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Magnitude and predictors of anemia among preschool children (36–59 months) in Atingo town, Jimma, Ethiopia

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Abstract

Introduction: Anemia is a serious public health concern that affects more than 25% of the world's population. It is still widespread and at its most severe in Ethiopia. This study pointed to identify the magnitude and predictors of anemia in preschool children in Atinago.

Method: A structured interview and anthropometric metrics had been used in a cross-sectional study to collect data from 309 preschool children using a systematic sampling strategy from May 10 to June 25, 2022. Frequencies, percentages, means, and a bar chart were created as descriptive statistics. Factors that were significant at the 25% level in univariate analysis were run through multiple logistic models. Odds ratios with respective 95% confidence intervals were developed to determine the relevant predictors.

Result: The majority (51.7%) of preschool children in Atinago town had anemia. The finding reveals that poor dietary diversity (adjusted odds ratio [AOR] = 1.77, 95% confidence interval [CI] = 1.02–3.07), children from families with food insecurity (AOR = 2.28, 95% CI = 1.31–3.9), child–mothers used iron folate for less than 3 months during pregnancy (AOR = 1.93, 95% CI = 1.07–3.48), households with more than five children (AOR = 1.880, 95% CI = 1.12–3.18), and stunted children (AOR = 1.78, 95% CI = 1.05–3.01) were highly susceptible to anemia.

Conclusion: The findings indicate that anemia was a serious issue among preschool children in Atinago. Therefore, stakeholders should provide community-based nutrition training on consuming diverse diets, dietary improvements in the home, consuming iron-rich meals, and the like; encourage mothers to participate in early ANC follow-up; and strengthen activities aimed at identifying households with food insecurity status.

KEYWORDS
anemia, associated factors, Atinago Town, Ethiopia, preschool children, prevalence

1 | INTRODUCTION

Iron deficiency is a usual type of dietary shortage in infancy that results from a persistently low iron balance caused by insufficient nutritional daily consumption, iron uptake or usage, and increased iron supply during the development phase. The hemoglobin concentration decreases in the later stages of iron deficiency, resulting in anemia.[1] Anemia is a condition that takes place when the amount or capacity of red blood cells to bring oxygen is inadequate to encounter physiological requirements.[2]

Anemia has serious health consequences as well as a negative impact on economic and social advancement.[3] It affects a significant proportion of children under the age of 5, as well as women who can procreate, and it raises the risk of infection-related illness and death, as well as leading to poor fetal outcomes, inadequate bodily development, and low productivity.[4]

Anemia in preschool children is caused by a variety of factors, including iron, folate, vitamin B12, and vitamin A deficiencies, as well as intestinal parasitic infections, malaria, and chronic illnesses.[5] Preschool-aged children are more exposed to anemia as a result of their quick expansion, heavy iron requirements, and infections with enteric pathogens, and had the highest prevalence (42.6%), with 9.6 million of these children suffering from severe anemia.[6] Anemia is classified as severe when the prevalence is greater than 40%, moderate if it falls between 20% and 40%, and mild if it falls between 5% and 20%.[7,8]

Anemia is a series public health concern that affects more than 25% of the world's population.[3] Almost 89% of the population in underdeveloped countries suffers from anemia, which mainly affects women and children. In Africa and Asia, it affects more than half (56.3%) of the world's preschool-aged children.[8,9] Preschool children in Africa have the highest rate of anemia (62.3%), followed by Southeast Asia (53.8%) and the Eastern Mediterranean (48.6%). Anemia affects 54% of children below the age of 5 in Sub-Saharan Africa, making it one of the worst-affected regions.[10,11] Anemia was present in 57% of preschool children in Ethiopia.[12]

Anemia has both long-term and short-term effects on the lives of affected children as well as the community at large. Anemia in children impairs immune function, resulting in increased healthcare costs for sick children both at the family and national levels.[5,13] Furthermore, it leads to poor cognitive and motor development, poor academic achievements, and reduced work efficiency in the lives of affected children, lowering earning possibilities and affecting nation-wide growth in the economy.[14,15]

One of the WHO's six global nutrition targets is to decline the problem of anemia. The World Health Assembly approved a comprehensive nutrition plan for mothers, infants, and young children in 2014, with the reduction of anemia (by 50%) by 2025 and subsequent relief being one of the worldwide targets.[3] The Ethiopian government prioritizes nutrition in the GTP (2016–2020). The Seqota Declaration, for example, which was released on July 15, 2015, reflects the GoE's strong commitment to improving nutrition and recognizing the role of nutrition in boosting sustainable development.[16] Most agricultural productivity programs, instead, are solely focused on high-value crops and livestock productivity, with no nutrition improvement objectives in the National Nutrition Coordination body to address nutritional issues like anemia.[17] Despite a few government initiatives, anemia is still widespread at its highest level of severity in Ethiopia, making it a public health concern.

As a result, findings from ongoing studies are required to distinguish relevant influences as well as the most effective intervention procedures to reduce the level of severity. It is also crucial to look into the unique causes and prevalence of anemia in a certain environment and community to reduce or cure anemia. According to preliminary findings from a study of the incidence of anemia and its risk factors in preschoolers in some parts of Ethiopia,[9,16,18,19] those findings should be supplemented with additional research in previously unexplored areas. There has been no research on the prevalence (rate) of anemia and the factors that contribute to it among preschool children in Atinago, Limu Seka district. The current study sought to examine the magnitude and predictors of anemia in preschool children (36–59 months) in Atinago town, Jimma Zone, Ethiopia.

2 | METHODS AND MATERIALS

2.1 | Study area, period, and design

The study was held in Atnago, Limmu Seka district, Jimma Zone, Ethiopia. Jimma Zone is 346 km southwest of Addis Ababa, and Limmu Seka is 110 km northwest of Jimma town, the capital, and center of Jimma Zone in Southwest Ethiopia. Atinago Town is the administrative and commercial center of Limmu Seka district, located 34 km northwest of Limmu Gannat Town, the capital of Limmu Seka, Jimma Zone, Southwest Ethiopia. The town had a total population of 6868 people and 1231 houses in 2022. The district has 6 health care facilities, 40 health posts, 13 primary private medical clinics, and 6 pharmacies. The district's elevation ranges from 1500 to 2500 m. A cross-sectional research design was undertaken in the community from May 25 to July 10, 2022.

2.2 | Inclusion criteria

All preschool-aged children who had lived in the Atinago district for more than 6 months studied, who underwent a blood transfusion within the 2 months before the data compilation, children or mothers with health conditions that impede verbal exchange, and children who previously had a 2-month anemia diagnosis and were taking treatment were excluded.

2.3 | Sample size determination and sampling procedures

The magnitude of the sample was established from a single population approach, with a 95% confidence level, a 5% error margin, and a 57% prevalence of anemia was taken.[9] The initial size of the sample was 376, when taking into consideration the 10% refusal to respond rate, the overall sample size was 413. Finally, the correction formula was applied to populations totaling less than 10,000 in the field of study, with a sample size of 309.

The sample frame was obtained from Atinago town health extension workers using a systematic random sampling technique. The town is divided into two kebeles, with 892 households in kebele-1 and 339 households in kebele-2. The kebeles were divided proportionally, and a systematic sampling method was utilized from house to house with a sampling interval of four. Finally, one preschool-aged child from each household was chosen. For parents with multiple children, however, one individual preschool child was chosen using a lottery procedure (Figure 1).

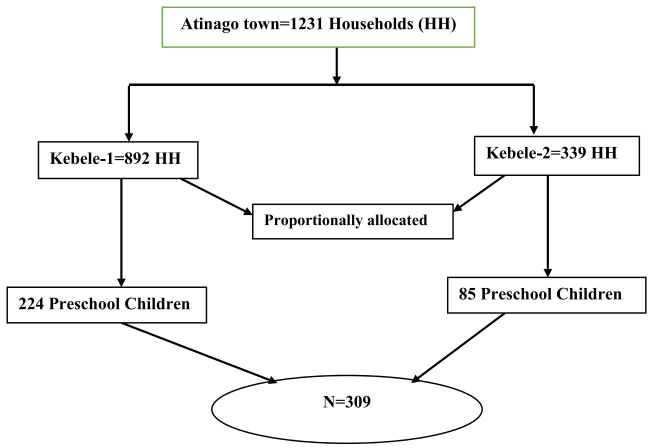

FIGURE 1 Flow of sampling techniques of preschool aged children in Atinago town.

2.4 | Variables of the study

The status of anemia was the outcome variable. While the study's independent variables are the mother's and child's age, child's sex, household wealth, parents' education, and parents' occupation, size of family, residence, status of malaria, surgery upon any organ or bodily component, 2 weeks' worth of diarrhea, use of ITN, source of water and latrine availability, soil-transmitted helminthiasis schistosomiasis, child diversity score, household food modification (germinating and fermenting), practicing feeding breasts, the timing of supplemental feeding introduction, vaccination history, utilization of iron and folate by the mother during pregnant, and monitoring and promoting growth.

2.5 | Operational definitions

Anemia is defined as having a hemoglobin level lower than 11 g/dL. Mild anemia is defined as possessing the amount of hemoglobin between 10 and 10.9 g/dL, moderate anemia as possessing the amount of hemoglobin between 7 and 9.9 g/dL, and severe anemia as possessing the amount of hemoglobin less than 7 g/dL.[17]

Underweight is described as a weight-for-age *z*-score of less than 2 standard deviations.[8]

Stunting is described as children with fewer than 2 standard deviations for the height-for-age *z*-score.[8]

Poor dietary diversity: dietary diversity scores of less than five food groups.[20]

Good dietary diversity: dietary diversity scores of less than or exactly equivalent to five food groups.[20]

Preschool children: are children aged 3–5 years.[21]

Wealth Index: Principal component analyses (PCA) were used to analyze household capital, and categorized into tertiles (low, middle, and high).[8]

Diarrhea is defined as having loose, watery, or bloody stools more than three times per day.

2.6 | Data collection tools and procedures

The demographic and socioeconomic information were gathered from interviewing mothers/caregivers of the child using the house-to-house data collection procedures. The standardized wealth index measurement device was altered from Ethiopian DHS and M. Garenne and S. Hohma.[22,23]

The FANTA instrument, produced by the FANTA Initiative in collaboration with the Institute for Development in Education, was conducted to measure household food insecurity.[24] The respondents were asked about food insecurity, specifically whether the condition had occurred in the previous 4 weeks (Yes or No). If the answer was "yes," question about the frequency of incidence was assessed to examine to see if the condition occurred infrequently (one or two times), occasionally (between 3 and 10 times), or frequently (not fewer than 10 times) during the 4 weeks prior. Each household's HFIAS rate was established by adding the values concerning each frequency of occurrences query and then classified as secure, mildly, moderately, or severely food insecure.

Dietary diversity was used to collect data on food consumption patterns to determine the minimum needs of dietary diversity with which specific dietary items or food types are consumed over time. Diets consumed by kids during the previous 24 h were asked about and filled out on a questionnaire based on their number of questions. It was then divided into eight food groups to determine the child's score for dietary diversity, as recommended by WHO.[20,25] Using a hand-held Global Positioning System (GPS), the altitude of the visiting households/kebele was determined.

Anthropometric body measurements of the child and mother or caretaker were taken to assess nutritional status. A child's height has been established standing up to the closest 0.1 cm utilizing a Stadio meter or portable anthropometer. The MUAC tape has been also utilized to quantify the upper middle arm circumference. The weight of the kids had been measured using a beam balance. Before weighing each measurement, the scale was reset to zero and the weight was calculated to the closest 0.1 kg.

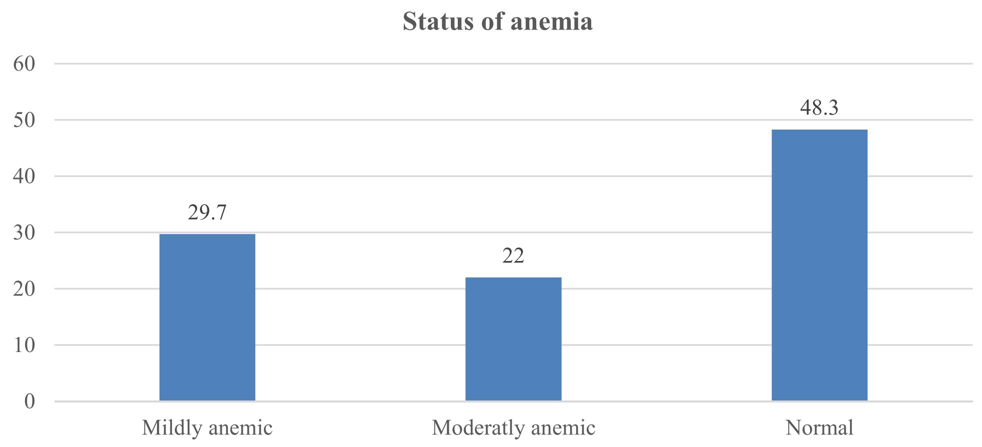

FIGURE 2 Prevalence of anemia among children (36–59) months in Atinago Town.

The kid's hemoglobin level was determined using capillary blood, and a blood in capillaries drop was carefully obtained via finger pricking, which involves rubbing sterile cotton that has been soaked in 70% alcohol on the fingertip before using a sterile disposable lancet to prick it. Hemocue was used to ascertain hemoglobin concentration, and the outcome was reported using the WHO cut-off point criteria and stated in g/dL. Nkrumah et al.[26] Malaria testing was also performed using a quick diagnostic test (RDT) to determine the child's malaria status. The blood for the malaria test was drawn using a needle inserted into the same finger used for the hemoglobin test. The test findings for their species specification were both negative and positive. Furthermore, fresh stool samples from children were collected and analyzed using direct microscopy (saline smear) to determine intestinal parasite infection.

2.7 | Data quality assurance

The data were gathered by qualified health extension workers, Nurses, and medical laboratory workers who received 2 days of training on the study purpose, methods for conducting interviews, anthropometric measures, and ethical concerns when gathering data. The structured questionnaires were tested beforehand for 15 (5%) of the total sample size in Atinago town before 3 days of gathering data to evaluate their precision, length, reliability, and completeness, as well as any linguistic and contextual gaps. Those questionnaires have been also translated into Afaan Oromo to aid respondents' comprehension. The researchers checked the questionnaires for accuracy, consistency, and completeness. To test the quality of the weighing scales, a known weight (premeasured) was used every morning and afternoon. The children's national status was evaluated and classified according to the WHO Child Growth Standards median.[21]

To ensure the accuracy of anthropometric measurements, each child's anthropometric data were collected multiple times and the average of the three measurements was taken. Quality control samples were used to ensure that instruments, laboratory reagents, and technical performance were working properly. All laboratory activities were conducted following the manufacturer's instructions and standard operating procedures, beginning with sample collection and ending with result reporting. Laboratory technologists handled all laboratory procedures. Using the participants' identification numbers, a result was recorded on report formats. Cleaning was performed before data analysis.

2.8 | Method of data handling and analysis

Data from the EPI Info was converted to SPSS, which was used for all investigations. For all categorical variables, both actual frequencies and percentages are presented, and continuous variables are expressed in terms of mean ± standard deviation. The categorical independent variables were also cross-tabulated by anemia status (yes/no), and the relationship to the respective independent variable was investigated using χ^2 tests. Variables that were statistically significant at the 25% level in univariate analyses were subjected to a multiple logistic regression with anemia status as an outcome. The explanatory variables were given adjusted odds ratios and 95% confidence intervals.

3 | RESULTS

3.1 | Socioeconomic, demographic, and care-related characteristics

The study included 309 child–mother pairs aged 36–59 months, with 296 (95.7%) providing a complete response. Out of 296 participants, 51.7% had anemia, with 29.7% having mild anemia (Figure 2). 48.3% of children were males, with an average age of 44.72 months, and 68.9% were under the age of 5. The majority of responding mothers or caregivers (76.7%) were aged 25–34 years, 49.7% had primary education, 98% were married, 79.4% were Oromo, 56.4% were

TABLE 1 Socioeconomic, demographic, and care-related characteristics.

Variable	Categories	Frequency	Percent (%)
Sex of child	Male	143	48.3
	Female	153	51.7
Age of mothers (years)	15–24 years	36	12.2
	25–34 years	227	76.7
	35–49 years	33	11.1
Age of children (months)	36–47 months	142	48
	48–49 months	154	52
Educational status of mothers	No formal educational	40	13.5
	Primary (1–8)	147	49.7
	Secondary (9–12)	44	14.9
	Higher education	65	22
Educational status of father	No formal educational	55	18.6
	Primary (1–8)	61	20.6
	Secondary (9–12)	45	15.2
	Higher education	135	45.6
Religion	Muslim	167	56.4
	Orthodox	74	25
	Protestant	51	17.2
	Others	4	1.4
Ethnicity	Oromo	235	79.4
	Amahara	52	17.6
	Tigray	2	0.7
	Others	7	2.7
Marital status	Married	290	98
	Divorced	6	2
Mother occupation	Unemployed	174	58.8
	Employed	122	41.2
Father occupation	Unemployed	26	8.8
	Employed	270	91.2
Family size	Less than or equal to 5	164	55.4
	Greater than or equal to 5	132	44.6
Number of under five children in the household	Less than two	204	68.9
	Greater than or equal to two	92	31.1
Wealth index	Poor	115	38.9
	Medium	75	25.3
	Rich	106	35.8

TABLE 1 (Continued)

Variable	Categories	Frequency	Percent (%)
Breastfeeding practice of mothers	Poor	234	90.3
	Good	25	9.7
Introduction time of complementary food	At 6 months	158	53.4
	Before or after 6 months	138	46.6
Vaccination status of children	Not timely vaccinated	17	5.7
	Not timely vaccinated	95	32.1
	Timely vaccinated	184	62.2
Monthly growth monitoring and promotion	No	140	47.3
	Yes	156	52.7
Iron folate	No	90	30.4
	Yes	206	69.6
Appropriately utilized iron folate	≥3 months	68	33.2
	<3 months	137	66.8

Muslim, 58.8% were unemployed, 38.9% have been from low-income households, and 91.2% of child fathers were employed. The majority of them (90.3%) were breastfed, 62.2% were vaccinated on time, 53.4% were introduced to complementary foods at 6 months, and 69.6% of child mothers took iron folate for less than 3 months (Table 1).

3.2 | Environmental health, morbidity, and diet-related variables in children aged 36–59 months

The majority (63.9%) had various types of illnesses in the previous 2 weeks, with 61.9% suffering from a diarrheal infection, 18.6% suffering from malaria, and 25.7% suffering from intestinal parasites. The majority of households (92.9%) used local pit latrines, 41.2% used piped water, 32.1% used public standpoints (Bonno), and 26.7% used protected well or spring water; 60.8% had a low level of dietary diversity (less diversified food consumption pattern). The majority of mothers (69.3%) had recently distributed ITN, with 59.1% using it effectively, 68.2% using nonfermented foods, and 63.9% using germinated foods (Table 2).

3.3 | Bivariate analysis of variables associated with the status of anemia

Bivariate logistic analyses reveal that the age of the children, mother's educational status, family size, household wealth index,

TABLE 2 Environmental health, morbidity, and diet-related variables in children aged 36–59 months.

Variable	Categories	Frequency	Percent (%)
Source of drinking water	Piped	122	41.2
	Public tab	95	32.1
	Protected well/spring	79	26.7
Toilet	No facility/bush/open	9	3
	Local pit latrine	275	92.9
	VIP latrine	12	4.1
Have diseases	No	107	36.1
	Yes	189	63.9
Fever	No	30	15.6
	Yes	162	84.4
Diarrhea	No	74	38.9
	Yes	116	61.9
ITN distribution	No	91	30.7
	Yes	205	69.3
Utilization of ITN	No	121	40.9
	Yes	175	59.1
Malaria status	No	241	81.4
	Yes	55	18.6
Intestinal parasite	No	220	74.3
	Yes	76	25.7
Dietary diversity score (DDS)	Good DDS	116	39.2
	Poor DDS	180	60.8
Fermented foods preparation	No	202	68.2
	Yes	94	31.8
Germinated or soaked foods	No	189	63.9
	Yes	107	36.1

breastfeeding practice, time to introduce complementary food, growth monitoring and promotion, iron consumption, intestinal parasite, dietary diversity score, fermented food intake, underweighting, stunting, and food insecurity were all associated with anemia ($p < 0.25$) and were thus entered into multivariate logistic regression (Table 3).

3.4 | Multivariate analysis of variables related to the status of anemia

The Hosmer–Lemeshow test was not significant (p value = 0.17), indicating that the logistic model fit well. Analysis of multivariate logistic regression reveals that dietary diversity, household food insecurity, family size, iron folate, and stunting are all significantly ($p = 0.05$) related to anemia status (Table 4).

Poor dietary diversity children had a significantly greater likelihood of anemia than children with good diversity in diet (adjusted odds ratio [AOR] = 1.77, 95% confidence interval [CI] = 1.02–3.07). Preschool children from food-insecure households were highly susceptible to anemia than children from families with food secure (AOR = 2.28, 95% CI = 1.31–3.9). The study also found that mothers who had used no more than 3 months of iron and folate while pregnant seem being twice as most likely anemic as mothers who used iron folate for more than 3 months (AOR = 1.93, 95% CI = 1.07–3.48).

Households with more than five children had significantly increased chances of being anemic than households with fewer than five children (AOR = 1.88, 95% CI = 1.12–3.18). Furthermore, anemic status was highly associated with children's nutritional status. Children who were stunted were 1.8 times more likely to develop anemia than children who were not stunted. (AOR = 1.78, 95% CI = 1.05–3.01) (Table 4).

4 | DISCUSSION

This study pointed to identify the magnitude and predictors of anemia in preschool children in Atinago. According to the findings, the overall incidence of anemia in preschool children was 51.7%. According to WHO, the rate of anemia among preschool children was thus a significant public health issue.[7] Anemia is a serious issue in Ethiopia, but the prevalence rate in Atinago is relatively low when compared with other studies that found 57% in Ethiopia,[9] 66% in Bata District, Equatorial Guinea,[15] and 84.6% in Tanzania.[27] In contrast, other studies revealed a prevalence of 26.6% in Mexico,[28] 28.5% in Menz Gera district, Ethiopia,[29] 43.7% in Jimma, Ethiopia,[30] and 48.9% in Shenen Gibe Hospital, Jimma, Ethiopia.[19] As a result, the difference could be attributed to sample size variability, sociocultural, and socioeconomic factors, as well as a high prevalence of intestinal parasites, stunted children, a lack of dietary diversity, and insufficient iron content food. Meanwhile, the findings agree with those of studies conducted in Bangladesh[31] and Cape Verde, West Africa,[32] which found that anemia was prevalent in 52.3% and 51.8% of preschool children, respectively.

Anemic preschool children were more probable to be found in poor dietary diversity households, which is consistent with research from other parts of Ethiopia, such as Damot Sore District,[17] Wag-Himra,[33] and Northwest Ethiopia.[34] This could be because of a monotonous diet of tuber roots and cereals, as well as insufficient consumption of iron-rich foods such as meat, due to households' low socioeconomic status. Another reason could be the seasonal scarcity of enhancing citric fruits like lemons and oranges.

TABLE 3 Bivariate analysis of variables associated with the status of anemia.

Variable	Categories	Status of anemia: Anemic	Status of anemia: Not anemic	COR (95% CI)	*p* Value
Age of children (months)	36–47 months	84(59.2%)	58(40.8%)	0.56(0.35–0.89)	0.01
	48–49 months	69(44.8%)	85(55.2%)	1	
Educational status of mothers	No formal education	21(52.5%)	19(47.5%)	0.95(0.43–2.09)	0.89
	Primary (1–8)	81(55.1%)	66(44.9%)	1.05(0.58–1.89)	0.87
	Secondary (9–12)	16(36.4%)	28(63.6%)	0.49(0.22–1.07)	0.07
	Higher education	35(53.8%)	30(46.2%)	1	0.61
Family size	≤5	74(45.1%)	90(54.9%)	1.81(1.14–2.88)	0.01
	>5	79(59.8%)	53(40.2%)		
Wealth index	Poor	62(53.9%)	53(46.1%)	1.53(0.90–2.60)	0.12
	Medium	45(60%)	30(40%)	1.96(1.07–3.57)	0.03
	Rich	46(43.4%)	60(56.6%)	1	0.13
Breastfeeding practice of mothers	Poor	128(54.7%)	106(45.3)	0.55(0.24–1.28)	0.12
	Good	10(40%)	15(60%)		
Introduction time of complementary feeding	At 6 months	72(45.6%)	86(54.4%)	1.69(1.07–2.69)	0.03
	Not at 6 months	81(58.7%)	57(41.3%)		
Monthly growth monitoring and promotion	No	81(57.9%)	59(42.1)	0.62(0.39–0.98)	0.04
	Yes	72(46.2%)	84(53.8%)	1	
Iron folate utilization	Yes	95(46.1%)	111(53.9%)	2.12(1.27–3.53)	0.004
	No	58(64.4%)	32(35.6%)		
Intestinal parasite	No	108(49.1%)	112(50.9%)	1	0.12
	Yes	45(59.2%)	31(40.8%)	1.51(0.89–2.55)	
DDS	Poor	102(56.7)	78(43.3)	1.66(1.04–2.66)	0.03
	Good	51(44%)	65(56)	1	
Food fermenting	No	113(56)	89(44)	0.58(0.36–0.96)	0.03
	Yes	40(42.6)	54(57.4)	1	
Household Food insecurity	Food insecure	111(57.3%)	82(42.7%)	1	0.01
	Food secure	43(41.3%)	61(58.7%)	1.90(1.17–3.09)	
Underweight	Not Underweight	112(54.6%)	93(45.4%)	1	0.13
	Underweight	41(45.1%)	50(54.9%)	0.68(0.42–1.12)	
Stunted	Not stunted	58(43%)	77(57%)	1	0.01
	Stunted	95(59%)	66(41%)	1.91(1.20–3.04)	
MUAC	Normal	85(46.4%)	98(53.6%)	1	
	Moderate	42(53.8%)	36(46.2%)	1.35(0.79–2.29)	0.27
	Severe	26(74.3%)	9(25.7%)	3.33(1.48–7.50)	0.004

Abbreviations: 95% CI, confidence interval; COR, crude odds ratio; DDS, dietary diversity score.

Anemic preschool children were significantly higher in households experiencing food insecurity. This finding is in line with previous reports from various regions of Ethiopia, such as Della town,[18] Menz Gera,[29] and Damot Sore district.[17] This may be due to climate change; in Ethiopia, there is not enough yield and agricultural productivity produced during the winter season for at least 7 months. Utilization of diverse diets, particularly iron-enhancing and abundant in vitamin C from animal sources meals has decreased due to

TABLE 4 Multivariable logistic regression analysis of factors associated with anemia.

Variables		Anemia status Anemic	Not anemic	COR (95% CI)	AOR (95% CI)	*p* Value
DDS	Poor	102(56.7)	78(43.3)	1.66(1.04–2.66)	1.77(1.02–3.07)	0.04
	Good	51(44%)	65(56)	1	1	
Household food insecurity	Food insecure	111(57.3%)	82(42.7%)	1.9(1.17–3.09)	2.28(1.31–3.95)	0.003
	Food secure	43(41.3%)	61(58.7%)	1	1	
Family size	≤5	74(45.1%)	90(54.9%)	1	1	0.02
	>5	79(59.8%)	53(40.2%)	1.81(1.14–2.88)	1.88(1.12–3.18)	
Iron Folate	No	58(64.4%)	32(35.6%)	1	1	0.03
	Yes	95(46.1%)	111(53.9%)	2.12(1.27–3.53)	1.93(1.067–3.48)	
Stunted	Not Stunted	58(43%)	77(57%)	1	1	0.03
	Stunted	95(59%)	66(41%)	1.91(1.20–3.04)	1.78(1.05–3.01)	

Abbreviations: 95% CI, confidence interval; AOR, adjusted odds ratio; COR, crude odds ratio; DDS, dietary diversity score.

low-income status and food price inflation in households across the country.

Anemic children were more likely if the mother used iron folate for less than 3 months during her pregnancy. This is consistent with reports from India.[35] The most likely reason is that mothers did not use iron folate as recommended by national guidelines due to delayed antenatal care commencement, a timely limitation of iron folate in medical facilities, worry about adverse effects, and mothers' ignorance of iron folate.

The study also found that having a larger family increased the likelihood of having anemic children. A study conducted by Melku et al. found that households with more than five children were more susceptible to anemia than households with fewer than five family members.[36] This finding could be since as family size increases, food scarcity may occur; smaller children may not be able to get enough food if agricultural output and the number of families do not grow at a similar rate, the incidence of poverty will rise households subsequently endure a shortage of food as a result.

Furthermore, children's nutritional status was significantly and positively related to their anemia status. Thus, stunting increased the likelihood of anemic children, which is consistent with preceding reports from several parts of Ethiopia, for instance, Dilla,[18] and Gonder.[33] Undernourished children are frequently anemic, which could be explained by low hemoglobin levels compromising linear expansion and coexistence with another lack of micronutrients. Stunting could contribute to the appearance of anemia through synergism. Generally, as an adapted reaction to their inadequate nutritional intake, malnourished children typically have a slower metabolism. This slower metabolism causes a lower demand for oxygen and a reduced synthesis of red blood cells, which leads to adaptive anemia. Children are more likely to have both malnutrition and anemia if they do not consume enough of the nutrients needed for growth and hemoglobin synthesis. Underweight children have a higher likelihood of being iron deficient, the vitamin most crucial to the production of hemoglobin.

4.1 | Strengths and limitations of the study

The study's first strength is its use of a community-based study design, which is representative of the population throughout Atinago town, and its second strength is the high response rate obtained from the sample size. While a cross-sectional study design allows limiting our evaluation to hemoglobin levels once upon a time so that we could not measure the temporal relationship of factors attributed to anemia, the use of 24-h recall methods does not show the typical dietary intake. Anemia was diagnosed using hemoglobin value, so biochemical tests such as serum ferritin were not used, and dietary information and monthly income may have a social desirability bias. Many other studies have used a single biomarker as a hemoglobin indicator because intestinal parasites can cause anemia directly, but we couldn't assess the magnitude and association of intestinal parasites in this research, and it is also limited by the recall and social desirability biases.

5 | CONCLUSION

According to the study, 51.7% of preschoolers in the town of Atinago had anemia overall. In the current study, poor dietary diversity, household food insecurity, maternal history of iron folate (IFA) utilization, household family members, and stunted children were found to be highly related to anemia. As a result, stakeholders should provide community-based nutrition training on consuming diverse diets, dietary improvements in the home, consuming iron-rich meals, and the like; strengthen activities on identifying households with food insecurity status; motivating women to use IFA and Early monitoring for ANC and improving maternal nutritional status; and provide health education to the community about educational nutrition micronutrients.

AUTHOR CONTRIBUTIONS

Fuad M. Sodde: Conceptualization; data curation; formal analysis; investigation; methodology; software; validation; visualization; writing—review and editing. **Abebe D. Liga**: Data curation; formal analysis; methodology; resources; software; supervision; validation; visualization; writing—original draft; writing—review and editing. **Yasin N. Jabir**: Data curation; formal analysis; resources; software; supervision; validation; visualization; writing—original draft; writing—review and editing. **Dessalegn Tamiru**: Supervision; validation; visualization; writing—review and editing. **Rediet Kidane**: Supervision; validation; visualization; writing—review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The information utilized in this investigation is accessible to the first and corresponding authors. As a result, it will only be sent in response to a valid request.

ETHICS STATEMENT

The Institute of Health at Jimma University, Research, and Community Service Office's Ethical Review Committee granted ethical approval. Jimma University, Jimma Zone Health Bureau, and Limmu Seka District Health Office will provide official support letters for the study. Each participant provided informed consent after being informed about the study's goals and significance, and confidentiality will be maintained at research at all levels.

TRANSPARENCY STATEMENT

The lead author Abebe D. Liga, Yasin N. Jabir affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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