WOLKITE UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCE

DEPARTMENT OF MEDICAL LABORATORY SCIENCE

PREVALENCE AND ASSOCIATED FACTORS OF ANEMIA AMONG UNDER FIVE CHILDREN IN WORABE COMPREHENSIVE SPECIALIZED HOSPTAL: CROSS SECTIONAL STUDY

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TSEGA DATI

A RESEARCH THESIS TO BE SUBMITTED TO DEPARTMENT OF MEDICAL LABORATORY SCIENCE, COLLEGE OF MEDICINE AND HEALTH SCIENCE, WOLKITE UNIVERSITY FOR PARTIAL FULFILLMENT OF REQUREMENT FOR BACHELOR OF SCIENCE DEGREE IN MEDICAL LABORTORY SCIENCE.

AUGUST, 2023 G.C

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LIST OF ACRONYMS/ ABBREVIATIONS

AOR-Adjusted odd ratio

CBC- Complete Blood Count

COR-Crude odd ratio

dl- Deci litre

E.C- Ethiopian Calendar

EDTA- Ethylene Diamine Tetra Acetic acid

fL- femtoliter

g- gram

G.C- Gregorian Calendar

HCT - Hematocrit

HGB - Hemoglobin

IDA - Iron Deficiency Anemia

MCH -Mean Corpuscular Hemoglobin

MCHC-Mean Corpuscular Hemoglobin Concentration

MCV -Mean Corpuscular Volume

RBC - Red Blood Cell

SNNPR- Southern Nations, Nationalities and Peoples Region

WBC-White Blood Cell

WCSH - Worabe Comphrensive Specialized Hospital

WHO - World Health Organization

μl - Micro liter

Abstract

Background: *Anemia is a low number of red blood cells or a low hemoglobin or hematocrit in which the hemoglobin content of the red blood cells is lower than normal range as a result of deficiency of one or more essential nutrients or due to heavy blood loss, parasitic infections and congenital hemolytic diseases. Due to various factors, children under the age of five and pregnant women are more affected. Therefore, the aim of this study was to determine the prevalence of anemia and its associated factors among under-five children in Worabe comprehensive Specialized Hospital, Silte Zone, southern Ethiopia.*

Objective: *To determine the prevalence and associated factors of anemia in under-five children attending in Worabe Comphrensive Specialized Hospital, Silte Zone, southern Ethiopia.*

Method*: A cross-sectional study was conducted from May to June and 200 participants were enrolled in the study. A convenient sampling method were used to recruit the study participant. Sociodemographic and clinical data was collected through structured questionnaires. Two milliliters of blood were collected from each study participants to determine the level of anemia. The data was presented using tables and figures. Multivariate logistic regression was used to determine the associated factors. P-values less than 0.05 was also used to declare stastiscal significance.*

Result*: The overall prevalence of anemia among under five children was 38% (76/200). Where, 44.74% had mild anemia, 39.47% had moderate anemia and 15.79% had severe anemia. Children who had history of malaria, history of intestinal parasitic infection, being male and maternal education is below read and write were more likely to become anemic.*

Conclusion; *In general, the magnitude of anemia in under five children in worabe comprehensive specialized hospital was 38% indicative of the fact that anemia is an important public health problem. Malaria infection, intestinal parasite infection, educational status of the mother and child breast feeding were factors associated with anemia in those under five children. Therefore, integrated public health interventions need to be prioritized to improve the health status of children to prevent anemia among under five children. Health professionals should incorporate anemia and its consequences in their day to day health education program for mothers who are pregnant and coming to the health center for care.*

Key word: *anemia, prevalence, under-five children, associated factor*

CHAPTER ONE

1. INTRODUCTION

1.1. Background information

Anemia is a low number of red blood cells(RBC) or a low hemoglobin(HGB) or hematocrit(HCT) in which the HGB content of the RBC is lower than normal range as a result of deficiency of one or more essential nutrients or due to heavy blood loss, parasitic infections and congenital hemolytic diseases [1]. According to the World health organization (WHO), children under five are anemic if their blood HGB is less than 110 g per liter or HGB < 11.0 g/dl) [2]. Based on the Mean Corpuscular Volume(MCV), Anemia is classified as microcytic (MCV) < 80 fL), normocytic (MCV 80-100 fL), or macrocytic (MCV > 100 fL) [3].

It can also be classified based on hemoglobinization of red cells as Normochromic, describing normal staining of RBC as seen when hemoglobinization is adequate, and hypochromic describing pale staining of RBC, as seen when hemoglobinization is inadequate. Hypochromic cells show an increased area of central pallor [4]. Microcytic anemia due to iron deficiency is the most common type of anemia in children that develops if children do not have enough iron in their body. Iron is needed to form HGB[5]. Anemia is the major public health problem and diagnosed as below the reference interval value of HGB or HCT concentration for healthy individuals of similar3 age, sex, and race with similar circumstances [6].

The hemoglobin is part of the complete blood cell(CBC) report, which also includes the white blood cell count (WBC), RBC, HCT, platelet count, and indices. When investigating the underlying cause of anemia, the most useful parts of the CBC are the HGB and the mean corpuscular volume. The MCV is the average volume of red cells in a specimen, which helps to narrow the differential diagnosis and guide any further testing [7]. Anemia impairs mental, physical, and social development and causes negative behavioral and cognitive effects, resulting in poor school performance and work capacity in later years [8].

In early childhood, poor feeding habits, especially during the weaning period, exacerbate the problem. Anemia frequently develops as breast milk is replaced by foods that are poor in iron and other nutrients, including vitamin B12 and folic acid. Low oxygenation of brain tissues, a consequence of anemia, may lead to impaired cognitive function, growth and psychomotor

development, especially in children. Infants, children under 5 years old and pregnant women have greater susceptibility to anemia because of their increased iron requirements due to rapid body growth and expansion of red blood cells [9]. Moreover, anemia leads to immune system compromise, resulting in a decreased ability to fight infections and increased mortality in African children, where resources to determine the basic etiology remain poor [10].

It is important to note that the normal ranges of the CBC parameters differ based on race, with persons of African ancestry having lower normal hemoglobin levels than persons of Caucasian ancestry. In addition, laboratories may have slightly different normal values for the CBC based on the equipment they utilize. Therefore, providers must follow their laboratory's parameters, as well as adjust for the patient's gender, age, and ethnicity [11]. Treatments of anemia include Iron supplements which can increase the iron in your body. This may help treat iron-deficiency anemia. Iron supplements are generally not given to people who do not have iron-deficiency anemia because too much iron can damage your organs. Vitamin B12 supplements or shots can help treat vitamin B12–deficiency anemia [12].

Anemia in children is associated with impaired intellectual and physical development, increased morbidity and mortality. Early detection of both mild and moderate anemia to avoid complications if necessary. Therefore, the aim of this study is to assess the prevalence of anemia and its associated factors among under-five children in the WCSH, Silte Zone, southern Ethiopia.

1.2. Statement of the problem

Globally, anemia affects 1.62 billion people, which corresponds to 24.8% of the population. (The highest prevalence is in preschool-age children which is 47.4%). World Health Organization regional estimates generated for preschool age children and pregnant and non-pregnant women indicate that the highest proportion of individuals affected are in Africa (47.5–67.6%), while the greatest number is in South East Asia where 315 million individuals are affected [13].

World Health Organization showed that 818 million children under the age of five and women are affected by anemia, mainly in developing countries. About one million of them die every year [13]. In the developing world, 42% of children less than five years of age and 53% of children 5–14 years of age are anemic [14]. About 67.6% of under-five children in Africa are suffering from anemia indicating anemia as a severe health problem. In East Africa, it is estimated that three quarters of under-five children suffer from anemia [13]. Studies conducted in

East Africa have shown that P. falciparum malaria and iron deficiency account for much of the anemia seen in young children [15].

The magnitude and prevalence of anemia in Ethiopia are 27.1%, of which 13.8% had mild, 10.8% moderate, and 2.3% severe anemia based on measured HGB concentration [16]. Another study conducted on children of 6 - 72 months old in per urban areas in south western Ethiopia and it shows the prevalence of anemia to be 43.7%, and that of IDA was 37.4%, so the commonest cause of anemia in the country is iron deficiency [17]. The study conducted in Hawassa, southern Ethiopia showed that the overall prevalence of anemia among under-five children was 41.7% and the mild, moderate, and severe anemia were 6.6%, 19%, and 16.1%, respectively [18].

Like other developing countries, the prevalence of intestinal parasites is widely spread in Ethiopia that can cause anemia in under-five children. Among the common intestinal protozoan parasites, Giardia, Cryptosporidium, and helminths such as Ascaris are widely distributed, where there is overcrowding, poor environmental sanitation, limited economic resources, and poor personal hygienic practice which are predisposing factors [19]. Most of the intestinal parasites are more severe in children than adults, which is associated with malnutrition, growth retardation, and poor care for children. the case is worth in under-five-year-old children because of poor maternal hygiene, play habitats of children in the house in close proximity to one another that creates an appropriate condition for the transmission and spread of the disease [20].

Despite these, detailed investigation of anemia in under-five children is limited in Ethiopia and existing data revealed variable magnitude. Therefore, this study was designed to assess the magnitude of anemia and its associated factors among under-5 children attending in Worabe comprehensive Specialized Hospital, Silte Zone, southern Ethiopia

1.3. Significance of the study

Even if the magnitude of under-five anemia is high in the country, there is no adequate health service and health professionals do not give attention on the prevention and early detection of under-five anemia [21]. Identifying the prevalence of anemia and the predisposing factors among under-five children visit in the WCSH under-five children OPD will help health professionals and other concerned bodies focus attention on the prevention and early detection of anemia and

its complications. Preventing anemia in under-five children result in the wellbeing development of the children, cognitive and school performance.

This study provides local data to the scientific world about prevalence and associated factors. It also sums up the limited knowledge about the topic among the general population in Ethiopia. As a result, it provides insight for responsible stakeholders and serve as reference documented information on the topic.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. Magnitude of Anemia

Under-five anemia is the global health problem both in its severity and prevalence. Globally, 1.6 million people were affected by anemia and 43 % of them were preschool children [22]. the study conducted in Western China show that prevalence of anemia in children under 5 years is 43%, which is much higher than the national average. The highest prevalence rates (59.1%–75.74%) were located in Qinghai province, and the highest levels were reported among children aged 6–24 months [23].

In Pakistan the reported prevalence of IDA in children under five is between 40–70% [24]. In Pakistani children IDA has been associated with growth retardation, impaired cognition, reduced physical activity and postulated as a contributor to the high national infant mortality rate. Widespread micronutrient deficiencies along with other clinical and social factors are believed to be the leading cause of IDA in Pakistan [25]. The results of studies conducted in Turkey showed that the prevalence of IDA was 17.2% with the highest prevalence in infants being 48% in southern Turkey [26]. Another study conducted in the western part of Turkey reported that the prevalence of IDA was 6.5% among adolescent age [27]. Kilinç et al. reported that the prevalence of IDA in the Southeastern Anatolia of Turkey was 15.5% among 2–5-year-old children [28].

The study conducted in Ghana Overall, the prevalence of anemia among children under five years (6-59months) in Ghana was 58.35% (95%CI=52.72-63.96). Also, a higher proportion of anemia was observed among children with fever or malaria (66.27%, $p<0.001$) and also the proportion of anemia was higher among children whose mothers had no formal education (65.54%, $p<0.001$) [29]. In a study was made in Kenitra, Morocco on prevalence of malnutrition and anemia among preschool children in 2010, out of 111 preschool children, 85 having a hemoglobin level below 11 g/dl with a prevalence of 76.5%. There was a significant relationship between maternal education and anemia in children [30].

The study conducted in Kenya show that the overall prevalence of anemia was 41.6%, a clear demonstration that it's a common issue at the study area. This prevalence is higher as compared

to that of WHO recommendations cut-off point of 11 g/dL in the same African children [31]. The study conducted in Sudan showed that the prevalence of anemia among preschool children in Karma Albalad village was 80.4%. This is consistent with the results of the household survey conducted in Sudan in 1994, which reported a prevalence of anemia in preschool children in Sudan as 84.9% [32].

According to a systematic review the pooled prevalence of under-five anemia in Ethiopia was 44.83%. In subgroup analysis, 50.36% of anemia was found in the age range of 6–23 months old and 43% of them were from the age range of 6–59 months' old [33]. The prevalence of anemia in under-five children ranges from 13.6% in Amhara region [34] to 72% in Somali region [35]. Another study conducted in south west Ethiopia revealed that the prevalence of anemia in under five children was 48.9%. Of this anemia, 25.0% mild, 15.8% moderate and 8.2% were severely anemic [36].

A study conducted in Hawassa, southern Ethiopia showed that the overall prevalence of anemia among under-five children was 41.7% and the mild, moderate, and severe anemia were 6.6%, 19%, and 16.1%, respectively [18]. A study conducted in Jimma town show that the prevalence of anemia under five children was 37.6% it is considered as a moderate public health problem according to World WHO standards [37].

2.2. Determinants of Anemia

The causes for anemia among under-five children are complex. Among these, low birth weight, undernutrition, poor socioeconomic status, household food insecurity, duration of breast feeding, poor dietary iron intake, poor maternal educational status, diarrhea, fever, poverty, poor sanitation and hygiene, monotonous diet, parent's level of education, and maternal anemia were the commonest contributors for under-five anemia [38][39].

Iron deficiency is frequently reported to be the major cause of anemia with an estimate that 50% of anemia worldwide is attributable to iron deficiency. However, the frequency of wide-ranging risk factors for anemia in developing countries, including iron deficiency, vitamin A deficiency, infection, and genetic risk factors, are not routinely measured in a single population. In sub-Saharan Africa, where undernutrition, HIV, malaria, helminthiasis, and hemoglobinopathies are prevalent, an iron supplementation intervention alone may not adequately address anemia [40].

The prevalence of iron deficiency, the most common cause of anemia in the world, is ~9% in toddlers, and anemia occurs in one third of children who are iron deficient [41].

A study conducted on the Pattern of severe and complicated malaria in children admitted to Gonder medical college hospital in 2002, reported the prevalence of anemia among under five children to be 36.7%. Another retrospective medical record analysis of five years done in Gonder medical college hospital, out of 427 malarial cases of under five children 369(86.4%) had severe anemia, coma and hypoglycemia overlapping [42]. High output cardiac diseases, appetite loss, lethargic, bleeding disorder, mental growth impairment as well as impairment of immunity system are among the complications of anemia in children.

2.3. Conceptual frame work

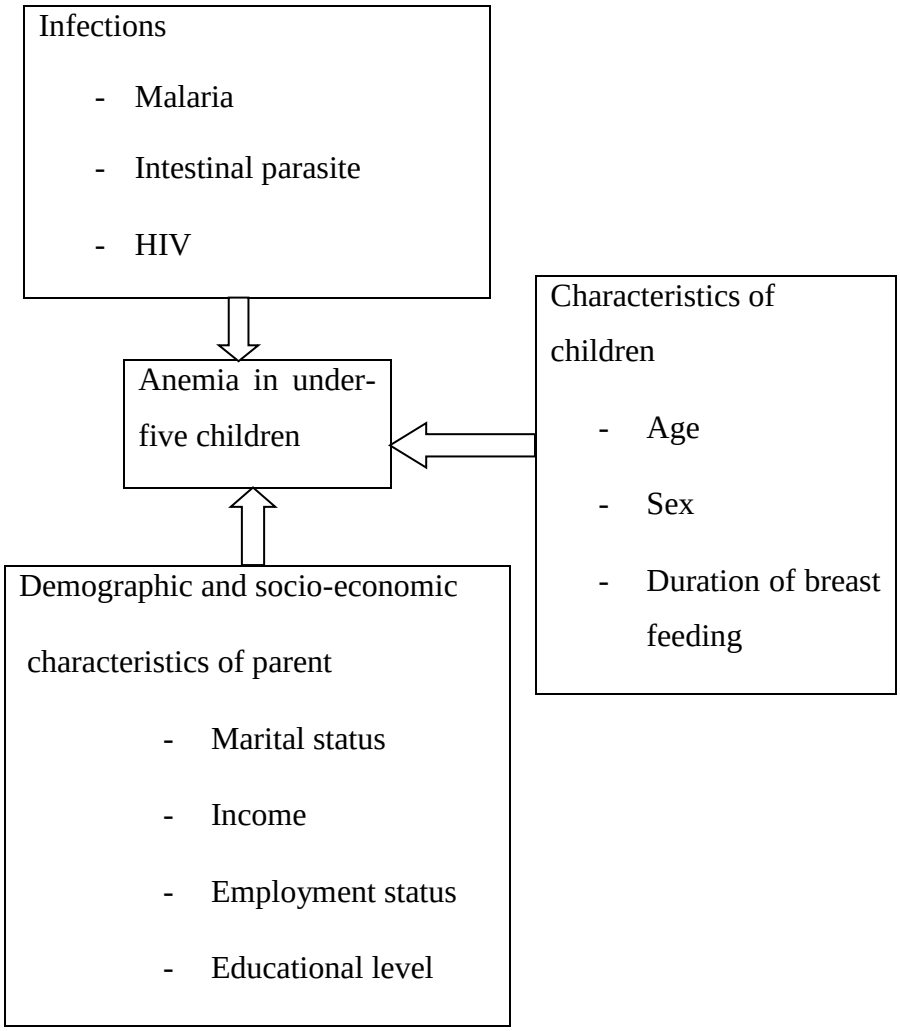

Figure 1 conceptual frame work of our study participants

CHAPTER THREE

3. OBJECTIVES

3.1. General objective

- To determine the prevalence and associated factors of anemia in under-five children attending in Worabe comprehensive Specialized Hospital, Silte Zone, southern Ethiopia. From May to June 2023, G.C.

3.2. Specific objectives

- To determine the prevalence of anemia among under-five children attending in Worabe comprehensive Specialized Hospital, Silte Zone, southern Ethiopia.
- To identify the associated factors of anemia in under-five children.

CHAPTER FOUR

4. METHODS AND MATERIALS

4.1. Study area

This study was conducted in the Worabe comphrensive Specialized Hospital, which is located in Worabe Town, Silte, southern Ethiopia. Worabe (allegedly from the Silte word for "Hyena") is a town in south-central Ethiopia. The town is located in the Silte Zone of the Southern Nations, Nationalities and Peoples Region (SNNPR)[43].

According to the 2007 National Housing and Population Census, the projected population of Worabe town for the year 2014/15 was about 15,920 and the estimated number of households was 3249. According to the town administration report the town has Six Keeble[44]. The Zonal administration is bounded in the North by Gurage Zone, in the West Hadia Zone, in the South East by Alaba Special Woreda and in the East by Oromia Regional State.

According to the official website of Worabe Comprehensive Specialized Hospital (WCSH), the hospital was established in 2008 G.C as a general hospital and upgraded to a comprehensive specialized hospital in 2019 G.C.

Some of the services provided by WCSH are; Laboratory services with international quality standards Surgical services including general surgery, orthopedics, urology, gynecology and obstetrics, Medical services including internal medicine, pediatrics, psychiatry and dermatology, Radiology services including ultrasound, X-ray and CT scan, Pharmacy services including drug dispensing and counseling.

4.2. Study Period

The study was conducted from May to June 2023 G.C

4.3. Study design

A cross-sectional hospital-based study was conducted to determine the prevalence of anemia and associated factors among under-five children in Worabe Comphrensive Specialized hospital, Silte Zone, southern Ethiopia.

4.4. Populations

4.4.1. Source population

All under-five children visited Worabe Comphrensive Specialized hospital for any medical service was considered as source population.

4.4.2. Study population

All under five children visited Pediatric unit in Worabe Comphrensive specialized hospital for any medical service during the study period, fulfilling the selection criteria was the study population.

4.4.3. Inclusion Criteria

All under five children requested blood for HGB test and whose parents were voluntary to participate in the study.

4.4.4. Exclusion criteria

- Children who had acute bleeding
- Children who have received blood or blood products in the last three months
- Children who was taking iron supplements recently

4.5. Sample size determination and sampling techniques

4.5.1. Sample size determination

Sample size was calculated using the formula

$$n = \frac{\left(Z_{\alpha/2}\right)^2 p(1-p)}{d^2}$$

‘n’ is the sample size

‘p’ is the estimated prevalence rate for the population which is 37.6% from previous study done in Jimma town [17].

‘d’ is margin of error

‘z’ is confidence interval

n= 361

our source population (N) is less than 10,000 (450 under five children were seen in February 2015 E.C) the sample size is adjusted using the adjustment formula

$$nf = \frac{ni}{1 + ni/N}$$

'nf' is adjusted sample size

'ni' is calculated sample size

'N' is source population

Nf= 361/ (1+ 361/450)

Nf= 200

4.5.2. sampling techniques

A convenience sampling technique was used for the study to include all under-five children attending Worabe Comphrensive Specialized hospital during the study period.

4.6. Measurement

4.6.1. Data collection instrument

A pretested structured questioner in English and Amharic language was used for data collection, along with laboratory assessment of hemoglobin values in children.

4.6.2. Data collection technique

Data on sociodemographic characteristics and associated factors were collected using a questionnaire prepared for this purpose through an interview with the parents/guardian of the children. Anemia was assessed by measuring the hemoglobin value.

4.6.3. Data collectors

Data collectors were the two members of the group who were final-year medical laboratory students.

4.6.4. Data quality control

To ensure the reliability and validity of the study we had used 5% of the sample size in the Worabe Health Center by the investigators and made necessary modifications when necessary, and the collected data was cross-checked by investigators for completeness.

4.6.5. Data analysis

Data entry and analysis was done using the software SPSS version 16 statistical package. Frequencies and proportions were calculated and association of variables were done with the outcome variable. The result was presented using appropriate frequencies, proportions, odds ratio and P-value < 0.05 was considered statistically significant at 95% confidence interval.

4.7. Variables

4.7.1. Dependent variables

- Anemia

4.7.2. Independent variables

-Age

-Religion

-Sex

-Monthly income of the family

-Educational status of the parents/guardian

-Presence of malaria infection

-Presence of intestinal parasites

4.8. Ethical consideration

Ethical clearance and approval were obtained from Wolkite University College of Health Science, department of Medical Laboratory Science. Verbal assent was obtained from each study participant, and confidentiality of the results was maintained throughout the study. Data was collected after permission were obtained from the study subjects following a brief discussion with the patients and their families about the purpose of the study.

4.9. Operational definitions

A. Anemia –hemoglobin concentration below the range of values occurring in healthy persons(<11gm/dl)

B. Mild anemia – hemoglobin value between 10gm/dl and 11gm/dl

C. Moderate anemia – hemoglobin value between 7gm/dl and 10gm/dl

D. Severe anemia – hemoglobin value less than 7gm/dl

E. Low income-those having monthly income 2000-3500 birr.

F. Medium income- those having monthly income from 3600 to 5100 birr.

G. High income- those having monthly income>5100 birr.

H. Small family size- family members 1- 4

I. Large family size-family member > 4

J. Breast feeding-the feeding of an infant directly from female(mother) breast

K. Illiterate-cannot read and write

4.10. Result Dissemination Plan

Study results will be presented to the Wolkite University School of Medicine and College of Health Science, and a written document will be submitted to the Department of Medical Laboratory Science and Library. Optionally, attempts will be made to publish in a reputable journal.

CHAPTER FIVE

5. RESULTS

5.1. Characteristics of Study Participants

A total of 200 under-five children participated in the study. Of the participants, 98 (49%) were males and 102 (51%) females. Regarding their age distribution, mean age of child were 2.77(±1.3), and the majority 81(40.5%) were between 6 and 23 months, Majority 175(87.5%) of the child were Muslim by religion. More than one-third, 173(86.5%) of the study participants were silte in ethnicity and 54.5%(109/200) were from rural area. All of our study participants were user of pipe water as source of consumption. Majority of 60%(120/200) of the respondent were mother in relation to the child. Regarding occupational status, nearly half, 45.5%(91/200) of the mothers were housewife, half 51%(102/200) of the fathers were farmers. one-third 33%(66/200) of the mother were illiterate and greater than one-third 89%(181/200) of father were literate (Table 1).

Table 1; Socio-demographic characteristics of under five children and parents attending in Worabe Comphrensive Specialized Hospital, silte zone, SNNPR, Ethiopia, 2015 E.C(n=200).

No	Characteristics		Frequency (%)
1	Sex of child	Male	98(49)
		Female	102(51)
2	Age of child in month	<6	27(13.5)
		6-23	81(40.5)
		24-35	37(18.5)
		36-47	20(10)
		48-59	35(17.5)
3	Address of child	Rural	109(54.5)
		Urban	91(45.5)
4	Ethnicity of child	Silte	173(86.5)
		Gurage	7(3.5)
		Wolayita	6(3)
		Other	14(7)

5	Religion	Protestant	4(2)
		Orthodox	19(9.5)
		Muslim	175(87.5)
		Catholic	2(1)
6	Respondent relation to child	Mother	120(60)
		Father	62(31)
		Relative	14(7)
		Sibling	4(2)
7	Marital Status of mother	Living together	164(82)
		Divorced	22(11)
		Widowed	10(5)
		Separated	4(2)
8	Occupation of mother	Merchant	51(25.5)
		Civil servant	35(17.5)
		Housewife	91(45.5)
		Daily labor	7(3.3)
		Others	16(8)
9	Occupation of father	Farmer	102(51)
		Merchant	45 (22.5)
		Civil servant	38(19)
		Handcraft	9(4.5)
		Others	6(3)
10	Educational status of mother	Illiterate	66(33)
		Read and write only	53(26.5)
		Primary	48(24)
		Secondary	10(5)
		Tertiary	23(11.5)
11	Educational status of father	Illiterate	22(11)
		Read and write only	69(34.5)

		Primary	59(29.5)
		Secondary	12(6)
		Tertiary	38(19)
12	Family monthly income in ETB	2000-3500	25(12.5)
		3600-5100	80(40)
		> 5100	95(47.5)
13	Number of family	1-4	113(56.5)
		>4	87(43.5)
14	Utilize latrine	Yes	200(100)
		No	0(0)

5.2. Clinical information

One-third 66(33%) and 35(17.5%) of our study participants had history of intestinal parasitic infection and malarial infection in the last three months respectively. (Table 2).

Table 2: Clinical information of the study participant.

No	Characteristics		Frequency (%)
1	Intestinal parasite	Yes	66(33)
		No	134(67)
2	Malaria infection	Yes	35(17.5)
		No	165(82.5)

5.3. Nutrition related characteristics

Nearly two third 137 (68.5%) of our study participants were breast fed and 63(31.5%) of them were not breast fed. Out of 200 study participants 116(58%) of them were started additional food after 6 months. (Table 3).

Table 3; Nutrition related characteristics of under five children.

No	Characteristics	Frequency(%)

1	Breast feeding	Yes	<6 months	9(4.5)
			=6 months	40(20)
			>6 months	88(44)
			Total	137(68.5)
		No		63(31.5)
2	Start additional food for child	Before 6 months		30(15)
		At 6 months		54(27)
		After 6 months		116(58)

5.4. Prevalence of Anemia

In this study, the overall prevalence of anemia as defined by hemoglobin levels lower than 11 g/dl was found to be 38% (76/200). Of them, 40.8% (31/76) were females and 59.2% (45/76) were males. The mean (SD) of hemoglobin concentration, hematocrit and mean cell volume were 11.2 (2.4) g/dl, 32.69 (7) % and 86.61(65.88) fL respectively Among the age groups, the highest prevalence was recorded in the age group of 6-23-months (46.9%) and lowest (30 %) was in the age group of 36-47 months (Figure 2).

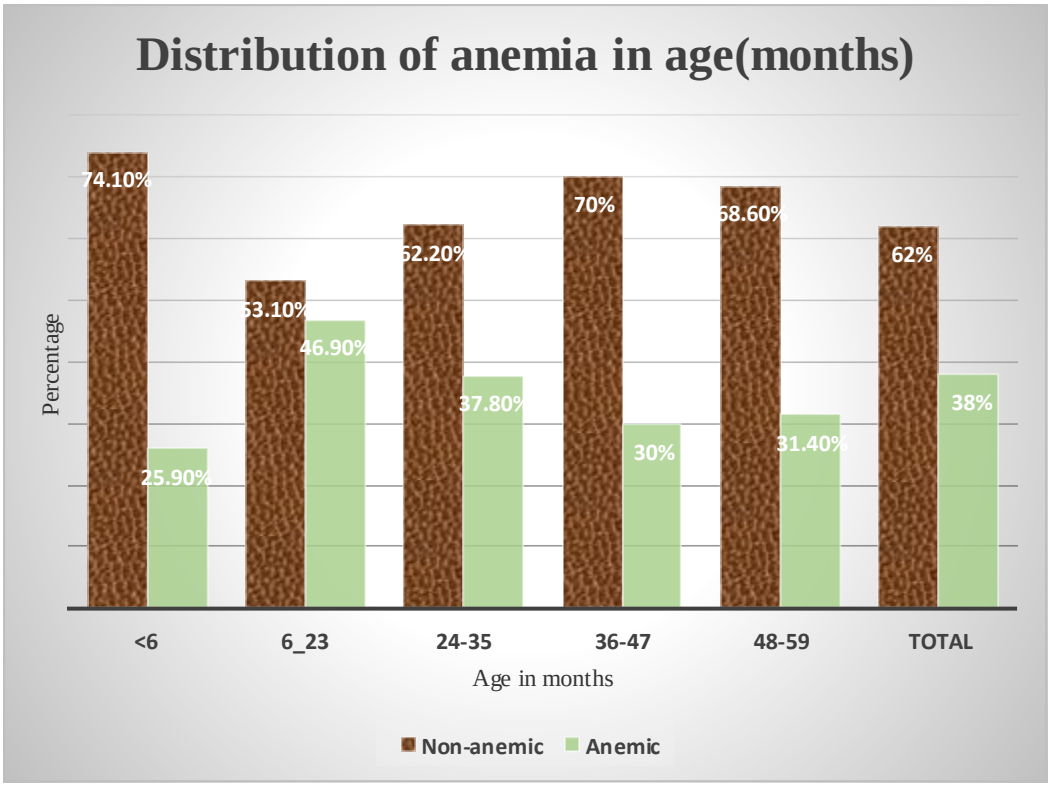

Figure 2; prevalence of anemia in under-five children.

Regarding the severity of anemia, among sampled children, 12 (15.79%) of them were severely anemic, whereas 30 (39.47%) were moderately anemic and 34 (44.74%) were mildly anemic (Figure 3).

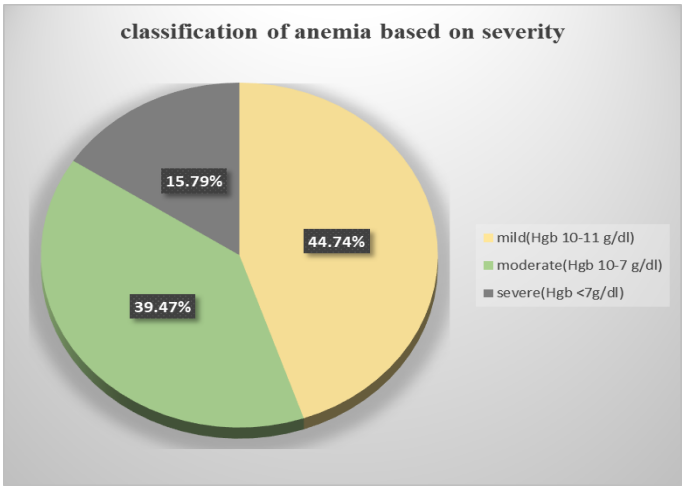

Figure 3; Distribution of anemia based on severity among under five children attending in worabe comprehensive specialized hospital, silte zone, SNNPR, Ethiopia, 2015 E.C(n=76).

5.5. Factors associated with anemia among under five children

All independent variables showing P-value <0.25 in the bivariate analysis) were analyzed for multivariable logistic regression analysis to control potential confounding factors and to determine the association between factors and dependent variables. In bivariate logistic regression child sex, age, breast feeding, family income, educational status of mother, intestinal parasite and malaria infection were confounding variables.

In the multivariable logistic regression, child sex, educational status of mother, intestinal parasite and malaria infection were independent variables that have significant association with anemia among under five children in worabe comprehensive specialized hospital. Accordingly, male (AOR = 0.334; 95% CI = 0.159–0.708, P = 0.004), illiterate mother (AOR = 0.315, 95% CI = 0.101–0.98, P = 0.046), intestinal parasite (AOR = 0.266; 95% CI =0.12–0.593, P = 0.001), malaria (AOR =0.174, 95% CI =0.063-0.478, P =0.001) P < 0.05 were demonstrated as significant association with anemia among under five children.

Male children were 0.3 times (AOR=0.334; 95% CI, (0.159–0.708)) more likely to be anemic than female children. Children who had intestinal parasite and malaria were 0.3 times (AOR=0.266; 95% CI, (0.12-0.593)) and 0.2 times (AOR=0.174; 95% CI, (0.063-0.478)) more affected than children who had not intestinal parasite and malaria respectively (Table 4).

Table 4: Association of anemia with risk factors among under five children.

Characteristic		Non anemic	Anemic	COR (95%)	P-value	AOR (95%)	P-value
Sex	Male	53(54.1%)	45(45.9%)	0.514(0.288-0.918)*	0.025	0.334(0.159-0.708)**	0.004
	Female	71(69.6%)	31(30.4%)	1			
Age in month	<6	20(74.1%)	7(25.9%)	1.31(0.428-4.006)	0.636		
	6-23	43(53.1%)	38(46.9%)	0.519(0.2245-1.197)*	0.124		
	24-35	23(62.2%)	14(37.8%)	0.753(0.284-1.996)	0.568		
	36-47	14(70%)	6(30%)	1.0696(0.324-3.527)	0.912		
	48-59	24(68.6%)	11(31.4%)	1			
Address of child	Rural	67(61.5%)	42(38.55)	0.952(0.536-1.689)	0.865		
	Urban	57(62.6%)	34(37.4%)	1			

Occupation of mother	Merchant	32(62.7%)	19(37.3%)	0.766(0.231-2.541)	0.663		
	Civil servant	20(57.1%)	15(42.9%)	0.606(0.173-2.218)	0.433		
	Housewife	58(63.7%)	33(36.3%)	0.799(0255-2.499)	0.7		
	Daily labor	3(42.9%)	4(57.1%)	0.341(0.055-2.131)	0.25		
	Other	11(68.8%)	5(31.3%)	1			
Occupation of father	Farmer	61(58.9%)	41(40.2%)	0.744(0.13-4.251)	0.739		
	Merchant	31(68.9%)	14(31.1%)	1.107(0.181-6.771)	0.912		
	Civil servant	21(55.3%)	17(44.7%)	0.618(0.101-3.789)	0.603		
	Handcraft	7(77.8%)	2(22.2%)	1.75(0.173-17.686)	0.635		
	Other	4(66.7%)	2(33.3%)	1			
Educational status of mother	Illiterate	22(33.3%)	44(66.7%)	0.267(0.098-0.724)*	0.10	0.315(0.101-0.980)**	0.046
	Read and write only	37(69.8%)	16(30.2%)	1.233(0.436-3.487)	0.692	1.823(0.565-5.881)	0.315
	Primary	45(93.8%)	3(6.3%)	8.(1.877-34.101)*	0.21	9.116(0.954-42.523	0.214
	Secondary	5(50%)	5(50%)	0.533(0.118-2.408)	0.414	0.8(0.156-4.105	0.789
	Tertiary	15(65.2%)	8(34.8%)	1			
Education status of father	Illiterate	16(72.7%)	6(27.3%)	1			
	Read and write	38(55.1%)	31(44.9%)	1.939(0.621-6.052)	0.54		
	Primary	41(69.1%)	18(30.5%)	0.891(0.401-1.984)	0.778		
	Secondary	7(58.3%)	5(41.7%)	1.657(0.708-3.874)*	0.244		
	Tertiary	22(57.9%)	16(42.1%)	1.018(0.273-3.796)	0.979		
Family monthly income	2000-3500	13(52.%)	12(48%)	1			
	3600-5100	56(70%)	24(30%)	2.154(0.859-5.398)*	0.102		
	>5100	55(57.9%)	40(42.1%)	1.269(0.524-3.072)	0.597		
Number of family	1-4	72(63.7%)	41(36.3%)	1.182(0.665-2.101)	0.569		
	>4	52(59.8%)	35(40.2%)	1			
Intestinal parasite	Yes	31(47%)	35(53)	0.39(0.213-0.717)*	0.002	0.266(0.12-0.593)**	0.001
	No	93(69.4%)	41(30.6%)	1			

Malaria infection	Yes	11(31.4%)	24(68.6%)	0.211(0.096-0.462)*	0.000	0.174(0.063-0.478)**	0.001
	No	113(68.5%)	52(31.5%)	1			
Start additional food for child	Before 6 months	20(66.7%)	10(33.3%)	1			
	At 6 months	32(59.3%)	22(40.7%)	0.727(0.286-1.849)	0.504		
	After 6 months	72(62.1%)	44(37.9%)	0.818(0.351-1.908)	0.642		
Breast feeding	Yes	94(68.1%)	44(31.9%)	2.279(1.234-4.208)*	0.008	1.48(0.685-3.201)	0.319
	No	30(48.4%)	32(51.6%)	1			

*Statistical significance in COR **Statistical significance in AOR, CI confidence interval, COR crude odds ratio, AOR adjusted odds ratio,"1" indicate preference.

CHAPTER SIX

6. DISCUSSION

The present study assessed the prevalence of anemia and its associated factors in under five children in worabe comprehensive specialized hospital, silte zone, worabe sub-city, southern Ethiopia. about 76 (38%) of the children who participated in the study were anemic. Factors associated with anemia in those under five children were intestinal parasite, malaria, sex of the child, educational status of the mother and breast feeding.

The prevalence obtained (38%) was similar with the study conducted in Jimma town 37.6%[17]. The prevalence obtained in this study was consistence with the study done in Jimma Medical Center South West of Ethiopia 44.8%[45], Asendabo Town, South West of Ethiopia 39.1%[46], Hawassa, southern Ethiopia 41.7% [18], with the systematic review of the pooled prevalence of under-five anemia in Ethiopia 44.83%[33].which is higher than prevalence of anemia in Amhara region 13.6%[34]. The prevalence obtained in this study is lower compared to study obtained in Shanna gibe hospital, Southwest Ethiopia 48.9%[36], Somali region 72%[35].The potential reason for this study's low magnitude of anemia might be due to variation in the geographical location of the study participants or due to variation in socio-demographic characteristics or socioeconomic status of parents in the areas.

The study was also consistent with a study in some African countries Kenya 41.6%[31]. The prevalence obtained in this study is lower compared to study obtained in Sudan, Karma Albalad village 80.4%[32], Ghana 58.35% (95%CI=52.72-63.96)) [29], Morocco, Kenitra 76.5%[30]. Which is higher than prevalence of anemia Turkey, Southeastern Anatolia 15.5%[28]. The prevalence obtained in this study is lower compared to study obtained in southern Turkey 48%[26], In Pakistan 40–70%[24], Western China Qinghai province (59.1%–75.74%)[23].

This study revealed that the odd of anemia among children who had history of intestinal parasitic infection is 0.3 times more likely than those children who had no history of intestinal parasitic infection. This finding is similar in a cross- sectional study among children attending in Gonder university hospital showed that intestinal parasitic infection was strongly associated with an increased risk of anemia[47]. The mechanism behind this relation can be due to the fact that the parasite directly induces iron deficiency through blood loss by mechanical rupture of host

capillaries and arterioles followed by the release of a battery of pharmacologically active polypeptides including anticoagulants, antiplatelet agents, and antioxidants[48].

This study showed that, the odds of anemia among children whose maternal educational status was illiterate being 0.3 times more likely than those children whose maternal educational status was tertiary (AOR=0.315, 95% CI = (0.101-0.980)). This may be explained by the fact that low level of maternal education may have a negative impact on the socioeconomic status of the family, which would affect the child nutritional status and optimal child care. Moreover, education enhances the mother's knowledge needed for their children's health and an appropriate feeding practice, which help to improve their children nutritional status. This finding is similar than a study done in north west Ethiopia[49].

Different studies had different result on the association between anemia and sex (gender). This study found significant difference in anemia prevalence between male and female, 45% and 31% respectively. This finding is supported by similar study conducted in Montreal, Canada [50]. They argued that the high prevalence of anemia in boys may be due to the faster growth of preschool boys than girls that has high iron demand which cannot be met by diet alone. While the study conducted in Jimma Medical Center, South West Ethiopia showed that the prevalence of anemia cannot vary between male and female children[51]. This study revealed that the odd of anemia among children who had history of malaria infection is 0.2 times more likely than those children who had no history of malaria infection. This finding is similar with a study conducted in Jimma Medical Center, South West Ethiopia[51].

CHAPTER SEVEN

7. STRENGTH AND LIMITATION OF THE STUDY

7.1. Strength

- Satisfactory response rates among participants was obtained.
- The study was prospective and determining the expected association factor was not compromised.

7.2. Limitation

One of the limitations of this study is the study lacks detailed investigation of the morphological appearance of red blood cells to differentiate anemia due to vitamin B12 and folic acid deficiencies from anemia due to iron deficiency. Stool examination to check intestinal parasites were also not determined due to resource limitation. Other limitation was anemia was measured based on hemoglobin concentration only, inclusion of other measures such as serum ferritin, total iron binding capacity, could lead to better diagnosis.

CHAPTER EIGHT

8. CONCLUSION AND RECOMMENDATION

8.1. Conclusion

In general, the magnitude of anemia in under five children in worabe comprehensive specialized hospital worabe sub-city was 38% indicative of the fact that anemia is an important public health problem. This study also showed that mild and moderate levels of anemia were found to be 44.74% and 39.47% respectively, while only 15.79% of the study participants had severe anemia. Malaria infection, intestinal parasite infection, educational status of the mother and sex of children were factors significantly associated with anemia in those under five children. It indicates that there should be well integrated public health interventions to improve the health status that needs to be prioritized to prevent anemia among under five children.

8.2. Recommendation

The ministry of health up to the local government health service authority should strengthen awareness creation, behavioral change programs in order to increase the knowledge of reproductive women's and also parents about anemia. Health professionals should incorporate anemia and its consequences in their day to day health education program for mothers who are pregnant and coming to the health center for care.

Specifically, health professionals in Maternity service delivery encouraged to strengthen one to one health information with mother regarding the importance of using bed nets to reduce malaria infection, on proper sanitation practice, children wearing practice, children feeding practice and early health facility visiting while the child became ill. Health extension workers must work in coordination with health professionals to deliver awareness about early screening and referral of child who develop fever during their home to home visit and encourage the mother to have ANC during their pregnancy to be provided with iron for prevention of maternal anemia. Further study should be conducted at the community in woreda level and at the kebele level to assess the magnitude of anemia and associated factors inclusion of other measures such as serum ferritin, total iron binding capacity, could lead to better diagnosis.

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ANNEXS

ANNEX I- Questionnaire

Informed Assent English version

Questioner format prepared for the study of prevalence of anemia and its associated factor in under-five children in WCSH, Silte zone, southern Ethiopia.

Good morning/afternoon, we are students of Wolkite university health science college. We kindly request you to give us information for research that is oriented in assessing prevalence and associated risk factors for anemia in children in this town. We assure you that the information that you are going to give us would be kept in secrete. Therefore, you are free to respond or not to respond the questions. Your support and willingness in responding the questions will be very important for the success of this study. So that, we need your cooperation by answering the questions that we are going to ask you. Are you willing to answer?

yes_____ no_____

If yes continue the interview and if no stop the interview.

Thank you for your cooperation.

1. Sex of children
   A) Male B) Female
2. Age of children in months
   A) < 6 months C) 24-35 months E) 48-59 months
   B) 6-23 months D) 36-47 months
3. Address of children

   A) Rural B) Urban

4. Respondent relation to children

A) Mother C) Sibling (daughter/son)

B) Father D) Relative

E) other, specify----------

5. Ethnicity of children

A) Gurage C) Wolayita

B) Silte D) Oromo

E) Others

6. Religion of children

A) Protestant C) Muslim

B) Orthodox D) Catholic

E) Others

7. Marital Status of mother

A) Living together C) Widowed

B) Divorced D) Separated

8. Occupation of mother

A) Merchant C) Housewife

B) Civil servant D) Daily labor

E) Others

9. Occupation of father

A) Farmer C) Civil servant

B) Merchant D) Handcraft

E) Others

10. Educational status of mother

A) Illiterate C) Primary

B) Read and write only D) Secondary

E) Tertiary

11. Educational statuses of father

A) Illiterate C) Primary

B) Read and write only D) Secondary

E) Tertiary

12. Family monthly income

A) <200-3500 B 3600-5100 C) >5100

13. Number of family

A) 1-4 B) > 4

14. Are your children affected by intestinal parasite in last 3 months?

A) Yes

B) No

15. Are your children affected by Malaria in last 3 months?

A) Yes

B) No

16. When you start additional food for your children?

A) Before 6 months C) After 6 months

B) At 6 months

17. Hemoglobin value of your children

A) Anemia (HGB<11gm/dl) C) Mild anemia (HGB10gm/dl-11gm/dl)

B) Moderate anemia (HGB7gm/dl-10gm/dl) D) Severe anemia (HGB S<7gm/dl)

18. Do you use the toilet?

A) Yes

B) No

19. Do your children feed breast?

A) Yes

B) No

20. Duration of breast feeding

A) <6 months B) 6 moths C) >6 months

21. What is the source of water that you use for consumption?

A) Pipe C) Zoned stream/river

B) Protected spring/well D) Unzone stream /river

E) Unprotected sprig/well F) Others ----------specify

Annex II: መጠይቅ

እንደምን አደሩ/ዋሉ እኛ የወልቂጤ ዩኒቨርሲቲ የጤና ሳይንስ ኮሌጅ ተማሪዎች ነን። በዚህ ከተማ ውስጥ በህጻናት ላይ የሚደርሰውን የደም ማነስ ስርጭት እና ተያያዥ አደጋዎችን በመገምገም ላይ ያተኮረ ምርመራ ልናካሂድ ስለሆነ በዚህ ዙሪያ የተለያዩ መረጃዎችን እንድትሰጡን በትህትና እንጠይቃለን። መረጃዎቹ በሚስጥር እንደሚጠበቁ እናረጋግጣለን። ስለዚህ, ለጥያቄዎች መልስ ለመስጠት ወይም ላለመስጠት ነፃ ነዎት. ለጥያቄዎቹ ምላሽ ለመስጠት ያለዎት ድጋፍ እና ፍላጎት ለዚህ ጥናት ስኬት በጣም አስፈላጊ ነዉ ። ስለዚህ እኛ የምንጠይቃቸውን ጥያቄዎች በመመለስ የእናንተን ትብብር እንፈልጋለን። መልስ ለመስጠት ፈቃደኛ ነዎት?

አዎ ---------- አይ----------

አዎ ከሆነ ቃለ መጠይቁን ይቀጥሉ ፣ካልሆነ ቃለ መጠይቁን ያቁሙ።

ለትብብርዎ እናመሰግናለን።

1. የልጁ/የልጅቷ ጾታ

ሀ) ወንድ ለ) ሴት

2. የልጁ/የልጅቷ ዕድሜ በወራት

ሀ) <6 ወር ሐ) 24-35 ወር ሠ) 48-59 ወር

ለ) 6-23 ወር መ) 36-47 ወር

3. የልጁ/የልጅቷ አድራሻ

ሀ) ገጠር ለ) ከተማ

4. ምላሽ ሰጪዎች ከልጁ/ከልጅቷ ጋር ያላቸው ግንኙነት

ሀ) እናት ሐ) እህት ወይም ወንድም (ሴት ልጅ / ወንድ ልጅ)

ለ) አባት መ) ዘመዶች

ሠ) ሌሎች፣ ይግለጹ_____

5. የልጁ/የልጅቷ ብሔር

ሀ) ጉራጌ ሐ) ወላይታ

ለ) ስልጤ መ) ኦሮሞ

ሠ) ሌሎች

6. የልጁ/የልጅቷ ሃይማኖት

ሀ) ፕሮቴስታንት ሐ) ሙስሊም

ለ) ኦርቶዶክስ መ) ካቶሊክ

ሠ) ሌሎች

7. የጋብቻ ሁኔታ (ወላጅ/አሳዳጊ)

ሀ) አብረዉ እሚኖሩ ሐ) ባል የሞተባት

ለ) የተፋቱ መ) ተለያይተዋል።

8. የእናት ሥራ

ሀ) ነጋዴ ሐ) የቤት እመቤት

ለ) የመንግስት ሰራተኛ መ) የእለት ተእለት ጉልበት ሰራተኛ

ሠ) ሌሎች

9. የአባት ሥራ

ሀ) አርሶ አደር ሐ) የመንግስት ሰራተኛ

ለ) ነጋዴ መ) የእጅ ሥራ

ሠ) ሌሎች

10. የእናት የትምህርት ደረጃ

ሀ) ምንም ያልተማሩ ሐ) የመጀመሪያ ደረጃ

ለ) ማንበብ እና መፃፍ ብቻ መ) ሁለተኛ ደረጃ

ሠ) ከፍተኛ ደረጃ

11. የአባት የትምህርት ደረጃ

ሀ) ምንም ያልተማሩ ሐ) የመጀመሪያ ደረጃ

ለ) ማንበብ እና መፃፍ ብቻ መ) ሁለተኛ ደረጃ

ሠ) ከፍተኛ ደረጃ

12. የቤተሰብ ወርሃዊ ገቢ

ሀ) 2000-3600 ብር ለ) 3600-5100 ብር ሐ) >5100 ብር

13. የቤተሰብ ብዛት

ሀ) 1-4 ለ) > 4

14. ልጁ/ልጅቷ ባለፉት 3 ወራት በ አንጀት ጥገኛ ተውሳክ (በ አንጀት ትላትል) ተጠቅተዉ ያዉቃሉ

ሀ) አዎ ለ) አይ

15. ልጁ/ልጅቷ ባለፉት 3 ወራት በወባ ተጠቅቶ/ታ ያዉቃል/ታዉቃለች

ሀ) አዎ ለ) አይ

16. መች ነዉ ልጁ/ልጅቷ ተጨማሪ ምግብ የጀመረዉ/ችዉ

ሀ) ከ 6 ወር በፊት ሐ) ከ 6 ወር በኋላ

ለ) በ 6 ወር

17. የልጁ/የልጅቷ የሂሞግሎቢን ውጤት

ሀ) የደም ማነስ (HGB<11gm/dl) ሐ) መጠነኛ የደም ማነስ (HGB10gm/dl-11gm/dl) ለ) መካከለኛ የደም ማነስ (HGB7gm/dl-10gm/dl) መ) ከባድ የደም ማነስ (HGB S<7gm/dl)

18. መጸዳጃ ቤት ይጠቀማሉ

ሀ) አዎ ለ) አይ

19. ልጁ/ልጅቷ ጡት ጠብቷል/ለች

ሀ) አዎ ለ) አይ

20. ለምን ያክል ጊዜ ነዉ ልጁ/ልጅቷ ጡት የጠባዉ/ችዉ

ሀ) ‹ 6 ወር ለ) 6 ወር ሐ) ›6 ወር

21. ለምግብ ፍጆታዎ የሚጠቀሙት ዋናው የውሃ ምንጭ ምንድነው?

ሀ) ቧንቧ

ለ) የተጠበቀ ምንጭ/ጉድጓድ

ሠ) ያልተጠበቀ ምንጭ /ጉድጓድ

ሐ) የተከለለ ዥረት / ወንዝ

መ) ያልተከለለ ዥረት/ወንዝ

ረ) ሌሎች ካሉ _____ ይግለጹ

Annex III- Laboratory Procedure

Materials and Reagents

Materials

- Structured questioners
- EDTA anticoagulant tube
- Tourniquet
- Protective glove
- CBC machine
- Syringe
- Gauze and cotton

Reagent

-70 % alcohol

Specimen collection

• About 2-3 ml of blood was collected in to an EDTA tube for CBC.

Laboratory Procedure for CBC

1. After specimen is collected, place it in a rack near the CELL-DYN 1800 System
2. After daily startup is completed, go to **MAIN** menu.
3. Select the desired specimen tube from the rack.
4. Confirm specimen ID on the tube
5. From the **MAIN** menu, press **RUN**
6. From the **RUN** menu, press **[SPECIMENTYPE]**, and then press **[PATIENT SPECIMEN]**.
7. Using the PC keyboard, enter specimen ID information and demographics
8. With the cap tightly secured, gently invert the tube 10 to 15 times.
9. Remove the cap from the pre-mixed specimen tube
10. Place tube under sample aspiration probe and raise the tube so that the end of the probe is deeply immersed in the specimen
11. Press touches plate to activate run.
12. After the instrument aspirates the specimen, the probe moves up. There is an audible beep and the message line displays **REMOVE SPECIMEN**.

13. Remove the specimen and replace the cap.
14. After the cycle is completed, the results were display on the **RUN** screen in terms of histogram and number and automatically print out the result.
15. Finally, the value of HGB recorded (g/dl)

Annex IV - Laboratory check lists

DATE----------

Identification code----------

RBC parameters

A. HGB value(g/dl) ----------

Annex VI: Declaration Form

The undersigned declares that this research paper complies with the university's regulations and meets the accepted standards concerning originality and quality. Principal investigators also agree to take responsibility for the research project's scientific, ethical, and technical conduct and the provision of required progress reports.

BSc candidate students name:

1. Name: EKRAM SNDEW_____ Signature: _____ Date: ___/____/_____

2. Name: NUJEBA MOHAMMED _____Signature: _____ Date: ___/____/_____

3. Name: TSEGA DATI _____Signature: _____ Date: ___/____/_____

APPROVAL OF THE ADVISORS

This research proposal approved by advisors:

1. Name of 1st advisor: MIS. ABSRA SOLOMON (MSC, ASSPROF.)

Signature: _____ Date of submission: _____/_____/_____

2. Name of 2nd advisor: MR. BISRAT FIKADU (MSC)

Signature: _____ Date of submission: _____/_____/_____

Examiner

Name: _____Signature: _____Date_____/_____/_____

Name: _____ Signature: _____Date_____/_____/_____

Name of School head: _____

Signature: _____ Date of submission: _____/_____/_____