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Magnitude of Anemia and Associated Factors among 6-59 Old Age Children Admitted To Gursum Woreda Health Facilities, Eastern Ethiopia

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Abstract

Background: Anemia is a major global health issue, especially common in developing countries because of various health and socioeconomic challenges. Despite its critical nature, there is limited data on anemia in our specific study area. Therefore, this study aims to assess the magnitude of anemia and identify its associated factors among children 6-59 month old admitted at Gursum Woreda, Health facilities, Eastern Ethiopia.

Methods: Between March 1 and May 30, 2024, a cross-sectional survey was carried out at primary hospitals of Gursum Woreda, Eastern Ethiopia. Structured questionnaires were administered to gather socio-demographic and socio-economic information, as well as health and anthropometric data of the children, directly from caregivers. Hemoglobin levels were measured using the HemoCue device (HemoCue Hb 301). Following data collection, the information underwent coding, cleaning, and Subsequently, the dataset was analyzed using SPSS version 27. Bivariate and multivariate logistic regression analyses were conducted to identify potential predictor variables, with statistical significance determined at a 95% confidence interval and a p-value threshold of less than 0.05.

Results: Of the planned 515 participants, all 515 mother-child pairs took part in the study, achieving a 100% response rate. Data were collected from both the children and their parents or guardians. The study found an anemia prevalence of 44.3% (95% CI, 40-49%). Household average income (AOR = 1.945 95% CI: 1.044-3.622) was identified as a significant factor associated with anemia.

Conclusion: Anemia is recognized as a public health issue among 6-59 month old attending primary hospitals of Gursum Woreda, Eastern Ethiopia, according to the World Health Organization's criteria. Household income was significantly linked to childhood anemia. Therefore, implementing effective public health interventions, such as engaging families in alternative income-generating activities, is crucial in this region.

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Introduction

Background of the study

Anemia is characterized by a decrease in hemoglobin, hematocrit, or the number of red blood cells, resulting in an inadequate oxygen-carrying capacity to meet the body's physiological needs. It is the most prevalent micro-nutrient deficiency disorder and can affect individuals at any stage of life, especially children under five years old and pregnant women, due to their increased iron requirements [1].

According to the World Health Organization (WHO) criteria, anemia is defined based on average hemoglobin levels according to age and sex: 11 g/dl for children aged 6 months to 6 years, 12 g/dl for children aged 7 to 14 years, 13 g/dl for adult men over 15 years, 11 g/dl for pregnant women, and 12 g/dl for non-pregnant women. Anemia prevalence in the population is classified as severe if it is 40% or higher, moderate if it is 20-39.9%, mild if it is 5-19.9%, and not a public health problem if it is less than 5% [2].

Anemia ranks as the second leading cause of death and illness globally, affecting 1.62 billion people, or 24.8% of the world's population, with 47.4% of these cases found in children under five years old [3]. In children aged 6-59 months, anemia remains a major health concern in nearly all developing countries, with an estimated prevalence of approximately 43%. Regional disparities include 62.3% in Africa, 53.8% in Southeast Asia, and 21.9% in the Western Pacific region. The prevalence of anemia in children ranges from 5% in North America to 22% in Europe and varies between 30-63% in Asia and 12-58% in Africa [2]. Research on hospitalized children in various African regions has revealed anemia prevalence rates of 56.3% in Uganda, 83.2% in Southern Tanzania, and 44-56% in Ethiopia [4].

In Ethiopia, anemia affects as many as six out of ten children under the age of five, with prevalence rates differing by region due to variations in food availability, income, and cultural practices. For example, the anemia rate is 83% in the Somali region, 75% in Afar, 72% in Dire Dawa, and 42% in the Amhara region [5].

Anemia is a worldwide public health problem, significantly affecting children under five in low and middle-income countries. In Ethiopia, it poses a major health challenge, with 57% of children under five affected. Anemia in young children is associated with impaired cognitive development, a heightened risk of infections, and increased mortality rates [6].

Gursum Woreda in eastern Ethiopia encounters numerous child health challenges, such as high malnutrition rates and limited access to healthcare services. Despite this, recent data on the prevalence and factors contributing to anemia among children under five admitted to health facilities in the region are lacking [7]. Understanding the extent of anemia and its determinants is essential for creating targeted interventions and enhancing child health outcomes.

Statements of problems

The causes of anemia are often multifactorial and interconnected in a complex way, with the condition being linked to various socioeconomic, biological, environmental, and nutritional factors [2]. These include stunting, low dietary diversity, food scarcity, the timely initiation of supplementary feeding, deworming, wasting, educational status, parasite infestations, maternal weight, and antenatal care visits [8].

There are also numerous root causes of anemia, including blood loss, decreased RBC production, infectious diseases, maternal anemia during pregnancy, although 50% of its causes are iron deficiencies [9]. If left untreated, childhood anemia has severe consequences, including growth retardation, impaired motor and cognitive development, poor school performance, exposure to comorbid diseases, adult anemia predictors and increased morbidity and mortality [2]. It also has adverse effects on economic development, physical, mental and social health [10].

Although some local studies have indicated the extent of anemia, specific data on children, particularly in our study area, is lacking. To reduce the impact of anemia, it is essential to focus on this demographic and provide a comprehensive package of interventions. Therefore, developing evidence-based strategies and responses to the issue will make a significant contribution.

Additionally, it is crucial to generate epidemiological data, identify risk factors, and determine the extent of anemia to reform regional and national public policies. This information is vital for program planners and policymakers to develop adaptable intervention and control strategies tailored to the local context. Moreover, with a greater emphasis on the prevention aspects of anemia, solid evidence will be created, encouraging policymakers and program managers to implement effective interventions to monitor and reduce the negative impacts of childhood anemia.

However, to the best of the authors' knowledge, no previous studies have been conducted in the study area. Therefore, this study aimed to examine the magnitude of anemia and identify associated factors among children under five years old at Gursum Woreda health facilities in eastern Ethiopia.

Despite efforts to reduce childhood anemia in Ethiopia, its prevalence remains high, especially among children 6-59 month. Factors contributing to this issue include limited access to healthcare services, inadequate nutrition, and poor maternal health knowledge [11]. There is a gap in specific information regarding the factors contributing to anemia among under-five children in Gursum Woreda, particularly those admitted to healthcare facilities.

The study aims to address the following research questions:

What is the magnitude of anemia among 6-59 month children admitted to health facilities in Gursum Woreda?

What socio-demographic and economic factors are associated with anemia in this population?.

Significance of the study

The significance of this study lies in its potential to contribute valuable insights into the prevalence and determinants of anemia among 6-59 children in Gursum Woreda, Eastern Ethiopia. The findings will inform policymakers, healthcare practitioners, and community stakeholders about the specific factors contributing to anemia in this population, allowing for targeted interventions to be developed.

The study's results can be used to advocate for increased access to healthcare services, improved nutrition programs, and enhanced maternal and child health education in Gursum Woreda. By addressing the underlying causes of anemia, such as nutritional deficiencies and limited access to healthcare, the study has the potential to improve child health outcomes and

contribute to the overall well-being of the community.

Literature review

Prevalence and Trends anemia

Various studies have highlighted the high prevalence of anemia among children 6-59 month in Ethiopia. The Ethiopian Demographic and Health Survey (EDHS) reports a national prevalence rate of 57%, underscoring a major public health issue. Moreover, there are regional differences in anemia prevalence, with eastern areas such as Gursum Woreda frequently experiencing higher rates due to socioeconomic disparities and limited access to healthcare services [12].

Risk Factors associated with anemia

Various socioeconomic, dietary, and healthcare-related factors contribute to childhood anemia. Socioeconomic factors such as poverty, low maternal education, and inadequate household income are associated with increased risk [13]. Dietary factors, including insufficient intake of iron-rich foods, limited access to micronutrient supplementation, and poor breastfeeding practices, play a significant role in anemia development [13]. Additionally, infectious diseases such as malaria and intestinal parasites contribute to anemia prevalence among under-five children in Ethiopia [14].

Healthcare Access and Utilization

Limited access to healthcare services, including antenatal care, skilled birth attendance, and pediatric healthcare visits, exacerbates the burden of childhood anemia [15]. Challenges such as distance to health facilities, transportation barriers, and cultural beliefs about illness prevention and treatment influence healthcare-seeking behaviors among caregivers, leading to delayed diagnosis and treatment of anemia in under-five children [16].

Impact on Child Health and Development

Anemia significantly affects child health and development. It increases vulnerability to infections, hampers cognitive development, and stunts physical growth. The long-term effects of childhood anemia include lower school performance, reduced productivity in adulthood, and a higher risk of chronic diseases in later life. Therefore, addressing anemia in children under five is essential for ensuring optimal health outcomes and breaking the cycle of intergenerational poverty [17].

Interventions and Policy Implications

Several interventions have been suggested to combat childhood anemia in Ethiopia, such as micronutrient supplementation programs, nutrition education initiatives, and enhancements to healthcare infrastructure. Effective implementation of these interventions necessitates a multi-sectoral approach, involving cooperation among government agencies, non-governmental organizations, and community stakeholders [18]. Policy recommendations include expanding proven interventions, bolstering health systems, and incorporating anemia prevention and treatment into existing maternal and child health programs [19].

Conceptual framework

The conceptual framework for the study "Magnitude of Anemia and Associated Factors among Under-Five Age Children Admitted to Health Facilities of Gursum Woreda, Eastern Ethiopia" outlines the theoretical foundation and interrelationships between key variables influencing childhood anemia in the study population. The framework guides the research design, data collection, and analysis, providing a structured approach to understanding the complex factors contributing to anemia prevalence among under-five children.

Socioeconomic Determinants

At the core of the framework are socioeconomic factors such as household income, parental education level, and access to basic amenities. These factors influence a family's ability to afford nutritious food, access healthcare services, and adopt preventive measures against anemia. Socioeconomic status serves as a proxy for the broader social determinants of health, shaping living conditions and health behaviors within the community [20].

Comorbidity

Infectious diseases like malaria and intestinal parasites significantly contribute to childhood anemia in Ethiopia. The framework considers variables related to the prevalence of these infectious diseases within the study population and includes measures for preventive interventions such as insecticide-treated bed nets and deworming programs. Tackling parasitic infections and implementing malaria prevention strategies are crucial components of comprehensive anemia control efforts [21].

Child Health Outcomes

The key outcomes in the conceptual framework include child health indicators such as hemoglobin levels, nutritional status (e.g., stunting, wasting), and developmental milestones. These indicators act as proxies for overall child well-being, offering quantitative measures of the impact of anemia on physical growth, cognitive development, and morbidity in children under five [22].

Objective

General Objective

To assess the prevalence of anemia and identify the factors associated with its occurrence among children under the age of five who are admitted to health facilities in Gursum Woreda.

Specific objectives

To Determine the Prevalence of Anemia:

To Identify Socioeconomic Determinants of Anemia:

To Explore the Association with comorbidity

Materials and methods

Study design, period and area

A quantitative cross-sectional study was conducted at Gursum Woreda health facilities in the East Hararghe Zone of Oromia Region, Ethiopia, from March 1 to May 30, 2024. The gursum woreda health facilities, located 595 km from Addis Ababa, the capital city of Ethiopia, is situated in an area with an altitude ranging from 1200 to 2950 meters above sea level. According to the 2007 population and housing census of Ethiopia, Gursum Woreda had a total population of 151,931, consisting of 77,112 men and 74,819 women. The majority of the residents identified as Muslim, accounting for 97.35% of the population, while 2.34% practiced Ethiopian Orthodox Christianity [23]. Regarding

gursum woreda health facilities, the hospital has providing different services including pediatrics, emergency, deliver, outpatient, in patient, laboratory, and pharmacy, medical and surgical service.

Study population

All children aged 6 to 59 months who visited Gursum woreda health facilities were included in this study. However, children with severe medical or surgical conditions, significant bleeding, recent iron and vitamin A supplementation within the last 3 months, or those who had a blood transfusion within the past 3 months were excluded. Additionally, children younger than six months were excluded because their hemoglobin levels are naturally higher at birth and shortly thereafter, which could skew the prevalence data for anemia [24,25].

Sample size determination and sampling technique

The sample size was determined using a single population ratio formula, and calculated using Open Epi-Data Version 3.1. The following statistical assumptions were considered for calculating our sample size: p = magnitude of anemia 33.3% taken from a study conducted in Ethiopia [26], Z α/2 = the corresponding Z score of 95% CI and d = Margin of error (5%).

$$N = \frac{(Z\ \alpha/2\quad)^2\ P\ (1-P)}{d^2} = \frac{(1.96\quad)^2\ X\ P(1-P)}{(0.05)^2} = \frac{3.8485\ X\ 0.222111 = 342}{(0.05)^2}$$

Here, d represents the margin of error between the sample and the population (d=5%), n is the sample size, Z α/2 denotes the 95% confidence interval (1.96), and P is the prevalence rate (33.3%). After accounting for a 15% non-response rate, based on the response rate of a previous study, the final sample size calculated was 393. To improve the precision of our estimates, enhance the statistical power, and ensure representativeness, we increased our sample size to 515, excluding children younger than six months from our dataset.

Our goal was to include all 515 children aged 6 to 59 months who consecutively visited Gursum woreda health facilities during the study period. The list of health institutions (6 Public health centers & 6 private medium clinics) was obtained from the gursum woreda health office and was stratified into public and private. Then, half of the public and one-third of the private institutions were selected using a simple random sampling technique (lottery method). The study subjects were selected using a systematic sampling method. The first child was selected by simple random sampling (lottery method) and then every 2 children was selected based on the order of their visit.

Data collection tools and procedures

Information was gathered through questionnaires administered by interviewers, which were initially prepared in English and then translated into the Afaan oromo language. A pretested structured questionnaire was employed during face-to-face interviews to collect socio-demographic and economic data from mothers. The tools for data collection were developed based on guidelines and relevant literature reviews [27]. The questionnaire design encompassed various socio-demographic characteristics and information on children's comorbidities.

Measurement of variables

Hemoglobin determination and anemia diagnosis: Hemoglobin concentration was used to assess anemia status through capillary blood samples. The HemoCue device (HemoCueHb 301) was employed to analyze hemoglobin levels, with adjustments made for altitude values in accordance with WHO guidelines.

Anemia was defined as a hemoglobin level below 11 g/dl and further categorized into mild, moderate, and severe. For children with hemoglobin levels between 10 and 11 g/dl, it was classified as mild anemia, while for those with levels between 7 and 10 g/dl, it was considered moderate anemia. Severe anemia was identified when hemoglobin levels were below 7 g/dl. Hemoglobin concentrations below 11.0 g/dl indicated anemia, while concentrations equal to or above 11.0 g/dl were considered normal. Anemia severity followed WHO guidelines, classifying children as mild, moderate, or severe anemic based on blood hemoglobin concentrations of 10.0-10.9 g/dl, 7.0-9.9 g/dl, and < 7.0 g/dl, respectively [28].

Laboratory analysis

To analyze hemoglobin levels, approximately 2 milliliters of venous blood were obtained from each participant. Hemoglobin levels were measured using the HemoCue device (HemoCueHb 301).

Outcome variable

Hemoglobin level below 11 mg / dl was taken as dependent variables.

Independent variables

Socio-demographic and socioeconomic characteristics included variables such as the child's sex, age in months, mother's age in years, place of residence, mother's occupation, maternal educational level, monthly family income, nutritional status of children aged 6-59 months, comorbidity, and religion. These variables served as independent factors in the study.

Data quality assurance and control

The questionnaire was initially drafted in English, then translated into the local Afaan oromo language, and subsequently back-translated into English to ensure consistency. Following training on the study's objectives, consent procedures, and data collection techniques, trained data collectors collected the data. The investigators closely supervised the data collection process. All measurements adhered to the manufacturers' recommendations. Technical error measurement (%TEM) values for both inter- and intra-observer reliability of anthropometric data measurements were considered "acceptable" if they were below 2%, and coefficients of reliability exceeding 99%.

Data management, analysis and interpretation

Data was entered, sorted, and categorized. Data cleaning was performed to ensure completeness, accuracy, and to address any missing values or errors, which were corrected as needed. The data was then analyzed using SPSS version 27. Descriptive statistics (mean, frequency) were used to describe the socio-demographic characteristics of the participants, presented in tables, pie charts, and graphs. A binary logistic regression model was applied to identify factors associated with anemia. Variables with a P-value ≤ 0.25 in the bivariate analysis were considered candidates for multivariate analysis. Multivariate logistic regression was conducted to control for potential confounding factors and to identify the true effects of the selected predictor variables. Model fitness was checked using the Hosmer-Lemeshow test. The association between various variables and anemia was measured using Adjusted Odds Ratios (AOR) at a 95% Confidence Interval (CI). A P-value ≤ 0.05 was considered statistically significant.

Ethical approval and consent

Data collection commenced following approval from Rift Valley University Harar Campus and communication with local administrative bodies, who granted permission for the study. Informed written consent was obtained from mothers/caregivers before proceeding with the study.

Results

Socio demographic and economic status

A total of 515 children aged between 6 to 59 months were included in the study. Among these participants, 267 (51.8%) were male and 248 (48.2%) were female. The age of the children ranged from 6 to 59 months, with a mean age of 27.21 months and a standard deviation of 14.763 months. In terms of age distribution, 88 children (17.1%) were between 6 and 23 months old, 132 (25.6%) were between 24 and 35 months old, 128 (24.9%) were between 36 and 47 months old, and 90 (17.5%) were between 48 and 59 months old (see Table 1).

Table 1: Socio-Demographic Characteristics of Children among 6-59 months Admitted to Gursum Woreda, primary hospitals Eastern Ethiopia.

Variables (n = 590)	Categories	n	(%)
Sex of child	male	267	51.8
	female	248	48.2
Age of child (in months)	6-11 month	88	17.1
	12-23 month	132	25.6
	24-35 month	128	24.9
	36-47 month	90	17.5
	48-59 month	77	15.0
Age of mother (years)	Less than or equal to 30	289	56.1
	More than 30	226	43.9
Residence	urban	212	41.2
	rural	303	58.8
Occupation of the mother	employed	235	45.6
	Non-employed	280	54.4
Maternal educational status	No formal education	359	69.7
	Have formal education	156	30.3
religion	Muslim	340	66.0
	orthodox	126	24.5
	protestant	47	9.1
	others	2	.4
Marital status	married	456	88.5
	Non married	59	11.5
Household average monthly income (ETB)	0-5250	461	89.5
	5251-10900	54	10.5

In this study, 515 mother-child pairs participated, resulting in a response rate of 100%. The children's ages ranged from 6 to 59 months, with a mean age of 27.21± 14.763 months. Approximately 89.5% of participants reported a monthly income less than 5250 ETB.

Magnitude and severity of anemia

The overall magnitude of anemia among children aged 6 to 59 months was, 44.3% (95% CI: 40-49%) with hemoglobin levels below 11 g/dl. Among anemic cases, the majority were moderate (7-9.9 g / dl) and mild (10-10.9 g / dl) anemic with 133 (25.8%) and 81 (15.7%) respectively; while only 14 (2.7%) children were seriously anemic with hemoglobin levels below 7 g / dl.

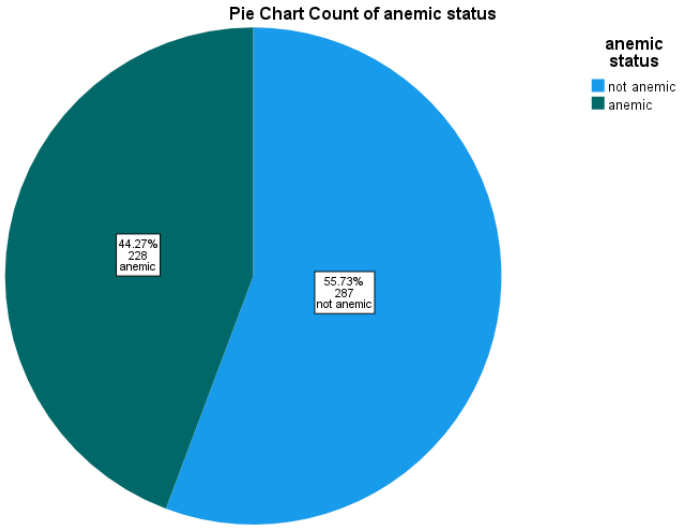

Figure 1: Pie chart that shows magnitude of anemia among 6-59 month children attended at gursum woreda health facilities.

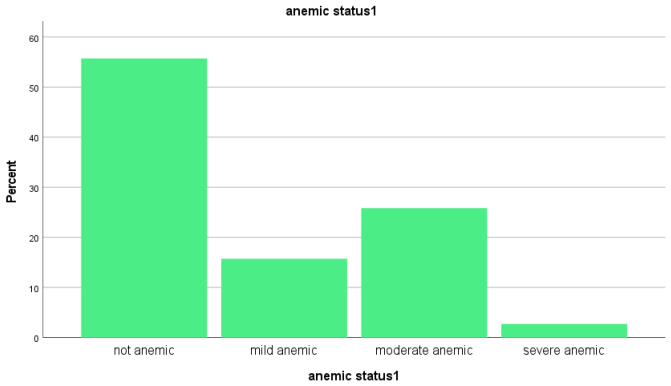

Figure 2: Bar chart that shows anemic level among children6-59 month attending in gursum woreda health facilities, 2024.

Table 2: Distribution of Hemoglobin Levels Among Male and Female Children Aged 6-59 Months at Gursum Woreda Health Facilities, Eastern Ethiopia, 2024.

Hgb value	Male (%)	Female (%)	Total (%)
<7 g/dl (severe)	7(2.6)	7(2.8)	14(2.7)
7-9.9 g/dl (moderate)	65(24.34)	68(27.4)	133(25.8)
10-10.9 g/dl (mild	46(17.22)	35(14.11)	81(15.7)
≥11 g/dl (non-anemic)	149(55.8)	138(55.6)	287(55.7)
Total	**267**	**248**	**515**

Table 3: Health characteristics and anthropometeric measurements among 6-59 month children admitted to health facilities of Gursum woreda, eastern Ethiopia.

Variables (n = 515)	Categories	n	(%)
Child comorbidity	yes	315	61.2
	no	200	38.8
Child wasting status	Not wasting	249	48.3
	wasting	266	51.7
Child stunting status	Not stunting	434	84.3
	Stunting	81	15.7
Child underweight status	Not underweight	336	65.2
	Underweight	179	34.8

Table 4: Bivariate and Multivariable analysis of factors associated with anemia among children aged 6-59 months at Gursum woreda health facilities, eastern Ethiopia, 2024.

Variables (n = 515)	Categories	Anemic status		COR (95% CI)	AOR (95% CI)	P-value for AOR
		Anemic n (%)	Non Anemic N (%)			
Sex of child	female	110(44.4)	138(55.6)	1.007(.711-1.425)		.881
	male	118(44.2)	149(55.8)	1		
Age of child (in months)	6-11 month	41(46.6)	47(53.4)	1		
	12-23 month	53(40.2)	79(59.8)	.769(.446-1.326)		.223
	24-35 month	61(47.7)	67(52.3)	1.044(.606-1.798)		.610
	36-47 month	44(48.9)	46(51.1)	1.097(.609-1.975)		.135
	48-59 month	29(37.7)	48(62.3)	.693(.372-1.291)		.149
Age of mother (years)	Less than or equal to 30	129(44.6)	160(55.4)	1.034(.728-1.468)		.756
	More than 30	99(43.8)	127(56.2)	1		
Residence	urban	96(45.3)	116(54.7)	1.072(.753-1.526)		.382
	rural	132(43.6)	171(56.4)	1		
Occupation of the mother	employed	106(45.1)	129(54.9)	1.064(.751-1.509)		.394
	Non-employed	122(43.6)	158(56.4)	1		
Maternal educational status	No formal education	163(45.4)	196(54.6)	1		.253
	Have formal education	65(41.7)	915(8.3)	.859(.587-1.256)		
religion	Muslim	145(42.6)	195(57.4)	1		
	orthodox	59(46.8)	67(53.2)	1.184(.785-1.786)		.858
	protestant	23(48.9)	24(51.1)	1.289(.700-2.374)		.986
	others	1(50.0%)	1(50.0%)	1.345(.083-21.680)		.986
Marital status	married	204(44.7)	252(55.3)	1		.336
	Non married	24(40.7)	35(59.3)	1.181(.680-2.049)		
Household average monthly income (ETB)	0-5250	211(45.8)	250(54.2)	1.837(1.005-3.356)	1.945(1.044-3.622)	.036**
	5251-10900	17(31.5)	37(68.5)	1	1	
Child comorbidity	yes	146(46.3)	169(53.7)	1.243(.869-1.779)	1.270(.878-1.836)	.205
	no	82(41.0)	118(59.0)	1	1	
Child wasting status	Not wasting	110(44.2)	139(55.8)	1		.720
	wasting	118(44.4)	148(55.6)	1.007(.711-1.427)		
Child stunting status	Not stunting	192(44.2)	242(55.8)	1		.595
	Stunting	36(44.4)	45(55.6)	1.008(.626-1.625)		
Child underweight status	Not underweight	151(44.9)	185(55.1)	1		.289
	Underweight	77(43.0%)	102(57.0%)	.925(.642-1.333)		

**significant variables of multivariate analysis.

Factors associated with anemia

Based on both bivariate and multivariable logistic regression, anemia among children aged 6-59 months was only associated with Household average monthly income ($p < 0.05$).

Depending on the multivariable logistic regression, only Household average monthly income of childhood anemia found to be predictive factor. Children with less Household average monthly income (income < 5250 ETB) was therefore found to be more likely to be anemic than their counterparts (AOR 1.945; 95% CI: 1.044, 3.622).

Discussion

The aim of this study was to assess the prevalence and contributing factors of anemia in children aged 6-59 months who attended health facilities in Gursum Woreda, eastern Ethiopia. Despite advancements in nutritional interventions, anemia continues to be a significant health issue in developing countries, leading to severe health consequences, particularly among children aged 6-59 months [29,26].

In this study, the overall magnitude of anemia in children aged 6-59 months was 44.3% (95% CI: 40-49%), defined by hemoglobin levels below 11 g/dl. This indicates a significant public health issue that necessitates the implementation of effective preventive measures, as anemia contributes to childhood morbidity and mortality [30].

According to the WHO, anemia is considered a public health issue if its prevalence exceeds 5%. The severity is classified as mild (5-19.9%), moderate (20-39.9%), and severe (≥ 40%) [31]. Therefore, the study area faces a severe public health problem, requiring effective preventive measures, as anemia contributes

to child morbidity and mortality [32,33].

This study revealed that the overall prevalence of anemia in children among 6-59 month old was 44.3%. The breakdown showed mild anemia at 15.7%, moderate anemia at 25.8%, and severe anemia at 2.7%. These results align with previous research, such as a 2016 study in Southern Ethiopia (41.7%), a 2010 study in Bangladesh (40.9%), research in North Kazakhstan (40.0%), and the national prevalence reported by the EDHS in 2011 (44%) [34].

However, the finding is lower than that of reported from Ghana (78.4%) in 2014 [35], Cape Verde (51.8%) in 2014 [36], northern part of Ethiopia (50.3%) [37], Nigeria (70.5%) in 2012 [38], Tanzania (77.2%) in 2015 [39], and Kenya (71.8%) in 2005 [40].

The lower prevalence observed in this study may be attributed to improvements from current nutritional and public health interventions, increased accessibility to health information provided by health extension workers, and other contributing factors. However, it remains higher than the prevalence reported in a 2011 study conducted in Eastern Cuba, which was 26% [41], 28.8% from Kenya in 2014 [40] and 38.8% from Haiti 2013 [42]. The possible reason for these differences may be due to geographical and seasonal differences, interventions used, lifestyles, and socioeconomic status.

In this study, the magnitude of severe anemia among the study participants was 2.7%. This result is lower than the study conducted in Tanzania (27.7%) [39]. But it was similar with the findings in western China which documented 3.2% severe anemia [43]. The possible explanations for variations in the magnitude of anemia between the present study and the above studies may be related to the seasonal and geographical variation of risk factors and disparities in the socioeconomic status of the populations.

In this research, average household income has been associated with anemia among children. Children living in households with lower monthly incomes were more likely to suffer from anemia than those with higher incomes. This is supported by similar findings in a study carried out in Brazil and northern Ethiopia [2,29]. This is because children from poor families are less likely to get iron-rich foods such as animal products and less likely to be able to afford health care during illness due to poverty. It is, therefore, necessary to engage women in income-generating activities so that their children have better health care and supplementary food.

The first limitation of this study is that it did not evaluate many potential risk factors for anemia, such as the introduction of complementary foods, intestinal parasites, place of delivery, dietary diversity score, and household food insecurity, which limits the generalizability of the findings regarding possible risk factors. Additionally, the study is quantitative; incorporating a qualitative approach could have strengthened the examination of additional determinants of anemia. Therefore, larger studies are needed to accurately demonstrate associations within the population. Despite these limitations, this is the first public health facility-based cross-sectional study to attempt to reveal the magnitude and associated factors of childhood anemia severity in the study area, making a significant contribution to improving the health of children aged 6-59 months

Conclusion

Overall, anemia is recognized as a public health issue among children aged 6-59 months attending public health facilities in Gursum Woreda, according to the World Health Organization's criteria. The study found that average monthly family income was significantly associated with childhood anemia. Therefore, effective public health interventions are necessary, such as educating women about nutrition and dietary diversification, and involving them in alternative income-generating activities, which can be crucial in the study area. Additionally, more extensive longitudinal studies with larger sample sizes should be conducted, including analyses of all red blood cell indices, red cell morphology, serum micronutrient levels, and subclinical infections, to establish a causal relationship between anemia and its contributing factors.

Acronomy

ETB: Ethiopian Birr; Hb: Haemoglobin; SPSS: Statistical Package For Social Science; WHO: World Health Organization; RBC: Red Blood Cell; EDES: Ethiopian Demographic and Health Survey; TEM: Technical Error Measurement; AOR: Adjusted Odd Ratio; COR: Crude Odd Ratio; CI: Confidence Interval.

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