

2022-09-19

Proportion of Anemia and Associated Factors Among Children Aged 6-59 Months Visiting Tibebe Ghion Specialized Hospital, Bahir Dar, Northwest Ethiopia, 2022.

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**BAHIR DAR UNIVERSITY COLLEGE OF MEDICINE AND HEALTH
SCIENCE DEPARTMENT OF Pediatrics and Child Health**

Proportion of Anemia and Associated Factors Among Children Aged 6-59 Months
Visiting Tibebe Ghion Specialized Hospital, Bahir Dar, Northwest Ethiopia, 2022.

A RESEARCH THESIS SUBMITTED TO BAHIR DAR UNIVERSITY
COLLEGE OF MEDICINE AND HEALTH SCIENCES, SCHOOL OF
MEDICINE, DEPARTMENT OF PEDIATRICS AND CHILD HEALTH FOR
PARTIAL FULLFILLMENT OF THE REQUIRMENTS FOR THE SPICALITY
IN PEDIATRIC AND CHILD HEALTH.

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SEPTEMBER, 2022.

BAHIRDAR ETHIOPIA

BAHIR DAR UNIVERSITY COLLEGE OF MEDICINE AND HEALTH
SCIENCE DEPARTMENT OF PEDIATRICS AND CHILD HEALTH

PREVALENCE OF ANEMIA AND ASSOCIATED FACTORS AMONG 6-59
MONTHS CHILDREN VISITING TIBEBE GION SPECIALIZED HOSPITAL,
BAHIR DAR, ETHIOPIA, 2022.

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Declaration

This is to certify that the thesis entitled “prevalence of anemia and associated factors among 6-59 months children visiting Tibebe Gion Specialized Hospital, Bahir dar, Ethiopia, 2022”, submitted in partial fulfillment of the requirements for the Specialty in Pediatrics and child health, Bahir Dar University, is a record of original work carried out by me and has never been submitted to this or any other institution to get any other degree or certificates. The assistance and help I received during the course of this investigation have been duly acknowledged.

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Approval of thesis for Defense

I hereby certify that I have supervised, read, and evaluated this thesis titled "prevalence of anemia and associated factors among 6- 59 months children visiting Tibebe Gion Specialized Hospital, Bahir dar, Ethiopia, 2022 "by Dr Alene Zewdu prepared under my guidance. I recommend the thesis be submitted for oral defense.

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Approval of thesis for defense result

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ACKNOWLEDGMENT

First of all i would like to extend my condolences to the families and friends of Dr. Amanu Aragaw a hard working man that helped me a lot in that short period of time we met.

i would like to express my deep-rooted thanks and gratitude to Dr. Tesfaye Taye and Mr. Dabere Nigatu for their encouragement and valuable comments throughout this thesis preparation.

My gratitude also extends to Bahir Dar university department of pediatrics and child health for giving this chance and support to develop this thesis work.

Finally, I would like to acknowledge the supervisor and data collectors and respondents for their cooperation throughout the data collection period.

List of Acronym and Abbreviation

ANC-----Ante Natal Care

AOR-----Adjusted Odds Ratio

CBC-----Complete Blood Count

CI-----Confidence Interval

EDHS-----Ethiopian Demography and Health Survey

ENT-----Ear Nose and Throat

ETAT-----Emergency Triage Assessment and Treatment

G/dl-----Gram per deciliter

Hb-----Hemoglobin

HFA----Height For Age

MUAC ---Mid Upper Arm Circumference

NICU---Neonatal Intensive Care Unit

OPD----Out Patient Department

SPSS---Software Program for Social Science

TGSH---Tibebe Gion Specialized Hospital

WHO— World Health Organization

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Abstract

INTRODUCTION -Anemia is a public health problem that affects populations in both rich and poor countries. Although anemia occurs in all age groups it is more prevalent in young children and pregnant women.

OBJECTIVE – To aim of the study was to determine the prevalence of anemia and associated factors among children aged 6-59 months visiting Tibebe Ghion Specialized Hospital.

METHODS- Hospital based cross sectional study was conducted among 341 children aged 6-59 months visiting Tibebe Ghion Specialized Hospital from from Nov.01/2021 - Feb.30/ 2022. Study participants were selected with systematic random sampling method. A pretested and structured questionnaire plus checklist was used to collect the data. The data was entered through epidata version 3.1, and analysed using SPSS Version 25 computer software. Bivariable and multi-variable logistic regression analysis was done to identify factors associated with anemia. Adjusted odds ratio with 95% confidence interval at a p-value<0.05 was declared as statistically significant

Result: Result: A total of 341 children were enrolled in this study with the prevalence of anemia being 32% with 95% CI: 26 - 37%. Among the participants majority of them 25% had mild anemia the rest 6.2% and 0.6% accounted moderate and severe anemia respectively. In the multivariable binary logistic regression children age, weight for height of children, maternal education, and maternal residency had significant associations. Children born to a mother who is unable to read and write were 2.6 times more likely to develop anemia than children born to a mother having university/college educational level (AOR:2.645, 95% CI:(0.917-7.630)). Multivariable analysis in this study showed that children in the age group 6-23 months were more likely to become anemic 3.8 times when compared with children in the age group of 48-59 months (AOR: 3.8, 95% CI: 1.536-9.470)

Conclusion: The study showed high prevalence of anemia among children in Tibebe Ghion Specialized Hospital. Age, maternal education had significantly associated with anemia.

Key words: Anemia, Associated factors, Children 6-59months, Prevalence,

Bivariate, Multivariate analysis

1. Introduction

1.1. Background

Anemia is a condition in which the number of red blood cells (and consequently their oxygen-carrying capacity) is insufficient to meet the body's physiologic needs. Specific physiologic needs vary with a person's age, gender, altitude, smoking behavior. Iron deficiency is thought to be the most common cause of anemia globally, but other nutritional deficiencies (including folate, vitamin B12), acute and chronic inflammation, parasitic infections, and inherited or acquired disorders that affect haemoglobin synthesis, red blood cell production or red blood cell survival, can all cause anaemia. According to the WHO for under five children, the threshold Hb level for being anemic is less than 11g/dL(1).

Anemia is a global public health problem affecting both developing and developed countries with major consequences for human health as well as social and economic development (2-4).

The estimated global anaemia prevalence is 24.8%, affecting 1.62 billion people with estimated anaemia prevalence of 47.4% in preschool-aged children, 41.8% in pregnant women and 30.2% in non-pregnant women. In numbers, 293 million preschool-aged children, are affected by anemia(2). Although anemia affects all age groups children and women of reproductive age are most at risk, with Africa and Asia accounting for more than 85% of the absolute anemia burden in high risk groups(1).

According to 2016 EDHS data the overall prevalence of anemia in under five children was 57% , with one-quarter of women age 15-49 in Ethiopia are anemic(5).

One of the commonest forms of nutritional anemia which is recognized throughout the world is iron deficiency anemia. It is probably the most prevalent half of cases and common micronutrient deficiency in the developing world today existing in populations of low socio-economic status. It is responsible for a higher incidence of morbidity because of the lack of proper investigation, prophylactic and therapeutic measures(4, 6).

Anemia in children is influenced by structural and environmental factors, community, household factors, and individual's health and nutritional level. Anemia in pre-school children has a negative effect on cognition, motor development and growth, academic performance, immunity, and susceptibility to infections(7).

1.2. Statement of the problem

Anemia affects one-quarter of the world's population and is concentrated in preschool-aged children and women, making it a global public health problem(8). More than 2 billion people in the world today suffer from micronutrient deficiencies caused largely by a dietary deficiency of vitamins and minerals. Although people in all population groups in all regions of the world may be affected, the most widespread and severe problems are usually found amongst resource poor, food insecure and vulnerable households in developing countries(9). In developing countries, low standards of living such as restricted access to food, personal hygiene, poor sanitation and lack of knowledge on good dietary practices contribute more to the high occurrence of iron-deficiency and hence anemia(10).

According to WHO mortality data, around 0.8 million deaths (1.5% of the total) can be attributed to iron deficiency each year. In terms of the loss of healthy life, expressed in disability-adjusted life years, iron-deficiency anemia results in 25 million disability-adjusted life years lost (or 2.4% of the global total)(11). According to WHO, in 2013 there was an estimated death of 90,000 people in both sexes and all age groups caused by iron deficiency anemia alone (12).

A study done in Togo and Uganda among under five children showed that the prevalence of anemia was 70.9% and 37.2% respectively(13, 14). A study done in Ethiopia among under five children showed the prevalence of Anemia to be 41.7%(15). A large number of observational studies have shown associations between iron deficiency, iron deficiency anemia and poor cognitive and motor development outcomes in children. Iron deficiency causes alterations to brain structure and function, which may be irreversible even with iron treatment, particularly if the deficiency occurs during infancy when neurogenesis and differentiation of deferent brain regions are occurring(16).

Overcoming micronutrient malnutrition is therefore a precondition for ensuring rapid and appropriate national development(9). Any strategy implemented to prevent or treat anemia should be tailored to local conditions, taking into account the specific etiology and prevalence of anemia in a given setting and population group(8). Early detection of anemia and subsequent measures to prevent anemia can help children grow healthily(17).

Currently there is no study done at TGSB that shows the magnitude and associated factors of anemia in under five children and this study will be important in determining the proportion and associated factors of anemia in children from 6-59months of age at our hospital.

1.3. Significance of the study

It has been documented in several studies that anemia is a Global health problem therefore knowing the magnitude of anemia in children from 6-59months of age and associated factors at Tibebe Gion Specialized Hospital will help in different aspect of prevention and management of anemia in our community.

The information generated from the study will be useful to the Ministry of Health, Amhara Health Bureau and other health agencies working on child health in designing appropriate interventions to improve anemia in children aged 6-59 months. Therefore, this study was aimed to assess prevalence of anemia and associated factors among children from 6-59months at Tibebe Ghion Specialized Hospital, Amhara region, North West Ethiopia.

2. Literature Review

A cross-sectional study done in Brazil among under five children showed that the prevalence of anemia was 56.6%(18). A cross-sectional study done in India among under five children showed that 77.8% children were anemic. In studied children 38% had mild anemia, 54% had moderate anemia and 8% had severe anemia. Male outnumbered than female in the ratio of 1.17:1. More than 50% presented with acute gastroenteritis, 79% of anemic children had malnutrition, 24% of anemic children were low birth weight(19). A study done in Lebanese children who were hospitalized showed that prevalence of both mild and moderate anemia was 71.8 and 25.4%, with only 2 cases of severe anemia encountered among children aged 6 months or above. Same study found out that the risk of anemia increases by around 3.4 folds among malnourished than in well-nourished children(20).

A study done in Tanzania showed that the prevalence of anemia in under five children was 77.2 % with mild, moderate and severe anemia being 16.5, 33 and 27.7 % respectively. Microcytic hypochromic anemia was detected in 37.5 % of the children with anemia. The factors associated with severe anaemia included unemployment of the parent, and malarial parasitaemia (21).

A study done in Togo among two thousand eight hundred ninety children aged 6–59months showed that the weighted prevalence of anemia was 70.9% with 2.6% of severe anemia among these children. Children's malaria status was strongly associated to childhood anemia with an AOR of 3.03(14).

A study done in Uganda showed that the prevalence of anaemia among children aged 1–5 years was 37.2%. The risk of anaemia was higher among males than females. Malaria was associated with a 1.5 times risk of anaemia(13).

A Multilevel Analysis of Data from the 2016 Ethiopia Demographic and Health Survey showed that the prevalence of anemia among children 6–23 months of age was 72.3%. In this analysis individual-level factors associated with anemia are female sex, age, exclusive breastfeeding, underweight children. Being Female and children who had exclusive breastfeeding were less likely to be anemic when compared to male and non exclusive breastfeeding children. Children 6–11 and 12–17 months old had a higher odds of anemia compared to children 18–23 months old. This study also revealed that being underweight was positively associated with anemia (22).

A cross-sectional health facility based Study done in south wollo under 5 children showed that the overall prevalence of anemia among under five children was 41.1%. Of the anemic under-five children, 67.5%, 31.3%, 1.2% had mild, moderate and severe anemia respectively. Multivariate analysis showed that children in the age group of 6–11 and 12–23 months were 4.5 times and 2.8 times more likely to be anemic than children in the age range of 48–59 months, respectively. Children living in an urban area were 1.8 times more likely to be anemic than those living in a rural area. Children with illiterate (or no formal education) mothers, and with primary education were 7 times and 3.3 times more likely to be anemic than children with mother of secondary and above education level. Children with a family monthly income of <750 Ethiopian birr and 750- 1500 Ethiopian birr were 5.2 times and 5.9 times more likely to be anemic than children with a family monthly income of >1500 Ethiopian birr. Children with early (6 months) initiation of complementary foods was 3.5 times more likely to be anemic than children with timely (>6months) initiation of complementary foods. Similarly, Underweight children were 2.1times more likely to be anemic than children with normal weight.(23).

A community-based cross-sectional study done in Debre Birhan among infants and young Children aged 6–23 Months showed the overall prevalence of anemia was 47.5% of which 18.3% were mildly anemic, 25% were moderately anemic, and 4.1% were severely anemic. Stunting, underweight were positively associated with anemia while having ≥ 4 antenatal care visits had a protective effect against anemia(24).

Institution based cross-sectional study done at Tsitsika Health Center in Wag-Himra Zone showed the overall prevalence of anemia is 66.6%. In multivariate logistic regression analysis, male sex, 9–11 months of age, poor dietary diversity, stunting, diarrhea, no formal education, early initiation of complementary food, and lowest wealth quintile were significantly associated with anemia(25). A study done in southern Ethiopia Arba Minchi Zuria District show the overall prevalence of anemia is 37.3%. Anemia was higher among children who were positive for intestinal parasitic infections(26). Study done at Jimma Medical Center shows the overall prevalence of anemia is 44.8%.

There was significant association between malaria and anemia. There was association between diarrhea and anemia. Anemia had significant association with mother illiterate but statistically. Family income had significant association with anemia(27).

Study done at Hawassa university hospital showed the overall prevalence of anemia was found to be 41.7%. (mean hemoglobin level was 10.59 g/dl). Anemia was of mild, moderate, and severe type in 6.6%, 19%, and 16.1% of the children, respectively. Children in the age group 6–23 months, and mothers having no formal education were identified as associated factors for anemia(15). The study done in Gondar university hospital among hospitalized children shows the overall prevalence of anemia is 58.6%.The same study with multivariate logistic regression analysis shows, being infected with parasitic infection and not eating meat and animal products were statistically associated with anemia(28).

A hospital-based cross-sectional study done at Debre Markos referral hospital showed the prevalence of anemia in children from 6-59months children was 11.9%(29).

3. Conceptual framework

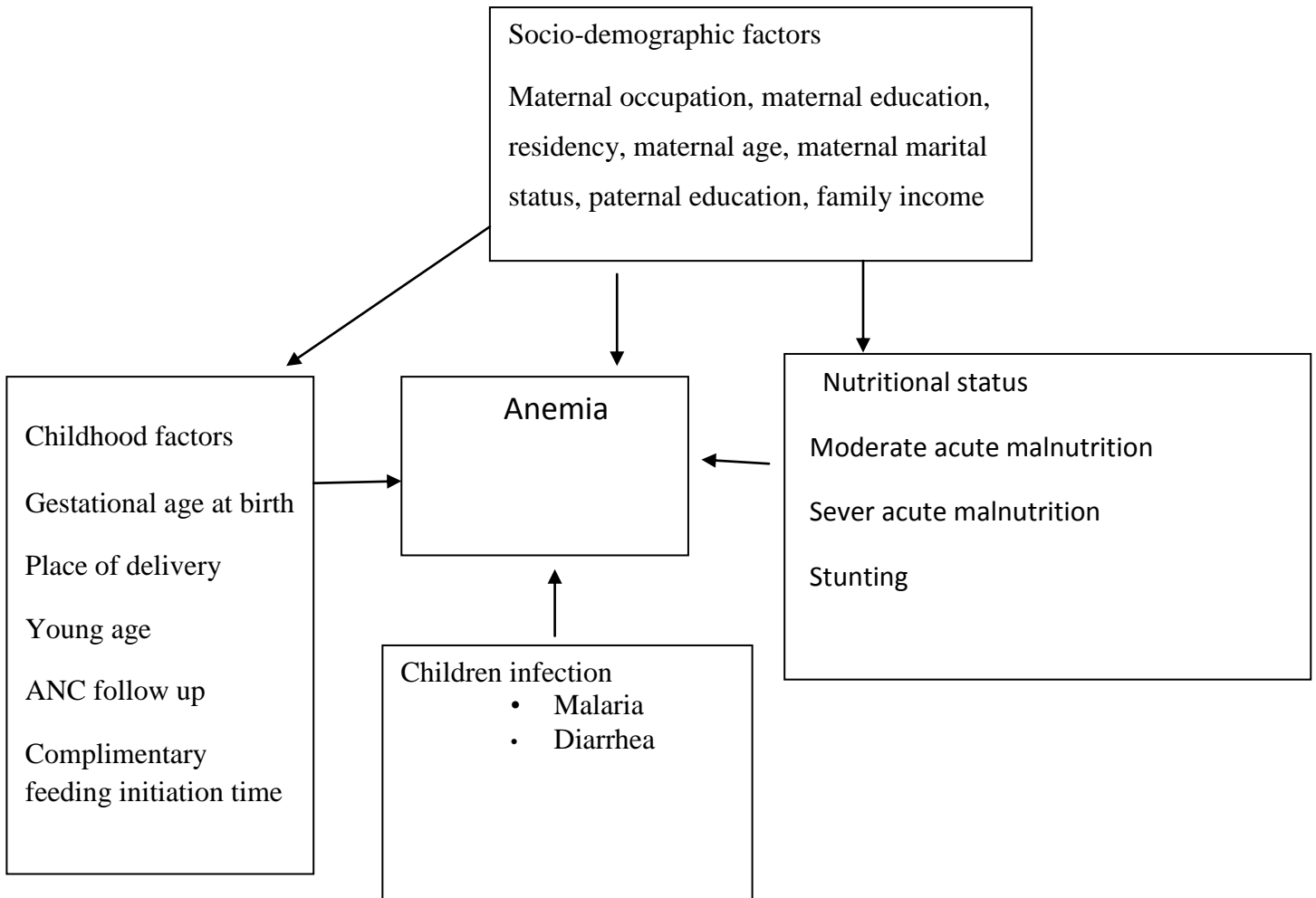


Figure 1: Shows conceptual framework for anemia and associated factors in children aged 6-59 months at TGSB, Bahir Dar, North West, Ethiopia 2022.

4. Objective of the study

4.1.General objective:

- To assess proportion of anemia and associated factors among children aged 6-59 months visiting TGSH, Bahir Dar, Northwest Ethiopia, 2022.

4.2.Specific objectives:

- To determine the proportion of anemia among children aged 6-59 months visiting TGSH, Bahir Dar, Northwest Ethiopia, 2022.
- To identify associated factors of anemia among children aged 6-59 months visiting TGSH, Bahir Dar, Northwest Ethiopia, 2022.

5. Methodology

5.1. Study design

An institution based cross sectional study was conducted among children 6-59 months visiting Tibebe Ghion Specialied Hospital.

5.2. Study area and period

The study was conducted at Tibebe Gion Specialized Hospital among children aged 6-59 months visiting the Hospital from Nov.01/2021 - Feb.30/ 2022. The hospital is found in Bahir Dar, the capital city of Amhara region. The town is located 560 km north from Addis Ababa. In addition to the four major department (Internal medicine, surgery, obstetrics & gynecology and pediatric and child health), the hospital comprises of different departments including ophthalmology, ENT, psychiatry, dermatology, pathology and radiology, Emergency medicine, maxillofacial, anesthesia, orthopedics. The study was conducted among 6-59 months children visiting Tibebe Ghion Specialized Hospital.

Pediatric department comprise of ward, ETAT, under five, above five OPD and chronic follow up, NICU. TGSB served 93,500 in year 2020 with the catchment area of 5 million people.

5.3. Population

5.3.1. Source population

All children who visited TGSB in the study period were the source population.

5.3.1. Study population

All children aged 6-59 months who visited TGSB during the study period were the study population.

5.4. Eligibility criteria

5.4.1. Inclusion criteria

Children 6-59 months who do not fulfill the exclusion criteria were included.

5.4.2. Exclusion criteria

Recent blood transfusion

Children having active bleeding.

5.5. Sampling technique

5.5.1. Sample size determination

The minimum sample size required for objective one was calculated using a single population proportion formula with the following considerations the 95% confidence interval with 5% marginal error, using the formula $n = z^2 p (1 - p) / d^2$, where n = sample size, z = statistic for a level of confidence ($z = 1.96$ at 95% CI), p = expected prevalence or proportion ($p = 41.7\%$), and d = precision (if 5%, $d = 0.05$)

From previous study done at Hawassa university specialized hospital among a total of 422 under-five children participated in the study overall prevalence of anemia was found to be 41.7%. The sample size was determined as

$$N = \frac{\left(\frac{z_{\alpha}}{2}\right)^2 pq}{\omega^2}, \quad \text{where } z = \text{confidence interval} = 95\%$$

$$P = 41.7\% \text{ from previous study}$$

$$q = (1 - p) = 0.58$$

$$\omega = \text{margin of error} = 0.05$$

$$\frac{z_{\alpha}}{2} = 1.96$$

$$n = \frac{1.96^2 * 0.42 * 0.58}{(0.05)^2} = 374.$$

Considering the finite population correction

Using the formula $n = [no / (1 + no/N)]$ and 10% for non-response rate the final sample size determined to be $n = 374 / (1 + 374/1000) = 272$, with 10% non-response rate 299.

For objective two from similar study child age and maternal education (no formal education) had significant association and with these factors sample size was determined using Epi info.

Factors/ variables	AOR	Power	z α /2 95%CI	Ratio	P1	P2	Sample size	SampleSize(wit correction and 10% non response rate formula non
Child age /6-23 m/	2.04	80	1.96	1	34.7%	52.0%	278	217+22=239
Mother's educational level /no formal/	1.74	80	1.96	1	35.6%	49.0%	452	310+31=341

P1= % outcome in unexposed group

P2= % outcome in exposed group

AOR= Adjusted Odds ratio

CI= confidence Interval

So the final sample size is 341 by considering the finite population correction and 10% non response rate.

5.5.2. Sampling procedure

Study participants were selected with systematic random sampling method with the final sample size being 341. The K value is calculated to be 3. Then the lottery method was employed to identify the first child to be interviewed. Consequently, the participants was interviewed every Kth which is every 3rd intervals for this study among children from 6-59 months visiting TGS.

5.6. Data collection tools and procedure

Data was collected using a structured questionnaire and check list. The questionnaire was adapted from different literatures of the same context (18, 25, 26, 28, 30, 31). The questionnaire was initially prepared in English then translated to Amharic and then back to English to check for consistency. Two clinical nurses and one general practitioner were recruited as data collector and supervisor, respectively. Two days training was given for data collectors and the supervisor about the objective of the study, technique of data collection, the content of the questionnaire,

and issues of confidentiality. The questionnaire was pretested at Felege Hiwot Referral Hospital with 10% of the sample size and revisions were made accordingly.

Data was collected through interviewing mother/caregivers using the local language, Amharic version of the tool among pediatric patient's 6-59 months of age. Data on nutritional status was collected by measuring the weight and height/length. The length was measured for children aged less than 2 years in a recumbent position and standing height was measured for children above two years using the measuring board.

The weight of the children was measured by a scale. The children were without shoes on and wearing a minimum of clothes. In addition, tape meter was used to measure mid-upper arm circumference of the children. Each measurement was collected twice and the mean value of the two measurements was recorded on the questionnaire. 3 milliliters of blood was collected for complete blood count analysis. Almost all patients admitted to the pediatric ward and patients at OPD were having CBC determinations and among the patients in the outpatient department four patients in the random probability sampling who could not afford to pay for CBC determination were sponsored.

5.7. Variable of the study

5.7.1. Dependent variable

Anemia (Yes/No)

5.7.1. Independent variable

Socio-demographic factors

Socio-economic factors of the family,

Nutritional status of the child

Children infection

Childhood factors (Gestational age at birth, Place of delivery, ANC follow up)

5.8. Operational definition, definition of terms, and measurement.

Anemia for children from 6month to 59 months of age (1).

Mild anemia 10-10.9mg/dl

Moderate anemia 7-9.9mg/dl

Severe anemia less than 7mg/dl

Gestational age

Term Between completed 37 weeks till 42 week gestation

Preterm less than 37 week gestational age

Nutritional status

Sever acute malnutrition MUAC less than 11.5cm, WFH/length less than -3z score

Moderate acute malnutrition--- MUAC \geq 11.5 cm and $<$ 12.5 cm or a WFH /L \geq -3 z-score and $<$ -2 z-score

Stunting--- HFA $<$ -2z score

5.9. Data processing and analysis

Data was checked and entered in to 3.1 versions Epi-data software, then it was transported to SPSS version 25.0 software for analysis. Associations between independent variables and dependent variables were analyzed using both bivariable and multivariable binary logistics regression analyses. Variables which had p value less than 0.2 in the bivariate analysis were used in the multivariable analysis. P value less than 0.05 at 95% confidence interval was considered as statistically significant throughout the study.

6. Ethical consideration

Ethical clearance was obtained from institutional Review Board of the College of Medicine and Health Sciences. Formal letter of cooperation was secured from TGSH.

Informed assent was obtained from each participant of the study. Name and other personal information which can violate the confidentiality of the patient was not exposed to the third party for any other reason. All information revealed was kept confidential.

7. Dissemination of research finding

The finding will be submitted to Bahir dar University College of medicine and health sciences and to Amhara National Regional State Health Bureau. Besides, research findings will be disseminated for different responsible bodies and stake holders. Efforts will be made to publish in peer reviewed journal.

6. Results

6.1. Socio-demographic and clinical characteristics of Children from 6-59 months at TGS, Bahir Dar, North West Ethiopia 2022.

A total of 341 children were included in this study with the age range from 6-59 months with an average age being 24.7 months. Among the study subjects 178 (52.2%) were males and the rest were females. The majority of the study subjects 309(90.6%) were born term. Majority of the respondents 274(80.6%) had normal weight for height/length measurement, the rest 41 (12%) and 26(7.6%) had moderate and severe acute malnutrition measurements respectively. Among the respondents 158(46.3%) were stunted. Three hundred nine (90.6%) had exclusive breast feeding for six months. About 257 (75.4%) of the study subjects had a complementary feeding that was initiated at the age of 6 months and around 37(10.9 %) of the respondents initiate complementary feeding below the age of 6 months. Among the respondents 72(21.1%) had experienced episodes of fever in the previous one month before they visited Tibebe Gion Specialized Hospital. The study subjects that experienced diarrhea and vomiting in the preceding one month before presentation were 159(46.6%) and 55 (16.1%) respectively. (Table 1)

Table 1: Socio-demographic and clinical parameters of children from 6-59 months at TGS, northwest Ethiopia, 2022.

Variable		Frequency	Percentage
Age of children	6-23 months	172	50.4
	24-35 months	91	26.7
	36-47 months	44	12.9
	48-59 months	34	10.0
Sex	male	178	52.2
	Female	163	47.8
Gestational age at birth	Term	309	90.6
	Preterm	32	9.4
Weight for height/length	Normal	274	80.4
	Moderate acute malnutrition	41	12.0
	Sever acute malnutrition	26	7.6
Height for age	Normal	183	53.7
	Stunted	158	46.3
Exclusive breast feeding	No	32	9.4
	Yes	309	90.6

Ever breastfeed	No	4	1.2
	Yes	337	98.8
Time of initiation of complementary food	Below 6 months	37	10.9
	At 6 months	257	75.4
	Above 6 months	47	13.8
Diarrhea	No	182	53.4
	Yes	159	46.6
Vomiting	No	286	83.9
	Yes	55	16.1
Malaria	No	297	87.1
	Yes	44	12.9

6.2. Socio-demographic and clinical characteristics of the parents

The mean age of the mothers in this study was 29.5years. Majority of the mothers 277(81.2%) were Christian orthodox followers. Almost 260 (76.2) of the mothers were currently married. Most of the mothers 132(38.7%) of the participants of this study were housewife in occupation and 190(55.7%) of them were in the age group of greater than 30 years. Majority of the respondents have attended secondary school and only 51 (15%) of them had educational level of college or university. Almost majority of the participants 247(72.4%) were urban residents with 291 (85.3%) of the mothers had a regular follow up in the antenatal care. Around 270 (79.1%) of the respondents delivered at health institution.(Table 2)

Table 2: Socio-demographic characteristics of parents

Variable		Frequency	Percentage
Maternal age	15-29 years	151	44.3
	30-49 years	190	55.7
Maternal Religion	Orthodox	277	81.2
	Muslim	45	13.2
	Protestant	19	5.6
Maternal ethnicity	Amhara	339	99.4
	Oromo	2	0.6
	Tigrie	0	0
Maternal marital status	Currently married	260	76.2
	Widowed	14	4.1

	Divorced	31	9.1
	Single	36	10.6
Maternal educational status	unable to read and write	83	24.3
	Primary school	40	11.7
	Secondary school	167	49.0
	University/college	51	15.0
Occupation of mother	Housewife	132	38.7
	Merchant	115	33.7
	Government employs	41	12.0
	Farmer	53	15.5
Residency of the mother	Rural	247	72.4
	Urban	94	27.6
Paternal educational status	unable to read and write	51	15.0
	Primary school	51	15.0
	Secondary school	152	44.6
	University/college	87	25.5
Paternal occupation	Government employ	89	26.1
	Merchant	85	24.9
	Private employ	101	29.6
	Farmer	66	19.4
Monthly household income	Below 10,000	267	78.3
	Above 10,000	74	21.7
Antenatal care follow-up	No	50	14.7
	Yes	291	85.3
Delivery place	Home	71	20.8
	Health institution	270	79.2

6.4. Prevalence of anemia among children from 6-59 months at TGSB, northwest Ethiopia, 2022.

The mean hemoglobin value of the participants was 11.5g/dl with a minimum and maximum value of 6.9g/dl and 14g/dl respectively. The prevalence of anemia among children from 6-59 months in this study was 32% with 95% a confidence interval of (26.8-37.2%). Among the participants majority of them 25% had mild anemia the rest 6.2% and 0.6% accounts moderate and severe anemia respectively. (Figure 2)

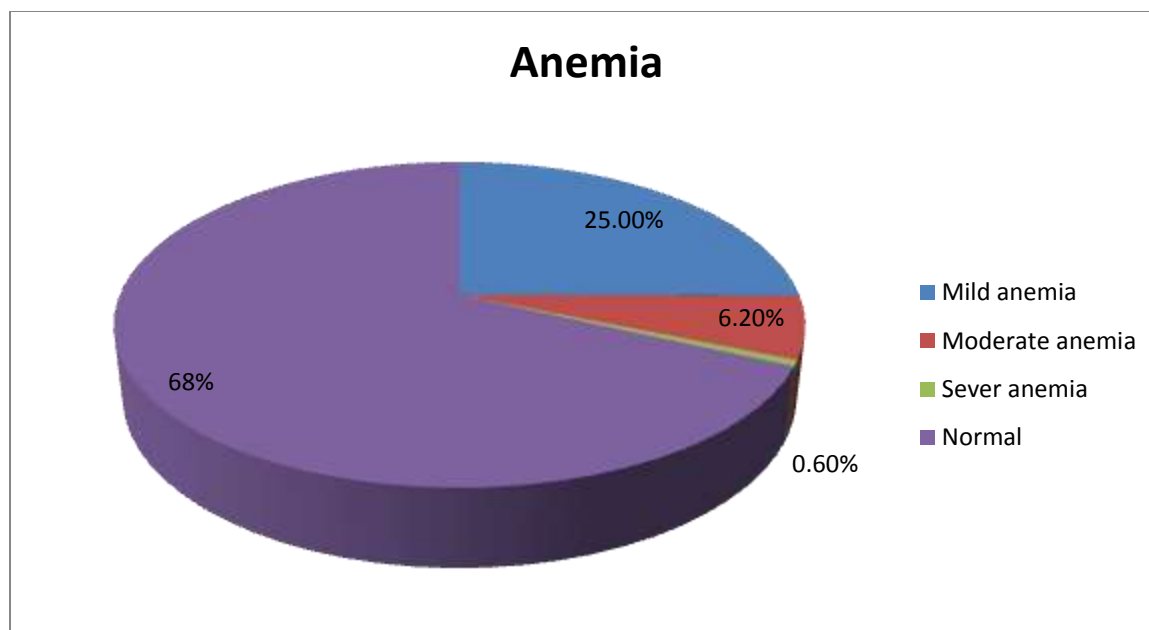


Figure 2: Prevalence of anemia among children from 6-59 months of age in TGSH, Northwest Ethiopia, 2022.

4.5. Factors associated with anemia among children from 6-59 months of age in TGSH, Northwest Ethiopia, 2022.

Bivariable and multivariable binary logistic regression was done for identifying the risk factors for anemia in children from 6-59 months of age. All variables were tested by bivariable binary logistic regression analysis and variable with a p-value of < 0.2 were entered into the multivariable logistic regression. Maternal education, maternal residency, age of children and weight for height were having a p value < 0.2 and were used in multivariable analysis.

In the multivariable analysis maternal education, maternal residency, age of children had significant association with the occurrence of anemia with a p value < 0.05 . Children born to a mother who is unable to read and write were 2.6 times more likely to develop anemia than children born to a mother having university/college educational level (AOR: 2.645, 95% CI:(0.917-7.630)). Children born from a mother having secondary school education had 67.4% lower odds of being anemic than children born from a mother with university or college level education (AOR=0.326, 95% CI: 0.125-0.853). Children who had born to a mother from rural area were 4.9 times more likely to be anemic than those who were born to a mother from urban area (AOR = 4.923 (CI: 2.442-9.925). Besides children in the age group 6-23 months were four

times more likely to become anemic when compared with children in the age group of 48-59 months (AOR: 3.8, 95% CI: (1.536-9.470)). Those children in the age group 24-35 months were 10 times more likely to become anemic when compared with children in the age group of 48-59 months (AOR:10, 95% ,(2.472-40.884)). Children in the age group 36-47months were more likely to become anemic 5.6 times when compared with children in the age group of 48-59 months (AOR:5.615, 95% , (1.632-19.319)) (table 3)

Table 2: Bivariable and multivariable binary logistic regression analysis for factors of anemia among children at TGSH, northwest Ethiopia, 2022

Variables		Anemia status		Odds ratio		p-value AOR
		No	Yes	Unadjusted	Adjusted	
Maternal education	Unable to read and write	69	14	.536(.231-1.244)	2.645(.917-7.630)	0.021
	Primary school	32	8	.661(.246-1.777)	1.690(.478-5.969)	
	Secondary school	94	73	2.052(1.033-4.079)	.326(.125-.853)	0.022*
	University/college	37	14	1		
Age of children	6-23 months	143	76	.502(.246-1.030)	3.814(1.536-9.470)	0.004*
	24-35 months	39	4	.097(.028-.329)	10.052(2.472-40.884)	0.001*
	36-47months	33	11	.315(.122-.815)	5.615(1.632-19.319)	0.006*
	48-59months	17	18	1		
WFH	Normal	186	88	.894 (.383- 2.084)	2.587(.803-8.333)	
	Moderate acute malnutrition	29	12	.782 (.273- 2.237)	2.105(.540-8.209)	
	Sever acute malnutrition	17	9	1		
Maternal residency	Rural	153	94	3.236(1.760, 5.948)	4.923(2.442, 9.925)	0.001
	Urban	79	15	1		

*=p-value<0.05

7. Discussion

The aim of this study was to assess the prevalence of anemia and associated factors among children from 6-59 months in TGSH, northwest Ethiopia. The prevalence of anemia was found to be 32% which is lower when compared to the 2016 EDHS report which showed the overall prevalence of anemia was 57% among children age 6-59 months. The discrepancy with the EDHS(32) report with the current study may be due to the nationwide prevalence of anemia that may include the most vulnerable group of patients and areas.

A Study done in Debre Birhan showed that the prevalence of Anemia was 47.5% that was conducted in children from 6-23 months which is higher than the finding at TGSH which is 32%, the discrepancy may be due to the age group included for the study at Debre Birhan where they included age groups from 6-23 months by the time anemia may be prevalent due to the increased erythropoiesis and relative rapid growth and development in these age group.

A study done in South Wollo among under five children showed that the prevalence of anemia was 41.1%(23) which is higher than the current study at TGSH, this discrepancy may be due to the period of the study since the previous study was done 4 years back with increasing awareness among families and socio-demographic issues. The same study showed that children in the age group of 6–11 and 12–23 months were 4.5 times and 2.8 times more likely to be anemic than children in the age range of 48–59 months, respectively. Regarding the factors associated with anemia those children the age group of 6-23 months were 3.8 times more likely to be anemic than the age group of 48-59months which is almost a similar finding with the study in south Wollo the possible explanations could be the rapid growth rate, erythropoiesis in this age group which requires high iron demands.

A study done at Hawassa University Hospital showed the prevalence of anemia in the age group 6-59months was 41.7% (15). The prevalence is lower at TGSH when compared to this study this may be due to difference in socio-demographic factors and time of the research done.

The same study showed that those children in the age group 6-23 months were 2 times more likely to be anemic than those children in age group of 48-59months. This is a finding is consistent with our findings with the age group more affected for anemia. In our study children

born to a mother who lives in the rural area had 4.9 times odds of being anemic when compared to their urban counterparts, this finding is consistent with a finding that was done at Hawasa university Hospital(15).

A cross sectional study that conducted on 384 hospitalized children at Gondar University Hospital showed the prevalence of anemia among children in the group 6-59months was 54.1%(33) which is higher when compared to the finding at TGSH, the possible explanations may be the study was conducted among hospitalized children, in our study children both hospitalized and in outpatient department were involved.

A hospital-based cross-sectional study done at Debre Markos referral hospital showed the prevalence of anemia in children from 6-59months children was 11.9% which is lower than the finding at TGSH this may be due to the study at Debremarkos Hospital exclude those patients having severe medical or surgical conditions, severe bleeding, iron and vitamin A supplementation over the past 3 months which were included in our case(29).

A study done in Tanzania among under-fives children showed the prevalence of anemia was found to be 77.2%(21)which is higher than the finding at TGSH; the higher prevalence may be due to high malarial parasitemia in the study area during the study period and genetic difference where sickle cell anemia was more prevalent in the study area, the other possibility may be the socio-demographic, and cultural factors.

A cross-sectional study done in Brazil involving 595 children showed the prevalence of anemia to be 56.6%(18), this finding is higher than the finding at TGSH this may be due to difference in population where the study in Brazil only includes those hospitalized children.

8. Conclusion

The overall prevalence of anemia among children 6-59months at TGSH was high which is 32% a finding which showed a moderate public health problem in the study area consistent with WHO's moderate levels of public health problem.

9. Limitation of the study

The study focuses on determining the proportion of anemia with the determination of complete blood count so in this study it is not possible to determine the type and etiology of anemia.

Being a Hospital based cross sectional study it may be difficult to generalize this finding to the national level.

10. Recommendation

To Amhara Regional Health Bureau

More effort should be given to decrease the burden of anemia by creating and enhancing awareness for the public specifically for those living in the rural Area by integrating with activities of health extension workers.

➤ To TGSH

It should be our routine practice in giving the necessary information to the public about childhood anemia using different health education programs. It is better to conduct screening for anemia among children visiting TGSH.

➤ To researchers

It is better to conduct further studies among children that could enable us to know the cause of anemia e.g studies that include determination of serum ferritin level to know children with iron deficiency anemia.

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12. ANNEX

10.1. Questionnaire and checklist

Annex I: Informed consent agreement in English

Hello, my name is.....i am pediatrics and child health resident at Bahir Dar University and I am going to conduct an interview with you on a research entitled "PROPORTION OF ANEMIA AND ASSOCIATED FACTORS IN CHILDREN AGED 6-59MONTHS VISITING TGSH". I would like to ask you some questions. Although some of the questions are sensitive and private, your honest and genuine response will highly be appreciated and credited, as it will help to make realistic analysis and to propose very practical suggestions, The purpose of this interview is to conduct a research that may help us to know the magnitude of anemia and associated factors which may help us to forward some recommendations to concerned bodies that will help us to improve the existing efforts.

The interview will just take about 30 minutes. I would also like to inform you that your name is not written on the paper and your answer will be completely confidential, and if at any time during the interview you want to stop answering questions, you are free to do so. If you are willing to participate, you will be requested to provide written informed consent before the interview.

If you have any question or if something is not clear please feel free to ask. You can contact the investigator and ask any query you have at any time.

Are you willing to participate in the interview?

Yes, Go to the next page

No, Thank them and interrupt the interview

Signature of the consenting interviewer-----

Data collector's Name:

1. ----- Signature -----

2. ----- Signature -----

Part I Socio-demographic characteristics of children aged 6–59months and other parameters

Characteristic	Categories	
s.no	Question	response
1.1	Age of child	-----
1.2	Sex of the child	1. Male 2. Female
1.3	Gestational age at birth	1. Term 2. Preterm 3. Do not remember
1.4	Exclusive breastfeeding for 6 months	1. yes 2. no
1.5	Complimentary feeding frequency/day	1. ≤ 3 2. > 3
1.6	Fully vaccinated/for age	1. Yes 2. No
	Child history of anemia	1. Yes 2. No
1.7	Malarial infection in the previous one year	1. Yes 2. no
1.8	Do the child have diarrhea in the last two weeks	1. yes 2. no

Part II Socio-demographic characteristics of parents/guardians

Characteristics	Categories	
s.no	question	response
2.1	Age of mother	-----
2.2	Religion of mother	1. Orthodox 2. Muslim

		<ul style="list-style-type: none"> 3. Protestant 4. other
2.3	Maternal educational status	<ul style="list-style-type: none"> 1. no formal education 2. primary school 3. secondary school 4. university/college
2.4	Paternal educational status	<ul style="list-style-type: none"> 1. no formal education 2. primary school 3. secondary school 4. university/college
2.5	Residency of the mother	<ul style="list-style-type: none"> 1. Urban 2. Rural
2.6	Occupation of mother	<ul style="list-style-type: none"> 1. Housewife 2. Employed 3. Small scale business 4. Farmer 5. Other
	Monthly household income	Birr -----
2.7	Mothers' meal frequency / day	<ul style="list-style-type: none"> 1. ≤ 3 2. > 3
2.8		
2.8	Marital status of the mother	<ul style="list-style-type: none"> 1. currently married 2. widowed 3. divorced
2.9	Antenatal care (ANC) follow-up	<ul style="list-style-type: none"> 1. yes 2. no
	Maternal anemia	<ul style="list-style-type: none"> 1. Yes 2. No
2.10	If yes to above question number of	

	ANC visits	-----
2.11	Place of delivery	1. Home 2. Health institution

Part III Checklist parameters for children aged 6–59 months.

s.no	parameter	Result	
3.1	Stool exam (IP)	1. Yes 2. no	Which parasite----- -
3.2	CBC	Hg----- MCV----- RDW CV-----	
3.3	Weight of child	----kg	
3.4	Height/length of child	----cm	
3.5	Weight for height/length	1. Normal 2. Moderate acute malnutrition 3. Sever acute malnutrition	
3.6	Height for age	1.Normal 2.stunted	