Nutrition and Dietary Supplements

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ORIGINAL RESEARCH

Zero Fruit and Vegetables Consumption and Associated Factors Among Children Aged 6–23 Months Old in Eastern Africa

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Introduction: Despite WHO and UNICEF recommending the consumption of fruit and vegetables by children as one of their indicators for evaluating infant and young child feeding practices, there is a dearth of literature about the magnitude of fruit and vegetable consumption among 6–23-month-old children in Eastern Africa. The current study adds to the scholarly discourse by providing insight into the magnitude of fruit and vegetable intake among 6–23-months-old children in East Africa.

Methods: The secondary source data analysis was conducted for 12 Eastern African countries. Twenty-three thousand seven hundred and fourteen children aged 6–23 months were included in this analysis. A multilevel statistical model with an odds ratio of 95% was fitted to estimate the strength of the association between zero fruits and vegetables and explanatory variables.

Results: Our study showed that 32.20%, with a 95% CI of 31.70–32.81, of children aged 6–23 months did not consume any fruit or vegetables. Mother's educational status [AOR= 0.77, CI: (0.69, 0.85)], [AOR = 0.75, CI: (0.68, 0.90)], [AOR = 0.49, CI: (0.37, 0.64)], husband's educational status [AOR= 0.75, CI: (0.62, 0.78)] and [AOR = 0.73, CI: (0.62, 0.82)], wealth index [AOR=0.82, CI: (0.73, 0.91), [AOR=0.78, CI: (0.69, 0.87)], [AOR= 0.77, CI: (0.68, 0.89)], [AOR= 0.67, CI: (0.56, 0.79)], Media exposure, [AOR= 0.74, CI: (0.67, 0.81)], Place of delivery [AOR=0.88, CI: (0.80, 0.97)] and child's postnatal checkup within the first 2 months [AOR= 0.83, CI: (0.76, 0.91)] were significantly associated with zero fruit and vegetables.

Conclusion: The magnitude of zero fruit and vegetables was found to be high. These findings are commendable, yet demand emphasis on interventions that target households with lower wealth indexes and integrating nutritional counseling into routine healthcare visits may help increase awareness and benefits of consuming fruits and vegetables.

Keywords: early childhood nutrition, fruit and vegetables, complimentary feeding, regression

Introduction

Throughout the course of a person's life, nutrition has a significant impact on health, and it is closely connected to cognitive and physical growth, particularly in early childhood.[1] For optimal growth and development in the first 2 years of life, children over 6 months require a nutrient-rich diet beyond breast milk alone.[2] In this critical period, particularly between 6 and 23 months, incorporating a variety of foods, including fruits and vegetables, is essential to support their physical and mental development.[3–6]

In recognition of the importance of nutrition in childhood development, the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) have developed the Infant and Young Child Feeding (IYCF) guidelines, which include various indicators such as minimum dietary diversity. These indicators are developed to identify the best feeding strategies for children.[7–9] In a recent update of the IYCF indicators, the WHO and UNICEF added a new indicator: zero

Received: 29 February 2024
Accepted: 16 July 2024
Published: 22 July 2024

vegetable or fruit (ZVF) consumption among children aged 6–23 months.[10] ZVF refers to the proportion of children aged 6–23 months who did not consume any fruits or vegetables during the day or night preceding the survey interview.[10]

Globally, while fruit and vegetable consumption falls below the recommended levels, this trend is especially pronounced in low and middle-income countries, where diets are often poor, and the intake of fruits and vegetables is markedly low.[11–14] One subcontinent-level study that utilized the ZVF indicator found that over half (47%) of children in Sub-Saharan Africa did not eat any fruits or vegetables.[15]

Beyond the short-term effects of micronutrient deficiencies and diseases, insufficient fruit and vegetable intake also raises the likelihood of developing non-communicable diseases.[16,17] Conversely, the existing scientific evidence demonstrates that eating fruits and vegetables improves cognitive and mental health and prevents the development of cataracts, coronary heart disease, stroke, diverticulosis, cancer, and depression.[18–22]

Despite WHO and UNICEF's introduction of ZVF consumption by children into their metrics for evaluating infant and young child feeding practices, there is a dearth of literature about the magnitude of ZVF consumption using the updated indicators and the associated factors among children aged 6 to 23 months in Eastern Africa. So, this study aims to address the gap in knowledge regarding the magnitude and associated factors of zero fruit and vegetable intake among young children in Eastern Africa, by leveraging data from the Demographic and Health Surveys (DHS), which provide comprehensive information on various health and demographic indicators, including dietary practices.

Methods and Materials

Study Setting and Source of Data

Based on the UN Statistics Division, the African continent has been classified into five regions. Among these five regions, East Africa is the largest region among five divisions containing 19 countries (Burundi, Comoros, Djibouti, Ethiopia, Eritrea, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Reunion, Rwanda, Seychelles, Somalia, Somaliland, Tanzania, Uganda, Zambia, and Zimbabwe). In this study, secondary analysis was performed on Demographic and Health Surveys (DHS) of East Africa. Among 19 East African nations, six (Djibouti, Somalia, Somaliland, the Seychelles, and Mauritius and Reunion) lack DHS at all. Moreover, among the remaining 13 nations, Eritrea DHS data contain surveys performed before 2010. Therefore, we stick to our analysis using DHS data from 12 nations (Burundi, Comoros, Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Rwanda, Tanzania, Uganda, Zambia, and Zimbabwe). In this study, secondary analysis was performed on the Demographic and Health Surveys (DHS) of East Africa. Among 19 East African nations, six (Djibouti, Somalia, Somaliland, the Seychelles, and Mauritius and Reunion) were collected after 2010. The current analysis was conducted using the officially authorized DHS program database, www.measuredhs.com after approval was granted via an online request stating the study's goals. The DHS program uses established procedures to ensure the collection of comparable information from every country in the world. This involves the use of standard taking assessment guides, manuals, and field techniques. The DHS conducts broadly representative household surveys and entails in-person interviews with women between the ages of 15 and 49. These surveys are useful for tracking and assessing impacts in these areas because they offer thorough information on a variety of indicators relating to population, health, and nutrition. A stratified, multi-stage, random sample sampling technique was used in the surveys. Information was gathered from eligible women in each country between the ages of 15 and 49.

Population

The study population for this study was all children aged 6–23 months in the selected catchment areas within 5 years before the survey in 12 East African countries. Children who had no data for the outcome of interest were excluded from the study. Accordingly, 23,390 children aged between 6 and 23 who fulfilled the inclusion criteria were considered for final analysis.

Variables of the Study

Outcome Variable

The dependent variable in this investigation was zero fruit and vegetable consumption. There were five indicators' (1. consumed potatoes, cassava, or other tubers; 2. consumed pumpkin, carrots, or squash (yellow or orange inside); 3. consumed any dark

green leafy vegetables; 4. consumed mangoes, papayas, or other vitamin A, fruits; and 5. consumed any other fruits), which assessed whether the child consumed any of the fruits and vegetables. From these five indicators, one dichotomous main outcome variable of the study was computed. Children who had not consumed all these five types of fruit and vegetables were recorded as 1 and 0 if they had consumed at least one of them.

Independent Variables

Independent variables were selected after reviewing previously conducted related studies. The independent variables of the study were the sex of the child, place of residence, sex of the household head, wealth index, mother's highest educational status, number of children five and under in the household, husband's educational status, media exposure, attended ANC, place of delivery, country. The four statistical models were fitted for these variables.

Data Processing and Management

STATA software version 14 was used to access data and perform statistical analysis. Before statistical analysis, the data were weighted using the sampling weight, primary sampling unit, and stratum to guarantee survey representativeness and take sampling design into account when computing standard errors to provide accurate statistical estimates.

Statistical Analysis

The description of the study participants was performed using frequencies and percentages for qualitative variables and mean with standard deviation were used to summarize the quantitative variables. Before statistical modeling, the important assumptions of logistic regression (chi-square and Multicollinearity assumptions) were checked, because participants in the same cluster had shared characteristics, the observation was dependent, and the variance was not equal across clusters. Therefore, it is important to address the violated assumption and consider advanced statistical modeling that can handle such kinds of data to ensure the reliability of the standard error and an unbiased estimate.

Multi-Level Analysis

A multi-level advanced statistical model was used to determine the correlated factors with zero fruit and vegetable consumption, considering the variability between clusters. A bi-variable multilevel logistic regression model was fitted for each independent variable, and covariates with a P-value of 0.25 were included in multi-variable two-stage logistic regression. A variable with a p-value≤0.05 was declared as a significant determinant of zero fruit and vegetables. An odds ratio with a 95% level of confidence was used to measure the strength of the relationship. The fixed effects sub-model was used to estimate the association between zero fruit and vegetables and explanatory variables. The intra-cluster correlation coefficient (ICC) with standard deviation was used to measure variation among clusters. Four different models were fitted. The first model was a model fitted without independent variables. The second model was fitted considering only individual-level variables such as Sex of the household head, Wealth Index, Number of children five and under in the household, Husband's educational status, Media exposure, Attended ANC, and Place of delivery). The third model was fitted only by including community-level variables (place of residence and Country). Finally, in the fourth model inclusive model was fitted considering both individual-level and community-level variables. The best model selection was made using Akaike and Bayesian Information Criteria (AIC and BIC).

Ethical Considerations

Demographic and health surveys (DHS) were available online. Before DHS data collection, the objectives and questionnaires were submitted, reviewed by each country's Institutional Review Board (IRB), and approved. Since the data is at the national level and the approval needs to be conducted at the country level, our local Institutional Health Research Review Committee of Haramaya University, College of Health, and Medical Science accepted national-level approval. In addition, ethical approval for each country can be shared via an online request from the corresponding author. The accessed data was held on a secure, password-protected system.

Results

Socio-Demographic Characteristics of Study Participants

A total of 23,390 records of children aged between 6 and 23 months were extracted from 12 East African countries. As illustrated in Table 1, a maximum number of children's records were from Tanzania, and a minimum number were from Comoros. Almost equal size of male and female data were extracted for analysis. Around three-fourths of children reside in rural areas. Among surveyed households, men accounted for more than 75% of the heads of household. Among children's mothers, around one-fourth of them have no formal education, and only 3.67% of them attended higher education. More than 25% of the 23,390 households have the lowest wealth index.

Table 1 Basic Characteristics of Children Aged 6–23 Months Old in East Africa

Variables	Weighted Frequency	Percentage (%)
Sex of child		
Male	12,007	50.56
Female	11,742	49.44
Place of residence		
Urban	5896	24.83
Rural	17,853	75.17
Sex of household head		
Male	18,221	76.72
Female	5528	23.28
Wealth index		
Poorest	6414	27.42
Poorer	4937	21.11
Middle	4315	18.45
Richer	3909	16.71
Richest	3815	16.31
Mother's highest educational status		
No formal education	5727	24.48
Primary	11,095	47.43
Secondary	5701	24.37
Higher	867	3.71
Number of under 5 children in the household		
No under 5 children	238	1.02
1 or 2 under 5 children	18,683	79.88
>2 under 5 children	4469	19.11

(*Continued*)

Table 1 (Continued).

Variables	Weighted Frequency	Percentage (%)
Husband's educational status		
No formal education	3943	19.30
Primary	8944	43.77
Secondary	6080	29.76
Higher	1466	7.17
Media exposure		
Yes	9788	41.87
No	13,588	58.13
Attended ANC		
Yes	1853	8.27
No	20,559	91.73
Place of delivery		
Home	7157	30.6
Health facility	16,230	69.40
Country		
Burundi	1971	8.30
Congo Democratic Republic	2647	11.15
Ethiopia	2949	12.42
Kenya	2896	12.19
Comoros	719	3.03
Madagascar	1875	7.90
Malawi	1567	6.60
Rwanda	1206	5.08
Tanzania	2517	10.60
Uganda	1460	6.15
Zambia	2829	11.91
Zimbabwe	1113	4.69

Magnitude of Fruit and Vegetable Consumption

As shown in Table 2, among the 23,714 East African countries where children aged 6 to 23 months were questioned, 32.20% with 95% CI (31.70, 32.81) consume zero fruit and vegetables; in other words, 32.26% of the children do not consume any kind of fruit or vegetables at all. 26.47% of the 23,714 children aged 6–23 months had consumed potatoes, cassava, or other tubers at some point in their lives. In addition, only 14.20% of them consumed pumpkin, carrots, or squash (yellow or orange inside), and 47.63% of them consumed any dark green leafy vegetables.

Table 2 Fruit and Vegetable Consumption Related Characteristics of Children Aged 6–23 Months Old in East Africa

Variables	Weighted Frequency	Percentage (%)
Consumed zero fruit and vegetables		
Yes	7651	32.26
No	16,063	67.74
Consumed potatoes, cassava, or other tubers		
Yes	6276	26.47
No	17,438	73.53
Consumed pumpkin, carrots, squash (yellow or orange inside)		
Yes	3368	14.20
No	20,346	85.80
Consumed any dark green leafy vegetables		
Yes	11,294	47.63
No	12,420	52.37
Consumed mangoes, papayas, and other vitamins and fruits		
Yes	5079	21.42
No	18,635	78.58
Consumed any other fruits		
Yes	5172	21.81
No	18,542	78.19

Factors Associated with Zero Fruit and Vegetable Consumption

As indicated in Table 3, multilevel logistic regression was fitted to identify the factors associated with zero fruit and vegetable consumption among 6–23-month-old East African children. The final model of multilevel logistic regression indicated that the mother's educational status, husband's educational status, wealth index, Media exposure, place of delivery, and child's postnatal checkup after 2 months were significantly associated with zero fruit and vegetable consumption.

This study's results depicted that children whose mothers have completed primary education are 23% less likely to have zero fruit and vegetable consumption. Children whose mothers have completed secondary education are 25% less likely to have zero fruit and vegetable consumption. Children whose mothers have completed higher education are 51% less likely to have zero fruit and vegetable consumption as compared to those who have no formal education. The final model showed that the odds of zero fruit and vegetable consumption were 25% [AOR= 0.75, CI: (0.62, 0.78)] times less likely among 6–23-month-old children whose fathers have primary as compared to those whose fathers have no formal education. Similarly, the likelihood of zero fruit and vegetable consumption was 27% [AOR = 0.73, CI: (0.62, 0.82)] times less likely among 6–23-month-old children whose fathers have primary and secondary educational status when compared to those who have no formal education.

Besides, the odds of zero fruit and vegetable consumption were 18% [AOR=0.82, CI: (0.73, 0.91), 22% [AOR=0.78, CI: (0.69, 0.87)], 23% [AOR= 0.77, CI: (0.68, 0.89)], 33% [AOR= 0.67, CI: (0.56, 0.79)] times less likely among 6–24-month-old children whose families had a poorer, middle, richer, and richest wealth index when compared to those who have the poorest wealth index, respectively. The current study showed that the likelihood of zero fruit and vegetable consumption was 26%

Table 3 Variable Multilevel Logistic Regression Analysis of Factors Associated with Zero Fruit and Vegetable Consumption in East African Countries from 2015 to 2018

Variables	Models			
	Null Model AOR (95% CI)	Model-I AOR (95% CI)	Model-II AOR (95% CI)	Model-III AOR (95% CI)
Maternal educational status				
No formal education		1		1
Primary		0.69 (0.62, 0.77)		0.77 (0.69, 0.85)
Secondary		0.70 (0.61, 0.81)		0.75 (0.68, 0.90)
Higher		0.49 (0.37, 0.65)		0.49 (0.37, 0.64)
Husband educational status				
No formal education		1		1
Primary		0.68 (0.60, 0.76)		0.75 (0.62, 0.78)
Secondary		0.75 (0.65, 0.86)		0.73 (0.62, 0.82)
Higher		0.94 (0.76, 1.15)		0.77 (0.62, 1.09)
Wealth index				
Poorest		1		1
Poorer		0.81 (0.72, 0.91)		0.82 (0.73, 0.91)
Middle		0.77 (0.69, 0.87)		0.78 (0.69, 0.87)
Richer		0.78 (0.68, 0.89)		0.77 (0.68, 0.89)
Richest		0.74 (0.63, 0.86)		0.67 (0.56, 0.79)
Media exposure				
No		1		1
Yes		0.73 (0.66, 0.79)		0.74 (0.67, 0.81)
Antenatal care visit				
No		1		1
Yes		0.66 (0.57, 0.76)		0.91 (0.79, 1.05)
Place of delivery				
Home		1		1
Health facility		0.72 (0.65, 0.79)		0.88 (0.80, 0.97)
Baby postnatal check within 2 months				
No		1		1
Yes		0.88 (0.81, 0.97)		0.83 (0.76, 0.91)
Place of residence				
Urban			1	1
Rural			1.50 (1.36, 1.65)	1.01 (0.90, 1.15)

(*Continued*)

Table 3 (Continued).

Variables	Models			
	Null Model AOR (95% CI)	Model-I AOR (95% CI)	Model-II AOR (95% CI)	Model-III AOR (95% CI)
Country				
Burundi			1	1
Congo Democratic Republic			3.20 (2.59, 3.95)	3.54 (2.80, 4.46)
Ethiopia			19.42 (15.76, 23.93)	18.41 (14.66, 23.12)
Kenya			4.09 (3.36, 4.98)	5.63 (4.49, 7.05)
Comoros			9.62 (7.29, 12.70)	11.21 (8.38, 15.00)
Madagascar			2.65 (2.13, 3.30)	3.10 (2.42, 3.97)
Malawi			2.27 (1.81, 2.84)	3.44 (2.68, 4.40)
Rwanda			0.95 (0.73, 1.25)	1.21 (0.89, 1.65)
Tanzania			2.86 (2.31, 3.54)	3.80 (3.00, 4.81)
Uganda			4.65 (3.72, 5.81)	6.29 (4.92, 8.05)
Zambia			3.64 (2.95, 4.49)	5.05 (3.98, 6.40)
Zimbabwe			3.76 (2.94, 4.80)	6.11 (4.62, 8.08)
Random Effects				
Community Variance	1.63	1.21	0.89	0.70
ICC%	33.30	26.90	21.32	17.67
Model Comparison				
AIC	28164.68	22,213.61	26,418.31	21,180.26
BIC	28180.83	22,339.61	26,531.13	21,400.77

[AOR= 0.74, CI: (0.67, 0.81)] times less likely among 6–23-month-old children whose families have media exposure when compared to their counterparts. Moreover, this study revealed that delivering at a health facility decreases the likelihood of zero fruit and vegetable consumption among 6–23-month-old children by 12% [AOR=0.88, CI: (0.80, 0.97)] compared to those who deliver at home. Finally, this study showed that the likelihood of zero fruit and vegetable consumption is 17% [AOR= 0.83, CI: (0.76, 0.91)] times less likely among 6–24-month-old children who attended a baby postnatal check within 2 months compared to their counterparts.

Discussion

This study investigated the zero fruit and vegetable (ZVF) consumption status of 12 East African Countries. The findings indicated that 32.2% of the children aged 6–23 months in the selected countries had zero fruit and vegetable consumption status. The proportion of children aged 6–23 months with ZVF consumption in these countries is less than that of the aggregated figure shown globally that utilized the same ZVF consumption indicator with 45.7% of children aged 6–23 months consuming ZVF, where the prevalence is highest in Central and West Africa (56.1%) and lowest in Latin America and the Caribbean (34.5%).[23]

The findings, despite being higher than the global figures,[23] indicate the extent to which children in the region are lacking these essential food groups in their diets and the need for intervention programs designed to enhance fruit and

vegetable consumption among adolescents. It also highlights that the cultivation and consumption of fruits and vegetables in the Eastern part of African regions like Ethiopia are extremely sub-optimal.[24] Studies looking into the consumption of fruits at a later age in Eastern African countries also depict that the problem does not just end at this younger age but persists throughout adolescence and adulthood.[25,26]

From the independent variables, the mother's and father's educational status stood out as significant determinants associated with ZVF. This is in line with a study conducted to assess ZVF consumption and associated factors among Children aged 6–23 months in Ethiopia.[27] Similarly, another study looking into factors associated with low consumption of fruits and vegetables by preschoolers with low socioeconomic backgrounds showed that lower paternal educational level was inversely associated with fruit and vegetable consumption among preschoolers.[28] This might be because mothers with lower educational status may lack the necessary knowledge about the importance of fruits and vegetables in a balanced diet, leading to zero consumption among their children. Similarly, the lower educational status of the mothers may result in limited exposure to a diverse range of fruits and vegetables, leading to a diminished interest or knowledge in integrating these essential foods into their children's diets.[29]

Our study showed that children from households with higher wealth indexes were progressively less likely to have zero fruit and vegetable consumption, with percentages decreasing from 18% to 33% compared to those from the poorest wealth index. This aligns with research carried out to evaluate factors associated with ZVF intake among children aged 6–23 months in Ethiopia,[27] as well as research evaluating the impact of social inequality on fruit and vegetable intake based on household and socio-demographic attributes in Argentina[30] and Thailand.[31] Additionally, it is consistent with research examining socio-demographic disparities in the consumption of vegetables, fruits, and foods from animal sources among children aged 6–23 months across 91 low- and middle-income countries (LMIC).[32] This phenomenon may be attributed to the differential access to nutritious foods, with children from middle- and high-income families having greater availability of fruits and vegetables, facilitated by their families' financial capacity to procure such items. Furthermore, the superior complementary feeding practices observed among women from households with middle to highest wealth indices may contribute to this disparity.[33] Conversely, families with lower income levels might face barriers in accessing and purchasing healthy food choices, primarily due to economic limitations, leading to a scarcity of fruits and vegetables in their children's diet. Hence, improving the financial well-being and overall socioeconomic status of households could play a pivotal role in bolstering food security and, consequently, the intake of fruits and vegetables. Additionally, advocating for improved complementary feeding practices can significantly diminish the occurrence of ZVF consumption among children.

Our study also showed that the likelihood of ZVF consumption was 26% times less likely among 6–23-month-old children whose families have media exposure than those with no exposure. This observation aligns with a study assessing trends and estimates of ZVF consumption among children aged 6–23 months in 64 countries that found that children from households with media exposure were 26% less likely to have ZVF consumption compared to those without media exposure.[23] Similarly, another study also found that children from households with access to media were less likely to have ZVF consumption.[27] Additionally, a study examining the impact of nutrition information disseminated via mass media, including booklets, the internet, and newspapers, on adolescents revealed a positive correlation between such exposure and daily intake of fruits and vegetables among this age group.[34] Additionally, evidence from another study indicated that social marketing and community-based education efforts could successfully enhance fruit and vegetable consumption among children.[35] Access to media (TV, mobile phones, and radio) was linked with a higher frequency of fruit and vegetable consumption, with TV having the highest association.[36] In general, these findings highlight the potential role of media exposure in promoting fruit and vegetable consumption among young children.

Moreover, this study revealed that delivering at a health facility decreases the likelihood of ZVF consumption among 6–to 23-month-old children by 12%, compared to those who deliver at home. This trend may reflect the educational benefits provided by health facilities, where new mothers receive guidance on the importance of a balanced diet for their children, thus reducing the instances of ZVF consumption. Furthermore, research on fruit and vegetable prescription programs within clinical settings has shown these interventions can significantly increase fruit and vegetable intake among children from low-income families, underscoring the value of healthcare environments in promoting healthier dietary habits through targeted programs and education.[37] The lower ZVF consumption among children born in health facilities may also stem from their parents' higher nutritional awareness. Parents opting for hospital births are likely to

have a better understanding of healthy diets, influencing both their choice of delivery location and their dietary decisions for their children. This pre-existing awareness could play a key role in the reduced ZVF consumption observed.

Finally, this study showed that the likelihood of ZVF consumption is 17% less among 6–23-month-old children who attended postnatal checks within the first 2 months when compared to their counterparts. This finding is in line with the findings of a study done in Ethiopia that found that children who attended a postnatal check within 2 months of birth were 17% less likely to have zero fruit and vegetable consumption compared to those who did not attend.[27] This supports the idea that attending a postnatal check can have a positive impact on vegetable and fruit consumption in young children.

This study has various strengths and limitations. One of the strengths of this study is the use of nationally representative and validated survey data from 12 countries and the use of newly developed indicator to assess vegetable and fruit consumption. However, utilizing secondary survey data comes with a few constraints, such as limited information on specific dietary practices and potential recall bias. Furthermore, evident heterogeneity across different regions within countries, driven by social, economic, and environmental influences, among others that could impact ZVF consumption, will not be captured due to data constraints.[23] The inherent limitations of the ZVF indicator are also duly recognized, including its inability to fully capture a child's overall nutritional status. This indicator, being based on the fruit and vegetable consumption reported on the day or night preceding the survey, might not accurately represent the child's regular dietary pattern. It is also susceptible to both under- and over-reporting, thus not providing a comprehensive picture of dietary habits.[38] Future research should consider incorporating more comprehensive dietary assessments by incorporating robust indicators as well as qualitative methods to gain a deeper understanding of the factors influencing fruit and vegetable intake among children in Eastern Africa.

In conclusion, this study provides valuable insights into the magnitude of ZVF intake and associated factors among children between the ages of 6–23 months in the selected East African Countries. The findings underscore the importance of addressing individual-level and contextual factors to improve vegetable and fruit consumption among young children. The magnitude of zero fruit and vegetables was obtained to be high. Several factors were found to be significantly associated with a zero fruit and vegetable intake among children aged between 6 and 23 months. These factors comprise the educational status of the mother and husband, household wealth index, media exposure, place of delivery, and whether the child received a postnatal checkup within the first 2 months. Our findings underlined that improving access to education for both mothers and husbands, interventions that target households with lower wealth indexes, and limited media exposure could play a crucial role in promoting healthier dietary habits. Moreover, the importance of integrating nutritional counseling and guidance into routine healthcare visits may help increase awareness and knowledge about the benefits of consuming fruits and vegetables.

Abbreviations

AIC, Akaike Information Criteria; ANC, Antenatal Care; AOR, Adjusted Odds Ratio; BIC, Bayesian Information Criteria; DHS, Demographic and Health Survey; ICC, Intra-class Correlation Coefficient; SSA, sub-Saharan Africa; WHO, World Health Organization.

Data Sharing Statement

The Demographic and Health Surveillance data sets are open and online accessible by providing the request online at the Measure DHS website, www.measuredhs.com, along with an objective of the study. The corresponding author will provide the datasets used in the current work upon reasonable request.

Acknowledgment

We acknowledge the Measure DHS program for permitting us to access all 12 DHS datasets.

Author Contributions

All the authors made a significant contribution to the manuscript, whatever the role where they contributed to the idea, study design, execution, data processing and analysis, interpretation, or any combination of these. Along with contributing to the article's writing, editing, or critical evaluation, they have also nominated the journal to which it will be submitted, provided their final approval for the version that will be published, and consented to be held responsible for every portion of the work.

Funding

No funding was obtained for this investigation.

Disclosure

The authors have stated that they do not have any conflict of interest with this study.

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