Article

Determinants of Fruits and Vegetables Consumption among In-School Adolescents in Ghana

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Abstract: Background: Fruit and vegetable consumption is an important source of nutrients for healthy growth and development, as well as a protective factor against chronic non-communicable diseases. Paucity of data exists on adolescents' fruit and vegetable consumption in Ghana. This study, therefore, sought to determine the prevalence and correlates of fruit and vegetable consumption among in-school adolescents in Ghana. Methods: Data for this study were extracted from the 2012 Global School-Based Health Survey. A cross-sectional analysis on 2786 in-school adolescents from junior and senior high schools was conducted. Descriptive analyses using frequencies and percentages were used to present the results on the prevalence of fruit and vegetable consumption. Multivariable binomial regression analysis was performed to determine the association between fruit and vegetable consumption and explanatory variables. The results of the regression analyses were presented using adjusted odds ratio (aOR) with their respective confidence intervals (CIs). Statistical significance was set at $p < 0.05$. Results: The prevalence of adequate fruits, adequate vegetables, and adequate fruit and vegetable consumption were 35.7%, 26.8%, and 27.8%, respectively. In-school male adolescents had lower odds of adequate fruit and vegetable consumption compared to female adolescents (aOR = 0.64, 95%CI = 0.51–0.82). Adolescents in senior high schools (aOR = 0.36, 95%CI = 0.22–0.61) were less likely to consume adequate fruits and vegetables compared to those in junior high schools. The odds of adequate fruit and vegetable consumption were higher among adolescents who consumed soft drinks (aOR = 3.29, 95%CI = 2.42–4.46), fast foods (aOR = 1.42, 95%CI = 1.13–1.77), and those who had sedentary behavior (aOR = 1.38, 95%CI = 1.07–1.77). Conclusions: The findings revealed that fruit and vegetable consumption among Ghanaian adolescents is relatively low. Sex of adolescents, grade, soft drink intake, fast food consumption, and sedentary behavior were factors associated with adequate fruit and vegetable consumption. Health promotion interventions to scale up fruit and vegetable consumption should pay attention to the factors identified in this study.

Keywords: consumption; fruits; Ghana; in-school adolescents; nutritional counseling; vegetables

1. Background

The inclusion of fruits and vegetables (FVs) in individual and household diets has been advocated by various researchers considering the numerous positive impacts FVs present on human health and wellbeing [1]. FVs are important sources of nutrients such as vitamins, minerals, proteins, and phytochemicals as well as fiber, which help the antibodies to effectively fight against diseases and the overall maintenance of one's health [2]. Consuming FVs in acceptable quantities (a minimum of 400 g per day) has been found to prevent most of the non-communicable and chronic diseases, including cardiovascular diseases (CVDs), obesity, high blood pressure, diabetes, cancer, and gastrointestinal infections [3,4]. More so, research has established a linkage between FVs consumption and colon and prostate cancer prevention [5]. Despite the abundant documented health advantages of FVs consumption, the World Health Organization (WHO) reported that nearly 1.7 million lives perish every year across the world as a result of inadequate consumption of FVs [6,7]. In this light, the WHO listed low FVs consumption among the first six high-risk factors significantly contributing to the upsurge in the world's mortality rate, and it is considered to have a similar debilitating effect as unsafe sex and tobacco use [8].

Based on the WHO and the Food and Agriculture Organization (FAO) recommendations, there should be minimum ingestion of 400 g of FVs daily, which is equivalent to five servings [9]. Pursuant to the recommendations, several countries have endeavored to meet the minimum daily requirement of FVs, even though the consumption rates of FVs among school children, adolescents, and adults remain incredibly low [10]. Some of the reasons that affect people's choices in consuming FVs include accessibility, availability, shelf life, cost, socio-economic factors, and socio-cultural factors [11]. In Ghana, vegetables such as kontomire, garden eggs (Ghana eggplant), lettuce, cabbage, okra, alefu, bira, ayoyo and bean leaves, and fruits such as oranges, pineapple, watermelon, banana, guava, pear, sweet apple, mangoes, and pawpaw are grown and eaten.

Since the formation of certain important nutritional and behavioral practices begins in adolescence, these practices may remain a lifetime characteristic if care is not taken [7,12]. Essentially, the consumption of adequate FVs and involvement in physical activity during adolescence reduces a person's risk of contracting diseases. Despite the widespread health campaigns targeted at adolescents worldwide to encourage the consumption of FVs, little progress has been made in this regard as parents of adolescents are faced with numerous challenges in the acquisition of FVs [11]. Globally, there seem to be sub-regional variations in the prevalence of inadequate FV consumption. For example, Hall et al. [13] in 2009 found in a survey of 52 countries that the prevalence of inadequate FV consumption ranged from 36.6% in Ghana to 99.2% in Pakistan for men, and from 38.0% in Ghana to 99.3% in Pakistan for women. Using the Global Ageing and Adult Health (SAGE) Wave 1 involving five countries (i.e., China, Ghana, India, Mexico, Russia, and South Africa), Wu et al. [14] identified a similar pattern for inadequate consumption of FVs in the studied countries. It has, therefore, become expedient for researchers, health organizations, and governments to continuously advocate the consumption of FVs among various populations, particularly adolescents.

So far, previous research on FVs consumption has found levels below the WHO recommended levels for the Ghanaian populace [13–15]. Specifically, Ruel et al. [16] in 2005 reported that FVs consumption was approximately 137.3 g per day, nearly a third of what should represent a daily requirement. Similarly, the 2014 Ghana demographic health survey revealed a FVs consumption pattern of only three out of the seven days in a week [17]. Despite these scholarly attempts, few studies have explicitly investigated the consumption of FVs among adolescents in Ghana. For instance, in 2013, Doku, Koivusilta, Raisamo, and Rimpelä's [18] study which focused on Eastern, Greater Accra, and Volta Regions of Ghana found that only 31% of adolescents rarely consumed FVs, even though younger adolescents between 12–15 years frequently consumed FVs compared to older adolescents aged 16–18 years. Using sampled students from a local technical university to identify FVs consumption patterns in 2015, Kpodo et al. [2] revealed that, compared to

vegetables, respondents seldomly consumed fruits 1–3 times a day. While these studies may have produced significant insights on the consumption of FVs among adolescents, their limited geographical focus restricts the scope of these studies, as limited nationally representative information still exist on the consumption patterns of FVs among in-school adolescents in Ghana. Besides, the Ministry of Health (MoH) since 2008 has advocated for FVs consumption as "medicine" as part of a regenerative health campaign strategy to promote healthy living through eating and a strategic attempt to alleviate the heightened risk of NCDs among residents [19]. However, scholarly information to support this noble initiative is sparse.

Therefore, the present study investigated the determinants of FVs consumption among Ghanaian in-school adolescents using nationally representative data. Understanding the determinants and consumption patterns of FVs among adolescents in Ghana could inform the further development of pragmatic policies and interventions to improve adolescents' life and also help curtail the onset of many preventable diseases.

2. Materials and Methods

2.1. Study Design and Data Source

This study involved a cross-sectional analysis of data from the Global School-Based Health Survey (GSHS). The GSHS was conducted among in-school adolescents in Ghana in 2012 with partnership from the World Health Organization (WHO), Center for Disease Control and Prevention (CDC), Middle Tennessee University, Ghana Education Service (GES), and Ministry of Health. The survey was conducted in over 94 low- and middle-income countries (LMICs) to obtain data on behavioral risk and protective factors such as alcohol and other drug use, dietary behaviors, hygiene, mental health, physical activity, protective factors (not a cause of mortality/morbidity), sexual behavior, tobacco use, violence, and unintentional injury.

2.2. Sampling Method and Sample Size

The GSHS employed a two-stage cluster sampling technique to recruit participants for the study. At the initial stage, the study's schools were selected with probability proportional to the school's enrolment size. At the last stage, classes within chosen schools were randomly selected and all eligible students were recruited to participate in the study. This sampling method ensured that every eligible student had an equal chance of being selected for inclusion in the study. A total of 3632 students from junior and senior high schools participated in the survey. Of this, 1648 and 1984 students were from junior high schools (JHS) and senior high schools (SHS), respectively. The overall response rates for the adolescents from JHS and SHS were 82% and 74%, respectively. A total of 2786 adolescents with complete cases on the variables of interest were included in the final analysis. The dataset is available freely at https://www.who.int/ncds/surveillance/gshs/ghanadataset/en/ (accessed on 18 March 2021). We relied on the "Strengthening the Reporting of Observational Studies in Epidemiology" (STROBE) statement in writing the manuscript [20].

2.3. Study Variables

Outcome Variables

Three outcome variables were considered in the present study. Two of these three outcome variables were extracted directly from the dataset while the third variable was an index created using the first two outcome variables. The first two variables were FVs consumption. The first variable, fruit consumption, was derived from the question "During the past 30 days, how many times per day did you usually eat fruit, such as oranges, pineapple, watermelon, banana, guava, pear, sweet apple, mangoes, or pawpaw?". The response options were 1 = I did not eat fruit during the past 30 days; 2 = Less than one time per day; 3 = 1 time per day; 4 = 2 times per day; 5 = 3 times per day; 6 = 4 times per day; and 7 = 5 or more times per day. These responses were re-categorized into "Inadequate

[no fruit consumption]" for those whose response options were 1–3 (at most 1 time per day) and "Adequate [consumed fruits]" for the remaining response options. The second variable, vegetable consumption, was derived from the question "During the past 30 days, how many times per day did you usually eat vegetables, such as kontomire, garden eggs (Ghana eggplant), lettuce, cabbage, okra, alefu, bira, ayoyo, or bean leaves?". The responses were 1 = I did not eat vegetables during the past 30 days; 2 = Less than one time per day; 3 = 1 time per day; 4 = 2 times per day; 5 = 3 times per day; 6 = 4 times per day; and 7 = 5 or more times per day. The response options were dichotomized into "Inadequate [no vegetable consumption]" for those who responded that they consumed vegetables at most 1 time per day (1–3) and "Adequate [consumed vegetables]" for the remaining responses. The third outcome variable called adequate FVs consumption was derived from the dichotomized outcomes in FVs consumption, respectively. The respondents with at least an adequate fruit and/vegetable consumption were said to have adequate FVs consumption while those who reported inadequate fruit and vegetable consumption were classified as having inadequate FVs consumption. The categorization of the FVs consumption was based on the WHO requirement for FVs consumption [7,12]. A similar classification has been used in previous GSHS studies [21,22].

2.4. Explanatory Variables

A total of 20 explanatory variables were used in this study. These include age, grade, sex, hunger, soft drinks consumption, fast food consumption, physical activity, sedentary behaviors, overweight, obesity, underweight, current alcohol consumption, current tobacco use, current cigarette smoking, current marijuana use, psychological distress, peer support, parental/guardian supervision, parental/guardian connectedness, and parental/guardian bonding. The variables were not determined a priori but rather based on parsimony and significant association with fruit and vegetable consumption from previous studies [23–25]. Psychological distress was assessed using four items (loneliness, anxiety, suicidal ideation, and close friends). All four (4) items were summed. Any respondent who responded "No" to all the four items was categorized as having "low psychological distress" while the remaining responses were grouped as moderate psychological distress for those with "Yes" in any of the four items; and "high psychological distress" for those with at least "Yes" in two of the four items. Detailed questions, response options, and coding can be found in the supplementary file attached (Table S1).

2.5. Statistical Analyses

Data in the present study was analyzed using Stata software version 16.0 (Stata Corporation, College Station, TX, USA). The analysis was sectioned into three parts. First, the proportion of adolescents who had adequate fruit, adequate vegetable, and adequate FVs consumption, respectively, were determined using percentages (Figure 1). Second, Pearson chi-square test of independence was conducted to determine the relationship between FVs consumption and explanatory variables (Table 1). The variable that showed significant associations at any of the outcome variables was placed in the regression model. In the third analysis, a binomial logistic regression model was employed to examine the association between FVs and the explanatory variables (Table 2). The results of the regression analyses were presented as adjusted odds ratio (aOR). Statistical significance was set at 95% confidence interval in all analysis. Multicollinearity was checked using the Variance Inflation Factor (VIF). The mean VIF was 1.56, showing no existence/evidence of multicollinearity. All frequency distributions were weighted, while the survey command (SVY) in Stata was used to adjust for the complex sampling design of the data.
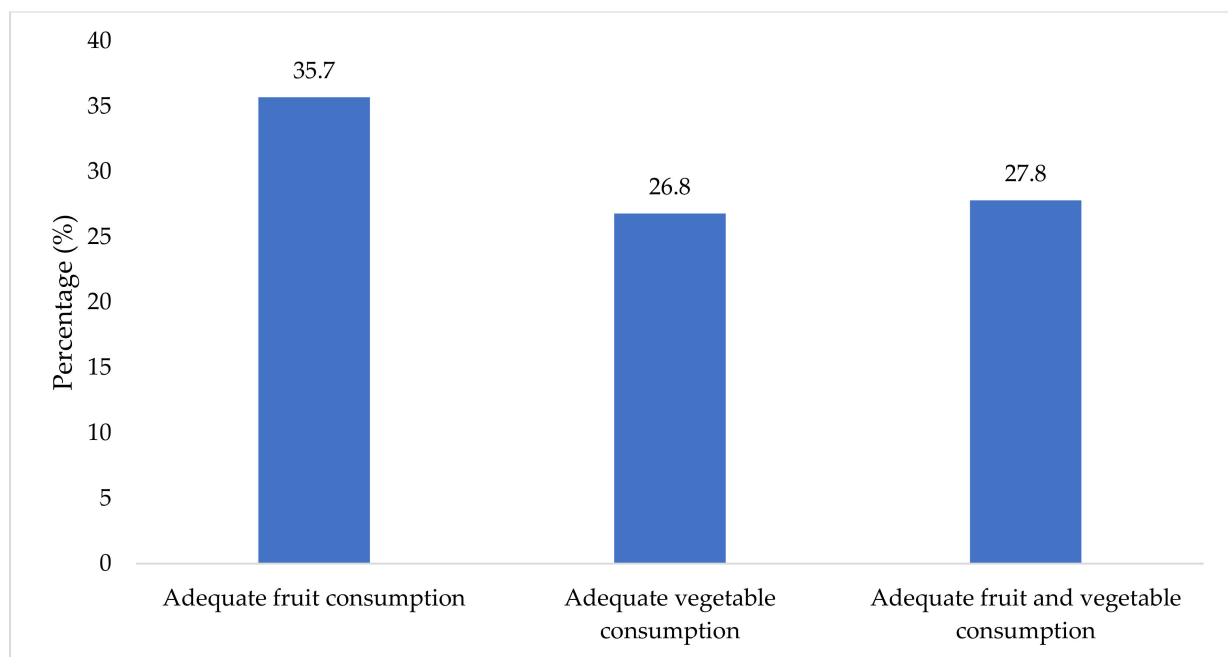
Figure 1. Prevalence of adequate fruit and vegetable consumption among the in-school adolescents in Ghana.

Table 1. Bivariate analysis of proportions of adequate fruit and vegetable consumption among in-school adolescents in Ghana (N = 2786).

Variable	Weighted N (%)	Adequate Fruit Consumption		Adequate Vegetable Consumption		Adequate Fruit and Vegetable Consumption	
		Yes	*p*-Value	Yes	*p*-Value	Yes	*p*-Value
Age			<0.001		0.088		0.002
14 years or younger	820 (29.4)	45.4		30.3		35.2	
15 years or older	1966 (70.6)	31.7		25.4		24.7	
Sex			0.097		0.002		0.002
Female	1362 (48.9)	38.2		30.4		32.2	
Male	1424 (51.1)	33.4		23.5		23.7	
Grade			<0.001		0.009		0.001
JHS	1610 (57.8)	46.1		32.7		36.1	
SHS	1176 (42.2)	21.6		18.9		16.5	
Felt hungry			0.332		0.930		0.707
No	2403 (86.2)	36.1		26.9		27.7	
Yes	383 (13.8)	33.2		26.6		28.9	
Soft drinks			<0.001		<0.001		<0.001
No	1540 (55.3)	20.1		16.6		15.9	
Yes	1246 (44.7)	55.1		39.5		42.6	
Fast food			<0.001		0.002		<0.001
No	2041 (73.3)	31.6		24.2		24.6	
Yes	745 (26.7)	47.0		34.0		36.8	

Table 1. *Cont.*

Variable	Weighted N (%)	Adequate Fruit Consumption		Adequate Vegetable Consumption		Adequate Fruit and Vegetable Consumption	
		Yes	*p*-Value	Yes	*p*-Value	Yes	*p*-Value
Physical activity			0.508		0.470		0.527
No	2215 (79.5)	36.1		26.4		27.4	
Yes	571 (20.5)	34.2		28.6		29.5	
Sedentary behaviour			0.026		0.361		0.040
No	2261 (81.2)	34.2		26.3		26.6	
Yes	525 (18.8)	42.4		29.1		33.1	
Overweight			0.545		0.547		0.547
No	2561 (91.9)	36.0		26.7		26.7	
Yes	225 (8.1)	33.0		28.7		28.7	
Obesity			0.348		0.489		0.848
No	2745 (98.5)	35.9		26.7		27.9	
Yes	41 (1.5)	26.4		33.1		25.9	
Underweight			0.606		0.829		0.289
No	2664 (95.6)	35.6		26.9		27.5	
Yes	122 (4.4)	38.1		25.7		35.4	
Current alcohol use			0.016		0.863		0.392
No	2422 (86.9)	34.9		26.9		27.5	
Yes	364 (13.1)	41.3		26.3		30.1	
Current cigarette smoking			0.069		0.301		0.999
No	2643 (94.9)	35.3		27.1		27.8	
Yes	143 (5.1)	43.6		21.7		27.8	
Current marijuana use			0.016		0.408		0.169
No	2666 (95.7)	35.0		27.0		27.4	
Yes	120 (4.3)	51.9		23.0		36.5	
Current tobacco use			0.276		0.451		0.659
No	2547 (91.4)	35.3		27.1		27.6	
Yes	239 (8.6)	40.4		24.1		29.8	
Psychological distress			0.944		0.323		0.161
Low	197 (7.1)	34.5		31.3		35.6	
Medium	1745 (62.6)	35.6		27.0		26.4	
High	844 (30.3)	36.3		25.5		29.0	
Peer support			0.035		0.184		0.182
No	1897 (68.1)	34.0		25.8		26.7	
Yes	889 (31.9)	39.5		29.0		30.3	

Table 1. *Cont.*

Variable	Weighted N (%)	Adequate Fruit Consumption		Adequate Vegetable Consumption		Adequate Fruit and Vegetable Consumption	
		Yes	*p*-Value	Yes	*p*-Value	Yes	*p*-Value
Parent or guardian supervision			0.003		0.160		0.160
No	1606 (57.6)	31.2		25.2		25.2	
Yes	1180 (42.4)	42.0		29.0		29.0	
Parent or guardian connectedness			0.292		0.307		0.307
No	1746 (62.7)	34.6		25.8		25.8	
Yes	1040 (37.3)	37.7		28.5		28.5	
Parent or guardian bonding			0.051		0.287		0.039
No	1737 (62.3)	34.0		26.2		26.7	
Yes	1049 (37.7)	38.6		27.9		29.8	

Table 2. Multivariable regression analysis on predictors of adequate fruit and vegetable consumption among in-school adolescents in Ghana.

Variable	Adequate Fruits Consumption	Adequate Vegetable Consumption	Adequate Fruit and Vegetable Consumption
	Model 1	Model 2	Model 3
	aOR [95% CI]	aOR [95% CI]	aOR [95% CI]
Age			
14 years or younger	1.0	1.0	1.0
15 years or older	1.11 [0.91, 1.35]	1.31 [0.99, 1.73]	1.13 [0.88, 1.46]
Sex			
Female	1.0	1.0	1.0
Male	0.82 [0.65, 1.04]	0.71 ** [0.57, 0.87]	0.64 ** [0.51, 0.82]
Grade			
JHS	1.0	1.0	1.0
SHS	0.34 *** [0.21, 0.55]	0.48 ** [0.28, 0.80]	0.36 ** [0.22, 0.61]
Soft drinks			
No	1.0	1.0	1.0
Yes	4.06 *** [3.23, 5.09]	2.90 *** [2.22, 3.79]	3.29 *** [2.42, 4.46]
Fast food			
No	1.0	1.0	1.0
Yes	1.45 ** [1.15, 1.83]	1.34 * [1.07, 1.67]	1.42 ** [1.13, 1.77]
Sedentary behaviour			
No	1.0	1.0	1.0
Yes	1.42 ** [1.12, 1.80]	1.15 [0.89, 1.49]	1.38 * [1.07, 1.77]

Table 2. *Cont.*

Variable	Adequate Fruits Consumption	Adequate Vegetable Consumption	Adequate Fruit and Vegetable Consumption
	Model 1	Model 2	Model 3
Current alcohol use			
No	1.0	1.0	1.0
Yes	1.12 [0.86, 1.46]	0.97 [0.64, 1.47]	1.01 [0.74, 1.39]
Current marijuana use			
No	1.0	1.0	1.0
Yes	1.27 [0.58, 2.78]	0.57 [0.32, 1.03]	0.99 [0.45, 2.20]
Peer support			
No	1.0	1.0	1.0
Yes	1.06 [0.90, 1.25]	1.06 [0.84, 1.34]	1.05 [0.87, 1.28]
Parent or guardian supervision			
No	1.0	1.0	1.0
Yes	1.35 [0.96, 1.92]	1.03 [0.76, 1.40]	1.13 [0.85, 1.51]
Parent or guardian bonding			
No	1.0	1.0	1.0
Yes	1.10 [0.88, 1.37]	1.02 [0.86, 1.24]	1.09 [0.92, 1.30]

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, aOR = Adjusted Odds Ratio; CI = Confidence Interval; 1.0 = reference category.

2.6. Ethical Consideration

Ethical approval for the GSHS was obtained from the Institutional Review Board at Middle Tennessee State University. Institutional permissions were obtained from the Ghana Health Service (GHS) and the Ministry of Education. All the ethical guidelines of the GHS Ethics Review Committee and that of the GES for involving students in studies were adhered to. Prior to the survey, written informed consent was obtained from students aged 18 and above, while written parental/guardian consent and child assent were sought from students below 18 years. The students anonymously and voluntarily completed the questionnaire.

3. Results

3.1. Prevalence of Fruit and Vegetable Consumption among In-School Adolescents

The prevalences of adequate fruit consumption and adequate vegetable consumption among the in-school adolescents were35.7% and 26.8%, respectively. Furthermore, 27.8% of the adolescents consumed adequate FVs, as shown in Figure 1.

3.2. Bivariate Analysis of Fruit and Vegetable Consumption and Explanatory Variables

Table 1 presents the results of the chi-square analysis of the FVs consumption among in-school adolescents. The results showed that adolescent age ($p < 0.001$), school grade ($p < 0.001$), soft drink consumption ($p < 0.001$), fast food consumption ($p < 0.001$), sedentary behavior ($p = 0.026$), current alcohol consumption ($p = 0.016$), current marijuana use ($p = 0.016$), peer support ($p = 0.035$), and parental or guardian supervision ($p = 0.003$), had a significant relationship with adequate fruit consumption. Adequate vegetable consumption was associated with sex ($p = 0.002$), school grade ($p = 0.009$), soft drink consumption ($p < 0.001$), and fast food consumption ($p < 0.001$). Additionally, adequate consumption of FVs was associated with age ($p = 0.002$), sex ($p = 0.002$), school grade ($p = 0.001$), soft drink consumption ($p < 0.001$), fast food consumption ($p < 0.001$), sedentary behavior ($p = 0.040$), and parental or guardian bonding ($p = 0.039$).

3.3. Multivariable Regression Analysis on Predictors of Adequate Fruit and Vegetable Consumption among In-School Adolescents

Table 2 shows the results of the multivariable binomial logistic regression analyses of predictors of adequate FVs consumption among in-school adolescents in Ghana. It was found that adolescents in SHS (aOR = 0.34, 95% CI = 0.21–0.55) were less likely to have adequate fruit consumption compared to those in JHS. The odds of adequate fruit consumption were higher among in-school adolescents who drink soft drinks (aOR = 4.06, 95% CI = 3.23–5.09), those who consumed fast foods (aOR = 1.45, 95% CI = 1.151–1.83), and those who had sedentary behavior (aOR = 1.42, 95% CI = 1.12–1.80) compared to their counterparts who did not consume soft drinks, fast foods, and had no history of sedentary behavior, respectively. Odds of adequate vegetable consumption were lower among male adolescents (aOR = 0.71, 95% CI = 0.57–0.87) and those in SHS (aOR = 0.48, 95% CI = 0.28–0.80) compared to females and those in JHS. Adolescents who consumed soft drinks (aOR = 2.90, 95% CI = 2.22–3.79) were more likely to consume adequate vegetables. Adolescents who consumed fast foods (aOR = 1.34, 95% CI = 1.07–1.67) were more likely to consume adequate vegetables. The odds of adequate FVs consumption were higher among adolescents who consumed soft drinks (aOR = 3.29, 95% CI = 2.42–4.46), consumed fast foods (aOR = 1.42, 95% CI = 1.13–1.77), and those that had sedentary behavior (aOR = 1.38, 95%, CI = 1.07–1.77). Adolescents in SHS (aOR = 0.36, 95% CI = 0.22–0.61) were less likely to consume adequate FVs compared to those in JHS. Male adolescents had lower odds of adequate FVs consumption compared to their counterpart female adolescents (aOR = 0.64, 95% CI = 0.51–0.82).

4. Discussion

This study investigated the determinants of FVs consumption among Ghanaian in-school adolescents. The study found that the proportion of adequate fruit consumption, adequate vegetable consumption, and adequate FVs consumption among in-school adolescents in Ghana were 35.7%, 26.8%, and 27.8%, respectively. Sex, grade, soft drinks, fast food consumption, and sedentary behavior were found as factors associated with adequate FVs consumption in the present study. Overall, the reported prevalence of FVs among studied in-school adolescents was only 27.8%, a finding that confirms the inadequate FVs intake reported in the general population in Ghana across recent surveys [14,17,26]. This finding is also relatively worse compared to previous estimations from other Sub-Saharan African countries; 68% in South Africa, 73% in Nigeria, 87.8% in Uganda, and 94% in Kenya [14,24,27–29]. It is possible that the availability and access to FVs are considerably limited in the country, especially beyond the main harvest season (i.e., June-August), thus requiring urgent attention and other empirical studies to ascertain the remote cause of this trend in Ghana [18,26,30]. Variations in socio-economic development and geographical restrictions relative to other mentioned countries might also be responsible for the noted differences in the prevalence of FVs intake [31].

Consistent with previous studies [32–34], current results also show that male adolescents were less likely to consume adequate FVs compared to their female counterparts. Although attributable reasons are inconclusive on the variations between females and males, it has been mentioned in the literature that women are more concerned about weight loss than men, hence may prefer more energy-deficient and high-fiber diets like fruit and vegetables [33]. Alternatively, men usually engage in higher energy-demanding tasks than females, so maybe more prone to the consumption of high-energy dense foods [35]. It has also been proven that adequate FVs can cause skin lightening through the enhancement of skin carotenoid concentration [36–38]. According to some researchers [35,39], females usually pay serious attention to their skin complexion and tone, so might use FVs consumption as a strategy to protect their skin layer and also promote their health.

In-school adolescents in the SHS grade were less likely to consume adequate fruits. Many SHS schools in Ghana rarely serve fruits as portions of diets and those who seldomly provide them do so in minute quantities as part of their regular meals in the schools because

of the huge cost implication associated with the purchase of fruits, including vegetables, especially during the off season of the main harvest period in the country [40]. The findings suggest that male adolescents should continuously be educated and encouraged to consume fruits as they provide enormous health benefits. Heads of SHSs should consider complimenting the diets of the students in SHSs with fruits to help improve the level of fruit consumption among adolescents in SHS. Schools with arable lands should be encouraged to introduce planting fruits and vegetables for their consumption. This production could possibly become a business venture to generate additional income for the schools.

Adolescents who consumed soft drinks and fast food have higher odds of consuming adequate FVs. It is reasonable to argue that the current findings appear to follow similar trends in other countries that are undergoing nutritional transition and urbanization, where healthier staple diets have been replaced with high energy-dense (i.e., fats and animal meat), saturated foods, and soft drinks amidst more FVs [18,39]. This is evident in the current study by the association between soft drinks (i.e., characterized by sugar) and fast foods (i.e., noted with fats, saturated oil) with a high probability of adequate FVs, though quite surprising. However, it is also possible that in-school adolescents who consume soft drinks and fast foods may be using adequate FVs consumption as compensatory means to provide the necessary nutrients for the maintenance of their health against chronic non-communicable diseases. It is also possible that in-school adolescents who consume soft drinks and fast foods have the affordability and access to FVs, hence are more likelihood to consume adequate FVs [41]. In-school adolescents may also adequately consume FVs to possibly reduce the risk of being overweight and/or obese due to their poor dietary habits [26,42]. This nutritional intake buttresses the impact of diet and lifestyle choices on the development of obesity [43].

In this study, sedentary behavior among in-school adolescents showed a high propensity of FVs consumption among in-school adolescents. To date, previous studies have found inconsistent results on the association between sedentary behavior and FVs intake [44,45]. This study links low physical activity or sedentary behavior with adequate FVs consumption, a finding that contradicts outcomes from previous studies [24,26,42] that found an association between unhealthy behaviors (e.g., low physical activity, binge drinking) with inadequate FVs intake. Possibly reducing or delaying the onset of cardiovascular diseases and obesity might account for the noted association between sedentary behavior and adequate FVs consumption. The inconsistencies currently dominating the literature might be due to methodological limitations or structural and geographical variations. Despite the noted associations, planned intervention programs (e.g., nutritional counseling, behavior modification strategies, exercise programs) ought to address a range of health-compromising behaviors (e.g., poor dietary habits, sedentary behavior).

Given the low level of FVs consumption among in-school adolescents in Ghana, the academic achievement of these adolescents may be hindered since cognitive and intellectual development requires adequate food nutrients for the brain to function efficiently and effectively [46,47]. Therefore, adequate nutrition should be provided for in-school adolescents in Ghana as this will help in achieving academic excellence.

Limitations of the Study

This study has some limitations. FVs consumption was measured by self-reporting based on retrospective accounts, hence might be prone to recall bias, random errors, and other social desirability concerns (e.g., under-or overreporting). Other social and context-specific permissiveness may have influenced noted findings in the current study. For example, the timing of the GDHS may either coincide within or outside the main harvest (i.e., June–September) season in Ghana, hence the availability and accessibility as well as cost of fruits and vegetables, may impact consumption. Therefore, the estimation of FVs consumption may be subjective and could affect the adequacy of servings at a particular point in time. The use of cross-sectional data did not allow assessment of changes of FVs consumption over time and further restricted the control of other factors

(e.g., cost, accessibility, availability) that might influence intake. The dataset is also relativey old.However, that is the most recent in Ghana. Furthermore, due to the study's cross-sectional design, causal conclusions between noted studied variables cannot be drawn.

5. Conclusions

The study examined the determinants of FVs consumption among Ghanaian adolescents. The finding revealed that FVs consumption among Ghanaian adolescents remains low, with sex, grade, soft drinks, fast food consumption, and sedentary behavior as the determinants of adequate FVs consumption. Pragmatic interventions (e.g., adequate health education and promotion programs; arable fruits and vegetable farming initiatives) to promote sufficient FVs consumption among in-school adolescents in Ghana seem necessary in order to improve intake. Other interventions (e.g., nutritional counseling, exercise programs) should help address the identified health-compromising behaviors (i.e., poor dietary habits, sedentary behavior) among in-school adolescents in Ghana. Policies should address identified factors that influence inadequate FVs intake among this target group in order to reduce nutrition-related health conditions such as obesity. Further studies examining accessibility, social, regional, seasonal, and geographical influences associated with inadequate FVs in Ghana using longitudinal designs are encouraged.

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