

Prevalence and Factors Associated with Vitamin A Rich Foods Consumption among Children Aged 6-59 Months in Hawi Gudina District, Eastern Ethiopia

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Abstract

Background: Vitamin A rich foods are important for children under the age of five years due to their increased physiological needs for growth and development. However, the magnitude of vitamin A rich foods consumption among children aged 6-59 months is not well studied and the determinant factors are not exhaustively identified.

Objectives: To assess the prevalence and factors associated with vitamin A rich foods consumption among children aged 6-59 months in Hawi Gudina District, Eastern Ethiopia from December 1 to 30, 2024.

Method: Across-sectional study was conducted among 401 randomly selected mother-child pairs in Hawi Gudina District, Eastern Ethiopia, 2024. A multistage sampling technique was used to select the study participants. Data were collected by using interviewer-administered questionnaire. Frequencies, percentages and mean score with standard deviations were generated to describe participants and report univariate outcomes. Consumption of vitamin A rich foods was assessed using a 7 days dietary recall. Logistic regression analysis was applied to identify determinant factors contributed to child vitamin A rich foods consumption practice.

Results; The overall prevalence of vitamin A rich foods consumption among children was [28.4% (95% CI: 24.2%, 33.0%)]. Family size of ≤ 4 [AOR=3.48 (95%CI: 1.15, 6.12)], child age of 48-59 months [AOR=2.59 (95%CI:1.08, 6.24)], maternal age of 30-39 years [AOR=3.25 (95% CI:1.37,7.69)], maternal higher education/college or above [AOR=1.24 (95%CI: 1.07, 2.69)], medium [AOR=2.82 (95%CI: 2.10, 6.18)] and rich [AOR=3.42 (95%CI: 2.13, 7.52)] household wealth index and household food security [AOR=1.97 (95%CI:1.00, 3.89)] were significantly associated with higher odds of vitamin A rich foods consumption among children aged 6–59 months.

Conclusions: The study indicated low magnitude of vitamin A rich foods consumption among children aged 6-59 months. Few family sizes, middle-aged mothers and higher maternal educational status, increase in child age, medium and rich wealth index, and household food security were the factors significantly and positively associated with consumption of vitamin A rich foods. Attention must be given to improve the socioeconomic status, maternal education and health care service delivery to enhance the consumption of vitamin A rich foods among children.

INTRODUCTION

Vitamin A is one of the essential vitamins that is vital for enhancing reproduction and vision, as well as for preventing blindness and infection (Sherwin et al., 2012;Song et al., 2023). It has also numerous important functions such as preserving the intestinal, respiratory, urinary tracts and the surface of the eyes, as well as for proper functioning of the immune system (Smith and Saul, 2012).

Vitamin A rich foods are especially important for children under the age of five due to their increased physiological needs for growth and development. During the first five years of life, children experience rapid physical growth, organ development, and immune system maturation, all of which require adequate vitamin A for proper functioning (WHO, 2009).

The best sources of preformed vitamin A are foods derived from animals such as breast milk, glandular meats, liver and fish liver oils, egg yolk, whole milk, and other dairy products. Plant sources rich in pro-vitamin A include dark green leafy vegetables, carrots, pumpkins, sweet potatoes, yams, watermelon, and yellow or orange fruits like papaya, mango, and squash (WHO, 2011;Combs Jr, 2016). Much of the vitamin A (provitamin A) in developing countries are obtained from plant sources, as livestock sources are inaccessible for most of the rural poor (Mbabazi et al., 2020).

In developed countries, animal-source food containing vitamin A accounts for nearly 65% of total vitamin A consumption, and plant-source food accounts for 35%. However, in developing countries, 70–90% of vitamin A is consumed as a pro-vitamin A carotenoid, because plant based foods are more affordable than animal products. Several studies conducted in these regions have shown that children often did not consume enough vitamin A-rich foods (Zongo et al., 2017;Kananu et al., 2020;Wolde and Tessema, 2023). In 51 low and middle-income countries (LMIC) 55%, and in Africa, 49% of children consumed vitamin A rich foods (Karlsson, 2021;UNICEF, 2022).

Studies conducted in Bangladesh and India, documented low dietary vitamin A intakes by children and that most of the vitamin A intake was derived from plant sources (Talukder et al., 2000;Suri et al., 2017). In Ethiopia, a study on children aged 6–23 months found that 38.99% of children had an intake of foods rich in vitamin A in the last 24 hours (Demsash et al., 2022). Another study among children aged 6–59 months in Dembia District found that 36% of them had consumed food rich in vitamin A in the last 7 days (Tariku et al., 2016). One in ten children consume meat, fish, shellfish, poultry or eggs (CSA, 2006).

Children who did not consume vitamin A rich foods were more likely susceptible to vitamin A deficiency disorders (VADD), blindness from Keratomalacia and measles (Hussey and Klein, 1990), malnutrition, anemia and missing of basic child health intervention like immunization and vitamin A supplementation (Semba et al., 2010). Globally, around 190 (33.3%) million, in Africa 56.4 (44.4%) million preschool children were vitamin A deficient (WHO, 2009). About 37.6% of under five years children were suffering from subclinical vitamin A deficiencies in Ethiopia (Haidar, 2011).

Inadequate consumption of vitamin A rich foods might be due to various interrelated factors, including having young mother's (Semba et al., 2010), being male in gender, poor living standard, living in rural area and dry environment, maternal and child age (Semba et al., 2010), low socio-economic status (Sofia Vilela, 2019), low maternal education (Kebede et al., 2022). In addition to these, inadequate production of vitamin A rich foods, lack of income to purchase, unavailability of vitamin A rich foods in markets, large family size and illness (Demissie T, 2009;UNICEF, 2019), low parental media exposure were also presumed as a contributing factors to the low consumption of vitamin A rich foods (Tiruneh et al., 2021;UNICEF, 2022)

Few studies have shown that there were poor consumption of vitamin A rich foods among 6–59 months aged children in Ethiopia (EDHS, 2019;Moroda et al., 2022). Most existing studies focus narrowly on under two years age children, pregnant or lactating mothers (Abebe et al., 2014;Jemberu Y, 2017;Aserese et al., 2020). This study, therefore, aims to assess the prevalence of vitamin A rich foods consumption and associated factors among children aged 6–59 months in Hawi Gudina District, Eastern Ethiopia. The finding helps mothers and their children in prevention and control of the risks associated with the inadequate consumptions of foods rich in vitamin A. It has paramount importance for the government, local authorities and development actors to design appropriate and effective interventions in Ethiopia and the study setting.

Methods and Materials

Study Area and Period

A community-based cross-sectional study design was conducted among children aged 6–59 months in Hawi Gudina District from December 1–30, 2024. Hawi Gudina District was one of the pastoralist districts found in West Hararghe Zone. Rimeti town was the center of the district. It was found at 486 KM from Addis Ababa, capital city of the country and 186 KM from Chiro, capital town of the zone. The total population of the district in 2023 was 120,790 with female population 61603 (51%) and male 59187 (49%), under 1 year old children 3889, under 5 years children 19326, 6–59 months age children 18118 and 25165 households. The district had five health centers, 32 health posts and 6 private clinics that served the population of the district and neighboring districts. The major food products are grain crops like wheat, maize, sorghum, bean, and other legumes. Potato, spinach, lettuce, cabbage, kale, pumpkin, and fruits available at the study area include mango, avocado, banana and orange.

Study participants and sampling

All randomly selected children aged 6–59 months in the selected kebele of Hawi Gudina District were the study populations, and all children aged 6–59 months in the selected kebele and had mother or caretaker at home during data collection time were considered as inclusion criteria. Children who were very sick, had a mental problem and lived in the area for less than six months were excluded from the study.

The minimum sample size required for the study was determined by using a single population proportion formula with the following assumption; 5% margin of error (d), 95% Confidence Interval (CI), 20% proportion of children age 6–59 months consuming vitamin A rich foods (Yadav et al., 2021), 10% non-response rate and 1.5 design effect. This resulted in a sample size of 406. The sample size for the factors associated with VARF consumption was determined by using Epi-info statcalc v 7.2 by considering the following assumption: 80% power of the study, 95% confidence level, 31.42% proportion of children age 12–17 months had not consumed vitamin A rich foods and AOR = 0.47 (Jemberu et al.,

2017), 10% non-response rate and design effect 1.5. This resulted in a sample size 338. Finally 51% proportion of children from highest wealth quintile consumed adequate vitamin A rich foods, 0.421 AOR (Kebede et al., 2022) with 95% confidence level, 10% non-response rate and 1.5 design effect, minimum of 200 study participants were required. Finally, comparing the three sample sizes, the largest sample size was taken 406.

Multistage sampling procedure followed by systematic random sampling procedure was implemented for sample selection. Initially, the district has 32 kebeles (small administrative unit in Ethiopia). The district was also divided into urban and rural kebeles. Accordingly, there were 30 rural and 2 urban kebeles from which 9 rural and 1 urban representative kebeles were selected by simple random sampling technique. The calculated sample (406) was proportionally distributed to the ten-selected kebeles in consideration of their population size. In the second stage, eligible households with children age 6–59 months in the selected kebele were identified from health posts family folder. Finally, the sampling fraction (k) was calculated by dividing total number of eligible households across all selected kebeles by the total sample size to calculate the sampling interval. Based on this, study participants were selected using a systematic random sampling technique at every 24th interval ($K = 9796/406 \approx 24$). From each household, one study subject was selected and where there more than one eligible study subject in the household, only one child was selected by lottery method.

Structured questionnaire was adapted from related different literatures used to collect data from mother-child pairs (Persson, 2001; EDHS, 2019). These questionnaires were drafted in English and translated into Afaan Oromo and then back to English. The questionnaire comprised various sections including socio-demographic characteristics, reproductive and health care related factors and dietary factors. These were analyzed to determine the prevalence and the associated factors with child vitamin A rich foods consumption.

In this study, the Helen Keller International food frequency questionnaire (HKI) (Rosen et al., 1993) was used to evaluate frequency of intake of vitamin A rich foods with modifications to the local context. The tool has twenty-eight different food items. Among the twenty-eight food items, twenty are available in the study area and are consumed by society. Only major sources of vitamin A, ≥ 100 -retinol equivalent (RE) were taken into consideration. The food items selected for the analysis of the consumption of foods rich in vitamin A were categorized into seven groups. Each food group was scored 0 if not given to the child and scored + 1 if if the respondent reported that the child had took at least one of those vitamin A rich foods item in the previous week (Persson et al., 1998; El-Arab et al., 2002).

The child's dietary diversity score was calculated as the sum of the number of different food groups consumed by the child in the 24 hours preceding the survey. The dietary diversity score ranges from zero to seven, where zero represents non-consumption of any of the food items and seven represents the highest level of dietary diversification. The seven food groups included 1.cereals, roots and tubers, 2.legumes and nuts, 3.dairy products (milk, yogurt), 4.flesh foods (meat, fish, poultry, and liver/organ meats), 5.eggs, 6.vitamins A rich fruits and vegetables 7.others fruits and vegetables. Children who

consumed at least four out of the seven food groups within a 24-hours recall period were considered to have adequate dietary diversity (WHO, 2021).

Nutrition knowledge of mothers was assessed using a scoring system based on responses to 9 nutrition-related standardized questionnaires. Finally, mothers with mean score of 4.5 or above were considered as having 'good knowledge' and those with less than the mean score were considered as having 'poor knowledge'(Berhe, 2017).

Similarly, mothers were asked for the history of their child illnesses include cough, diarrhea, eye and skin infections. The overall illness refers to being ill regardless of types, episode, and the severity of illness in the last two weeks preceding the survey (Andago, 2004;Demissie T, 2009).

Household Food Insecurity Access Scale (HFIAS) measurement tool developed by the Food and Nutrition Technical Assistance (FANTA) project was used to assess the household food security status of households (Coates et al., 2007).

Wealth index was computed as a measure of household wealth using principal component analysis (PCA), a method typically used to reduce the dimensionality of multiple factors in a dataset (Jolliffe and Cadima, 2016).

Data collections were conducted over a period of four weeks by five diploma holder nurses supervised by two-health officers. Data were collected from mothers or caretakers with children aged 6–59 months by using questionnaire via face-to-face interview. Five percent of the questionnaires were pretested in areas not included in the actual study and appropriate modification was made after the pre-testing.

Mothers with children aged 6–59 months were interviewed to provide information regarding child's vitamin A rich foods consumption status and the associated factors. In a situation where eligible study subject temporarily absent at the selected house during the interview, two repeated visits were done and otherwise, an adjacent house would be substituted. The interview took around 30 minutes for each participant.

Study Variables

Dependent variables

The consumption of vitamin A rich foods was the outcome variable, dichotomized as "yes" if participants consumed at least one among the seven vitamin A rich foods otherwise "No". These food groups were i. Eggs, ii. Meat (beef, pork, lamb, chicken), iii. Pumpkin, carrots, and squash, iv. any dark green leafy vegetables, v. mangoes, papayas, and others with vitamin A fruits, vi. Liver, heart, and other organs and vii. Fish or shellfish (Gebremedhin et al., 2021;Demsash et al., 2022).

Independent variables

Socio-demographic factors

Residency, family size, child age and sex, birth order, numbers of under five years children, parent's occupation and educational level, maternal age and marital status, household head and wealth index,

Reproductive and health care related factors

Parity, gravidity, antenatal care, place of delivery, postnatal care, maternal knowledge on VARF, child vaccination status, deworming and morbidity in the last two weeks,

Dietary factors

Breast-feeding status, complementary feeding initiation time, child meal frequency, dietary diversity, food security level, and household's home gardening were included in this study.

Operational Definitions

Vitamin A rich foods consumption

if the respondent reported that the child had eaten' at least one among the seven VARF, we considered "yes = 1"; otherwise "no = 0" within the previous seven days before the study (Demsash et al., 2022).

Wealth index: Households are given scores based on the number and kinds of goods they own. These scores are derived using principal component analysis. Households were first ranked into quintiles and then regrouped into three categories: poor wealth index (lowest and second wealth quintile), medium wealth index (middle quintile), and rich (fourth and highest quintiles) (Rutstein, 2015;Wuneh et al., 2019). A detailed explanation of the weighting procedure can be found in the EDHS methodology report (EDHS, 2016).

Maternal knowledge

on vitamin A rich foods were determined using nutrition-related standardized questionnaires (nine items).Then, if the mothers correctly answer above the mean of knowledge questions, she was considered as having a good knowledge; otherwise, she has a poor knowledge (Nti et al., 2012;Adem et al., 2024).

Child vaccination status

was determined from the child's immunization card or, if the record was not available, by maternal recall. Children were classified as fully vaccinated if they had received all basic vaccine in line with the national schedule, partially vaccinated if they had received some but not all and not vaccinated if they had not received any vaccine (Semba et al., 2010).

Child dietary diversity

considered adequate if the children aged 6–59 months consumed food and drink from at least four from seven food groups in the preceding 24 hours of the interview (WHO, 2021).

Child minimum meal frequency

was determined by asking the mother how many times the child took solid, semi-solid, or soft foods in the 24 h preceding the survey. Accordingly, two or more times for breastfed infants 6–8 months of age, three or more times for breastfed children 9–23 months, four times for non-breastfed children 6–23 months and for 24–59 months four and above per day were considered as the children received the minimum meal frequency (WHO, 2008)

Household food insecurity: A situation that occurs when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life (Napoli M, 2011). Based on HFIAS score, household food insecurity can be categorized into four levels: Food secure, if the household scores 0 or 1, mild food insecure, if the household scores from 2 to 8, moderate food insecure, if the household scores from 9 to 16, severe food insecure, if the household scores from 17 to 27 (Coates et al., 2007).

Data Quality Control

In order to assured the quality of data, the following measures were undertaken. Pretest had done on 5% of the random samples (20 participants) one week before the actual study to ensure internal consistency of the instrument. After collecting the pretest data, each individual questionnaire response were checked for any potential problem and modification were made accordingly. The questionnaire was prepared in English and translated into Afaan Oromo (local language) and then back into English by language expert.

Training was given to data collectors on the objective of the study, data collection process and relevance of the study prior to data collection. Each questionnaire was coded with a unique identification number. Throughout the course of the data collection, data collectors were supervised at each site. The data was checked for completeness on site and before data entry. Double data entry was performed and the data were crosschecked to ensure consistency. Finally, after checking for data completeness, Epi-Data was utilized for data entry.

Data Processing and Analysis

Data had been coded, entered and cleaned by using Epi-data software version 4.6 and exported to statistical software packaging for social science (SPSS) version 26.0 for analysis. Descriptive statistics were performed to compute summary statistics and information was presented in the table and text such as frequencies, percent, central tendency, and standard deviation.

Household food security was analyzed using Household Food Insecurity Access Scale (HFIAS). The tool includes nine questions with frequency of occurrence responses (rarely = 1, sometimes = 2, often = 3). The total score (0–27) was calculated and households were then classified as food secure (0–1) or food insecure (2–27) based on the scale.

Household wealth index was constructed by using Principal Component Analysis (PCA). Ownership of each asset was given a score of “1” and non-ownership was given a score of “0”. Principal component analyses were conducted to generate wealth index after checking all assumptions such as sample adequacy ($KMO \geq 0.5$, $antiimage \geq 0.5$ and $communality \geq 0.5$, Bartlett's test of Sphericity ($P < 0.5$) and absence of variable with complex structure. The wealth index score was then ranked into tertile as the highest tertile was taken as rich, the middle was the medium and the lowest tertile was taken as poor.

Bivariate analysis between each explanatory variable and the outcome variable was done to determine the variables to include in the multivariable model. Explanatory variables that were significantly associated with the outcome variable at P value less than 0.25 were included in the multivariable logistic regression model, to identify independent determinants of vitamin A rich foods consumption. The model fitness was evaluated using the Hosmer and Lemeshow goodness-of-fit test (p -value = 0.256), and multicollinearity was assessed using variance inflation factor (VIF). $VIF < 5$ and tolerance test > 0.1 was used as a cut-off point for no multicollinearity. To assess the significance of relationships, crude and adjusted odds ratios with the corresponding 95% confidence interval were employed, and p -value < 0.05 was regarded as statistically significant (Berhe, 2017).

Ethical Considerations

The study was conducted following the Helsinki Declaration of Research involving human subjects (CIOMS & WHO, 1993). The study was approved by Haramaya University, College of Health and Medical Sciences, Institutional Health Research Ethics Review Committee (IHRERC) Ref. No. IHRERC/088/2024.

Study participants were adequately informed about the purpose, method and benefit of the study. Using a standard consent form, Informed, Voluntary, Written and Signed Consent was received from each study participant before interview.

Results

Sociodemographic characteristics

Among 406 mothers-child pairs approached, 401 consented to take part in the study with response rate of 98.8%. The mean ($\pm$ SD) age of mothers was 28.23 (± 5) years, and majority of them (79.8%) were between 20 and 39 years. Most mothers, [283 (70.6%)] had no formal education, with only [21 (5.2%)] reaching higher education and near to half [201 (50.1%)].

The mean ($\pm$ SD) age of the children was 25.25($\pm$ 14.8) months, with the majority [266 (66.3%)] were between 6–35 months. About half (50.4%) of them were male and (48.9%) (Table 1).

Table 1
Socio-demographic characteristics of mother-child pairs in Hawi Gudina District,
Eastern Ethiopia, 2024(n = 401).

Variables	Category	Frequency	Percent
Residency	Rural	353	88
	Urban	48	12
Religion	Muslim	363	90.5
	Orthodox	26	6.5
	Protestant	12	3.0
Household family size	≤ 4	124	30.9
	5–6	137	34.2
	≥ 7	140	34.9
Child sex	Male	202	50.4
	Female	199	49.6
Child age (in months)	6–23	185	46.1
	24–35	81	20.2
	36–47	73	18.2
	48–59	62	15.5
Child birth order	< 3	205	51.1
	> 3	196	48.9
Maternal age in years	15–19	55	13.7
	20–29	171	42.6
	30–39	149	37.2
	40–49	26	6.5
Head of household	Male	381	95.0
	Female	20	5.0
Maternal educational status	No formal education	283	70.6
	Primary education	66	16.5
	Secondary education	31	7.7
	Higher education	21	5.2

Variables	Category	Frequency	Percent
Maternal marital status	Single	4	1.0
	Currently Married	384	95.8
	Widowed	4	1.0
	Divorced	9	2.2
Maternal occupational status	House wife	320	79.8
	Merchant	27	6.7
	Employed	32	8.0
	Daily labor	22	5.5
Father educational level	No formal education	251	62.6
	Primary education	79	19.7
	Secondary education	50	12.5
	Higher education	21	5.2
Father's occupation	Farmer	310	77.3
	Employed	55	13.7
	Daily labor	5	1.3
	Merchant	31	7.7
Household wealth index	Poor	201	50.1
	Medium	106	26.4
	Rich	94	23.5

Reproductive and health care related factors

Three hundred fifty-four (88.3%) of mothers were multiparous, whereas [375 (93.5%)] were multigravida. Two hundred fifty-five (63.6%), 232 (57.8%) and 200 (49.9%) of mothers had ANC follow up, had given birth at health facility and had postnatal care follow up respectively. One hundred sixty-seven (41.6%) of mothers had claimed to have information about vitamin A of whom the majority, [104 (62.1%)] mentioned health extension workers as their source of information. Only about less than one third, [118 (29.4%)] had good knowledge about vitamin A rich foods.

Concerning to the health status of the children, [45 (11.2%)] were sick during the last two weeks prior to the study and majority, [287 (71.6%)] were fully vaccinated (Table 2).

Table 2
Reproductive and health care related factors of mother-child pairs in Hawi Gudina District, Eastern Ethiopia, 2024(n = 401)

Variables	Category	Frequency	Percent
Parity	≤ 1	47	11.7
	≥ 2	354	88.3
Gravidity	≤ 1	26	6.5
	≥ 2	375	93.5
ANC	Yes	255	63.6
	No	146	36.4
Place of delivery	Home	169	42.1
	Health facility	232	57.9
Postnatal care	Yes	200	49.9
	No	201	50.1
Child vaccination status	Fully vaccinated	287	71.6
	Partially vaccinated	114	28.4
Deworming	Yes	139	64.4
	No	77	35.6
Morbidity in the last two weeks	Yes	45	11.2
	No	356	88.8
Common causes of morbidity	Diarrhea	14	31.1
	Cough	24	53.3
	Others*	7	15.6
Walking distance to the nearest health facility in hours	< 2	115	28.7
	2–3	156	38.9
	> 3	130	32.4
Heard about vitamin A	Yes	167	41.6
	No	234	58.4
Sources of information on Vitamin A	HEW	104	62.1
	HCP	52	31.3

Variables	Category	Frequency	Percent
	Others	11	6.6
Mother's Knowledge of vitamin A	Poor	283	70.6
	Good	118	29.4

Notes: * Malaria, skin infection and conjunctivitis, HEW: health extension workers, HCP: health care professionals

Dietary factors

Majority, [166 (89.7%)] of children aged 6–23 months were breast-feeding, and among the total children, [291 (72.6%)] had started complementary feeding after six months postpartum (Table 3).

The proportion of children who consumed foods from grains, roots and tuber was found to be the highest [335 (83.5%)] followed by legumes and nuts [263 (65.6%)], and dairy products [126 (31.4%)]. The proportion of children who were given foods from at least four food groups were [130 (32.4%)] and more than half [242 (60.3%)] had inadequate meal frequency per day. Majority of the households were food insecure (68.3%) and not engaged in home gardening (62.1%).

Table 3
Dietary related factor among mother-child pairs in Hawi Gudina District, Eastern Ethiopia,
(n = 401)

Variables	Category	Frequency	Percent
Breast feeding currently (6–23 months)	Yes	166	89.7
	No	19	10.3
Continued breast feeding (12–23 months)	Yes	47	52.8
	No	42	47.2
Complementary feeding initiation time	Before 6 months	110	27.4
	After 6 months	291	72.6
Dietary diversity	≥ 4	130	32.4
	< 4	271	67.6
Meal frequency per day	> 4	159	39.7
	< 4	242	60.3
Home gardening	Yes	152	37.9
	No	249	62.1
Household food security level	Secure	127	31.7
	Insecure	274	68.3

Prevalence of Vitamin A Rich Foods Consumption

The prevalence of vitamin A rich foods consumption among children aged 6–59 months was [28.4% (95% CI: 24.2%, 33.0%)] within previous seven days before the survey. Animal sources vitamin A rich foods were consumed by [47 (11.7%)] and plant source vitamin A rich foods were consumed by [74 (18.5%)] children (Fig. 1).

Factors Associated with Consumption of Vitamin A Rich Foods

The association between the consumption of vitamin A rich foods and predictors was analyzed using binary logistic regression. In the bivariate analysis, residency, family size, child age and birth order, maternal age, maternal educational status, wealth index, child vaccination status, maternal knowledge, place of delivery, ANC and PNC follow up, household food security level, meal frequency per day and dietary diversity were associated with child vitamin A rich foods consumption at p-value < 0.25, and then fitted to multivariate analysis. However, religion, child sex, household head, parity and gravidity, walking distance to nearest health facility, breast feeding status, morbidity in the last two weeks and

complementary feeding initiation time were not significant at p-value less than 0.25; hence, these variables were excluded from multivariable analysis (Table 4).

In the multivariable logistic regression analysis, the odds of consumption of vitamin A rich foods among the children aged 6–59 months from family size ≤ 4 were 3.48 times higher as compared to children from family size ≥ 7 [AOR = 3.48 (95% CI:1.15, 6.12)]. The odds of eating vitamin A rich foods among children aged 6–59 months whose mothers' had higher educational level was 1.24 times higher as compared to those children whose mothers' had no formal education [AOR = 1.24(1.07, 2.69)]. The odds of consuming vitamin A rich foods among children the whose mothers age ranged 30–39 years were found to 3.25 times higher as compared to children with mothers in the youngest age category (15–19 years) [AOR = 3.25 (95% CI: 1.37, 7.69)]. As child age increases, the consumption of vitamin A rich foods was increases. Children aged 48–59 months were 2.59 times more likely of consuming vitamin A rich foods when compared with children aged 6–23 months [AOR = 2.59 (95% CI:1.08, 6.24)]. Children from the rich and medium wealth index households had significantly highest odds of consuming vitamin A rich foods relative to those from poor households [AOR = 3.42 (95% CI: 2.13, 7.52)] and [AOR = 2.82 (95% CI: 2.10, 6.18)] respectively. Children from the food secure households were consumed two times more likely of getting vitamin A rich foods as compared with those from food insecure households [AOR = 1.97 (95% CI: 1.00, 3.89)] (Table 4).

Table 4

Binary and multivariable logistic regression analysis showing factors associated with vitamin A rich foods consumption among children aged 6–59 months in Hawi Gudina District, Eastern Ethiopia, 2024 (n = 401)

Variables		Vitamin A rich foods consumption		COR (95% CI)	AOR(95%CI)	P-value
		Yes (%)	No (%)			
Residency	Rural	94 (23.4)	259 (64.6)	1	1	
	Urban	20 (5.0)	28 (7.0)	1.97 (1.06, 3.66)	2.18 (0.79, 5.98)	0.129
Household family size	≥ 7	32 (8.0)	108 (26.9)	1	1	
	5–6	43 (10.7)	94 (23.5)	1.54 (0.95, 2.51)	1.84 (0.81, 4.20)	0.147
	≤ 4	39 (9.7)	85 (21.2)	2.71 (1.27, 5.80)	3.48 (1.15, 6.12)	0.041
Child age in months	6–23	35 (8.7)	150 (37.5)	1	1	
	24–35	31 (7.7)	50 (12.5)	2.65 (1.48, 4.74)	1.31(0.58, 2.96)	0.514
	36–47	21 (5.2)	52 (13.0)	1.73 (0.92, 3.23)	0.86 (0.36, 2.06)	0.730
	48–59	27 (6.7)	35 (8.7)	3.30 (1.77, 6.16)	2.59 (1.08, 6.24)	0.034
Child birth order	≥ 3	49 (12.2)	147 (36.7)	1	1	
	< 3	65 (16.2)	140 (34.9)	1.39 (0.90, 2.15)	1.39 (0.90, 2.15)	0.324
Maternal age (in years)	15–19	35 (8.7)	20 (5.0)	1	1	
	20–29	26 (6.5)	145 (36.2)	0.74 (0.41, 1.32)	0.73 (0.34, 1.59)	0.431
	30–39	48 (12.0)	101 (25.2)	1.71 (1.00, 2.91)	3.25 (1.37, 7.69)	0.007
	40–49	5(1.2)	21 (5.2)	0.64 (0.22, 1.84)	2.29 (0.51, 10.21)	0.279
Maternal educational status	No formal education	39 (9.7)	244 (60.9)	1	1	
	Primary education	49 (12.2)	17 (4.2)	1.17 (0.72, 1.91)	0.20 (0.15, 1.79)	0.121
	Secondary education	17 (4.2)	14 (3.5)	1.82 (0.77, 4.30)	0.51 (0.18, 1.47)	0.214

	Higher education	9 (2.3)	12 (3.0)	2.39 (1.15, 4.95)	1.24 (1.07, 2.69)	0.017
Wealth index	Poor	53 (13.2)	148 (36.9)	1	1	
	Medium	24 (8.5)	72 (18.0)	2.32 (1.66, 5.62)	2.82 (2.10, 6.18)	0.000
	Rich	27 (6.7)	67 (16.7)	4.15 (2.03, 8.46))	3.42 (2.13, 7.52)	0.000
ANC	No	41(10.2)	105 (26.2)	1		
	Yes	73 (18.2)	182 (45.4)	1.02 (0.65, 1.61)		
Place of Delivery	Home	52 (12.9)	117 (29.2)	1		
	Health facilities	62 (15.5)	170 (42.4)	1.75 (1.13, 2.72)	1.11 (0.56, 2.19)	0.775
PNC	No	59 (14.7)	142 (35.4)	1		
	Yes	55 (13.7)	145 (36.2)	1.09 (0.71, 1.69)		
Maternal knowledge on vitamin A rich foods	Poor	80 (20.0)	203 (50.6)	1	1	
	Good	34 (8.5)	84 (26.2)	1.02 (0.63, 1.65)	1.23 (0.66, 2.29)	0.511
Child vaccination status	Partial	20 (5.0)	94 (23.4)	1	1	
	Full	94 (23.4)	193 (48.2)	2.28 (1.33, 3.93)	1.80 (0.79, 4.11)	0.162
Child meal frequency per day	< 4	48 (12.0)	194(48.4)	1	1	
	≥ 4	66 (16.4)	93(23.2)	2.87 (1.36, 3.28)	1.652 (0.89, 3.07)	0.112
Child dietary diversity	< 4	549(13.5)	217(54.1)	1	1	
	≥ 4	60(14.9)	70(17.5)	3.44 (1.12, 4.68)	1.96 (0.90, 4.26)	0.090
Household food security level	Insecure	54 (13.5)	220 (54.9)	1	1	
	Secure	60 (14.9)	67 (16.7)	1.05 (0.67, 1.64)	1.97 (1.00, 3.89)	0.040

DISCUSSION

The study revealed that the consumption of vitamin A rich foods among children aged 6–59 months in Hawi Gudina District was 28.4% in the week preceding the survey. This result aligns with findings from

similar studies conducted in Ethiopia (Jemberu Y, 2017;EDHS, 2019), indicating a consistent pattern of suboptimal vitamin A rich foods consumption among children in the country. The study result was also consistent with the review in LMIC in which Ethiopian children consumption of vitamin A rich food was as low as 26% (Karlsson, 2021). However, the study result was lower than the study in East Africa Countries (62.91%) (Wolde and Tessema, 2023). This might be due to differences in scale of the studies, socio-economic status, and feeding habits. It was also lower than the study conducted in North Shoa District of Ethiopia with prevalence report at 39.1% (Moroda et al., 2022). This discrepancy might be due to the geographic proximity of the North Shoa District to Addis Ababa, the country's capital privileging a relatively easy physical access of different food items. The findings of the present study is also lower than the study in Gondar Town (38.94%) (Aserese et al., 2020). This disparity is due to difference in the study population that was among lactating mothers while ours was among children aged 6–59 months.

From the studied children, [327 (81.5%)] did not consume vitamin A rich plant foods within 7 days preceding the survey. In addition, the proportion of consumption of animal sources of vitamin A, including meat, or fish was 4.2% and chicken egg was 8.5%. This low consumption of animal sources of vitamin A is in agreement with other studies in Dembia, Northern Ethiopia (Tariku et al., 2016), Aleta wondo Southern Ethiopia (Dafursa and Gebremedhin, 2019b) and other study somewhere in Ethiopia (Woldegebriel et al., 2020) in which flesh foods were the least consumed by the studied children. However, as compared to the very low consumption of flesh foods in the current study, studies conducted in Oshana and Oshikoto regions in Namibia reported a much higher consumption of chicken (98%), beef (96%) and fresh fish (95%) (Angula et al., 2024). Similarly, study conducted in Kenya reported a higher consumption of flesh foods (33.8%) and eggs (52.1%) among study participated children (Kananu et al., 2020). The disparities in results can be explained by the effect of differences in the study settings, socio-economic status and cultural variances.

According to WHO (2003), children are recommended to consume vitamin A rich foods on a daily basis to prevent VAD. Similarly, the HKI method suggested that the level of inadequate intake should not exceed 70% of the community (Rosen et al., 1993). However, the present study revealed that a substantial proportion of children failed to meet the recommendation, indicating that they are at considerable risk of VAD. This finding underscores the seriousness of the problem and highlights the need for targeted nutritional interventions to improve children's access to and consumption of vitamin A rich foods.

A striking finding of this study is that the great majority of the study participated children, [287 (71.6%)] did not consume Vitamin A rich foods, which might be paralleled with a high prevalence of food insecurity in the study area (68.3%) according to our study. Food insecurity is known to limit the availability and access to diverse and nutritious foods, including fruits and vegetables (Estibel, 2022;Bolka et al., 2024).

Fewer families in the household were significantly associated with the child intake of vitamin A rich foods. The existence of a strong association between vitamin A rich foods consumption and family size

was documented by previous studies (Semba et al., 2010;Aserese et al., 2020). For the present study 69.1% of children were from households' with family size of five or more, that might be among attributing factors to the poor consumptions of vitamin A rich foods in the study area.

Additionally, the timing of the data collection, which was conducted during the dry season, may have contributed to the observed low intake. During this period, the availability of fresh fruits and vegetables typically declines, making it more difficult for households to access these foods (Abizari et al., 2017).

In this study, the consumption of plant source vitamin A rich foods among children was higher than that of animal source. This finding is in agreement with earlier studies conducted in Ethiopia (Muhye et al., 2022;Mekisso et al., 2024), Kenya (Kananu et al., 2020) and Bangladesh (Begum et al., 2021) in which most of the vitamin A intake of children was reported to be obtained from plant sources. It was also reported that in developing countries, above 80% of the dietary vitamin A intake is obtained from Pro-vitamin A carotenoids (McLaren and Frigg, 1997;Ramakrishnan et al., 1999). Previous studies have shown that, in general, bioefficacy of carotenoids from a range of plant sources is very scarce (Bloem et al., 1998;Arimond and Ruel, 2003). However, such a greater dependency on plant foods as major sources vitamin A was not observed in the present study, it could have its own negative aspects due to low bioavailability of vitamin A from these foods. Overall, the relatively low percentage of children consuming vitamin A rich foods suggests that more efforts are needed to improve dietary diversity and access to vitamin A rich foods in Ethiopia.

A number of factors are contributing to the adequate consumption of vitamin A rich foods among children in the study area. Socio-demographic factors like family size, maternal age and educational status, age of the child, household wealth index and food security level were found to be significantly associated ($p < 0.05$) with children consumption of vitamin A rich foods (Table 4).

Children those in age group 48–59 months were 2.59 times more likely of consuming vitamin A rich foods than those children in age group 6–23 months. This finding was in line with the study conducted in Kachabira and Wolaita Sodo, Southern Ethiopia (Jemberu Y, 2017;Mekisso et al., 2024). This could be attributed to a better awareness of mothers to increase and diversify children's foods as age increased. This might also be the result of the existing health care access and nutrition programs in the study area.

Middle age mothers (30–39 years old) were 3.25 times more likely to feed their children vitamin A rich foods compared to younger mothers (15–19 years old). The result is similar with the study in India (Semba et al., 2010). This might be explained by education, economic stability, health care access and maternal experiences in rearing children that lead them to better feeding practices than younger age mothers. However, the study was in contrast to the study in South Ethiopia (Jemberu Y, 2017). This might be due to disparities in geographic location, socio-demographic factors, social norms and cultural traditions.

Children from mothers who had completed higher education were 1.24 times more likely of consuming vitamin A rich foods when compared to those children from mothers who had no formal education [AOR

= 1.24 (95%CI:1.07, 2.69)]. This indicated that maternal education plays a great role in child nutrition in general. This finding is supported by different studies conducted in Ethiopia (Demsash et al., 2022; Muhye et al., 2022) and DHS surveys from 11 countries (Arimond and Ruel, 2004). It could be because educated mothers are more likely to have access to more information through reading and more aware of the necessity of complementary feeding, dietary consumption of vitamin A rich foods, and the causes of vitamin A deficiency.

Household socioeconomic status has also determined children vitamin A rich food consumption status. Children belonging to rich and medium wealth index household's intake 3.5 and 3 times, more likely of vitamin A rich foods than those belongs to poor households respectively. This align with study conducted in Addis Ababa (Kebede et al., 2022) and North Shoa, Ethiopia (Moroda et al., 2022). The dietary consumption pattern showed a marked improvement as the wealth status of the household improves (Woldegebriel et al., 2020; de Juras et al., 2022). This suggests that wealthier households are better able to afford a variety of nutrient-dense foods.

This study also indicated that children from food secure household were about two times more likely of vitamin A rich foods intake as compared to those children from food insecure households [AOR = 1.97 (95% CI;1.00, 3.89)]. This result was consistent with studies in other areas like East Badawacho District (Betebo et al., 2017), Aleta Wondo District, Southern Ethiopia (Dafursa and Gebremedhin, 2019a) and Nepal (Chitekwe et al., 2022). This might be because of children from the food secure households have higher DDS when compared with children from food insecure households (Ali et al., 2019).

Our study has several strengths including uses of large sample sizes; community-based study represent target population and focused on children aged 6–59 months in under researched setting, offering valuable insights for local governance and stakeholders. It might help to promote program intervention related to improved vitamin A rich food consumption within these communities.

However, this study was a cross-sectional study, thus it is difficult to identify cause effect relationship, and there might be recall and social desirability biases due to the data were based on the respondent memory. To minimize these biases, we employed trained enumerators, incorporated multiple questions, created nonjudgmental environment during the interview and assured the confidentiality of their responses. We also did not consider seasonal variation in food consumption, which might affect food consumption pattern. In addition, information on the amount of consumption of vitamin A rich foods was not collected. Despite these constraints, our study contributes valuable baseline data to guide effective nutritional interventions in the study area and in the region. Future studies could consider longitudinal designs, multiple seasonal assessments and biomarkers to overcome these limitations.

Conclusions

This study revealed low prevalence of consumption of vitamin A rich foods among children aged 6–59 months, which was less than three out of ten mothers fed vitamin A rich foods to their children in the past seven days before the survey in Hawi gudina District, Eastern Ethiopia. Plant based vitamin A rich

foods were more commonly consumed than animal-based sources, which need particular concerning. Children in the study area are at considerable risk of vitamin A deficiency.

Multivariable analysis underscores key socio-demographic determinants: children aged 48–59 months, mothers aged 30–39 years, higher maternal education, ≤ 4 family sizes, greater household wealth, and food-secure households all significantly increased the likelihood of vitamin A rich foods intake among children aged 6–59 months in the study area. These results indicated the critical influence of maternal education, economic stability, and household resilience on child nutrition.

Government should improving socio economic status, food security level, maternal education and health care service delivery. We also recommend Regional Health Bureau to giving more attention to food-based strategies to enhance the consumption of vitamin A rich foods among children. Health sector of the study setting should have to educate mothers through health extension workers and different media on vitamin A rich foods. The agricultural sector should have to encourage kitchen gardening and animal rearing, hence the community could easily accessed vitamin A rich foods for their children. The family has to feed their children vitamin A rich foods particularly for infants less than two years of age. We also recommend researchers that it would be valuable to conduct further year round assessments to understand the seasonal variations in the consumption of vitamin A rich foods and tailored interventions.

Abbreviations

ANC

Antenatal Care

AOR

Adjusted Odds Ratio

COR

Crude Odds Ratio

DDS

Dietary Diversity Score

DGLV

Dark Green Leafy Vegetables

FFQ

Food Frequency Questionnaire

HKI

Hellen Keller International

PNC

Post Natal Care

VARF

Vitamin A Rich Foods

Declarations

Conflict of Interest

The authors declare that they have no conflict of interests.

Clinical trial number

Not applicable

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Author Contribution

All authors had substantial involvement in the conception and designing of the research, fieldwork, data analysis, interpretation, and manuscript drafting, revising, and final approval for submission. C.N initiated the research, wrote the research proposal, conducted the fieldwork, did the data entry, analysis, and report write up and prepared the first draft of this manuscript. W.A and H.A involved in the write up of the research proposal, data analysis, interpretation, and manuscript writing. A.D participated in the statistical analysis, report write up, and manuscript writing and revision. All authors read and approved the final manuscript.

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Data Availability

All data supporting the findings of this study are available upon request.

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Figures

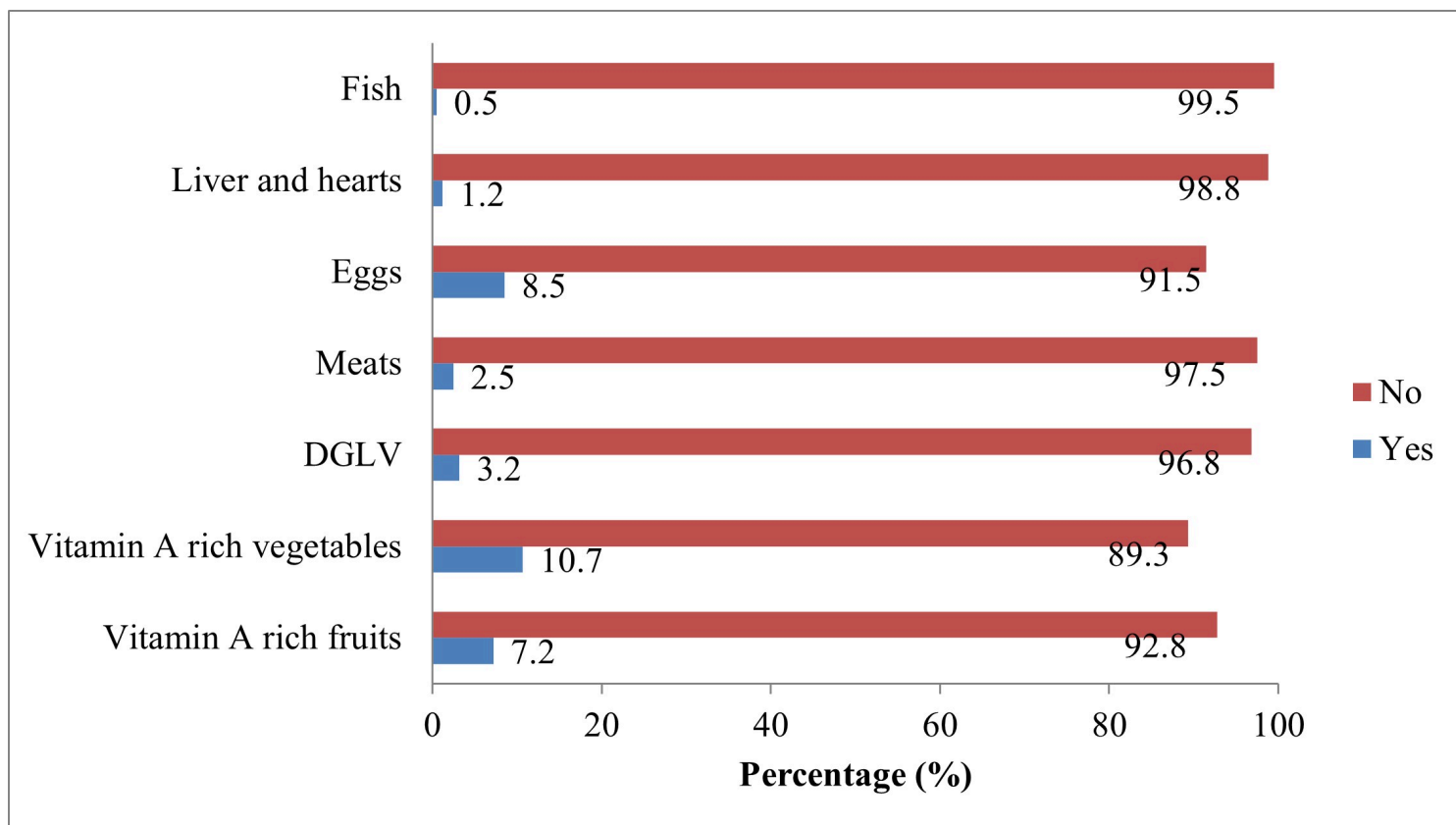


Figure 1

Vitamin A rich foods consumption among children aged 6-59 months in Hawi Gudina District, Eastern Ethiopia, 2024 (n=401).