ORIGINAL ARTICLE

Disparities in micronutrient intake among children 6-23 months in Ethiopia: a multi-level analysis based on national survey data

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ABSTRACT

Both micronutrient deficiency and undernutrition among children are priority areas of public health concern in Ethiopia. The main objective of this study was to examine the factors associated with disparities in micronutrients intake among children 6-23 months. Data were drawn from the 2016 Ethiopian Demographic and Health Surveys (EDHS). A total of 3076 children aged 6-23 months were used for the present analysis. The outcome variable was multiple micronutrient intake, which was constructed based on the linear combination of six sets of variables (4 supplements and 2 food-based intakes). Mixed-effect Poisson regression model was used to assess the determinants of multiple micronutrient intakes. The regression results show that micronutrient intakes were lower among children of non-first birth order by 58% (IRR=0.492, 95% CI:0.441-0.550); higher for children who got antenatal care (ANC) service during pregnancy (RR=1.121 95%CI:1.027-1.224) and postnatal care service in the first two months after birth (RR=1.255, 95% CI:1.138-1.383). Other predictors included mother's age (RR=1.246, 95%CI: 1.118-1.389), parity (RR=1.538, 95% CI:1.316-1.798), maternal education (RR=1.204, 95%CI:1.089-1.331, maternal work status, household wealth, and access to the radio. The results also showed a regional disparity in micronutrient intake. Given the huge adverse impacts of poor micronutrient intake, fortification (supply side) is suggested as one of the ways to enable households to get easy access to these essential micronutrients. In conjunction with this, improving knowledge and attitude mothers through continuous behavioral change communication approaches could make a significant impact on the uptake of micronutrient supplements.

Key words: micronutrients, supplementation, infant and young children, Ethiopia

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INTRODUCTION

Infancy and early childhood, especially the first 24 months period, is a very critical window of opportunity for growth and development. This is the time when infants and young children experience rapid growth and development. Children of this age will also be the most vulnerable to malnutrition as they transit from total exclusive breastfeeding to a solid food regime. During this time, growth faltering and micronutrient deficiencies are common due to children's increased demand for nutrients relative to their energy and micronutrient intakes[1]. Today, micronutrient deficiencies cause an estimated 1.1 million of the 3.1 million child deaths that occur each year as a result of undernutrition[2,3].

Recent evidence and WHO publications emphasized the importance of promoting good nutrition (breastfeeding, diet diversity, food frequency, timely initiation of complementary feeding and micronutrient supplementation) [4–9]. Studies indicated that intake of essential micronutrients at an early age plays a significant role in reducing childhood undernutrition and mortality in Africa and other developing countries[10]. Scaling up these essential curative, preventive and promotive childhood interventions is necessary to curb childhood morbidity and mortality [11,12]. However, micronutrient deficiencies, including vitamin A, zinc, selenium, iron and iodine deficiency are still major public health concerns[13].

In Ethiopia, undernutrition and micronutrient deficiencies among children are unacceptably high. The most common forms of malnutrition in Ethiopia include acute and chronic undernutrition (low energy and/or protein intake), vitamin A deficiency (VAD), iron deficiency anemia (IDA), and iodine deficiency disorder (IDD)[14]. For example, less than 10% of Ethiopian children aged 6-59 months received iron supplements and deworming pills [15].

The very low micronutrient intake of children under the age of 24 months has several far-reaching consequences. For instance, VAD is a severe public health problem in Ethiopia affecting around half of the children 6-59 months of age in the 11 administrative regions of the country[16]. The deficiency can lead to childhood blindness, and is one of the major contributing factors to the high under-five mortality rate of Ethiopia. More than 70% of children under the age of 24 months were anemic due to poor iron intake[15]. Iron deficiency may delay muscular and nervous system development and mental performance, especially in preschool-age children. Compared to the losses suffered in the other African countries, micronutrient deficiencies coupled with undernutrition pose greater challenges to the economic and human capital development of Ethiopia. Recent figures suggest that childhood undernutrition and micronutrient deficiencies cost 16.5% of its GDP, which was equivalent to USD 4.7 billion [17]. Undernutrition and micronutrient deficiency have also been reported to be responsible for 28% of all child deaths in Ethiopia[17]. There are also recent reports about the significant impacts of micronutrient deficiency on the school performance of children in Ethiopia.

Given this, research focusing on micronutrient intakes among children is relatively scarce in Ethiopia. The very few studies conducted on this subject were based on only one or two indicators or focused on a specific region or district. Those studies emphasized the role of education, household characteristics and access to health services. To the best of the author's knowledge, there were very few attempts to use a more comprehensive measure of micronutrient intakes as an outcome variable. Further, the multilevel modeling used in the present analysis will allow us to explore the importance of social context by dividing the total variation into individuals and community/cluster levels to be assessed separately. The current study, thus, primarily aimed to assess the factors associated with disparities in micronutrients intakes among children 6-23 months in Ethiopia based on a composite outcome measure.

METHODS

The study area

Ethiopia is the second-most populous country in Africa and the 13th most populous in the world [18]. Administratively, the country is divided into nine regions and two autonomous cities. The country has an agrarian economy where agriculture accounts for more than 60% of the GDP and employs nearly 85% of the population[19]. It is also a country with almost one-quarter of its people living under severe poverty[20]. Ethiopia is dominantly a young population, where the median age in 2015 was 18.3 years. Despite a significant decline in the rate of stunting and underweight by 34.5% and 41.5%, respectively, in the past 15 years (2000-2016) [21], about half (48.2%, equivalent to 6.3 million) of children under the age of five years were malnourished [22], 24% were underweight, and 10% were wasted[15]. For the last few years, Ethiopia has been striving towards improving the status quo. The National Strategy for Infant and Young Child Feeding (IYCF) and implementation of the National Nutrition Program (NNP I and II) have been integral part of this effort [21]. The National Strategy for IYCF was developed in 2004[23]. The strategy document emphasized the importance of the first 12 months. This is the period when growth faltering takes hold due to sub-optimal infant feeding practices[23]. Reduction of VAD, and anemia; and controlling iodine deficiency were priority targets of the policy [23].

Data sources

The EDHS of 2016 collected health-related information from women of reproductive ages 15-49 [15]. It was a cross-sectional household survey that employed a stratified two-stage cluster sample design. For the present analysis, the data file of the EDHS, containing entries for 10,641 respondents who had children under five years of age, was used. The data file contains household and women's characteristics. For the present analysis, only those who had recently given birth (within three years prior to the survey date) were considered. Mothers currently pregnant were excluded from the analysis. Mothers' Permission to use the data for the present study was granted by ICF international (U.S.) and Central Statistics Authority (Ethiopia) (http://dhsprogram.com/data/Access-Instructions'). Ethical approval was obtained from the Ethical and Research Committee in the year 2018.

Measure of the outcome and exposure variables

The outcome variable of this study is micronutrient intakes of children aged 6-23 months. It is a composite combination of four key micronutrients (either through diet or supplements). The EDHS included questions asking if the youngest children aged 6-23 months living with the mother consumed foods rich in vitamin A and iron, given multiple micronutrient powder, iron and vitamin A supplements, and deworming medication. Responses for each of these indicators were collected using 'yes=1; no=0' questions. The outcome variable was constructed by summing up the responses; taking the value of '0' if a mother's response to the six indicators is "no", and 6 if mothers responded 'yes' to all the six indicators.

Micronutrient uptake is thought to depend on a set of individual parental, household, and community-level characteristics. Thus, the exposure variables in the current analysis were categorized into three major groups: Maternal and child factors (which included, birth order, mothers' education, parity, age, work status, access to information/radio), household factors (which included non-monetary wealth index, religion, and type of family structure); and a community variable (region). The wealth index was constructed based on key asset ownership, and other characteristics related to economic status[24] and was categorized into three groups.

Statistical analysis

The EDHS data are clustered (i.e. individuals are nested within households, and households are nested within enumeration areas/EAs)[24]. It is thus expected that mothers within the same cluster may have a similarity. This violates the assumption of independence of observations across the clusters, and hence, limits the use of conventional regression since an outcome may be measured more than once on the same person[25]. Thus, a mixed-effects regression model is recommended. The model is useful for data having more than one source of random variability[25]. In this analysis, level one represents the individual (children characteristics), whereas level two is the cluster (enumeration areas/ EA's). Data were analyzed using STATA version 12[26].

A mixed-effect Poisson regression model was used to assess the determinants of multiple micronutrient intakes, which takes the form of count/rate, and are skewed to the right (Figure 1). The analysis began with checking if there was any multicollinearity between the explanatory variables using tolerance test/ variance inflation factors (VIF). Using the routine Collin in Stata, a VIF >10 or mean VIF> 6 represents severe multicollinearity[27]. Then, the bivariate association between the outcome and each potential predictor was examined. All predictors statistically associated with a p-value of <0.2 at bivariate level were subsequently included in the multivariable regression models. The model selection criterion was the Akaike Information Criterion (AIC), and the level of statistical error was set to be 5%. In the final model, we used a p-value of <0.05 to define statistical significance. The ratio of Deviance and Degree of Freedom (Deviance/DF) was used to test the model fitness.[28]. The fitness of the model was also compared with a negative binomial regression model using AIC values and dispersion scores.

RESULTS

Table 1 presents the characteristics of the study participants. It is noted that female children account for a little more than 50 percent. About 20% were in the first birth order. A higher proportion of mothers had no education (61%) compared to 47% of fathers. In terms of access to health service utilization, only 34% of the mothers reported having ANC service, less than 40% delivered at health facility and only 17% reported having postnatal care service for the index child. Most of the children were living in the poorest households (44%), and a considerable fraction of mothers reported having poor access to media (72.5%). About 73% of mothers were working either for income-generating jobs or family farms during the survey.

Table 1 Background characteristics of the study participants, Ethiopia (n=3076)

Variables	No	%
Sex		
Male	1445	47.0
Female	1631	53.0
Birth order		
First	609	19.8
Second and above	2466	80.2
Age of the mother		
15-24	852	27.7
25-34	1597	51.9
34+	627	20.4
Education of mother		
No education	1873	60.9
Primary level	942	30.6
Secondary and higher level	260	8.5
Education of father		
No education	1458	47.4
Primary level	1204	39.2
Secondary and higher level	413	13.4
ANC service received *		
No	1923	62.5
Yes	1039	33.8
Place of delivery (the index child)		
Home	1884	61.3
Health facility	1191	38.7
Postnatal care services received		
No	2544	82.7
Yes	531	17.3
Parity		
0-3	1550	50.4
4-6	937	30.5
7 and above	588	19.1
Work status		
Yes	817	26.6
No	2258	73.4
Wealth index		
Poorest/poorer	1355	44.1
Middle	687	22.3
Richest/richer	1033	33.6
Religion		
Orthodox Christian	1061	34.5
Muslims	1243	40.4
Others	772	25.1

Variables	No	%
Access to radio		
Yes	847	27.5
No	2229	72.5
Polygamy*		
Yes	2624	85.3
No	293	9.5
Type of micronutrient intake*		
Iron supplement	240	7.8
Vitamin A supplement	1312	40.5
Deworming pills	277	9.0
Micronutrient powder	157	5.1
Vitamin A rich food	1162	35.9
Iron rich food	656	20.2

**The total is <100% due to missing data*

The percentage distribution of the concurrent micronutrient intake suggests that the majority of the sampled children did not take any type of micronutrient supplement or diet having vitamin A/ iron. On the contrary, only an insignificant proportion of them was reported to have taken 3 or more micronutrients. Thus, as portrayed in Figure 1, we have a right skewed distribution of micronutrient intake. The number (one, two, three….) in the horizontal axis indicate the number of micronutrient supplements taken by a child, and the y-axis indicate the corresponding percentages.

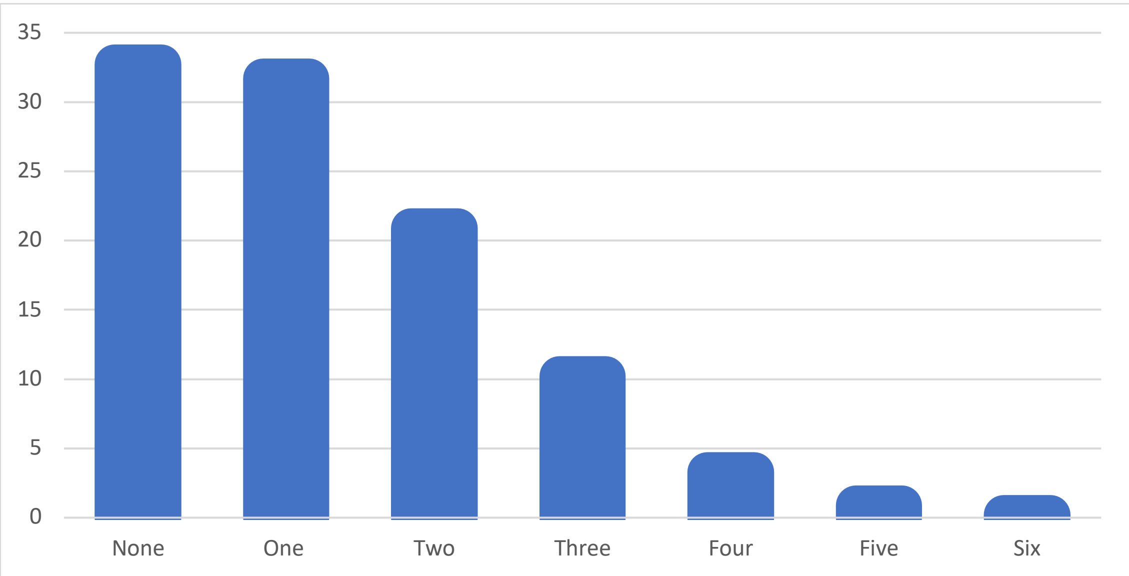

Figure 1 % distribution of multiple micronutrient intake, Ethiopia.

In table 2, the results of bivariate mixed-effect Poisson regression are presented. It is noted that all of the variables had a significant association with the outcome of interest.

Therefore, all variables were considered for further analysis in the multivariable mixed-effect Poisson regression as presented in Table 3.

Table 2 Results of bivariate mixed-effect Poisson regression assessing the association between selected explanatory variables and multiple micronutrient intakes, Ethiopia

Variables		95% CI		
	RR	Lower	Upper	p-values
Sex				
Male [RC]	1	-	-	-
Female	0.947	0.882	1.019	0.149
Birth order				
First [RC]	1	-	-	-
Second and above	0.424	0.388	0.463	<0.001
Age of the mother				
15-24 [RC]	1	-	-	-
25-34	0.734	0.674	0.799	<0.001
34+	0.671	0.601	0.749	<0.001
Education of mother				
No education [RC]	1	-	-	-
Primary level	1.695	1.553	1.851	<0.001
Secondary and higher level	2.215	1.963	2.501	<0.001
Education of father				
No education [RC]	1	-	-	-
Primary level	1.206	1.101	1.323	<0.001
Secondary and higher level	1.822	1.633	2.032	<0.001
ANC service received				
No [RC]	1	-	-	-
Yes	1.463	1.345	1.591	<0.001
Delivery at health facility				
No [RC]	1	-	-	-
Yes	1.619	1.478	1.774	<0.001
Postnatal care services received				
No [RC]	1	-	-	-
Yes	1.643	1.502	1.798	<0.001
Parity				
0-3[RC]	1	-	-	-
4-6	0.525	0.482	0.572	<0.001
7 and above	0.481	0.431	0.537	<0.001
Work status				
Yes [RC]	1	-	-	-
No	0.822	0.755	0.895	<0.001
Wealth index				
Poorest/poorer [RC]	1	-	-	-
Middle	1.306	1.164	1.464	<0.001
Richest/richer	1.651	1.484	1.835	<0.001
Religion				
Orthodox Christian [RC]	1	-	-	-
Muslims	0.555	0.483	0.638	<0.001
Others	0.939	0.813	1.085	0.397
Access to radio				
Yes [RC]	1	-	-	-
No	0.707	0.647	0.771	<0.001
Polygamy				
Yes [RC]	1	-	-	-

Variables	95% CI			
	RR	Lower	Upper	p-values
No	0.784	0.693	0.887	<0.001
Regions				
Addis Ababa [RC]	1	-	-	-
Afar	0.171	0.122	0.241	<0.001
Amhara	0.411	0.299	0.564	<0.001
Oromia	0.449	0.334	0.603	<0.001
Somali	0.161	0.117	0.219	<0.001
Benishangul	0.602	0.436	0.831	0.002
SNNPR	0.530	0.393	0.714	<0.001
Gambela	0.738	0.533	1.020	0.066
Harari	0.651	0.462	0.917	0.014
Tigray	0.828	0.614	1.117	0.216
Dire Dawa	0.803	0.569	1.133	0.211

N=3105, No of groups=621; minimum and maximum observation per group 1-15
Note: RC= Reference Category; RR= Rate Ratio; CI= Confidence Interval

In Table 3, the multivariable mixed effect Poisson regression is presented. The goodness of fit for the model was checked using the ratio of Deviance and Degree of Freedom (D/DF). The result showed that there was no substantial overdispersion i.e. the ratio of Deviance /DF is closer to unity (1). The output was also compared with a Negative Binomial (NB) regression model to see if the latter fits the data better. However, the estimated dispersion coefficient of the NB regression coefficient (0.714; 95% CI: 0.652- 0.782) suggested that the mixed-effect Poisson regression was more appropriate. Further, comparing the AIC of the two competing models suggested that the mixed effect Poisson regression had a slightly lower AIC (18102.44) compared to the AIC of the NB regression model (AIC= 18779.43).

The analysis began with only a random effect model to examine the variations of micronutrient intake score among children clustered together within each EA before considering individual-level variations. The random effect model had significant variance (0.243; CI:0.205-0.290). A covariate effect was interpreted as: for every one-unit increase in the covariate, there will be a multiplicative effect of e^{β} (denoted as RR) on the expected mean of micronutrient intake score.

Table 3 Results of multivariable mixed effect Poisson regression for predictors of multiple micronutrient intake, Ethiopia.

Variables	95% CI			
	RR	Lower	Upper	p-values
Sex				
Male [RC]	1	-	-	-
Female	0.941	0.874	1.013	0.104
Birth order				
First [RC]	1	-	-	-
Second and above	0.492	0.441	0.550	<0.001
Age of the mother				
15-24 [RC]	1	-	-	-
25-34	1.246	1.118	1.389	<0.001
34+	1.538	1.316	1.798	<0.001

Variables	95% CI			
	RR	Lower	Upper	p-values
Education of mother				
No education RC	1	-	-	-
Primary level	1.204	1.088	1.331	<0.001
Secondary and higher level	1.109	0.956	1.286	0.172
Education of mother				
No education RC	1	-	-	-
Primary level	0.981	0.889	1.082	0.700
Secondary and higher level	1.098	0.966	1.247	0.152
ANC service received				
No RC	1	-	-	-
Yes	1.121	1.026	1.224	0.011
Child was delivered at health facility				
No RC	1	-	-	-
Yes	1.103	0.993	1.224	0.067
Postnatal care services received				
No RC	1	-	-	-
Yes	1.254	1.138	1.383	<0.001
Parity				
0-3RC	1	-	-	-
4-6	0.665	0.598	0.739	<0.001
7 and above	0.555	0.479	0.644	<0.001
Work status				
Yes RC	1	-	-	-
No	0.897	0.823	0.979	0.014
Wealth index				
Poorest/poorer RC	1	-	-	-
Middle	1.222	1.088	1.372	0.001
Richest/richer	1.212	1.082	1.358	0.001
Religion				
Orthodox Christian RC	1	-	-	-
Muslims	0.854	0.734	0.994	0.041
Others	0.945	0.808	1.105	0.478
Access to radio				
Yes RC	1	-	-	-
No	0.909	0.828	0.999	0.047
Polygamy				
Yes RC	1	-	-	-
No	0.918	0.811	1.038	0.173
Regions				
Addis Ababa RC	1	-	-	-
Afar	0.530	0.379	0.742	<0.001
Amhara	0.904	0.674	1.213	0.501
Oromia	1.085	0.822	1.431	0.565
Somali	0.605	0.440	0.831	0.002
Benishangul	1.442	1.072	1.938	0.015
SNNPR	1.160	0.876	1.537	0.301
Gambela	1.329	0.979	1.804	0.067
Harari	1.229	0.902	1.677	0.191
Tigray	1.441	1.101	1.886	0.008
Dire Dawa	1.464	1.069	2.005	0.017

N=3105; No of groups=621; minimum and maximum observation per group, 1-15
Note: RC= Reference Category; RR= Rate Ratio; CI= Confidence Interval

Table 3 presents the results of multivariable Mixed-effect Poisson regression. The results indicated that, after controlling other variables, the mean score of micronutrient intake was lower among children of non-first birth order by 58% (e^{β}=0.492, 95% CI:0.441-0.550) compared to first birth orders. The association between health service utilization and micronutrient intake was strongly significant ($p<0.05$). The expected mean score of micronutrient intake was higher for children who got ANC service during pregnancy (RR=1.121 95%CI:1.027-1.224). Similarly, children who had postnatal care service in the first two months after birth had higher expected mean score of micronutrient intake (RR=1.255, 95% CI:1.138-1.383). The expected mean score of micronutrient intake decreased by 33% and 44% for children born from mothers of 4-6 and 6+ parities.

The expected mean of micronutrient intake was 1.24 and 1.54 times higher for children born from mothers of age 25-34 and 34+(RR=1.246, 95%CI: 1.118-1.389 & RR=1.538, 95% CI:1.316-1.798, respectively) compared to the younger women (15-24). Children born from mothers with primary education had a higher expected mean of micronutrient intake (RR=1.204, 95%CI:1.089-1.331) compared to those with no education.

Children living with non-working mothers had lower expected mean score of micronutrient intake. On the other hand, the expected mean became higher for those residing in more affluent households, and those in households with no households with access to radio. The result further showed regional disparity in micronutrient intakes (putting the capital city, Addis Ababa, as reference). While Afar and Somali regions showed lower expected mean scores, children residing in the other three regions (Tigray, Dire Dawa and Benishangul Gumuz) had higher expected mean scores of micronutrient intake compared to the reference region.

DISCUSSION

This study was primarily aimed at assessing the disparities in micronutrient intake among children 6-23 months. It was found that the micronutrient intake among young children was low. For instance, only less than 10% of children took iron follicles, vitamin A (40.5%), deworming pills (9%), and micronutrient powder (5.1%.). Micronutrient-rich foods were consumed by a much smaller segment of the population: only 36% and 20% of the children 6-23 months consumed meat, vitamin A and iron rich foods during the survey. The very poor diet diversity is strongly associated with risks of deficiencies of essential micronutrients such as vitamin A, iron and zinc in young children[29].

The analysis indicated that micronutrient intake among children was associated with a wide range of individual, household, and community variables. Birth order of the index child, age of mother, maternal education and work status, paternal education, parity, access to radio, access to key health services (such as ANC and postnatal care) are individual variables determining the expected mean score of micronutrient intake. Among the household variables, religion and household wealth index appeared to be significant determinants. Region was the only community variable having a significant association with concurrent micronutrient intake.

We found that children in the second and above birth order are less likely to take multiple micronutrient intake. This could be due to the additional attention given to the first birth. Most mothers use health services (ANC, delivery and postnatal care) for first births, where they usually get nutrition counselling and supplementation of micronutrients.

The expected mean of multiple micronutrients consumption varied by mothers' parity. Children from mothers of higher parity had a lower mean score of micronutrient intake. This finding may be related to the responsibility of preparing meals or the lower attention given to food or individuals in families with many children[30].

The expected mean score of micronutrient intake was higher among children of educated mothers compared to those who had no education. Studies in Ethiopia and elsewhere indicated that mothers who attended primary and secondary schools and above are more likely to practice appropriate feeding, including micronutrient intake, compared to those mothers who have no formal education[31–37]. The lack of formal schooling may pose a potential challenge on knowledge reception capacity and translation of interventions directed at improving maternal and child nutrition as well as child caring practices[38]. A related variable, working mothers are more likely to access multiple micronutrient intake. Both education and work status of mothers usually signify women's empowerment level in society. Recent research conducted in Sub-Saharan African countries showed that the overall empowerment of women was positively associated with multiple IYCF practices in Mali, Rwanda, and Sierra Leone[39].

There is also a growing interest in examining the association between a mother's health service utilization and micronutrient intake/feeding practices. Interestingly, we found a strong association between access to health service utilization (ANC and postnatal care) and micronutrient intake. Recent studies in Ethiopia[31] indicated a significant association between antenatal care visits and diet diversity and feeding practice. This finding also agrees with the studies conducted in Nigeria and five Asian countries[34,36] where inadequate antenatal care was associated with inappropriate feeding. The WHO recommends ANC visits of at least four times for normal pregnancies. Antenatal visits by mothers are not only beneficial in terms of avoiding adverse pregnancy outcomes (pregnancy complications), but it's also an important entry point for the delivery of messages on essential nutrition actions (ENA) through the current health extension program (HEP) [40].

Access to media (especially radio) plays an important role in promoting healthy eating and nutrition in various ways. In the present study, mothers with better access to the radio had a higher expected mean of scores for micronutrient uptake by their children. Despite only a third of households in Ethiopia having access to the radio, the impacts on mothers' knowledge and attitude on childcare practices could be great. In studies conducted in Mexico, mass media has been successfully used to promote food-based supplementation[41].

Strength and limitations

The generalizability of the findings to a larger population is one of the major strengths of this study. Further, one unique feature of the study is that most of the exposure variables analyzed have not been addressed much in previous studies. Given that very limited studies were conducted on the subject, the results of the study will serve as good reference points for researchers and policy makers. The main drawback of the study is that it cannot draw a causal/temporal relationship between the exposures and outcome of interest as the analysis was based on cross-sectional data. As the data were generated based on the reports of women respondents, most of whom had no formal education, there might be some under reporting of some key variables and differential recall bias which may create underestimation/ overestimation of the exposure and outcome variables of interest. Further, our model did not include some important confounding variables (such as frequency of health education, distance from health facilities etc.) due to the lack of appropriate variables in the data set.

CONCLUSION AND RECOMMENDATIONS

The findings of this study are based on 3076 children aged 6-23 months. The study concluded that micronutrient intake among young children was unacceptably low. A wide range of individual, household and community variables were found to predict the expected mean score of micronutrient intake in Ethiopia. Maternal status (education and work status), access to health services (ANC and postnatal care), media access, household wealth, religion and place of residence (region) were the most important predictors. Given the huge adverse impacts of poor micronutrient intake (especially in increasing the prevalence of stunting, morbidity, and mortality), the concerned authorities at local and regional levels should pay more attention to both demand and supply side factors. Increasing the micronutrient content through fortification could be a good way to ensure that households get easy access. In conjunction with this, improving knowledge and attitude of mothers through continuous behavioral change communication approaches could make a significant increase in the uptake of micronutrient supplements.

Finally, future studies may consider making an in-depth analysis of more explanatory variables of micronutrient intakes, which are not addressed in this study (such as eating behavior, child health and morbidity status, frequency of health education etc.).

DECLARATIONS

Ethics approval and consent to participate

The DHS took informed consent from respondents prior to the administration of the questionnaire. Permission to use the data for the present study was granted by the DHS program (U.S.) and Central Statistics Authority (Ethiopia).

Consent for publication

NA

Availability of data and material

The datasets used for this study are made available from ICF international/ DHS program at https://dhsprogram.com/data/Access-Instructions.cfm. Thus, administrative permissions were required to access the raw data from this organization. Public access to the database is open upon permission.

Competing interests

The author declare no competing interest.

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