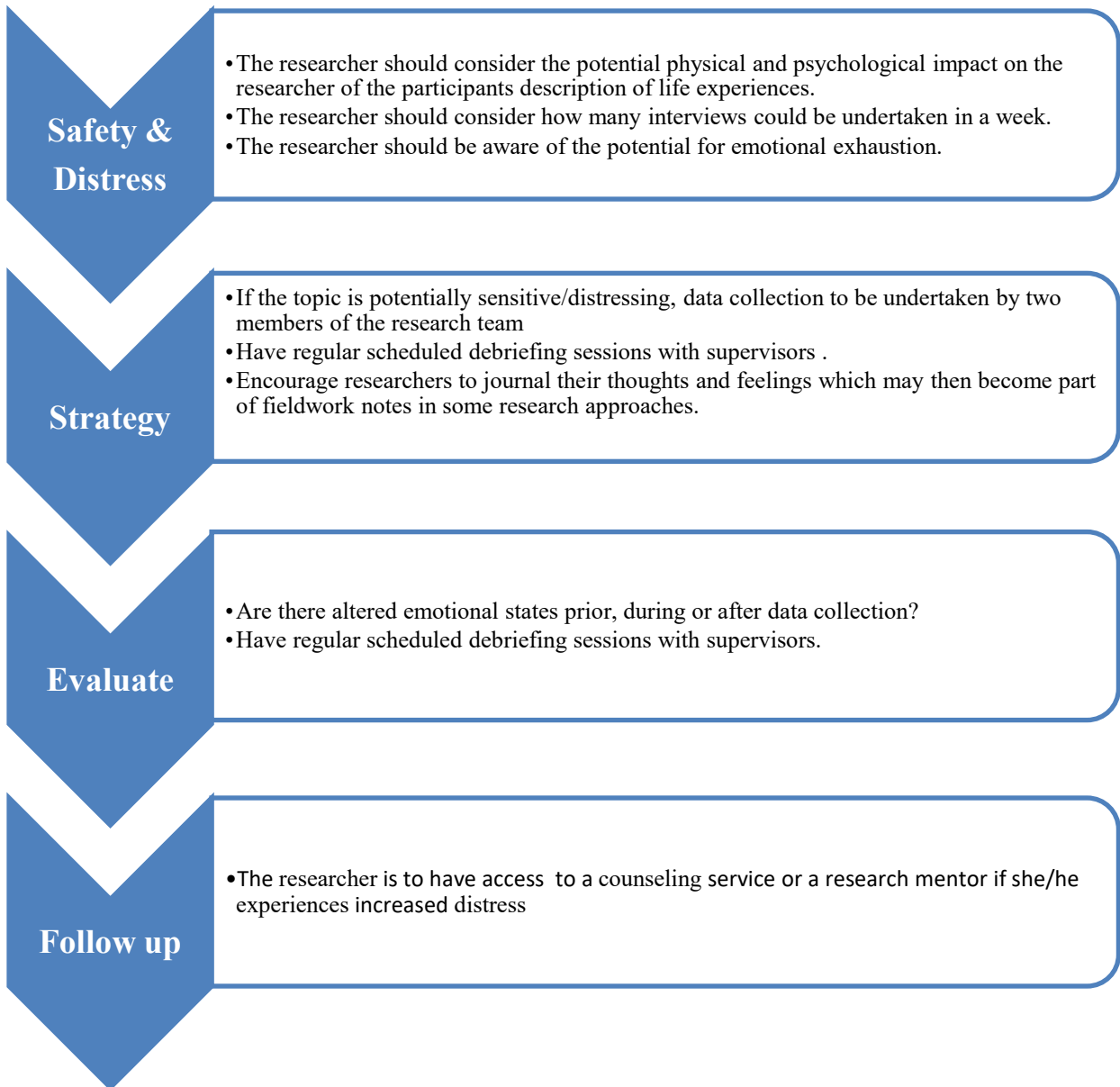
- 1- If a participant expressed emotional discomfort or a high level of distress, I would suggest stopping the interview, providing immediate support, and discussing her concerns if appropriate.
- 2- The researcher will then refer the participant to a mental health professional in consultation with the study supervisor. (Mr Yacob Abraham is a mental health professional who has worked at the College of Medicine and Health Sciences, Hawassa University. His cell phone number is +251 [REDACTED], and his email address is [REDACTED]@gmail.com ).
- 3- I will link the study participants to the hospital. Any women in this programme needing assistance are eligible for mental health services free of charge at the psychiatric clinic within the hospital.
- 4- If a participant experiences acute distress, I will provide immediate support and refer the participant to Mr Yacob Abraham and link them to the hospital for follow-up support.

- 5- The researcher will make a follow-up phone call to ensure that the participant is well and to determine the feasibility of a follow-up interview if one is planned.



## Researcher safety and distress protocol

The following protocol will be implemented if a researcher becomes distressed and requires additional or ongoing assistance.



## **Appendix 8: Focus group guide: women**

Zemenu Yohannes Kassa, a PhD student at the University of Technology Sydney, Faculty of Health, Student ID: 13689094

### **The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia: A Mixed-Methods Study**

Date and time:

Age:

Parity:

Educational status:

1. What are your experiences and feelings about the maternal and perinatal health services you received during the COVID-19 pandemic?
2. How do you assess healthcare providers' maternity care service delivery during the COVID-19 pandemic?
3. How do you assess the availability and accessibility of maternal and perinatal health services during the COVID-19 pandemic?
4. How do you assess the hospital's preparedness to deliver maternity care during the COVID-19 pandemic?
5. How do you assess a community's preparedness to utilise maternity care service as a community member during the COVID-19 pandemic?
6. How do you perceive the maternal and perinatal care services before and during the COVID-19 pandemic?



## **Appendix 9: Semi-structured interview guide: health professionals**

Zemenu Yohannes Kassa, a PhD student at the University of Technology Sydney, Faculty of Health, Student ID: [REDACTED]

### **The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia: A Mixed-Methods Study**

Semi-structured interview guide for interviews with health professionals

Date and time:

Participant ID

Workplace:

Profession (all professional):

Educational status:

Years of experience:

1. What is your perception of the effect of the COVID-19 pandemic on maternity care in your region?
2. How do you assess the community's maternity care service utilisation during the COVID-19 pandemic?
3. What was/were the standard protocols you adopted for maternity care during the COVID-19 pandemic?
4. How do you assess the hospital's preparedness for the availability and accessibility of the necessary materials for maternal and perinatal care delivery during the COVID-19 pandemic?
5. How do you assess a healthcare provider's preparedness and readiness to deliver maternity service care during the COVID-19 pandemic?
6. How do you perceive the maternal and perinatal care services before and during the COVID-19 pandemic?

## Appendix 10: Data collection tool before COVID-19 (from March 2019 to February 2020) HMIS

The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia: A Mixed-Methods Study

[UTS HREC REF NO. ETH22-7567]

Data collection tool pre-COVID-19 (from March 2019 to February 2020) medical records

Hospital code	XXXX					
Variables	March 2019	April 2019	May 2019	June 2019	July 2019	August 2019
Gestational age						
ANC1						
ANC4						
Birth weight						
Mode of birth						
Stillbirth						
Neonatal death						
Maternal death						
Neonatal admission						
Premature birth						
Low birth weight						
Availability of drugs						

NB: The data will be taken from the hospital's health management information system in an Excel spreadsheet.

## Appendix 11: Data collection tool during COVID-19 (from March 2020 to August 2020) chart review

[UTS HREC REF NO. ETH22-7567]

Data collection tool during COVID-19 (from March 2020 to August 2020) medical records

Hospital code	XXXX					
Variables	March 2020	April 2020	May 2020	June 2020	July 2020	August 2020
Gestational age						
ANC1						
ANC4						
Birth weight						
Mode of birth						
Stillbirth						
Neonatal death						
Maternal death						
Neonatal admission						
Premature birth						
Low birth weight						
Availability of drugs						

NB: The data will be taken from the hospital's health management information system in an Excel spreadsheet.

## Appendix 12: ለፎክስ ቡድን ተሳታፊዎች የመረጃ ሽት : ለእናቶች

### The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia: A Mixed-Methods Study

#### ይህን ጥናት የሚያካሂደው ማነው?

ዘመኑ የሐንስ ካሳ እባላላሁ፤ በ “University of Technology Sydney Faculty of Health” የሶስተኛ ዲግሪ ተማሪ ነኝ። በሀዋሳ ዩኒቨርሲቲ፣ህክምና እና ጤና ሳይንስ ኮሌጅ ሰራተኛ ነኝ። በሲዳማ ክልል በሚገኙ የመንግስት ሆስፒታሎች የኮቪድ-19 ተጽእኖ በእናቶች እና ጨቅላ ህጻናት ጤና ክብካቤ ከትትል ላይ የሚያመጣው ተጽእኖ ለማየት ጥናት ከሚያካሂድ አባላት አንዱ ነኝ። የእኔ ጥናት አማካሪ ደግሞ ዶክተር ዲቦራ ፎክስ ትባላለች።

#### ጥናቱ ስለ ምንድን ነው የሚያጠናው?

ይህ ጥናት በሲዳማ ክልል በሚገኙ የመንግስት ሆስፒታሎች የኮቪድ-19 ተጽእኖ በእናቶች ወሊድ፣ እና ጨቅላ ህጻናት ጤና ክብካቤ ከትትል ላይ የሚያመጣው ተጽእኖ ላይ ነው። በዚህ ጥናት እንዲሳተፉ ተጋብዘዋል ምክንያቱም በኮቪድ-19 ወረርሽኝ ወቅት ስለወለዱ እና የእናቶች እና ጨቅላ ህጻናት ጤና ክብካቤ ከትትል ስላገኙ ነው። በሲዳማ ክልል ውስጥ የኮቪድ-19 በእናቶች እና በወሊድ ክብካቤ ላይ ያለውን ተጽእኖ ማየት በጣም ጠቃሚ ነው ለወደፊት የእናቶች እንክብካቤን ለማሻሻል አስፈላጊ ነው። ይህ ጥናት በኢትዮጵያ የተለያዩ አካባቢዎች በወሊድ አገልግሎት እቅድ ላይ እንደሚረዳ ተስፋ እናደርጋለን። በኮቪድ-19 ወረርሽኝ ወቅት ስለ እናቶች እና የወሊድ እንክብካቤ ያለዎት አስተያየት ማወቅ የወሊድ እንክብካቤን ለመገምገም እና ለማሻሻል ወሳኝ ነው።

#### አንቺ እንድትሳተፉ የተጋበዥበት ምክንያት?

በሲዳማ ክልል በሚገኝ የመንግስት ሆስፒታል በቅርቡ ልጅ የወለድሽ ስለሆነ በዚህ ጥናት እንድትሳተፉ ተጋብዘኻል። ለመሳትፍ ፈቃደና ከሆንሽ የሆስፒታል አገልግሎት በእናቶች ወሊድ፣ እና ጨቅላ ህጻናት ጤና ክብካቤ ከትትል ላይ የኮቪድ-19 ወረርሽኝ ስላለው ተጽእኖ የአንቺን ያለሽን አመለካከት ለመወያየት በዚህ ጥናት ላይ እንዲሳተፉ ተጋብዘኻል። በምንዎይነት ስዓት ውይይቱ በድምፅ መቅረጫ ሪከርድ ይደረጋል ፣ ወዲያውኑ ለመተንተን ወደ ፅሁፍ እቀይረዋለሁ። የተቀዳው መረጃ ሚስጥራዊ ይሆናል፣ እና ከጥናት ተመርማሪዎች በስተቀር ሌላ ማንም ሰው የእርስዎን ምላሾች አይመለከትም። ቃለ መጠይቁ እስከ 60 ደቂቃ አካባቢ ይወስዳል።

#### የእኔ ተሳትፎ ምንን ያካትታል?

በቡድን ውይይት ላይ የተሳታፊ ብዛት ከ 6 እስከ 8 እናቶች እንዲሳተፉ እናደርጋለን። ውይይቱ በድምፅ መቅጃ ይቀዳል ። ውይይቱ የሚፈጀው ስዓት 60 ደቂቃ አካባቢ ነው ።

#### መሳተፉ የተለየ ስጋት አለው?

ከዚህ ጥናት መሰረት ጋር ተያይዞ የሚመጣ ችግር የለም ከጊዜ ስለተቀየረ፣ ስለሆነው ስለገልግሎት የእርስዎን ልምድ በሚናገሩበት ጊዜ ወይም ስለሌሎች ተሞክሮ በምትሰማበት ጊዜ ለጭንቀት ልትዳረጉ ትችላላችሁ። ጭንቀት ከተሰማሽ ውይይቱ ባለበት ይቆማል፣ እና እኔ ድጋፍ ይሰጥሃለሁ፣ ተጨማሪ ድጋፍ ካስፈለገ፣ ያለምንም ክፍያ ወደ የአእምሮ ጤና ባለሙያ እልክ ሻለሁ። እዚህ ጥናት መሰረት ስራሽ ወይም እድገትሽ ላይ ምንም ተጽእኖ አይደርስብሽም። በውይይቱ ላይ የሚሳተፉት ጭንቀትሽን ሊያወቁት ይችላሉ። በዚህ ጥናት ውስጥ መሰረት አንቺን ምንም ዋጋ አያስከፍልም፣ እንዲሁም በግል ለአንቺ ምንም ከጥተኛ ጥቅም የለውም። አንቺ የምታጋሪን መረጃ መሰረት ግን በኢትዮጵያ የእናቶች እና ጨቅላ ህጻናት ጤና ክብካቤ ክትትል ለማሻሻል እና ምክረ ሀሳቦችን ለማዘጋጀት ወሳኝ ነው።

**በዚህ የምርምር ጥናት ውስጥ መሰረት አለብኝ?**

በዚህ የምርምር ጥናት ውስጥ መሰረት በፈቃደኝነት ላይ የተመሰረተ ነው። ለመሰረት መወሰን ወይም አለመወሰን ሙሉ በሙሉ በአንቺ በፈቃደኝነት ላይ የተመሰረተ ነው።

**ከዚህ የምርምር ጥናት ውይይት ብታቻርጬ?**

የምርምር ጥናት ውይይት ከተጀመረ በኋላ ለማቆም ከፈለግሽ በማንኛውም ጊዜ ምክንያቱን ሳይትገልጽ ማቻረጥ ትችላለሽ። በዚህ ጥናት ውስጥ ላለመሰረት ቢፈልጉ በምንም መልኩ በአንቺ ላይ ምንም አይደርስብሽም። በፈለግሽ ጊዜ ከውይይቱ መሰረት ማቆም ትችላለሽ። በአንቺ ላይ ምንም አሉታዊ ውጤቶች አይኖሩም። ሆኖም፣ አንዳንድ የግል መረጃዎችን አስቀድመሽ ካስወገድሽ፣ በውይይት ላይ የገለፅሻቸውን ሀሳቦች ከጥናቱ ላላስጥታው እችላለሁ። ከውይይቱ ለመውጣት ከወሰንሽ፣ ተጨማሪ የግል መረጃ ከአንቺ አንሰበስብም (ለምሳሌ ስም፣ አድራሻ፣ የትውልድ ቀን ወዘተ)። ቀድመው ስለአንቺ የተሰበሰቡ መረጃዎች በህጉ መሰረት ይቀመጣሉ። ውይይቱ ከተጀመረ ጀምሮ እክታቻርጬ ያለው መረጃ የጥናቱ አካል ይሆናል። ይህን እንዲሆን ካልፈገሽ ጥናቱን ከመቀላቀልሽ በፊት አሳውቂኝ። በጥናቱ ባለመሰረት ወይም ለማቻረጥ ከወሰንሽ ከሆስፒታሉ ወይም ከአሰሪሽ ጋር ያለሽን ግንኙነት አይጎዳውም። እንዲሁም ከተመራማሪው ወይም ከሲድኒ የቴክኖሎጂ ዩኒቨርሲቲ ጋር ባለው ግንኙነት ላይ ምንም ተጽእኖ አይኖረውም።

**ስለ እኔ መረጃ ምን ይሆናል?**

የስምምነት ቅጹን በመፈረም የጥናት ቡድኑ ስለእርስዎ የግል መረጃ እንዲሰበስብ እና ለጥናቱ እንዲጠቀም ተስማምተዋል። ሁሉም መረጃዎች በሚስጥር ይያዛሉ። ያቀረቡት መረጃ በሚስጥር ይጠበቃል እና ለዚህ ጥናት ብቻ ጥቅም ላይ ይውላል። አንቺ የምትገለጭቸው ሀሳቦች እዳያመልጡኝ ቃለ-መጠይቁ በድምጽ ይቀዳል። የተቀዳው ቃለ-መጠይቅ በሚስጥር ይቀመጣል፣ እና ለጥናቱ አባላት ሊያዩት ይችላሉ። የጥናቱ ግኝቶች በተለያዩ ጀርገሎች ይታተማሉ ወይም በተለያዩ መድረኮች ይቀርባል።

በማንኛውም ህትመቶች እና/ወይም የዘግጅት ከአንቺ ፈቃድ በስተቀር አንቺን ሊያሳውቅ በማይቻልበት መንገድ መረጃ ይቀርባል። በሚመለከታቸው የአውስትራሊያ እና/ወይም የNSW የግለሰብ ህጎች መሰረት፣ በጥናት ቡድኑ የተሰበሰበ እና የተከማቸ ስለአንቺ ያለውን መረጃ ለማግኘት የመጠየቅ መብት አለሽ።

ያልተስማማሽበትን ማንኛውም መረጃ እዲስተካከል የመጠየቅ መብት አለሽ። እባክሽ መረጃውን ማግኘት ከፈለግሽ በዚህ ሰነድ መጨረሻ ላይ ለተጠቀሰው የጥናት ቡድን አባል አሳውቁ። የዚህ ጥናት ውጤት የኢንተርኔት ዳታቤዞችን ጨምሮ በተለያዩ ጁርናሎች፣ ሳይንትፊክ የመረጃ ቻጥ ልናጋራው እንችላለን። ሌሎች ተመራማሪዎች መረጃውን ለሌላ ጥናት ሊጠቀሙት ይችላሉ። በምናጋራቸው ግኝቶች የማንም የግል መረጃዎችን (ለምሳሌ ስም፣ አድራሻ፣ የትውልድ ቀን ወዘተ) አናካትትም።

**ስጋት ወይም ቅሬታ ቢኖርሽ?**

ስጋት ወይም ቅሬታ ካለሽ እኔ ወይም የጥናቱ አማካሪ ልንረዳሽ እንችላለን። እባክሽ በነፃነት እኔ ማግኘት ትችያለሽ (ዘመን የሃንስ ካሳ) [ZemenuYohannes.Kassa@student.uts.edu.au](mailto:ZemenuYohannes.Kassa@student.uts.edu.au) ወይም የእኔ አማካሪ ወይም የእኔ አማካሪ ዶ/ር ዲቦራ ፎክስ፣ ዲቦራ። [Fox@uts.edu.au](mailto:Fox@uts.edu.au)

**NOTE:**

This study has been approved in line with the University of Technology Sydney Human Research Ethics Committee [UTS HREC] guidelines. If you have any concerns or complaints about any aspect of the conduct of this research, please contact the Ethics Secretariat on ph.: +61 2 9514 2478 or email: [Research.Ethics@uts.edu.au](mailto:Research.Ethics@uts.edu.au) and quote the UTS HREC reference number. Any matter raised will be treated confidentially and investigated, and you will be informed of the outcome.

የፈቃድ ቅፅ፡፡ ለእናቶች የውይይት ቡድን

[UTS HREC REF NO. ETH22-7567]

**The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia: A Mixed-Methods Study**

እኔ \_\_\_\_\_ ዘመኑ ዩኒቨርሲቲ ካሳ የሶስተኛ ዲግሪ ተማሪ በ” University of Technology Sydney, Faculty of Health “በሚሰራው ጥናት ለመሳተፍ ተስማምቻለሁ ።

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የተሳታፊውን መረጃ ወረቀት አንብቤአለሁ፤ ወይም የሆነ ሰው በምረዳው ቋንቋ አንብቦልኛል።

በተሳታፊ መረጃ ሉህ ላይ እንደተገለጸው የጥናቱ ዓላማዎች፣ ሂደቶች እና ስጋዎችን ተረድቻለሁ።

ጥያቄዎችን የመጠየቅ እድል አግኝቻለሁ፤ እናም በመልሶች ረክቻለሁ።

በተገለፀው መሰረት በዚህ ጥናት ለመሳተፍ በነጻነት ተስማምቻለሁ እናም በማንኛውም ጊዜ ጥናቱን ማቋረጥ እደምችል ከተመራማሪዎቹ ወይም ከድርጅቱ/ትምህርት ቤት ጋር ያለኝን ግንኙነት እንደማይሻክር ተረድቻለሁ።

የዚህ ሰነድ የተፈረመ ቅጂ እንደሚሰጠኝ ተረድቻለሁ።

አዲድ ለመቅረጽ ተስማምቻለሁ።

በዚህ ጥናት የተሰበሰበው መረጃ በምንም መልኩ እኔን እንደማይለየኝ አምናለሁ።

በዚህ ጥናት ላይ ስጋት ካለኝ

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ማግኘት እንደምችል አውቃለሁ።

\_\_\_\_\_ / / \_\_\_\_\_

ፊርማ [ተሳታፊ] ቀን

\_\_\_\_\_ / / \_\_\_\_\_

ስም እና ፊርማ [ተመራማሪ] ቀን

## Appendix 13: ቃለ-መጠይቅ ለሚደረግላቸው የተሳተፉዎች መረጃ ሽት፡ እናቶች

### The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia: A Mixed-Methods Study

#### ይህን ጥናት የሚያካሂደው ማነው?

ዘመኑ የሐንስ ካሳ እባላለሁ፤ በ “University of Technology Sydney Faculty of Health” የሶስተኛ ዲግሪ ተማሪ ነኝ። በሀዋሳ ዩኒቨርሲቲ፣ህክምና እና ጤና ሳይንስ ኮሌጅ ሰራተኛ ነኝ። በሲዳማ ክልል በሚገኙ የመንግስት ሆስፒታሎች የኮቪድ-19 ተጽእኖ በእናቶች እና ጨቅላ ህጻናት ጤና ክብካቤ እና ክትትል ላይ የሚያመጣው ተጽእኖ ለማየት ጥናት ከሚያካሂዱ አባላት አንዱ ነኝ። የእኔ ጥናት አማካሪ ደግሞ ዶክተር ዲቦራ ፎክስ ትባላለች።

#### ጥናቱ ስለ ምንድን ነው የሚያጠናው?

ይህ ጥናት በሲዳማ ክልል በሚገኙ የመንግስት ሆስፒታሎች የኮቪድ-19 ተጽእኖ በእናቶች ወሊድ፣ እና ጨቅላ ህጻናት ጤና ክብካቤ እና ክትትል ላይ የሚያመጣው ተጽእኖ ላይ ነው። በዚህ ጥናት እንዲሳተፉ ተጋብዘዋል ምክንያቱም በኮቪድ-19 ወረርሽኝ ወቅት ስለወለዱ እና የእናቶች እና ጨቅላ ህጻናት ጤና ክብካቤ እና ክትትል ስላገኙ ነው። በሲዳማ ክልል ውስጥ የኮቪድ-19 በእናቶች እና በወሊድ ክብካቤ ላይ ያለውን ተጽእኖ ማየት በጣም ጠቃሚ ነው ለወደፊት የእናቶች እንክብካቤን ለማሻሻል አስፈላጊ ነው። ይህ ጥናት በኢትዮጵያ የተለያዩ አካባቢዎች በወሊድ አገልግሎት እቅድ ላይ እንደሚረዳ ተስፋ እናደርጋለን። በኮቪድ-19 ወረርሽኝ ወቅት ስለ እናቶች እና የወሊድ እንክብካቤ ያለዎት አስተያየት ማዎቅ የወሊድ እንክብካቤን ለመገምገም እና ለማሻሻል ወሳኝ ነው።

#### አንቺ እንድትሳተፉ የተጋበዘሁት ምክንያት?

በሲዳማ ክልል በሚገኝ የመንግስት ሆስፒታል በቅርቡ ልጅ የወለድሽ ስለሆነ በዚህ ጥናት እንድትሳተፉ ተጋብዘኩል። ለመሳተፍ ፈቃደኛ ከሆንሽ የሆስፒታል አገልግሎት በእናቶች ወሊድ፣ እና ጨቅላ ህጻናት ጤና ክብካቤ እና ክትትል ላይ የኮቪድ-19 ወረርሽኝ ስላለው ተጽእኖ የአንቺን ያለሽን አመለካከት ለመወያየት በዚህ ጥናት ላይ እንዲሳተፉ ተጋብዘኩል። በምንም ደብዳቤ ስዓት ውይይቱ በድምፅ መቅረጫ ሪከርድ ይደረጋል ፣ ወዲያውኑ ለመተንተን ወደ ፅሁፍ እቀይረዋለሁ። የተቀዳው መረጃ ሚስጥራዊ ይሆናል፣ እና ከጥናት ተመርማሪዎች በስተቀር ሌላ ማንም ሰው የእርስዎን ምላሾች አይመለከትም። ቃለ መጠይቁ እስከ 30 ደቂቃ አካባቢ ይወስዳል።

#### የአንቺ ተሳትፎ ምንን ያካትታል

ቃለ መጠይቁ በሆስፒታሉ ውስጥ ጸጥ ባለ ቦታ ላይ፣ በሚመች ጊዜ ይካሄዳል። ቃለ መጠይቁ እስከ 30 ደቂቃ አካባቢ ይወስዳል።

#### መሳተፉ የተለየ ስጋት አለው?



ከዚህ ጥናት መሳተፍ ጋር ተያይዞ የሚመጣ ችግር የለም ከጊዜሽ በስተቀር፣ ስለሆስፒታል አገልግሎት የእርስዎን ልምድ በሚናገሩበት ጊዜ ለጭንቀት ልትዳረግ ትችላለሽ። ጭንቀት ከተሰማሽ ውይይቱ ባለበት ይቆማል፣ እና እኔ ድጋፍ ይሰጥሻለሁ። ተጨማሪ ድጋፍ ካስፈለገ፣ ያለምንም ክፍያ ወደ የአእምሮ ጤና ባለሙያ እልክሻለሁ። እዚህ ጥናት መሳተፍ ስራሽ ወይም እድገትሽ ላይ ምንም ተጽእኖ አይደርስብሽም። በዚህ ጥናት ውስጥ መሳተፍ አንቺን ምንም ዋጋ አያስከፍልም፤ እንዲሁም በግል ለአንቺ ምንም ከጥተኛ ጥቅም የለውም። አንቺ የምታጋሪን መረጃ መሳተፍ ግን በኢትዮጵያ የእናቶች እና ጨቅላ ህጻናት ጤና ክብካቤ እና ክትትል ለማሻሻል እና ምክረ ሀሳቦችን ለማዘጋጀት ወሳኝ ነው።

**በዚህ የምርምር ጥናት ውስጥ መሳተፍ አለብኝ?**

በዚህ የምርምር ጥናት ውስጥ መሳተፍ በፈቃደኝነት ላይ የተመሰረተ ነው። ለመሳተፍ መወሰን ወይም አለመወሰን ሙሉ በሙሉ በአንቺ በፈቃደኝነት ላይ የተመሰረተ ነው።

**ከዚህ የምርምር ጥናት ውይይት ብታቻርጪ?**

የምርምር ጥናት ውይይት ከተጀመረ በኋላ ለማቆም ከፈለግሽ በማንኛውም ጊዜ ምክንያቱን ሳይትገልጽ ማቻረጥ ትችላለሽ። በዚህ ጥናት ውስጥ ላለመሳተፍ ቢፈልጉ በምንም መልኩ በአንቺ ላይ ምንም አይደርስብሽም ። በፈለግሽው ጊዜ ከውይይቱ መሳተፍ ማቆም ትችላለሽ ። በአንቺ ላይ ምንም አሉታዊ ውጤቶች አይኖሩም። ሆኖም፣ አንዳንድ የግል መርጃዎችን አስቀድመሽ ካስወገድሽ፣ በውይይት ላይ የገለፅሻቸውን ሀሳቦች ከጥናቱ ላላስዎጣው እችላለሁ። ከውይይቱ ለመውጣት ከወሰንሽ፣ ተጨማሪ የግል መረጃ ከአንቺ አንሰበስብም (ለምሳሌ ስም፣ አድራሻ፣ የትውልድ ቀን ወዘተ) ። ቀድመው ስለአንቺ የተሰበሰቡ መረጃዎች በህጉ መሰረት ይቀመጣሉ። ውይይቱ ከተጀመረ ጀምሮ እክታቻርጪ ያለው መረጃ የጥናቱ አካል ይሆናል። ይህን እንዲሆን ካልፈግሽ ጥናቱን ከመቀላቀልሽ በፊት አሳውቁኝ። በጥናቱ ባለመሳተፍ ወይም ለማቻረጥ ከወሰንሽ ከሆስፒታሉ ወይም ከአሰሪሽ ጋር ያለሽን ግንኙነት አይጎዳውም ፤ እንዲሁም ከተመራማሪው ወይም ከሲድኒ የቴክኖሎጂ ዩኒቨርሲቲ ጋር ባለው ግንኙነት ላይ ምንም ተጽእኖ አይኖረውም።

**ስለ እኔ መረጃ ምን ይሆናል?**

የስምምነት ቅጹን በመፈረም የጥናት ቡድኑ ስለእርስዎ የግል መረጃ እንዲሰበስብ እና ለጥናቱ እንዲጠቀም ተስማምተዋል። ሁሉም መረጃዎች በሚስጥር ይያዛሉ። ያቀረቡት መረጃ በሚስጥር ይጠበቃል እና ለዚህ ጥናት ብቻ ጥቅም ላይ ይውላል። አንቺ የምትገለጭቸው ሀሳቦች እዳያመልጡኝ ቃለ-መጠይቁ ቡድንም ይቀዳል። የተቀዳው ቃለ-መጠይቅ በሚስጥር ይቀመጣል ፣ እና ለጥናቱ አባላት ሊያዩት ይችላሉ። የጥናቱ ግኝቶች በተለያዩ ጆረናሎች ይታተማሉ ወይም በተለያዩ መድረኮች ይቀርባል።

በማንኛውም ህትመቶች እና/ወይም ዝግጅት ከአንቺ ፈቃድ በስተቀር አንቺን ሊያሳውቅ በማይቻልበት መንገድ መረጃ ይቀርባል። በሚመለከታቸው የአውስትራሊያ እና/ወይም የNSW የግለሰብ ህጎች መሰረት፣ በጥናት ቡድኑ የተሰበሰበ እና የተከማቸ ስለአንቺ ያለውን መረጃ ለማግኘት የመጠየቅ መብት አለሽ።

ያልተስማማሽበትን ማንኛውም መረጃ እዲስተካከል የመጠየቅ መብት አለሽ። እባክሽ መረጃውን ማግኘት ከፈለግሽ በዚህ ሰነድ መጨረሻ ላይ ለተጠቀሰው የጥናት ቡድን አባል አሳውቁ። የዚህ ጥናት ውጤት የኢንተርኔት ዳታቤዞችን ጨምሮ በተለያዩ ጁርናሎች፣ ሳይንትፊክ የመረጃ ቻጥ ልናጋራው እንችላለን። ሌሎች ተመራማሪዎች መረጃውን ለሌላ ጥናት

ሊጠቀሙት ይችላሉ። በምናጋራቸው ግኝቶች የማንም የግል መረጃዎችን (ለምሳሌ ስም፣ አድራሻ፣ የትውልድ ቀን ወዘተ) አናካትትም።

ስጋት ወይም ቅሬታ ቢኖርሽ?

ስጋት ወይም ቅሬታ ካለሽ እኔ ወይም የጥናቱ አማካሪ ልንረዳሽ እንችላለን። እባክሽ በነፃነት እኔ ማግኘት ትችያለሽ (ዘመን የሃንስ ካሳ) [ZemenuYohannes.Kassa@student.uts.edu.au](mailto:ZemenuYohannes.Kassa@student.uts.edu.au) ወይም የእኔ አማካሪ ወይም የእኔ አማካሪ ዶ/ር ዲቦራ ፎክስ፡ ዲቦራ፡፡ Fox@uts.edu.au

**NOTE:**

This study has been approved in line with the University of Technology Sydney Human Research Ethics Committee [UTS HREC] guidelines. If you have any concerns or complaints about any aspect of the conduct of this research, please get in touch with the Ethics Secretariat on ph.: +61 2 9514 2478 or email: Research.Ethics@uts.edu.au] and quote the UTS HREC reference number. Any matter raised will be treated confidentially and investigated, and you will be informed of the outcome.

የፈቃድ ቅፅ:: ለእናቶች

[UTS HREC REF NO. ETH22-7567]

**The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia: A Mixed-Methods Study**

እኔ \_\_\_\_\_ ዘመኑ ዩኒቨርሲቲ የሶስተኛ ዲግሪ ተማሪ በ” University of Technology Sydney, Faculty of Health “በሚሰራው ጥናት ለመሳተፍ ተስማምቻለሁ።

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የተሳታፊውን መረጃ ወረቀት አንብቤአለሁ፣ ወይም የሆነ ሰው በምረዳው ቋንቋ አንብቦልኛል።

በተሳታፊ መረጃ ሉህ ላይ እንደተገለጸው የጥናቱ ዓላማዎች፣ ሂደቶች እና ስጋዎችን ተረድቻለሁ።

ጥያቄዎችን የመጠየቅ እድል አግኝቻለሁ፣ እናም በመልሶች ረክቻለሁ።

በተገለፀው መሰረት በዚህ ጥናት ለመሳተፍ በነጻነት ተስማምቻለሁ እናም በማንኛውም ጊዜ ጥናቱን ማቋረጥ እደምችል ከተመራማሪዎቹ ወይም ከድርጅቱ/ትምህርት ቤት ጋር ያለኝን ግንኙነት እንደማይሻክር ተረድቻለሁ።

የዚህ ሰነድ የተፈረመ ቅጂ እንደሚሰጠኝ ተረድቻለሁ።

አዲሱ ለመቅረጽ ተስማምቻለሁ።

በዚህ ጥናት የተሰበሰበው መረጃ በምንም መልኩ እኔን እንደማይለየኝ አምናለሁ።

በዚህ ጥናት ላይ ስጋት ካለኝ ማግኘት እንደምችል አውቃለሁ።

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\_\_\_\_\_ / \_\_\_\_ / \_\_\_\_

ፊርማ [ተሳታፊ] ቀን

\_\_\_\_\_ / \_\_\_\_ / \_\_\_\_

ስም እና ፊርማ [ተመራማሪ] ቀን

# Appendix 14: ቃለ-መጠይቅ ለሚደረግላቸው የተሳታፊዎች መረጃ ሽት፡ ለጤና ባለሙያዎች

[UTS HREC REF NO. ETH22-7567]

## The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia: A Mixed-Methods Study

### ይህን ጥናት የሚያካሂደው ማነው?

ዘመኑ የሱዳን ካሳ እባላላሁ፤ በ “University of Technology Sydney Faculty of Health” የሶስተኛ ዲግሪ ተማሪ ነኝ። በሀዋሳ ዩኒቨርሲቲ፣ህክምና እና ጤና ሳይንስ ኮሌጅ ሰራተኛ ነኝ። በሲዳማ ክልል በሚገኙ የመንግስት ሆስፒታሎች የኮቪድ-19 ተጽእኖ በእናቶች እና ጨቅላ ህጻናት ጤና ክብካቤ ክትትል ላይ የሚያመጣው ተጽእኖ ለማየት ጥናት ከሚያካሂድ አባላት አንዱ ነኝ። የእኔ ጥናት አማካሪ ደግሞ ዶክተር ዲቦራ ፎክስ ትባላለች።

### ጥናቱ ስለ ምንድን ነው የሚያጠናው?

ይህ ጥናት በሲዳማ ክልል በሚገኙ የመንግስት ሆስፒታሎች የኮቪድ-19 ተጽእኖ በእናቶች ወሊድ፣ እና ጨቅላ ህጻናት ጤና ክብካቤ ክትትል ላይ የሚያመጣው ተጽእኖ ላይ ነው። በዚህ ጥናት እንዲሳተፉ ተጋብዘዋል ምክንያቱም በኮቪድ-19 ወረርሽኝ ወቅት ስለወለዱ እና የእናቶች እና ጨቅላ ህጻናት ጤና ክብካቤ ክትትል ስላገኙ ነው። በሲዳማ ክልል ውስጥ የኮቪድ-19 በእናቶች እና በወሊድ ክብካቤ ላይ ያለውን ተጽእኖ ማየት በጣም ጠቃሚ ነው ለወደፊት የእናቶች እንክብካቤን ለማሻሻል አስፈላጊ ነው። ይህ ጥናት በኢትዮጵያ የተለያዩ አካባቢዎች በወሊድ አገልግሎት እቅድ ላይ እንደሚረዳ ተስፋ እናደርጋለን። በኮቪድ-19 ወረርሽኝ ወቅት ስለ እናቶች እና የወሊድ እንክብካቤ ያለዎት አስተያየት ማዎቅ የወሊድ እንክብካቤን ለመገምገም እና ለማሻሻል ወሳኝ ነው።

### አንተ/ቺ እንድትሳተፍ/ሬ የተጋበሽበት/የተጋበከበት ምክንያት?

በሲዳማ ክልል በሚገኝ የመንግስት ሆስፒታል በእናቶች ወሊድ፣ እና ጨቅላ ህጻናት ጤና ክብካቤ ክትትል ላይ ኮቪድ-19 ወረርሽኝ ባለበት ጊዜ ስትሰራ/ሪ ስለነበር በዚህ ጥናት እንድትሳተፉ ተጋብዘሻል። ለመሳተፍ ፈቃደኛ ከሆንሽ የሆስፒታል አገልግሎት በእናቶች ወሊድ፣ እና ጨቅላ ህጻናት ጤና ክብካቤ ክትትል ላይ የኮቪድ-19 ወረርሽኝ ስላለው ተጽእኖ የአንቺን ያለሽን አመለካከት ለመወያየት በዚህ ጥናት ላይ እንዲሳተፉ ተጋብዘሻል። በምንዎያይበት ስዓት ውይይቱ በድምፅ መቅረጫ ሪከርድ ይደረጋል ፣ ወዲያውኑ ለመተንተን ወደ ፅሁፍ እቀይረዋለሁ። የተቀዳው መረጃ ሚስጥራዊ ይሆናል፣ እና ከጥናት ተመርማሪዎች በስተቀር ሌላ ማንም ሰው የእርስዎን ምላሾች አይመለከትም። ቃለ መጠይቁ እስከ 30 ደቂቃ አካባቢ ይወስዳል።

### የአንተ/ቺን ተሳትፎ ምንን ያካትታል

ቃለ መጠይቁ በሆስፒታሉ ውስጥ ጸጥ ባለ ቦታ ላይ፣ በሚመች ጊዜ ይካሄዳል። ቃለ መጠይቁ እስከ 30 ደቂቃ አካባቢ ይወስዳል።

**መሳተፉ የተለየ ስጋት አለው?**

ከዚህ ጥናት መሳተፍ ጋር ተያይዞ የሚመጣ ችግር የለም ከጊዜሽ በስተቀር፣ ስለሆስፒታል አገልግሎት የእርስዎን ልምድ በሚናገሩበት ጊዜ ለጭንቀት ልትዳረጉ ትችላለሽ። ጭንቀት ከተሰማሽ ውይይቱ ባለበት ይቆማል፣ እና እኔ ድጋፍ ይሰጥሻለሁ። ተጨማሪ ድጋፍ ካስፈለገ፣ ያለምንም ክፍያ ወደ የአእምሮ ጤና ባለሙያ እልክ ሻለሁ። እዚህ ጥናት መሳተፍ ስራሽ ወይም እድገትሽ ላይ ምንም ተጽእኖ አይደርስብሽም። በዚህ ጥናት ውስጥ መሳተፍ አንቺን ምንም ዋጋ አያስከፍልም። እንዲሁም በግል ለአንቺ ምንም ከጥተኛ ጥቅም የለውም። አንቺ የምታጋሪን መረጃ መሳተፍ ግን በኢትዮጵያ የእናቶች እና ጨቅላ ህጻናት ጤና ክብካቤ ክትትል ለማሻሻል እና ምክረ ሀሳቦችን ለማዘጋጀት ወሳኝ ነው።

**በዚህ የምርምር ጥናት ውስጥ መሳተፍ አለብኝ?**

በዚህ የምርምር ጥናት ውስጥ መሳተፍ በፈቃደኝነት ላይ የተመሰረተ ነው። ለመሳተፍ መወሰን ወይም አለመወሰን ሙሉ በሙሉ በአንቺ በፈቃደኝነት ላይ የተመሰረተ ነው።

**ከዚህ የምርምር ጥናት ውይይት ብታቻርጩ?**

የምርምር ጥናት ውይይት ከተጀመረ በኋላ ለማቆም ከፈለግሽ በማንኛውም ጊዜ ምክንያቱን ሳይትገልጽ ማቻረጥ ትችላለሽ። በዚህ ጥናት ውስጥ ላለመሳተፍ ቢፈልጉ በምንም መልኩ በአንቺ ላይ ምንም አይደርስብሽም ። በፈለግሽው ጊዜ ከውይይቱ መሳተፍ ማቆም ትችላለሽ ። በአንቺ ላይ ምንም አሉታዊ ውጤቶች አይኖሩም። ሆኖም፣ አንዳንድ የግል መረጃዎችን አስቀድመሽ ካስወገድሽ፣ በውይይት ላይ የገለፅሻቸውን ሀሳቦች ከጥናቱ ላላስዎታው እችላለሁ። ከውይይቱ ለመውጣት ከወሰንሽ፣ ተጨማሪ የግል መረጃ ከአንቺ አንሰበስብም (ለምሳሌ ስም፣ አድራሻ፣ የትውልድ ቀን ወዘተ) ። ቀድመው ስለአንቺ የተሰበሰቡ መረጃዎች በህጉ መሰረት ይቀመጣሉ። ውይይቱ ከተጀመረ ጀምሮ እክታቻርጩ ያለው መረጃ የጥናቱ አካል ይሆናል። ይህን እንዲሆን ካልፈግሽ ጥናቱን ከመቀላቀልሽ በፊት አሳውቂኝ። በጥናቱ ባለመሳተፍ ወይም ለማቻረጥ ከወሰንሽ ከሆስፒታሉ ወይም ከአሰሪሽ ጋር ያለሽን ግንኙነት አይጎዳውም ፣ እንዲሁም ከተመራማሪው ወይም ከሲድኒ የቴክኖሎጂ ዩኒቨርሲቲ ጋር ባለው ግንኙነት ላይ ምንም ተጽእኖ አይኖረውም።

**ስለ እኔ መረጃ ምን ይሆናል?**

የስምምነት ቅጹን በመፈረም የጥናት ቡድኑ ስለእርስዎ የግል መረጃ እንዲሰበስብ እና ለጥናቱ እንዲጠቀም ተስማምተዋል። ሁሉም መረጃዎች በሚስጥር ይያዛሉ። ያቀረቡት መረጃ በሚስጥር ይጠበቃል እና ለዚህ ጥናት ብቻ ጥቅም ላይ ይውላል። አንቺ የምትገለጭቸው ሀሳቦች እዳያመልጡኝ ቃለ-መጠይቁ በድምጽ ይቀዳል። የተቀዳው ቃለ-መጠይቅ በሚስጥር ይቀመጣል ፣ እና ለጥናቱ አባላት ሊያዩት ይችላሉ። የጥናቱ ግኝቶች በተለያዩ ጀርገሎች ይታተማሉ ወይም በተለያዩ መድረኮች ይቀርባል።

በማንኛውም ህትመቶች እና/ወይም የዝግጅት ከአንቺ ፈቃድ በስተቀር አንቺን ሊያሳውቅ በማይቻልበት መንገድ መረጃ ይቀርባል። በሚመለከታቸው የአውስትራሊያ እና/ወይም የNSW የግለሰብ ህጎች መሰረት፣ በጥናት ቡድኑ የተሰበሰበ እና የተከማቸ ስለአንቺ ያለውን መረጃ ለማግኘት የመጠየቅ መብት አለሽ።

ያልተስማማሽበትን ማንኛውም መረጃ እዲስተካከል የመጠየቅ መብት አለሽ። እባክሽ መረጃውን ማግኘት ከፈለግሽ በዚህ ሰነድ መጨረሻ ላይ ለተጠቀሰው የጥናት ቡድን አባል አሳውቁ። የዚህ ጥናት ውጤት የኢንተርኔት ዳታቤዞችን ጨምሮ በተለያዩ ጁርናሎች፣ ሳይንትፊክ የመረጃ ቻጥ ልናጋራው እንችላለን። ሌሎች ተመራማሪዎች መረጃውን ለሌላ ጥናት ሊጠቀሙት ይችላሉ። በምናጋራቸው ግኝቶች የማንም የግል መረጃዎችን (ለምሳሌ ስም፣ አድራሻ፣ የትውልድ ቀን ወዘተ) አናካትትም።

**ስጋት ወይም ቅሬታ ቢኖርሽ?**

ስጋት ወይም ቅሬታ ካለሽ እኔ ወይም የጥናቱ አማካሪዎ ልንረዳሽ እንችላለን። እባክሽ በነፃነት እኔ ማግኘት ትችያለሽ (ዘመን የሃንስ ካሳ) [ZemenuYohannes.Kassa@student.uts.edu.au](mailto:ZemenuYohannes.Kassa@student.uts.edu.au) ወይም የእኔ አማካሪወይም የእኔ አማካሪ ዶ/ር ዲቦራ ፎክስ፣ ዲቦራ። [Fox@uts.edu.au](mailto:Fox@uts.edu.au)

**NOTE:**

This study has been approved in line with the University of Technology Sydney Human Research Ethics Committee [UTS HREC] guidelines. If you have any concerns or complaints about any aspect of the conduct of this research, please contact the Ethics Secretariat on ph.: +61 2 9514 2478 or email: [Research.Ethics@uts.edu.au](mailto:Research.Ethics@uts.edu.au) and quote the UTS HREC reference number. Any matter raised will be treated confidentially, investigated, and you will be informed of the outcome.

የፈቃድ ቅፅ። ለጤና ባለሙያዎች

[UTS HREC REF NO. ETH22-7567]

### The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia: A Mixed-Methods Study

እኔ \_\_\_\_\_ ዘመኑ ዩኒቨርሲቲ የሥነ ምግባር ተምህርት ሰነድ "University of Technology Sydney, Faculty of Health "በሚሰራው ጥናት ለመሳተፍ ተስማምቻለሁ።

[ZemenuYohannes.Kassa@student.uts.edu.au](mailto:ZemenuYohannes.Kassa@student.uts.edu.au), +251 \_\_\_\_\_.

የተሳታፊውን መረጃ ወረቀት አንብቤአለሁ፣ ወይም የሆነ ሰው በምረዳው ቋንቋ አንብባለሁ።

በተሳታፊ መረጃ ሉህ ላይ እንደተገለጸው የጥናት ዓላማዎች፣ ሂደቶች እና ስጋቶችን ተረድቻለሁ።

ጥያቄዎችን የመጠየቅ እድል አግኝቻለሁ፣ እናም በመልሶች ረክቻለሁ።

በተገለፀው መሰረት በዚህ ጥናት ለመሳተፍ በነጻነት ተስማምቻለሁ እናም በማንኛውም ጊዜ ጥናቱን ማቆረጥ እደምችል ከተመራማሪዎቹ ወይም ከድርጅቱ/ትምህርት ቤት ጋር ያለኝን ግንኙነት እንደሚይሻክር ተረድቻለሁ።

የዚህ ሰነድ የተፈረመ ቅጂ እንደሚሰጠኝ ተረድቻለሁ።

አዲሱ ለመቅረጽ ተስማምቻለሁ።

በዚህ ጥናት የተሰበሰበው መረጃ በምንም መልኩ እኔን እንደማይለዩኝ አምናለሁ።

በዚህ ጥናት ላይ ስጋት ካለኝ

[ZemenuYohannes.Kassa@student.uts.edu.au](mailto:ZemenuYohannes.Kassa@student.uts.edu.au), +251 \_\_\_\_\_ or [Deborah.Fox@uts.edu.au](mailto:Deborah.Fox@uts.edu.au)

ማግኘት እንደምችል አውቃለሁ።

\_\_\_\_\_ / / \_\_\_\_\_

ፊርማ [ተሳታፊ] ቀን

\_\_\_\_\_ / / \_\_\_\_\_

ስም እና ፊርማ [ተመራማሪ] ቀን

# Appendix 15: የቃል ስምምነት ሰነድ

[UTS HREC REF NO. ETH22-7567]

## The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia: A Mixed-Methods Study

የቃል መጠይቅ ቁጥር	
ቀን:	
ሰዓት:	
የጠያቂው ስም:	ዘመኑ ዩሐንስ ካሳ

ኮቪድ-19 በእናቶች ክትትል እና በወሊድ እንክብካቤ ላይ ስላለው ተጽእኖ ዛሬ ከእኔ ጋር ለመነጋገር ስለተስማማችሁ እና መሰጠት ለተገባው ኮቪድ-19 በእናቶች ክትትል እና በወሊድ እንክብካቤ ላይ ያለውን ተጽእኖ መረዳት ለወደፊት የወሊድ እንክብካቤ ለማሻሻል አስፈላጊ ነው። ይህ ምናልባት ሚስጥራዊነት ያለው ጉዳይ ሊሆን ይችላል፤ ስለዚህ የተጨነቁ ከሆነ ወይም እረፍት መውሰድ ከፈለጉ በማንኛውም ጊዜ ማቆም እንችላለን። ቃል መጠይቁ በግምት 60 ደቂቃ ይወስዳል። ቃል መጠይቁ ላይ መሳተፍ ካልፈለግሽ ወደ በቃል መጠይቁ አንገባም። ተሳታፊዎ ለመቀጠል ደስተኛ መሆን እስኪያረጋግጥ ድረስ መጠበቅ፣ አለበለዚያ ለጊዜሽ አመሰግናለሁ።

አመሰግናለሁ። አሁን ስለአንቺ የተወሰነ መረጃ ማረጋገጥ አለብኝ፤ እና የድምጽ ቀረጻ ልጅምር ነው። በኮቪድ-19 ወረርሽኝ ወቅት የእናቶች ክትትል እና የወሊድ ጤና አገልግሎት አጠቃቀም ልምድሽን በትክክል እንድንመዘግብ ይረዳኛል፤ ገንጠል ግን እነዚህ ሁሉ መረጃዎች ሙሉ በሙሉ ሚስጥራዊ ይሆናሉ። ተስማምተሻል?

በመጀመሪያ፣ ለመሳተፍ ፈቃደኛ መሆንሽን ለማረጋገጥ አንዳንድ ጥያቄዎችን ልጠይቅሽ እፈልጋለሁ። ያስታውሽ፣ እነዚህን ጥያቄዎች ከመለሽ በኋላም ቢሆን፣ በቃል መጠይቁ ወቅት የአንቺን ስምምነት በማንኛውም ጊዜ ማንሳት ትችላለሽ። ገንጠል ግን ሆኖም፣ አንዳንድ የግል መርጃዎችን አስቀድመሽ ካስወገድሽ፣ በውይይት ላይ የገለፅሻቸውን ሀሳቦች ከጥናቱ ላላስዎጣው እችላለሁ።

የስምምነት ጥያቄዎች

ጥያቄ	አዎ	አይ
በተሳታፊ የመረጃ ሽት ውስጥ ያለውን መረጃ አንበበሽዋል ወይስ አንቺ በሚረጅው ቋንቋ አንብውለልሻል?		



ጥያቄዎችን ለመጠየቅ እድል አግኝተዋል፣ እና በተቀበልኻቸው መልሶች ረክተዋል?		
በወሊድ ጊዜ ያጋጠመሽን ክስተት በምታስታውሽበት ጊዜ ጭንቀት ሊያጋጥም እንደሚችል ተረድተዋል?		
ይህ ጥናት በተለያዩ የምርምር መድረኮች እደሚቀርብ እና በጀርናሎች ላይ እደሚታተም ተረድተዋል።		
በማንኛውም ጊዜ ማቋረጥ እንደምትችይ በመረዳት በዚህ ጥናት ለመሳተፍ በነፃነት ተስማምተዋል?		
ይህ ቃለ መጠይቅ በድምጽ እንዲቀዳ እና ወደ ፅሁፍ እንዲገለበጥ ተስማምተዋል?		

ከእነዚህ ውስጥ አንዳቸውም መልስ አይ ከሆነ ማብራራት ወይም ቃለ መጠይቁን ማቋረጥ

ስጋት ወይም ቅሬታ ካለሽ እኔ ወይም የጥናቱ አማካሪ ልንረዳሽ እንችላለን፣ እባክሽ በነፃነት እኔ ማግኘት ትችያለሽ (ዘመን የሃንስ ካሳ) [ZemenuYohannes.Kassa@student.uts.edu.au](mailto:ZemenuYohannes.Kassa@student.uts.edu.au) phone +251 [redacted] ወይም የእኔ አማካሪ ወይም የእኔ አማካሪ ዶ/ር ዲቦራ ፎክስ፣ ዲቦራ። [Fox@uts.edu.au](mailto:Fox@uts.edu.au)

ለመሳትፍ ፈቃደኛ ካልሆንሽ፣ ለጊዜሽ አመስግናለሁ እና ቃለ መጠይቁ ይቋርጣል።  
ለመሳትፍ ፈቃደኛ ከሆንሽ

ከጥናቱ ጋር ግንኙነት ከሌለው ሰው ጋር መነጋገር ከፈለግሽ፣ ማነጋገር ይቻላል Research Ethics Officer on 02 9514 9772 or [Research.ethics@uts.edu.au](mailto:Research.ethics@uts.edu.au) and quote this number

## Appendix 16: ለፎክስ ቡድን ተሳታፊዎች የመረጃ ሽት : ለእናቶች

ዘመኑ የሐንስ ካሳ እባላለሁ፤ በ “University of Technology Sydney Faculty of Health” የሰነድ ዲግሪ ተማሪ ነኝ። የተማሪ መለያ ቁጥር: [REDACTED]

### The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia: A Mixed-Methods Study

ቀን እና ሰዓት:

ዕድሜ:

ስንት ልጅ ወልደሻል:

የትምህርት ደረጃ:

1. በኮቪድ-19 ወረርሽኝ ወቅት ስላገኛችሁት የእናቶች እና የወሊድ ጤና አገልግሎት ያለዎት ተሞክሮ እና ስሜት ምን ይመስላል?
2. በኮቪድ-19 ወረርሽኝ ወቅት የጤና ባለሙያዎች ለእናቶች ክትትል እና የወሊድ አገልግሎት አሰጣጥ ዝግጁነት እንዴት አያችሁት?
3. በኮቪድ-19 ወረርሽኝ ወቅት የእናቶች ክትትል እና የወሊድ ጤና አገልግሎት መገኘት እና ተደራሽነት እንዴት አያችሁት?
4. በኮቪድ-19 ወረርሽኝ ወቅት የእናቶች ክትትል እና የወሊድ አገልግሎት ለመስጠት የሆስፒታሉን ዝግጁነት እንዴት አያችሁት?
5. በኮቪድ-19 ወረርሽኝ ወቅት የእናቶች ክትትል እና የወሊድ እንክብካቤ አገልግሎትን እንደ ማህበረሰብ አባልነት ለመጠቀም የማህበረሰብን ዝግጁነት እንዴት አያችሁት?
6. ከኮቪድ-19 ወረርሽኝ በፊት እና ወቅት የእናቶች ክትትል እና የወሊድ እንክብካቤ አገልግሎቶችን እንዴት አያችሁት?

# Appendix 17: ቃለ-መጠይቅ ለሚደረግላቸው የተሳታፊዎች መረጃ ሽት፡ ለጤና ባለሙያዎች

[UTS HREC REF NO. ETH22-7567]

ዘመኑ የሐንስ ካሳ እባላለሁ፤ በ “University of Technology Sydney Faculty of Health” የሶስተኛ ዲግሪ ተማሪ ነኝ። **The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia: A Mixed-Methods Study**

የተማሪ መለያ ቁጥር: [REDACTED]

ቀን እና ሰዓት:

ዕድሜ:

ተሳታፊ መለያ ቁጥር:

የስራ አይነት:

የትምህርት ደረጃ:

የስራ ልምድ:

1. በሆስፒታል ውስጥ የኮቪድ-19 ወረርሽኝ በእናቶች ክትትል እና በወሊድ እንክብካቤ ላይ ስላለው ተጽእኖ ያለዎት አመለካከት ምንድነው?
2. በኮቪድ-19 ወረርሽኝ ወቅት የማህበረሰቡን በእናቶች ክትትል እና የወሊድ አገልግሎት አጠቃቀም እንዴት አይደለም?
3. በሆስፒታል ውስጥ በኮቪድ-19 ወረርሽኝ ወቅት ለእናቶች ክትትል እና የወሊድ አገልግሎት ያመች ዘንድ ያዘጋጃችሁት ፕሮቶኮል ካለ ምን ምን ነበር?
4. በኮቪድ-19 ወረርሽኝ ወቅት የእናቶች ክትትል እና የወሊድ አገልግሎት ለመስጠት የሆስፒታሉን ዝግጁነት እንዴት አያችሁት?
5. በኮቪድ-19 ወረርሽኝ ወቅት የጤና ባለሙያዎች ለእናቶች ክትትል እና የወሊድ አገልግሎት አሰጣጥ ዝግጁነት እንዴት አያችሁት?
6. ከኮቪድ-19 ወረርሽኝ በፊት እና ወቅት የእናቶች ክትትል እና የወሊድ እንክብካቤ አገልግሎቶችን እንዴት አያችሁት?

## Evidence of Research Integrity Modules Completion

zemenu Kassa > Grades

---

### Courses I'm Taking

Faculty of Health HDR Home	no mark
Research Integrity for HDR students	100%
RES Hub: Research Integrity - Introduction to Research Data Management	100%

Evidence of Research Data Management Plan developed and recorded in Stash.



**The impact of COVID-19 on  
maternal and perinatal care at  
public health hospitals in the  
Sidama region, Southern Ethiopia:  
A mixed method study**

Hi Zemenu,

Thank you for sending the waiver of consent through which has been saved on file for our records. I confirm that you have now satisfied the conditions on the UTS approval.

We wish you all the best with the commencement of your research.

Kind regards

Quinn

**Quinn Nguyen (Ms)**

Research Ethics Administrator

**University of Technology Sydney**

T. +61 (02) 9514 9772

PO Box 123 Broadway NSW 2007 Australia

[Research Ethics Website](#)

[Research Master](#)

To make it easier for you to access information about Research Ethics and Integrity, we have launched a new [website](#)! There you will be able find [Committee dates & deadlines](#), advice for submitting applications, booking an ethics clinic, templates, guidelines, answers to [frequently asked questions](#) and more!

For all other research pages, visit [Staff Connect](#)

Dear Applicant

Re: ETH22-7567 - "The Effect of COVID-19 on Maternal and Perinatal Care at Public Hospitals in the Sidama Region, Southern Ethiopia: A Mixed Method Study"

The Human Research Ethics Executive Review Committee reviewed your amendment application for your project and agreed that the amendments meet the requirements of the NHMRC National Statement on Ethical Conduct In Human Research (2007). I am pleased to inform you that the Committee has approved your request to amend the protocol as follows:  
Amendment to study:

"In my original application, I plan to use deidentified data from 15 hospitals' health management information systems (HMIS) databases, including the timeframes from March 2019 to August 2019 (before COVID-19) and March 2020 to August 2020 (during COVID-19), as outlined in my original ethics submission. However, to strengthen the analysis, I want to also incorporate the data from September 2019 to February 2020. The Institutional Research

Board in Ethiopia has approved the use of the complete dataset from March 2019 to August 2020 at the point of original approval. This amendment is to notify the committee that the full dataset will be used in the analysis."

This amendment is subject to the standard conditions outlined in your original letter of approval. You are reminded that this letter constitutes ethics approval only. This research project must also be undertaken in accordance with all UTS policies and guidelines including the Research Management Policy.

You should consider this your official letter of approval. If you require a hardcopy please contact the Research Ethics Secretariat.

To access this application, please [click here](#), a copy of your application has also been attached to this application

If you wish to make any further changes to your research, please contact the Research Ethics Secretariat in the Research Office.

In the meantime, I take this opportunity to wish you well with the remainder of your research.

Yours sincerely,

The Research Ethics Secretariat

on behalf of the Human Research Ethics Executive Review Committee

C/- Research Office

University of Technology Sydney

T: (02) 9514 2478

Research.Ethics@uts.edu.au | [Website](#)

PO Box 123 Broadway NSW 2007Ref: E13-3



Ref. No: IRB-033/14  
Date: 01/02/2022

To: Zemenu Yohannes Kassa et al.  
Hawassa, Ethiopia

Re: Approval of waiver

It is recalled that you have applied to the Institutional Review Board (IRB) of Hawassa University College of Medicine and Health Sciences requesting approval of waiver to your previously approved protocol titled “*effect of COVID-19 on maternal and perinatal care at public health hospitals in the Sidama region, Southern Ethiopia: A mixed method study*”.

Our IRB has re-evaluated your protocol and learnt that the second and third objective will use Health Management Information System data (HMIS) of Hospitals. The objectives are: To determine the number of women presenting to hospital for ANC contact pre and during COVID-19 in Sidama Region in 2020, and To describe the trend of maternal, fetal, and neonatal outcomes pre and during COVID-19 in 2020.

Therefore, as per the national ethical guideline and CMHS-IRB-SOP, waiver for the consent of individual for the aforementioned objectives has been approved, and you can undertake your study as per the protocol.

With Best Regards,

Production Note:  
Signature removed prior to publication.



**Dawit Jember (Asst. Professor)**

**Chairperson, Institutional Review Board**

CC  
IRB



Meeting No: 4/2014

Ref. No: IRB/029/14

Date: 20/12/2021

Name of Researcher(s): Zemenu Yohannes Kassa (M.Sc.), Deborah Fox (Ph.D.), Vanessa Scarf (Ph.D.), Sabera Turkmani (Ph. D.)

Topic of Proposal: Effect of COVID-19 on maternal and perinatal care at public health hospitals in the Sidama region, Southern Ethiopia: A mixed method study

Dear researcher(s),

The Institutional Review Board (IRB) at the College of Medicine and Health Sciences of Hawassa University has reviewed the aforementioned research protocol with special emphasis on the following points:

- |  |     |                                     |    |                          |
|--|-----|-------------------------------------|----|--------------------------|
| 1. Are all principles considered?                        |     |                                     |    |                          |
| 1.1. Respect for persons:                                | Yes | <input checked="" type="checkbox"/> | No | <input type="checkbox"/> |
| 1.2. Beneficence:  | Yes | <input checked="" type="checkbox"/> | No | <input type="checkbox"/> |
| 1.3. Justice:  | Yes | <input checked="" type="checkbox"/> | No | <input type="checkbox"/> |
| 2. Are the objectives of the study ethically achievable? | Yes | <input checked="" type="checkbox"/> | No | <input type="checkbox"/> |
| 3. Are the proposed research methods ethically sound?    | Yes | <input checked="" type="checkbox"/> | No | <input type="checkbox"/> |

Based on the aforementioned ethical assessment, the IRB has:

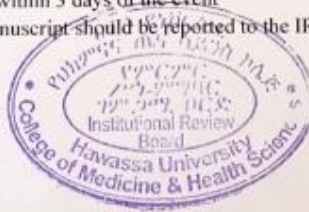
- |   |                                     |  |
|---|-------------------------------------|--|
| A. Approved the proposal for implementation | <input checked="" type="checkbox"/> | -Approval period from Dec.20/ 2021 to Dec.19 /2022 |
| B. Conditionally Approved                   | <input type="checkbox"/>            | -Element Approved: Protocol Version No. 1          |
| C. Not Approved                             | <input type="checkbox"/>            | -Follow up report expected in 6 months             |

Obligation of the PI:

- Should comply with the standard international and national scientific and ethical guidelines
- All amendment and changes made in protocol and consent form needs IRB approval
- The PI should report SAE within 3 days of the event
- End of study, including manuscript should be reported to the IRB

Yours faithfully,

Production Note:  
Signature removed prior to publication.



Dawit Jember (Asst. Prof.)  
Institutional Review Board Chairperson.





Ref. No: IRB/066/15  
Date: 23/09/2022

To: Zemenu Yohannes Kassa et al.

Re: Approval of amendment

It is recalled that you have applied to the Institutional Review Board (IRB) of Hawassa University College of Medicine and Health Sciences requesting approval of amendment to a protocol previously exempted from full ethical review process (Ref. No. IRB/033/14; date: 01/02/2022).

The previously waived protocol involves collection of 12 months data from Health Management Information System (secondary data). Our IRB has evaluated your request and learnt that the reason to the current amendment request is to use 18 months (March 2019 to August 2020) Health Management Information System (HMIS) data.

Therefore, as per the national ethical guideline and CMHS-IRB-SOP, the amendment request has been approved through an expedited review and you can undertake your study as per the amendment.

With Best Regards,

Production Note:  
Signature removed prior to publication.

**Dawit Jember (Asst. Professor)**  
Chairperson, Institutional Review Board



CC  
IRB

*Respect.  
Now.  
Always.*

**This is to certify that**

**Student** *Zemenu Yohannes Kassa*  
**ID**

**has successfully completed the  
UTS Consent Matters subject**



**Date** *26/07/2023*