



# Parents' mental health and the social-emotional development of their children aged between 24 and 59 months in low-and middle-income countries: A systematic review and meta-analyses



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## ARTICLE INFO

Handling Editor: Dr A Tsai

### Keywords:

Parents' mental health  
Children's social-emotional development  
Second 1000 days  
Low- and middle-income countries

## ABSTRACT

**Aim:** To synthesize the evidence about the relationships between parents' mental health and the social-emotional development of their children aged 24 to 59 months in low and middle-income countries (LMICs).

**Methods:** We used a systematic strategy to search six databases for studies from LMICs, published between 2010 and 2021, of mental health problems experienced by parents and the social-emotional development of their children. We followed the standard methods for systematic reviews and meta-analyses set down in the PRISMA, MOOSE and COSMOS-E guidelines. Data were reported in a narrative synthesis. Meta-analysis was undertaken to calculate pooled odds ratios (ORs) and standard mean differences (SMD).

**Results:** Overall, 26 papers reporting 15 cross-sectional studies and secondary analyses and 11 prospective cohort studies, from seven LMICs met inclusion criteria. The parent mental health problems studied were depression, anxiety, common mental disorders, stress, and mood disorders. Almost all the studies that assessed either perinatal or contemporaneous exposure to parental mental health problems found a significant association with increased child social-emotional development problems when aged 24 to 59 months. The use of harsh discipline in parenting mediated the relationship between maternal depression and higher prevalence of child's externalizing behaviours. The children of parents with mental health problems were at nearly twice the odds of having social-emotional development problems (OR: 1.92, 95% CI: 1.47, 2.37), compared to children of parents without them. The pooled size of the effect (SMD) of parents' symptoms of mental health problem on child social-emotional development scores was 0.14 (95% CI: 0.04; 0.24).

**Conclusion:** In LMICs, interventions to optimize early childhood social-emotional development need to address the mental health of parents. Rigorous prospective studies are needed to identify mechanisms and causal pathways, including modifiable risk and protective factors in the many LMICs which lack evidence to inform local policies, programs, and practices.

## 1. Introduction

Early childhood encompasses a life phase of significant physical, cognitive, language and social-emotional development. In low- and middle-income countries (LMICs), an estimated 250 million children aged under five years fail to meet their development potential in at least one of these domains each year (Black et al., 2017).

The first 1000 days, from conception to two years of age represents an important window of development and has received considerable research and programmatic attention (Black et al., 2017; Britto et al., 2017; Engle et al., 2007; Engle et al., 2011; Grantham-McGregor et al., 2007; Richter et al., 2017; Walker et al., 2007; Walker et al., 2011). The second 1000 days of life (age 2–5 years) is now emerging as an area of focus for optimizing early childhood development. This phase provides

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<https://doi.org/10.1016/j.ssmmh.2023.100197>

Received 27 February 2022; Received in revised form 13 February 2023; Accepted 13 February 2023

Available online 19 February 2023

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an opportunity to consolidate gains achieved in the first 1000 days, and to address developmental opportunities that might have been missed, or developmental problems including emotional and behavioural problems that are emerging. Reducing environmental risks, promoting protective factors, and establishing healthy developmental and behavioral trajectories are core components by which the second 1000 days of life can be used to help children to reach their development potential.

Brain development is governed by interactions among a young child's genetic characteristics and their experiences (Hepper, 2015). Although mechanisms are not yet established with certainty, maternal psychological functioning is thought to influence the child's social and emotional development through multiple pathways. In pregnancy, prenatal stress and anxiety can influence development through foetal programming, in which changes in the intrauterine environment attributable to increased cortisol influence brain growth. Another potential pathway is through epigenetic changes leading to alterations in gene expression in the hypothalamic – pituitary – adrenal axis which have been associated with attention and behaviour regulation problems in children.

Social-emotional development reflects children's capacities to experience, express and manage their emotions and behaviours, and to develop positive relationships with other children and adults (Cohen et al., 2005). It is shaped by the social-emotional qualities of sustained relationships with caregivers and peers. A crucial social-emotional skill is the capacity to self-regulate or modulate attentional and emotional responses and related behaviours in socially appropriate and adaptive ways (Blair and Diamond, 2008). Self-regulation includes compliance, inhibition and effortful control (Karreman et al., 2006), and children with better effortful control have fewer emotional and behavioural problems and are more socially competent (Gunduz et al., 2015). Social-emotional capabilities influence subsequent school performance and self-confidence. In LMICs, 26.2% of preschoolers have poor social and emotional skills (McCoy et al., 2017).

Developmental processes which take place in the early learning period are positively influenced by nurturing care, imparting lifelong effects on health, learning, productivity, and social and emotional well-being (Campbell et al., 2014; Nofziger and Rosen, 2017).

Nurturing care influences children's health, growth and development. The Nurturing Care Framework (World Health Organization, United Nations Children's Fund, & World Bank Group, 2018) identifies five essential dimensions: health, nutrition, responsive care, safety and security, and early learning.

Early caregiver – child relationships are of fundamental importance in buffering or exacerbating problems. Children of parents who find it difficult to express affection or show enthusiasm, and interest in what the child is paying attention to or offer comfort and reassurance to a child who is distressed can have difficulties with emotional regulation (Herba et al., 2016).

The mental health of parents is an environmental factor which influences the extent to which children receive nurturing care. Caregivers who have strong mental health have the capacity to engage positively with their children, take an interest in their children's activities and provide comfort and reassurance when their child is distressed. Depression symptoms among parents may reduce their ability to care optimally for their children. Some of these symptoms may lead to poorly controlled irritability leading to harsh responses, resentment about the child's dependency needs, or withholding of care (Gustafsson, Cox, & the Family Life Project Key, 2012). Responsive care which involves recognising and responding effectively to the child's behavioural cues and needs influences children's development positively (Scherer et al., 2019).

In a review of the then-available evidence about parents' mental health and child development (all generated in high-income countries and without child age specifications), Cummings and Davies (1994) concluded that the children of mothers with depression and anxiety are more likely to have emotional or behavioural disorders. Maternal depression during the postnatal period has been associated with higher rates of subsequent behavioural and emotional problems of children at

the age of five (Giles et al., 2011). In Vietnam, it was found in a cohort study that there was an indirect adverse effect of maternal antenatal depression and anxiety on lower social-emotional scores of six-month old infants via postnatal maternal mental health problems (Tran et al., 2014).

Depression is one of the most common mental health problems and is prevalent among women in the life phase when they are pregnant and caring for infants and young children. Mean prevalence of postpartum depression is significantly higher in LMICs (19%) (Fisher et al., 2012; Gelaye et al., 2016) than in high-income countries (10%–13%) (Hendrick et al., 1998). Common Mental disorders (CMD) including depressive symptoms among women at this life stage are predominantly socially determined, including by socioeconomic disadvantage (OR range: 2.1–13.2); being younger (2.1–5.4); being unmarried (3.4–5.8); lack of partner's empathy and support (2.0–9.4); having hostile in-laws (2.1–4.4); experiencing intimate partner violence (2.11–6.75); having insufficient emotional and practical support (2.8–6.1); in some settings, giving birth to a female (1.8–2.6) (Fisher et al., 2012). Protective factors were: having more education (RR: 0.5,  $p = 0.03$ ); having a permanent job (OR: 0.64; 95% CI: 0.4–1.0); being of the ethnic majority (OR: 0.2; 95% CI: 0.1–0.8) and having a kind, trustworthy intimate partner (OR: 0.52; 95% CI: 0.3–0.9) (Fisher et al., 2012). It is not known how these risks interact to influence the social-emotional development of children from toddlerhood and through the pre-school years in LMICs.

The aims were to review systematically the evidence about parents' mental health as an environmental factor that influences the social-emotional development of children aged 24–59 months in LMICs, and to conduct a meta-analysis to estimate the magnitude of this effect.

## 2. Method

This review followed the methods for systematic reviews and meta-analysis set out in the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA), Meta-analysis Of Observational Studies in Epidemiology (MOOSE), and Conducting Systematic reviews and Meta-analyses of Observational Studies of Etiology (COSMOS-E) guidelines (Dekkers et al., 2019; Moher et al., 2009; Stroup et al., 2000). The protocol was registered on the PROSPERO database (CRD42021272737) on 9 October 2021.

### 2.1. Selection criteria

The inclusion criteria were to be:

- Cross-sectional, case control or cohort studies, or secondary analyses of existing data, that quantified the associations between parents'/ caregivers' mental health and the social-emotional development of children aged from 24 to 59 months, or with a mean age under 59 months;
- Conducted in LMICs as classified by the World Bank Group 2020 or the Organisation for Economic Co-operation and Development's Development Assistance Committee 2020;
- Reported in peer-reviewed papers published in English between January 1st 2010 and February 28th 2021

The exclusion criteria were:

- Parents who are in special institutions such as hospitals, or prisons or in humanitarian settings;
- Children with special needs or a disability or chronic condition, such as cerebral palsy, being HIV+ or having cancer

### 2.2. Search strategy

Six databases (Ovid Medline, Ovid Embase, Ovid PsycInfo, Ovid Emcare, Ovid Maternal & Infant care and Cochrane CENTRAL) were

searched. After an initial search for articles in Medline and Embase, an analysis of the text words contained in the title and abstract, and of the index terms used to describe these articles was conducted. A second search using identified key words and index terms was then undertaken for data published from January 2010 to February 2021 across all six databases. The search strategies used a combination of Subject Headings and free text terms that aimed to cover the areas of (1) LMICs or developing countries, AND (2) target population groups including parents, mothers, fathers, infants, children, toddlers, AND (3) parents/caregiver conditions including depression, anxiety, common mental disorders, stress, AND (4) children's social-emotional development and behaviours. Searches were adapted to the specifications of each of the 6 databases. The final searches are presented in Table 1 (also see the Supplementary Appendix for full list of search terms). Hand-searching and the reference checking of citations and reference lists were undertaken and grey literature sources such as websites from government organisations, reports from international organisations including the World Health Organization and United Nations Children Fund, and other websites such as Google Scholar, OpenGREY, and Science.gov were searched.

### 2.3. Data extraction and quality appraisal

We used the Covidence Systematic Review Management System (<https://www.covidence.org/>) to manage and screen the retrieved studies and enable independent assessment of the eligibility of each study and to identify and resolve differences. The downloaded titles and abstracts were screened by two reviewers (TH and JF), who then reviewed

**Table 1**  
Search strategy – keywords.

Keywords Category	Search Keywords and Terms
<b>Country Terms</b>	Low and middle income countries list of World Bank and OECD/DAC developing countr* OR developing OR underdeveloped OR less-developed OR least-developed OR resource-constrained countr* OR low-income OR middle-income countr* OR resource-limit OR resource-poor OR limited-resource OR resource-constrained countr*
<b>Population terms</b>	mother* OR parenting OR parent* OR father* child* OR toddler* OR preschool* OR pre-school OR kinder* OR infant*
<b>Exposure (maternal/parental mental health) terms</b>	depression OR depressive disorder* OR mental disorder* OR mental health OR psychological distress OR mood disorder* OR stress OR anxiety disorder* OR obsessive-compulsive disorder* OR anxiety OR panic disorder* OR mental instability* OR emotional instability* OR nervous breakdown OR postpartum mental health
<b>Outcome 1 (child development) terms</b>	child Development OR child behav* OR behav* Disorder* OR infant behav* OR growth and development OR development disorder* OR emotional regulation* OR social and emotional behav* OR emotional disorder* OR socialization OR problem behav* OR resilience OR temperament OR social behav* OR anxiety separation OR personality development OR cognition OR cognitive disorder* OR intelligence OR internal-external control OR internality OR externalizing behav* OR internalizing behav* OR attention deficit and disruptive behav* disorder* OR anger control maternal behav* OR mother-child relations OR father-child relations OR parent-child relation* OR mother-child interaction* OR parent* behav* OR maternal behav* OR negative parenting OR neglectful parent* OR maternal negativity OR maternal neglectfulness OR maternal emotional abandonment OR parental emotional abandonment
<b>Outcome 2 (Parental behaviour and Parent-child Relations)</b>	

the full texts of potentially eligible studies to identify whether or not they met inclusion criteria. Data from the included papers were extracted into a data summary form, independently by two reviewers (TH and SP). Data included study design, objectives, location, sample size, measures of exposure (maternal/parental mental health) and outcomes (children's social-emotional development), timing of the assessment, main findings, conclusions and limitations.

The methodological and analytical quality of included studies was appraised independently by two reviewers (TH and SP) using the Kmet Standard Quality Assessment Criteria (Kmet et al., 2004). The 14 criteria were each scored 0:No, 1:Partial, or 2:Yes. The three criteria that applied to intervention evaluations and trials were not used for observational studies. A total score was calculated by dividing the summed criteria scores by the number of criteria that applied (14 or 11). As there are no standard guidelines to categorise studies based on their quality, we followed Burger et al.'s recommendation (Burger et al., 2020), whereby a study scoring >85% is considered 'high' quality, 50–84% 'medium', and <50%, 'low'. The reviewers scored each paper meeting inclusion criteria independently and resolved any discrepancies by discussion and the final scores were reached by agreement (Table 2). The level of agreement of the quality scores of the studies between the two assessors (TH & SP) was evaluated applying the intraclass correlation coefficient (ICC). ICC ranges from 0 to 1. ICC less than 0.5, between 0.5 and 0.75, between 0.75 and 0.9, and greater than 0.90 indicates poor, moderate, good, and excellent agreement, respectively (Koo and Li, 2016). The ICC was calculated using STATA Version 17 (StataCorp).

### 2.4. Synthesis of the results and data analysis

Structured summaries of findings are presented in a narrative form with an emphasis on the characteristics of included studies along with data extracted that are relevant to the review outcomes. The synthesis included quantitative results in the individual studies that showed the description and the process of analysis, and the patterns within and across these groups. The studies analysed were grouped into; (1) mental health problems of parents (most commonly mothers) and child social and emotional development, (2) association between maternal mental health and social and child emotional development, and (3) confounding variables and mediating factors.

Two meta-analyses were then undertaken. The first meta-analysis was to assess the effect of parents' mental health problems on child social-emotional development delays/problems. We included in the analysis the studies reporting effect sizes (odds ratio) of parents' mental health problems (binary [yes/no] exposure) on child social-emotional development delays/problems in a binary outcome and studies reporting effect sizes of binary exposures and continuous outcomes, by converting to odds ratio using Hasselblad & Hedges' method (Chinn, 2000; Hasselblad & Hedges, 1995). Another meta-analysis was conducted for studies which reported an effect size (standardized mean difference) of the symptoms of perinatal mental health problems (continuous exposure) on child social-emotional development problem scores (continuous outcome) or on child social-emotional development delays/problems in a binary outcome by converting them to standardized mean difference using Hasselblad & Hedges' method (Chinn, 2000; Hasselblad & Hedges, 1995). The meta-analyses were conducted using random effects modelling. The  $I^2$  statistic was used to quantify heterogeneity (Higgins et al., 2003). The Egger test was used to assess possible publication bias (Egger et al., 1997). A 95% prediction interval for the pooled effect size in each meta-analysis was estimated. The prediction interval is defined as the interval within which the effect size of a new study would fall if this study was selected at random from the same population of the studies already included in the meta-analysis (Int'Hout et al., 2016). We also calculated E-values for the meta-analyses. The E-value characterises the severity of bias that would be required, hypothetically, to shift the pooled estimate to the null or to otherwise explain away the results of the meta-analysis (VanderWeele and Ding, 2017; Mathur and VanderWeele, 2020). Study

**Table 2**  
Quality assessment (after Kmet et al., 2004).

Author Year	Criteria											
	Questions and objective sufficiently described?	Study design Evident and appropriate?	Method of subject group selection or source of information or input variables described appropriate?	Subject characteristics sufficiently described?	Outcome and exposure measures well defined and robust to measurement, misclassification bias?	Sample size appropriate?	Analytic methods described or justified and appropriate?	Some estimate of variance is reported or the main results?	Controlled for confounding?	Results reported in sufficient detail?	Conclusions supported by the results?	Score
Alenko et al., 2020	Partial	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Partial	Partial	.86
Caetano et al., 2020	Partial	Partial	Yes	Yes	Partial	Yes	No	Yes	Partial	No	Yes	.63
Caliskan and Ozyurt, 2020	Partial	Partial	Partial	Partial	Partial	Yes	Partial	Partial	No	No	Partial	.45
Flynn et al., 2017	Yes	Partial	Yes	Yes	Partial	Yes	Partial	Yes	Partial	Partial	Partial	.72
Garman et al., 2019	Yes	Yes	Yes	Yes	Partial	Yes	Partial	Partial	Partial	Yes	Partial	.77
Gunduz et al., 2015	Yes	Yes	Partial	Partial	Yes	Yes	Partial	Partial	No	Partial	Yes	.68
Karabekiroglu et al., 2013	Partial	Partial	Yes	No	Partial	Yes	Partial	Partial	Partial	Partial	Partial	.55
Mak et al., 2020	Yes	Partial	Partial	Partial	Yes	Partial	Yes	No	No	Partial	Partial	.55
Melis Yavuz et al., 2017	Yes	Partial	Yes	Partial	Yes	Partial	Partial	Yes	Partial	Yes	Yes	.77
Nguyen et al., 2018	Yes	Yes	Yes	Yes	Yes	Yes	Partial	Yes	Yes	Partial	Partial	.86
Rocha et al., 2020	Yes	Yes	Yes	Yes	Partial	Yes	Partial	Yes	No	Partial	Partial	.72
Xing et al., 2017	Partial	Partial	Partial	Yes	Yes	Yes	No	Yes	No	Yes	Yes	.68
Xuan et al., 2018	Yes	Partial	Yes	Partial	Yes	Yes	Partial	Partial	Partial	Yes	Yes	.77
Yurdusen et al., 2013	Yes	Partial	Partial	Partial	Partial	Yes	Partial	Partial	No	Partial	Partial	.55
Arguz et al., 2020	Partial	Partial	Partial	Partial	Partial	Partial	Yes	No	No	Partial	Yes	.50
Bao et al., 2016	Yes	Yes	Yes	Yes	Partial	Yes	Yes	Yes	Partial	Yes	Yes	.90
Dora and Baydar, 2020	Partial	Yes	Yes	Partial	Yes	Yes	Yes	Partial	Partial	Partial	Yes	.77
Finch et al., 2018	Yes	Yes	Partial	Partial	Yes	Yes	Partial	Partial	Yes	Yes	Partial	.77
Lin et al., 2017	Partial	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	.86
Liu and Wang, 2015	Partial	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Partial	Yes	.72
Ma et al., 2021	Partial	Partial	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	.90
Pearson et al., 2019	Yes	Yes	Partial	Partial	Yes	Partial	Partial	Yes	Yes	Partial	Yes	.77
Ramchandani et al., 2010	Partial	Yes	Partial	Yes	Partial	Yes	Partial	Yes	Yes	Yes	Yes	.82
Santos et al., 2014	Partial	Yes	Yes	Partial	Yes	Yes	Yes	Partial	Yes	Yes	Yes	.77
Santos et al., 2016	Partial	Yes	Yes	Partial	Yes	Yes	Partial	Partial	Yes	Partial	Partial	.73
Wang et al., 2021	Yes	Partial	Yes	Yes	Yes	Yes	Yes	Partial	Yes	Yes	Yes	.90

quality ratings were not used to weight the effect sizes in the meta-analyses because quality weighting adds uncertainty to average effects but does not eliminate serious bias related to study quality (Ahn and Becker, 2011). Analyses were performed using STATA Version 17 (StataCorp).

### 3. Results

#### 3.1. Search results and study quality

The study selection process is presented in Fig. 1. Following PRISMA guidelines, a total of 6940 initial studies were identified in the six databases and seven studies were found by manual searches. After removing 2989 duplicates, 3958 were screened based on titles and abstracts. Of those, 50 full-text studies were assessed according to the eligibility criteria. Then 26 were retained for the systematic review, and 16 of these were included in the meta-analyses. Of the 26 studies covering a combined study population of 34,568 mother and child pairs, 12 were cross-sectional, 3 were secondary analyses (Table 3), and 11 were prospective cohort studies (Table 4). Of the 26 studies, 23 were conducted in upper-middle income countries (China:8, Turkey:7, South Africa:2, Brazil:6), 2 were in lower-middle income countries (Pakistan:1, India:1) and only one was from a low-income country (Ethiopia).

Of the 15 cross-sectional studies and secondary analysis, two were rated as of high methodological quality (>85%) (Alenko et al., 2020; Nguyen et al., 2018), 12 were medium (50–85%) (Caetano et al., 2020; Flynn et al., 2017; Garman et al., 2019; Gunduz et al., 2015; Karabekiroglu et al., 2013; Mak et al., 2020; Melis Yavuz, Selcuk, Corapci and Aksan, 2017; Rocha et al., 2020; L. M. Santos et al., 2016; Xing et al.,

2017; Xuan et al., 2018; Yurdusen et al., 2013), and 1 was of low quality (<50%) (Caliskan and Ozyurt, 2020) (Tables 2 and 3). Of the 11 longitudinal studies, 4 were rated as high quality (Bao et al., 2016; Lin et al., 2017; Ma et al., 2021; Wang et al., 2021), and 7 were of medium quality (Arguz et al., 2020; Dora and Baydar, 2020; Finch et al., 2018; Liu and Wang, 2015; Pearson et al., 2019; Ramchandani et al., 2010; I. S. Santos et al., 2014) (Tables 2 and 4). The inter-rater reliability (Intraclass correlation coefficient: ICC) was 0.80 which indicated good reliability (Koo and Li, 2016). Most papers described the study design, objectives and inclusion criteria clearly, and conducted appropriate statistical analyses. However, some studies lacked reliability in the measurement of exposure and outcome, had samples of insufficient size, and failed to provide the details of study setting and sociodemographic information. Although the inclusion of low-quality studies may diminish the validity of our findings, they were retained to avoid selection bias.

#### 3.2. Mental health problems experienced by parents/caregivers and social and emotional problems among their children

The most common mental health problem studied was maternal depression ( $n = 14$ ), others were postnatal anxiety ( $n = 2$ ), prenatal anxiety ( $n = 1$ ) prenatal and postnatal anxiety ( $n = 1$ ), CMD ( $n = 5$ ), Stress/Distress including pregnancy related stress ( $n = 7$ ), and mood disorders ( $n = 1$ ) (Tables 3 and 4). One study examined the impact of grandmothers' emotional symptoms on internalizing and externalizing symptoms in grandchildren from a three-generation birth cohort study (Pearson et al., 2019). Only one study examined mental health problems experienced by fathers and the impact of these on the social-emotional development of their children (Xing et al., 2017).

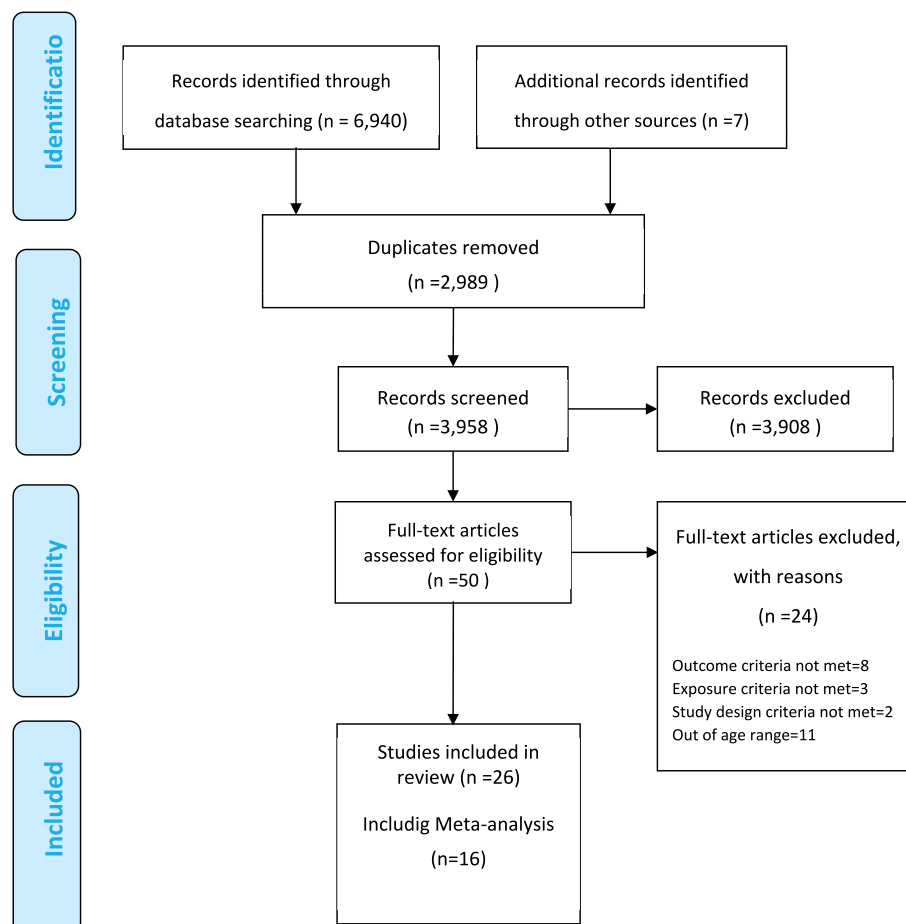


Fig. 1. Flow diagram of screened and included studies.

**Table 3**  
Summary of cross sectional studies and secondary analysis.

Author, Year & Country	Study design and Sample size	Mothers/Caregivers' Mental Health Measure and Timing of Assessment	Child Socio-emotional Development Measure and Timing of Assessment	Main findings	Quality Assessment
Alenko et al., 2020 Ethiopia	Cross sectional study, 734 mother and child pairs	Measure: Maternal depression using PHQ-9, and maternal IPV experience using HITS Timing: 3 years postpartum	Measure: Child Emotional and Behavioural problem using SDQ Timing: 3–10 years old (data was disaggregated by age group: 3–6 years, and, and 7–10 years old)	Maternal depression had significant association with child EBP (AOR = 2.38, 95% CI: 1.55 to 3.66). Children aged 7–10 years, family size categories of ≤3 and 4–6, maternal intimate partner violence and maternal Khat (recreational drug) use had significant association with child emotional and behavioural problem.	High
Caetano et al., 2020 Brazil	Cross sectional study 1292 caregiver and child pairs	Measure: Parenting stress using Parental Stress Index –Short Form (PSI/SF)* Timing: 4–5 years postpartum	Measure: Socio emotional and behaviour using CBCL and ASQ. Timing: 4–5 years old	Parents stress (both high and clinical) is associated with child internalizing and externalizing behaviours problems (p < 0.001)	Medium
Caliskan and Ozyurt, 2020 Turkey	Cross sectional study 219 preschool children-mothers	Measure: Maternal mental health using GHQ-12 Timing: 4–6 years postpartum	Measure: Emotion regulation using ERC Timing: 4–6 years old (data were disaggregated by 4, 5, 6 yrs old)	A weak positive correlation between total general health scores of the mothers and total emotion regulation of male children with normal BMI (r = 0.288, p < 0.01 and r = 0.251, p < 0.01)	Low
Flynn et al., 2017 Mexico	Cross sectional study 4.442 mothers and 5503 children	Measure: Depressive symptoms using CES-D Timing: 24–72 months postpartum	Measure: Behaviour problems using BPI Timing: 2–6 years old (M: 46.12 months, SD:13.54)	Maternal depressive symptoms was significantly associated with child behavior problems ( $\beta = 0.114$ , p < 0.0001, 95%CI 0.101, 0.127) in adjusted models. Child and maternal age, and asset are confounder that influenced parental mental health and child social-emotional development.	Medium
Garman et al., 2019 South Africa	Secondary analysis of Cluster RCT 446 mother and child pairs	Measure: Maternal depression using EPDS Timing: Four timings: 1) Mean 26.6 weeks of gestational period, 2 weeks, 6, 18 and 36 months postpartum.	Measure: Child development using BSI, and socioemotional development using CBCL Timing: 18 and 36 months old	Mother with chronic high depression is associated with child emotional symptom (p < 0.018), prosocial (p < 0.027), and early postpartum depression is associated with prosocial (p < 0.009) and late postpartum depression is associated with peer problem (p < 0.039) at 36 months of age.	Medium
Gunduz et al. (2015) Turkey	Cross sectional 217 mother and child pairs	Measure: Maternal depressive symptoms using the BDI Timing: about 4–5 years postpartum	Measure: Socio-emotional competence using Penn Interactive Peer Play Scale, Social Competence and Behavior Evaluation Scale, and Affect Knowledge Test Timing: mean 53.66 months old	Maternal depressive symptoms were significantly associated with child socioemotional competence (r = .39, p < 0.001).	Medium
Karabekiroglu et al., (2013) Turkey	Secondary analysis of demographic data 2775 mother and child pairs	Measure: Psychological distress using BSI Timing: 10–48 months postpartum	Measure: Socioemotional and behavioural problems using BITSEA. Timing: 10–48 months old (Mean:26.19 months)	Higher total score of maternal depressive symptom was significantly associated with Child emotional competence (p < 0.001)	Medium
Mak et al., (2020) China	Cross sectional study 371 preschool child and mother pairs	Measure: Parenting stress using PSI-SF Timing: 3–7 years postpartum	Measure: Child Behavior Problems using SCBE-30 Timing: Mean 54.48 months	Higher level of parenting stress was associated with higher level of child behavior problems; anxiety-withdrawal (r = .36, p < 0.001), and anger-aggression (r = .52, p < 0.001).	Medium
Melis Yavuz et al., (2017) Turkey	Cross sectional study 118 mother and child pairs	Measure: Maternal stress using PSI, maternal warmth& control using CRQ Timing: about 4–5 years postartum	Measure: Child temperament using Lab-TAB, and Internalizing Symptoms using CBCL Timing: Mean 4.79 years old	Parenting stress was associated with lower warmth (p < 0.05), higher negative control (p < 0.05), and internalizing symptoms (p < 0001).	Medium
Nguyen et al., (2018) India	Secondary analysis of RCT 2934 mother–child pairs	Measure: Maternal depressive symptoms measured using CES-D 10 Timing: 6–48 months postpartum	Measures: Child development using ASQ-3 Timing Mean 30.47 months old	Mother with medium score of depressive symptoms had higher personal social than lower score (AOR 1.29 95%CI: 1.08-1.55), and mother with high score of depressive symptoms had higher problem solving (AOR 1.59, 95%CI:1.16-2.17) and personal social (AOR 1.43, 95%CI:1.04-1.96). Child growth was confounder that influenced parental mental health and child social-emotional development.	High
Rocha et al., (2020) Brazil	Population based cross sectional study 3566 mother and child pairs	Measure: Psychiatric disturbance using SRQ Timing: Up to 72 months postpartum	Measure: Child development using ASQ. Timing: Mean 31.8 months	Maternal mental health-CMD is associated with child problem solving (p < 0.24) and personal and social (p < 0.05), and SRQ score is associated with problem solving (p < 0.04) in adjusted models	Medium
Santos et al., (2016) Brazil		Measure: Maternal mental health using CIDI Timing:	Measure: Behaviour problems using CBCL	Behavior problems were associated with maternal mental health variables; presence	Medium

(continued on next page)

Table 3 (continued)

Author, Year & Country	Study design and Sample size	Mothers/Caregivers' Mental Health Measure and Timing of Assessment	Child Socio-emotional Development Measure and Timing of Assessment	Main findings	Quality Assessment
	Cross sectional study 349 mother and child pairs	children between 49 and 72 months postpartum	Timing: Between 49 and 72 (data were disaggregated by under 5 and above).	of at least one psychiatric diagnosis (OR: 3.01, CI 1.75-5.18), anxiety disorder (OR 2.06, 95%CI 1.20-3.46), affective disorder (OR 2.10, 95%CI 1.21-3.65), and mental health disorders due to use of psychoactive substances (OR 2.31, 95%CI 1.18-4.55).	
Xing et al., (2017) China	Crosse sectional study 328 mother and child pairs	Measure: Paternal/maternal anxiety using DASS-21 Timing: about 4 years postpartum	Measure: Negative emotionality using CBQ-VSF Timing: mean 4.11 years old	Child negative emotionality correlated with maternal anxiety ( $p < 0.01$ ) and parental anxiety ( $p < 0.05$ ). Child negative emotionality was significantly associated with parental anxiety for both mothers ( $B = 0.15$ , $p < 0.01$ ) and fathers ( $B = 0.12$ , $p < 0.05$ )	Medium
Xuan et al., (2018) China	Cross sectional study 2925 mother and child pairs	Measure: Parenting stress using PSI-SF, and parental conflict using OPS Timing: 33–82 months postpartum	Measure: Behavioural problems using PBQ, and emotional problems using PTQ Timing: Mean: 55.04 months	Parenting stress correlates with negative emotionality of children ( $r = -.24$ , $p < 0.01$ ), and internalizing behaviour ( $r = .27$ , $p < 0.01$ ), and externalizing behaviour ( $r = .27$ , $p < 0.01$ ). Parenting stress partially mediated the association between parental conflict and both of children's externalizing and internalizing behavior problems	Medium
Yurdusen et al., (2013) Turkey	Cross sectional study 204 mother and child pairs	Measure: Maternal depression using BDI, and anxiety using STAI Timing: 18 and 71 months postpartum	Measure: Child-Behaviour using CBCL Timing: Mean 49.16 months	Maternal depression is correlated with internalizing ( $r = .33$ , $p < 0.001$ ) and externalizing ( $r = .26$ , $p < 0.001$ ) behaviours of children. Mothers' well-being and anxiety had significant association with child's behavioural and emotional problems ( $p < 0.001$ ).	Medium

ASQ: Ages & Stages Questionnaires, BDI: Beck Depression Inventory, BITSEA: Brief Infant–Toddler Social and Emotional Assessment, BPI: Behavior Problems Index, BSI: Brief Symptom Inventory, CBCL: Child Behavior Checklist, CBQ-VSF: Child Behavior Questionnaire-Very Short Form, CES-D: Center for Epidemiologic Studies Depression Scale, Child Behavior Questionnaire-Very Short Form, CIDI: Composite International Development Interview, CRQ: Child Rearing Questionnaire, DASS: Depression Anxiety Stress Scales, EPDS: Edinburgh Postnatal Depression Scale, GHQ: General Health Questionnaire, Lab-TAB: Laboratory Temperament Assessment Battery, OPS: O'Leary-Porter Scale, PBQ: Preschool Behavior Questionnaire, PHQ: Patient Health Questionnaire, PSI: Parenting Stress Index, PSI-SF: Parenting Stress Index-Short Form, 3rd Edition Short Form, PTQ: Parent Temperament Questionnaire, SCBE: Social Competence and Behavior Evaluation, SDQ: Strengths and Difficulties Questionnaire, SRQ: Self-Reported Questionnaire, STAI: State-Trait Anxiety Inventory.

\*The measure for parental stress was not provided in the original article (Caetano et al.), but confirmed it through a direct enquiry to the author.

Most studies assessed exposure to maternal mental health problems postnatally ( $n = 20$ ), whereas others assessed prenatally ( $n = 4$ ) or both pre and postnatally ( $n = 2$ ). Varied measures were used to assess maternal/parental mental disorders. Of the 14 studies of maternal depression, the most widely used measures were the Centre for Epidemiological Studies-Depression Scale ( $n = 4$ ), the Beck Depression Inventory ( $n = 2$ ) and the WHO Self-Reporting Questionnaire ( $n = 5$ ) (Tables 3 and 4). Most used standardized self-report measures that were developed in the US, the UK and other English-speaking countries, some of which were locally validated for the study country. In one study, the research team developed their own pregnancy-related anxiety questionnaire and established its internal consistency, but there were no formal validations using blinded comparisons against a gold standard diagnostic measure (Wang et al., 2021).

The main child development outcomes assessed were internalizing and/or externalizing problems ( $n = 20$ ), emotionality and temperament, ( $n = 13$ ) and personal-social skills ( $n = 3$ ). These studies used diverse measures to assess social-emotional outcomes, the most common being the Child Behaviour Checklist ( $n = 7$ ), the Strengths and Difficulties Questionnaire ( $n = 4$ ) and the Brief Infant–Toddler Social-Emotional Assessment ( $n = 2$ ).

### 3.3. Association between maternal/parental mental health problems and child social-emotional development

Most of the studies that assessed pre- and or postnatal exposure to parental mental health problems found a significant association with worse toddler and child social-emotional development. Four cross-sectional studies (Alenko et al., 2020; Flynn et al., 2017; Gunduz et al.,

2015; Yurdusen et al., 2013), three secondary analyses (Garman et al., 2019; Karabekiroglu et al., 2013; Nguyen et al., 2018) and five longitudinal studies (Bao et al., 2016; Dora and Baydar, 2020; Finch et al., 2018; Ma et al., 2021; Ramchandani et al., 2010) found an association between pre- or postnatal depression experienced by either parent and worse toddlers' or children's behavioural and emotional development. One cross-sectional study (Xing et al., 2017) and one longitudinal study (Wang et al., 2021) found that parental anxiety was associated with poorer social-emotional development, while one longitudinal study reported no association between parental anxiety and depression and social-emotional development of the child (Arguz et al., 2020). Four cross-sectional (Caetano et al., 2020; Mak et al., 2020; Melis Yavuz et al., 2017; Xuan et al., 2018) and three longitudinal studies (Lin et al., 2017; Liu and Wang, 2015; Ramchandani et al., 2010) reported that parental stress experienced by either mother or father was negatively associated with children's social-emotional development (Liu and Wang, 2015). Three cross-sectional studies (Caliskan and Ozyurt, 2020; Rocha et al., 2020; L. M. Santos et al., 2016) and one longitudinal study (Pearson et al., 2019) reported that mother's/grandmother's CMD were associated with negative emotions and fewer prosocial behaviours among their children/grandchildren.

Overall, 18 studies assessed mothers/parents and children aged 2 through 5 contemporaneously. All studies found a significant association between maternal mental health problems and child social-emotional development. Another eight studies examined early experience of maternal mental health problems and subsequent child social-emotional development. Of these, three observed exposures to maternal mental health problems during pregnancy (Garman et al., 2019; Ma et al., 2021; Wang et al., 2021), two postpartum (Finch et al., 2018; I. S. Santos et al.,

**Table 4**  
Summary of longitudinal studies.

Author, Year & Country	Study design and Sample size	Mothers/Caregivers' Mental Health Measure and Timing of Assessment	Child Socio-emotional Development Measure and Timing of Assessment	Main findings	Quality Assessment
Arguz et al. (2020) Turkey	Cohort study 83 mother and child pairs	Measure: Parental attachment, depression, and anxiety using PAI, BDI and BAI Timing: 28–40 weeks of gestation, and 21–31 months postpartum	Measure: Socioemotional and behavioural problems using BITSEA Timing: 21–36 months old	Prenatal attachment levels were the predictors of both behavioral ( $p = 0.014$ ) and emotional competence and development ( $p = 0.002$ ). Prenatal attachment was a stronger predictor of development than was maternal depression ( $p = 0.035$ ). No significant association between maternal depression and socioemotional development. (mean 21–36 months)	Medium
Bao et al., (2016) China	Longitudinal population survey 1480 mother and child pairs	Measure: Maternal depression and parenting style using CES-D & EMBU. Timing: three waves (Oct 2010, Nov 2011, and Jun 2013), 3–6 years postpartum	Measure: Socioemotional and behavioural problems and temperament using SDQ and BSQ. Timing: three waves (Oct 2010, Nov 2011, and Jun 2013) 3–6 years old children	Maternal depression in wave 1 is associated with increase of child behaviour problems (AOR:1.133, 95% CI:1.036–1.239) Punishment is associated with increase of child behaviour problem (AOR: 1.124, 95% CI 1.022–1.237)	High
Dora and Baydar (2020) Turkey	Longitudinal study 1053 mother and child pair	Measure: Maternal depressive symptoms using BSI Timing: Between 36 and 47 months postpartum, up to 7 years old, and analysis focused below 5 years old.	Measure: Child externalizing behaviors using ECBI Timing: Mean age 41.53 months (age group was disaggregated by 3,4,5,6,7 years old, and analysis focused below 5 years old.	Maternal depressive symptoms were significantly associated with child externalizing behaviors at age 3 ( $z = 5.14, p < 0.001$ ). Harsh parenting behaviour mediated the relationship between maternal depression and child's externalizing behaviour.	Medium
Finch et al., (2018) Pakistan	Birth cohort 1302 mother and child pairs	Measure: Maternal depressive symptoms using SRQ-20 Timing: 12 months postpartum	Measure: Socioemotional behaviours using SDQ, and cognitive, language, and social-emotional skills using BSID-III. Timing: 4 years old	Maternal depressive symptoms is associated with externalizing behavior problems at four years of children ( $p < 0.05$ ). Maternal education, home environment quality, and social-emotional skills were associated with more prosocial behaviors at four years ( $p < 0.001$ )	Medium
Lin et al. (2017) China	Cohort study 225 mother and child pairs	Measure: Postnatal stress using SCL-90 and GSI, and prenatal stress using LESPW and LES Timing: 28–36 weeks of gestation, And 24–30 months postpartum.	Measure: Toddler's temperament using TTS Chinese version Timing: 0–30 months old	Higher maternal GSI scores were significantly associated with scores of multiple temperament dimensions, including regularity ( $P < 0.007$ ), adaptability ( $p < 0.028$ ), intensity of reaction ( $P < 0.035$ ), mood ( $P < 0.001$ ), and persistence ( $P < 0.002$ )(mean 32.12 months)	High
Liu and Wang (2015) China	Longitudinal study 311 preschool child and mother/father pairs Recruited twice in 2011 and 2012.	Measure: Parenting stress using PSI-SF, and psychological aggression using CTSPC Timing: 3–5 year postpartum	Measure: Problem behavior using CBCL Timing: 3–5 years old (mean: 4 years)	Mothers scored significantly higher than fathers on parental distress ( $p < 0.01$ ), while fathers reported a higher level of parent-child dysfunctional interaction ( $p < 0.01$ ). The mediating factors indicate that maternal parenting stress had direct effects on children's internalizing ( $r = .37, p < 0.01$ ) and externalizing ( $r = .44, p < 0.01$ ) problem behavior and indirect effects through maternal psychological aggression.	Medium
Ma et al. (2021) China	Birth cohort 1125 mother and child pairs	Measure: Maternal depression using CES-D Timing: 30–34 gestational weeks	Measure: ADHD symptoms using CHI Timing: 48–54 months	Mothers with higher depression score were at higher risk of ADHD (20.1% vs 11.1%, $P = 0.003$ ; adjusted RR = 1.75, 95% CI: 1.10-2.81). Maternal depression and neonatal Vitamin D deficiency had higher risk of ADHD (adjusted RR = 3.10, 95% CI: 1.44-6.63) than the ones without maternal depression (at 48–54 months of age). Lower neonatal Vitamin D levels mediated the relationship between maternal depression and ADHD symptoms.	High
Pearson et al., (2019) Brazil	Birth cohort study 92 grandmother and grandchild pairs	Measure: Physical and psychological symptoms using SRQ-20 Timing: Grandmother = data of cohort in 1982	Measure: Emotional and behavioural problems using CBCL Timing: 4 years old	Maternal grandmothers' mental health was associated with increased emotional (adjusted $\beta$ -coefficient: 2.1, 95% CI: 0.8, 3.4, $p = 0.001$ ), and behavioural (adjusted $\beta$ -coefficient: 2.5, 95% CI: 0.5, 4.7, $p = 0.018$ ) problems in	Medium

(continued on next page)



Table 4 (continued)

Author, Year & Country	Study design and Sample size	Mothers/Caregivers' Mental Health Measure and Timing of Assessment	Child Socio-emotional Development Measure and Timing of Assessment	Main findings	Quality Assessment
Ramchandani et al., (2010) South Africa	Birth cohort study 953 mother and child pairs	Measure: Maternal mental health using SRQ-20 Timing: 3 months after birth	Measure: Behavioural problems using Richman Behaviour Screening Questionnaire Timing: 2–4 years old	grandchildren in the unadjusted and adjusted models. Children of mothers with high levels of prenatal stressors had no increased risk of behavioral problems at age 2 years, but they had at 4 years (AOR 2.52 95% CI:1.04, 6.09).	Medium
Santos et al., (2014) Brazil	Birth cohort study 3581 mother and child pairs	Measure: Maternal mood and mental health using SRQ-20 Timing: 3 months postpartum	Measure: Development and well-being using DAWBA. Timing: 49.5 months	Children of mothers with mood symptoms during pregnancy were more likely to have psychiatric disorders than children of mothers without (OR: 1.82; 95%CI:1.48–2.25, $p < 0.001$ ) at 6 years old. Children of mother with positive SRQ during pregnancy are more likely to have psychiatric disorders at 6 years old (OR 1.87; 95%CI: 1.50–2.33, $p < 0.01$ ).	Medium
Wang et al. (2021) China	Population-based cohort study 3443 mother and child pairs.	Measure: Pregnancy-related anxiety questionnaire developed by research team Timing: 1st and 3rd trimester of pregnancy	Measure: Emotional and behavioural development using SDQ Timing: Mean age 4.2 ( $\pm 0.5$ ) years old	Boys of mothers with pregnancy related anxiety in the 1st and 3rd trimester had an increased risk of conduct problems of and (AOR 1.97 CI:1.05–3.71) hyperactivity (AOR 1.91 95% CI:1.01–3.61) and total difficult score (AOR: 2.51 CI: 1.35–4.70) than those without (mean age 4.3 yrs in 1st and 3rd trimester) Pregnancy-related anxiety in the 1st trimester and in both 1st and 3rd trimester increased the risk of preschool girls' emotional problems and total difficult problems (AOR 1.91 95% CI:0.93–3.92) and total difficult score (AOR 2.49 95%CI:1.37–4.51) (mean age 4.3 yrs in 1st trimester and 4.4 yrs in 1&3 trimester).	High

ASQ: Ages & Stages Questionnaires, BAI: Beck Anxiety Inventory, BDI: Beck Depression Inventory, BITSEA: Brief Infant–Toddler Social and Emotional Assessment, BSI: Brief Symptom Inventory, BSID: Bayley Scales of Infant Development, BSQ: Behavioural Style Questionnaire, EMBU: CTSPC: Conflict Tactic Scales, Parent-Child, Egma Minnenav Bardnosna Uppforstran, SDQ: Strengths and Difficulties Questionnaire, ASQ: Ages & Stages Questionnaires, CBCL: Child Behavior Checklist, CES-D: Center for Epidemiologic Studies Depression Scale, CHI: Conners' Hyperactivity Index, DAWBA: Development and Well-Being Assessment, ECBI: Eyberg Child Behavior Inventory, EMBU: Egma Minnenav Bardnosna Uppforstran, LES: Life Event Stress Scale, LESPW: Life Event Stress Scale for Pregnant Women, PAI: Prenatal Attachment Inventory, PSI-SF: Parenting Stress Index-Short Form, SCL: Symptom Checklist, SDQ: Strengths and Difficulties Questionnaire, SRQ: Self-Reported Questionnaire, TTS: Toddler Temperament Scale.

2014), and two both during pregnancy and in the postpartum period (Lin et al., 2017; Ramchandani et al., 2010). These seven studies found that an early exposure to maternal depression, anxiety, stress, or mood symptoms results in significantly higher rates of later child emotions and behavioural problems (Finch et al., 2018; Garman et al., 2019; Lin et al., 2017; Ma et al., 2021; Ramchandani et al., 2010; I. S. Santos et al., 2014; Wang et al., 2021).

### 3.4. Confounders and mediating factors

Most studies adjusted for a number of potential “confounders” including sociodemographic characteristics, parental relationship, and family violence, but did not specify which variables actually were confounders that influenced both exposure (maternal mental health) and outcome (child social and emotional development). However, only two studies clearly stated and identified confounding variables. The significant association was identified in greater child age (Flynn et al., 2017), younger maternal age (Flynn et al., 2017), fewer asset (Flynn et al., 2017), and growth deficiency (Nguyen et al., 2018). One study reported that there were no individual confounding variables (maternal/grandmother's and socioeconomic characteristics) that had an influence on the associations (Pearson et al., 2019).

A mediator is a factor in the causal pathway that mediates the relationship between the experience and the outcome (Stein et al., 2014). Two longitudinal studies identified several factors that mediated the

impact of maternal mental health problems on the child's social-emotional development. Dora and Baydar (2020) reported that harsh parenting behaviour mediated the relationship between maternal depression and higher prevalence of child externalizing behaviours. Ma et al. (2021) demonstrated that lower neonatal Vitamin D levels mediated the association between maternal depression and increased likelihood of a child having ADHD symptoms. Three cross-sectional studies also claimed that higher negative parenting styles including authoritarian and permissive attitudes (Mak et al., 2020), maternal ‘power assertiveness’ (Gunduz et al., 2015), controlling behaviours and lower maternal warmth (Melis Yavuz et al., 2017) mediated the relationships between maternal mental health problems and increased likelihood of child emotional and behavioural problems. However, mediation cannot be established in cross-sectional studies as the exposure, mediator and outcome are measured at the same time.

### 3.5. Meta-analyses of parent mental health problems and children's social-emotional development

The meta-analysis of the association between parents' mental health problems and child social-emotional development included effect size estimates using odds ratios from ten data points derived from nine studies, covering a combined study population of 17,877 mother and child pairs (Fig. 2). We included two data points from Wang et al. (2021), because the results were reported for boys and girls separately. Of the

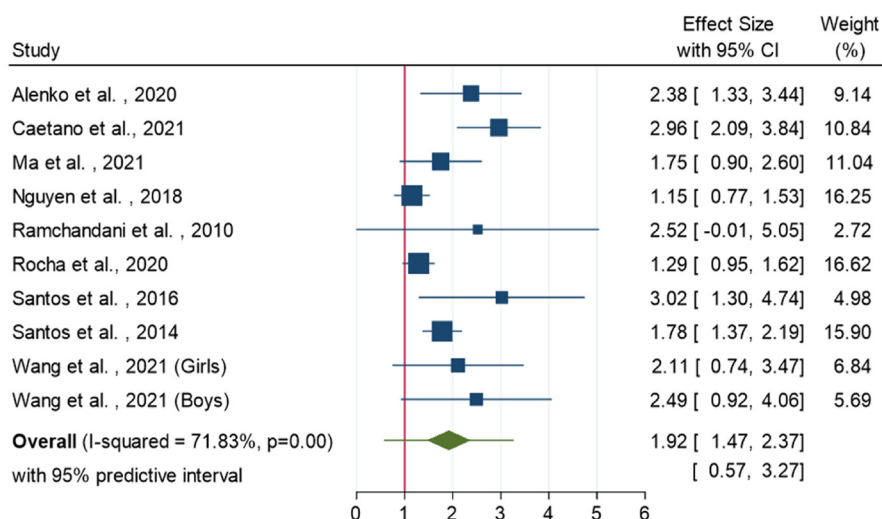


Fig. 2. Forest plot presenting the effect size (odds ratio) of perinatal mental health problems on child social-emotional development delays/problems.

nine studies included in the meta-analysis, four were cross-sectional (Alenko et al., 2020; Caetano et al., 2020; Rocha et al., 2020; L. M. Santos et al., 2016), one was secondary analysis (Nguyen et al., 2018), four were longitudinal (Ma et al., 2021; Ramchandani et al., 2010; I. S. Santos et al., 2014; Wang et al., 2021), with the different maternal/parental mental health problems including depression (Alenko et al., 2020; Ma et al., 2021; Nguyen et al., 2018), anxiety (Wang et al., 2021), stress (Caetano et al., 2020; Ramchandani et al., 2010), mood disorder (I. S. Santos et al., 2014) and caregivers' having a CMD (Rocha et al., 2020; L. M. Santos et al., 2016). Four studies were rated as high (Alenko et al., 2020; Ma et al., 2021; Nguyen et al., 2018; Wang et al., 2021), and five were of medium quality (Caetano et al., 2020; Ramchandani et al., 2010; Rocha et al., 2020; I. S. Santos et al., 2014; L. M. Santos et al., 2016). The resulting pooled effect size (odds ratio) was 1.92 (95% CI: 1.47 to 2.37). The I<sup>2</sup> of 71.83% was in a range that suggests substantial heterogeneity. All Egger test statistics confirmed a lack of the asymmetry that indicates publication bias (p = 0.83).

The meta-analysis of the association between parents' symptoms of mental health problems and child social-emotional development included effect size estimates using standardized mean difference from ten data points derived from seven studies, covering a combined study population of 9248 mother and child pairs (Fig. 3). Of the seven studies

included in the meta-analysis, three were cross-sectional (Flynn et al., 2017; Gunduz et al., 2015; Yurdusen et al., 2013), one was secondary analysis (Karabekiroglu et al., 2013), three were longitudinal (Arguz et al., 2020; Finch et al., 2018; Lin et al., 2017), with the different maternal/parental mental health problems including depression (Arguz et al., 2020; Finch et al., 2018; Flynn et al., 2017; Gunduz et al., 2015; Yurdusen et al., 2013), anxiety (Arguz et al., 2020; Yurdusen et al., 2013), and stress/distress (Karabekiroglu et al., 2013; Lin et al., 2017). One study was rated as high (Lin et al., 2017), and six were of medium quality (Arguz et al., 2020; Finch et al., 2018; Flynn et al., 2017; Gunduz et al., 2015; Karabekiroglu et al., 2013; Yurdusen et al., 2013). The resulting pooled effect size (standardized mean difference) was 0.14 (95% CI: 0.04 to 0.24). The I<sup>2</sup> of 99.47% was in a range that suggests substantial heterogeneity. All Egger test statistics confirmed a lack of the asymmetry that indicates publication bias (p = 0.98).

The E-value for the meta-analyses of the perinatal mental health problems on child social-emotional development delays/problems (Fig. 2) was 3.25. It means that unmeasured confounders must have the effect sizes (odds ratio) equal or higher than 3.25 on both exposure and outcome to shift the pooled estimate to the null. Similarly, the E-value for the meta-analysis of the effect of the symptoms of perinatal mental health problems on child social-emotional development problem scores was 1.5

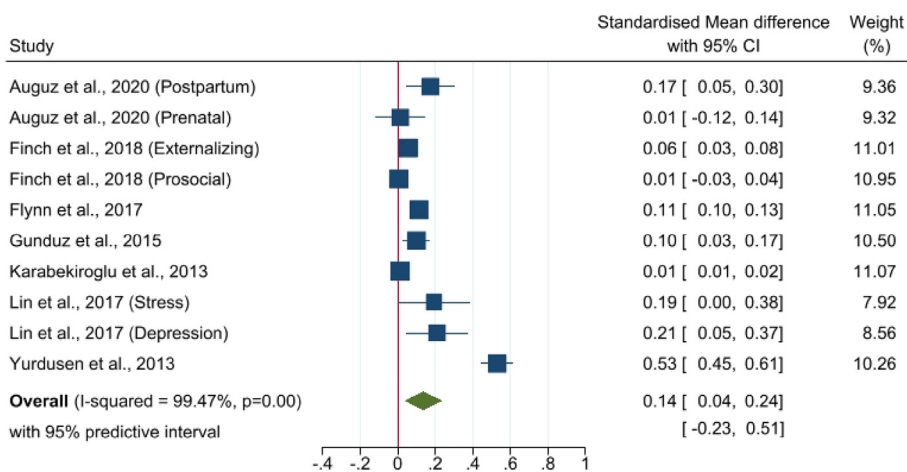


Fig. 3. Forest plot presenting the effect size (Standardised mean difference) of the symptoms of perinatal mental health problems on child social-emotional development problem scores.

(Fig. 3).

#### 4. Discussion and conclusion

To the best of our knowledge, this is the first systematic review with meta-analyses to have synthesised evidence from low- and middle-income countries on the associations between parental mental health problems and the social-emotional development of children in the second 1000 days of their lives. The 15 cross-sectional and 11 longitudinal studies were relatively well balanced in terms of the distribution of focus within the study design. In the meta-analyses, there was general consistency in the effect size estimates, lending weight to the evidence of the association.

We found that in LMICs, social-emotional developmental problems among children aged 24–59 months are associated with their parents experiencing a mental health problem. These included more internalizing and externalizing behaviour problems, difficult temperament and emotionality, and fewer prosocial behaviours. Parental mental health problems including their experiences of depression, anxiety, stress, mood disorders and CMD were most commonly found among mothers. The findings were also consistent with other studies that had different designs and measures, different timings of assessing exposures and outcomes, different age ranges of children, and across diverse settings.

Our review included the study of the impact of grandmothers' mental health and grandchildren's emotional problem. This is because in many non-Western cultures, grandmothers are traditionally regarded as advisors on child-rearing and active caregivers (Aubel, 2012; Pearson et al., 2013), and some evidence suggests that in Latin America, grandmothers are highly valued as the 'authority' figure while fathers have a relatively limited role and influence in daily caregiving during early childhood (Aubel, 2012; Chioda, 2016). As such, grandmothers' mental health may impact on grandchildren's mental health, directly through frequent caregiving, and indirectly through influence on their parents (Johnston et al., 2011). Similar evidence in high-income countries suggested that parent-reported history of grandparent depression and anxiety is associated with increased risk of grandchildren's developmental disorders (Cents et al., 2011; Hancock et al., 2013). However, in this review, we could not confirm the information on the specific roles that grandmothers play, such as the type and frequency of child care, geographical proximity to their grandchildren, or their 'authority' status in the family.

The findings of this review also indicate that it is early exposure not only to maternal depression but also to the risk factors for maternal depression that is linked to higher rates of later behavioural and emotional problems among toddlers and children. In particular, living in circumstances in which there is violence, conflict and coercive control perpetrated by an intimate partner, and poverty, in which mothers have become depressed, is associated with long term adverse effects on children's social and emotional development in the preschool years (Alenko et al., 2020; Finch et al., 2018; Garman et al., 2019; Gunduz et al., 2015; Liu and Wang, 2015; Xuan et al., 2018).

The causal relationship between parental mental health and child's developmental outcomes can be mediated by some other factors, rather than being only a direct relationship. Several studies included potential confounders in their analysis, but only two studies explicitly investigated confounders including maternal and child age, asset holding and child growth that influenced potentially both the exposure and the outcome. Gelaye et al. (2016) pointed out that validity and causal inferences from available studies are hindered because of incomplete control of confounding factors, therefore, called for data from disparate settings and with meaningful covariate controls.

One study in this review identified that harsh parenting was the primary mediating factor in the association between maternal depression and externalizing behaviours. Parental warmth, understanding, maternal education, and a high-quality home environment in the early years are protective factors (Fihrer et al., 2009; Rice et al., 2010). Parents who experienced higher level of stress were more likely to exhibit

authoritarian parenting behaviours including harsh and humiliating punishment of their children, resulting in child behavioural problems (Anthony et al., 2005). In a meta-analysis of 46 observational studies in high income countries, a correlation between higher maternal depression and negative parenting behaviours including threatening gestures, negative facial 'expressions', expressed anger, and intrusiveness was found (Lovejoy, Graczyk, O'Hare and Neuman, 2000). In addition, Burger et al. (2020) found that the severity and persistence of a parent's mental disorder, occupying a low socio-economic position, lacking social and partner support, and experiencing intimate partner violence each increased the risk of adverse outcomes in children. These indicate that child developmental problems are multifactorially determined, and that the exposure (parental mental health) and the outcomes are likely to have common risks.

Our meta-analyses found that the children of parents with mental health problems were nearly twice as likely to have social-emotional development problems (OR: 1.92, 95% CI: 1.47, 2.37) compared to children of parents without them. This is consistent with other meta-analyses on the links between parental mental health problems and child health and growth outcomes. In a meta-analysis of the results of 17 studies in LMICs, Surkan et al. (2011) found that the young children of mothers with depression were more likely to be underweight (pooled OR: 1.5; 95% CI: 1.2–1.8) or stunted (pooled OR: 1.4; 95% CI: 1.2–1.7). Another meta-analysis by Pierce et al. (2020) revealed significantly higher odds of injuries (pooled OR: 1.15, 95% CI: 1.04–1.26), asthma (pooled OR: 1.26, 95% CI: 1.12–1.41); malnutrition: (pooled OR: 2.55, 95% CI: 1.74–3.73); and diarrhoea (pooled OR: 2.16, 95% CI: 1.65–2.84). The systematic review by Burger et al. (2020) concluded that maternal perinatal mental health problems were significantly associated with neurodevelopmental outcomes in cognitive, motor, language and behaviour and social-emotional domains of children in the first 1000 days of life in LMIC's. Yet, the authors were unable to conduct a meta-analysis because of the variability of mental health assessments and domains of neurodevelopment assessed and decided that there was insufficient evidence available to draw clear conclusions.

In our meta-analyses, high levels of heterogeneity leading to wide prediction intervals were found. It might reflect the fact that the relationship between parental mental health and child social-emotional development can have diverse confounders and moderators. The reviewed studies controlled for different sets of bio-psycho-social covariates at individual and family levels that might affect the findings of the individual studies differently. There are a large number of potential moderators including household economic status, mother's and partners' education levels, negative personality traits, intimate partner relationship, social support, cultural factors and policies (Gutierrez-Galve et al., 2015; Pearson et al., 2013) that can also affect the samples of the reviewed studies differently. Despite heterogeneity of designs and the results of the reviewed studies, the pooled effect sizes of OR 1.92 and standardized mean difference 0.14 in our meta-analyses suggest that parents' mental health is an important determinant of social and emotional development among children in the second 1000 days of their lives in LMICs.

These data indicate that programmes to assist the healthy development of young children should also address the needs of their primary caregivers, who are most usually their mothers. Maternal mental health problems can be assisted including through structured community-based interventions that foster problem-solving and behavioural activation in home visits and group-based psychoeducation (Surkan et al., 2011). For instance, lay community health workers can implement these programmes in resource constrained settings if given training and ongoing supportive supervision (Christodoulou et al., 2019; Tomlinson et al., 2018). A meta-analysis of perinatal interventions for maternal mental health through community based home visits demonstrated maternal benefits in addition to improved child cognitive development, growth, and immunisation (Rahman et al., 2013).

Addressing maternal/parental mental health problems might benefit

parents' health, improvements in child growth, future health, development and well-being. Scaled up support for early child development in poverty reduction, education, health and nutrition, child protection, and social safety net strategies is required (Richter et al., 2017). Caregiver capability is a foundational requirement for the provision of the nurturing care that children need in order to thrive and can be improved through group-based multicomponent programmes, peer mentorship, and structured home visits. Most evidence about strengthening parents' capabilities, including sensitivity and responsiveness to the child's needs, has been generated in the first 1000 days postpartum, when the home is the main caregiving environment. These data indicate that similar community-based interventions to support the parenting capabilities and mental health of mothers and their toddlers and children into the pre-school years are likely also to be beneficial (Maselko et al., 2020). As many children are by this life stage also receiving some centre-based care, direct assessment and interventions by early childhood educators could provide complementary education and support (Surkan et al., 2011).

We acknowledge limitations in the evidence available for this review. First, although this review focused on LMICs, data were available from only one low-income country whereas the rest were lower and upper-middle income countries, resulting in a bias toward data from relatively economically advantaged countries. However, the purpose of this review was not only to examine findings, but also to establish the extent to which evidence exists and is available in LMICs. Second, while China and Turkey have quite detailed evidence about the relationship between maternal/parental mental health problems and the social-emotional development of children aged two to five years, most LMICs have either minimal or no evidence to inform local policies and programmes. Third, the search was restricted to studies published in English and to the period 2010 to 2020. There might be relevant studies published in languages other than English and prior to 2010 that were missed. Fourth, apart from the secondary analysis, most children were enrolled in early childhood education centres, particularly in the upper-middle income countries such as China and Turkey where parents can afford to send them to preschool. The experiences of the many children in LMICs who do not have access to early childhood education were not ascertained. Sixth, there is a highly disproportionate focus on the mental health of mothers, with only one investigation on the impact of mental health problems experienced by fathers (Xing et al., 2017). Seventh, the included studies varied in quality, and while some adjusted for potential confounding variables or covariates, others made no adjustments. Also, although we attempted to examine the association of early experience of maternal mental health problems during the postpartum period and subsequent child social-emotional development, we could not conduct separate analyses of associations of social-emotional development between the first and second 1000 days. Eighth, it is known that depression screening instruments yield higher estimates than diagnostic interviews of prevalence of mental health problems (Tsai, 2014). Our review was not intended to determine the prevalence of adult mental health problems, but it is possible that the estimates of this exposure and therefore the population wide magnitude of the consequences for children's social and emotional developmental problems are imprecise. Ninth, data about children were, most commonly, collected from mothers' reports which can be influenced by their mood and by social desirability and possibly yield inaccurate estimates of children's difficulties. It is possible in cross-sectional studies that reverse causality whereby the child's emotional and behavioural difficulties contribute to parent mental health problems was relevant but was not considered in interpretation of the findings of any of the studies. Finally, we could not include all reviewed studies in the meta-analyses because of the variability of the types of the exposure measure and unavailability of appropriate effect sizes reported. This leads to an increase in the margin of error because of the loss of power. Having had no access to the raw data, we could not calculate standardized effect sizes for the rest of the studies. Despite these limitations, we believe this evidence synthesis provides a valuable indication

of the links between the mental health of parents and the social and emotional development of their children in the second thousand days of life in LMICs.

There are significant knowledge gaps. Elucidation of causal pathways, including identification of mediators and potentially modifiable risk and protective factors for managing and supporting maternal mental health, healthy parenting and the development and well-being of their children in diverse cultural contexts is needed. Further research is required to demonstrate evidence about the feasibility, acceptability, and effectiveness in LMICs of multicomponent interventions to reduce maternal/parental mental health problems and improve emotional and behavioural problems among toddlers and pre-schoolers. There is substantial scope to improve the lives and social-emotional development of children in LMICs in the second 1000 days of their lives.

## Funding

JF is supported by the Finkel Professorial Fellowship, which is funded by the Finkel Family Foundation; TT is supported by a Monash Strategic Bridging Fellowship.

## CRediT authorship contribution statement

**Tomoko Honda:** Conceptualization, Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. **Thach Tran:** Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. **Sally Popplestone:** Data curation, Methodology, Writing – original draft, Writing – review & editing. **Catherine E. Draper:** Conceptualization, Writing – review & editing. **Aisha K. Yousafzai:** Conceptualization, Writing – review & editing. **Lorena Romero:** Data curation, Methodology, Writing – review & editing. **Jane Fisher:** Conceptualization, Data curation, Methodology, Supervision, Funding acquisition, Writing – original draft, Writing – review & editing.

## Declaration of competing interest

The authors declare that there were no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Acknowledgements

We would like to extend our sincere thanks to Sunil Bhopal, Jorge Cuartas, Sonja Klingberg, Dana McCoy, Kate Milner, Jelena Obradović, Lauren Pisani, Aditi Roy, Jonathan Seiden, Christopher Sudfeld, Stephanie Wrottesley, the members of the Lancet Commission for Early Childhood Development in the Second 1000 Days for their invaluable contributions that underpinned the findings in this review.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ssmmh.2023.100197>.

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