HARAMAYA UNIVERSITY

COLLEGE OF HEALTH AND MEDICAL SCIENCES

SCHOOL OF GRADUATE STUDIES

Prevalence of Anemia and Associated Factors among Children aged 6-59 months in Guba Qoricha District, Western Hararghe Zone, Oromia Region, Eastern Ethiopia

MPH THESIS

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November, 2020

Harar, Ethiopia

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Prevalence of Anemia and Associated Factors among Children aged 6-59 months in Guba Qoricha District, Western Hararghe Zone, Oromia Region, Eastern Ethiopia

A Thesis Submitted to the School of Public Health, School of Graduate Studies In Partial Fulfillment of the Requirements for the Degree of Masters In Public Health Nutrition

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HARAMAYA UNIVERSITY

SCHOOL OF POST GRADUATE STUDY

I hereby certify that I have read and evaluated this Thesis entitled Prevalence of anemia and Associated factors among children 6-59 months of age in Health Facility, Catchment of Guba Qoricha District, Western Hararghe Zone, and Eastern Oromia prepared under my guidance by Ahmed Abrahim Adem. I recommend that it can be submitted as fulfilling the thesis requirement.

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As a member of the Board of Examiners of the MPH Defense. Examination, I certify that I have read and evaluated the thesis prepared by Ahmed Abrahim Adem and examined the candidate. I recommend that the thesis be accepted as fulfilling the thesis requirements for the degree of Master of Public Health in Public Health Nutrition.

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ABBREVIATIONS AND ACRONYM

AOR	Adjusted Odds Ratio
ANC	Antenatal Care
CDC	Center for Disease prevention and Control
CI	Confidence Interval
EDHS	Ethiopian Demographic Health Survey
FANTA	Food and Nutrition Technical Assistant
HFIAS	Household Food Insecurity Access Scale
IHRERC	Institutional Health Research Ethical Review Committee
IYCF	Infant and Young Child Feeding
NGOs	Non-Governmental Organizations
NNP	National Nutrition Program
PSP	Philippine Pediatric Society
SPSS	Statistical Package for Social Science
UNICEF	United Nation Children's Fund
USAD	United States Agency for International Development
WHO	World Health Organization

ABSTRACT

Background: Anemia is a problem of both developed and developing countries. It occurs at all age groups affecting growth and mental development. Hence, this study aimed at assessing the prevalence and factors associated with severity of anemia among children aged 6–59 months in Guba Qoricha woreda, eastern Ethiopia.

Objective: To assess the prevalence of anemia and associated factors among children aged 6-59 months in Guba Qoricha District, Western Hararghe Zone, Oromia Regional state, eastern Ethiopia from August 1, 2020 to October 10, 2020.

Methods: Health facility based cross sectional study design was used. Sociodemographic and economic characteristics, feeding practice and other risk factors were assessed using a pretested and structured questionnaire. Hemoglobin test was done using HemoCue Hb 301 to determine anemia. SPSS version 22 was used to analyze data. A binary logistic regression analysis was used to identify the association between anemia and each independent variable. Multivariable logistic regression analysis was done to control for all possible confounders and to identify factors associated with anemia. Odds ratio along with 95% CI was estimated to assess strength of the association. Level of statistical significance was declared at P-value ≤ 0.05.

Result: The overall prevalence of anemia was 37.5% (95% CI; 33.77% -41.39%). Of the anemic under-five children, 187(30.4%) had mild anemia and 44(7.1%) had moderate anemia. The highest prevalence was recorded in the age group of 24–42 months (AOR=6.42; 95% CI: 6.36-7.77),child had fever before two weeks (AOR=6.20; 95% CI: 2.85-7.50), children's mothers aged 35-44year(AOR=4.12; 95% CI: 1.05-6.06),parent had no formal education (AOR=8.62; 95% CI: 4.19-17.76) and had family size ≥5 (AOR=2.96; 95% CI: 1.19-7.35), poor exclusively breast feeding practice (AOR=8.60; 95% CI: 4.53-10.50), preceding birth interval (AOR=37.55; 95% CI: 14.08-44.09), a family monthly income<750 ETB (AOR=5.29; 95% CI: 2.45-11.42),wasting (AOR= 7.82; 95% CI: 2.68-9.84)and moderate elevation (AOR=0.13; 95% CI: 0.07- 0.22).

Conclusion: Anemia was found to be a moderate public health problem among children aged 6–59 months in Guba Qoricha District, Health Facility. Providing regular health education about childcare and child-feeding practices and to support nutrition low social economic status may help to reduce the anemia.

Key words: Anemia, Associated factor, Children, Severity.

1. INTRODUCTION

1.1. Background

World health organization (WHO) recommends introduction of complementary foods for children at age of six months together with continued breastfed until two years and beyond to meet child nutritional supports optimal growth and development (WHO, 2013). Nutrition during the first 1000 days is critical for child health, growth, cognitive development and to increase productivity in the later life (USAID, 2014). Children during this period have highest nutritional demand because of rapid physical growth and cognitive development. Under two years children have greatest risk of malnutrition, infection as well as growth faltering. Inadequate nutrition at this period results in long-term and irreversible effects on child physical growth and mental development. In contrast, appropriate nutrition prevents childhood diseases, enhance school performance and earn more wages in adult life (PPS, 2017).

Anemia is defined as low hemoglobin concentration in the blood or low red blood cells which cause for poor oxygenation of body tissue (World Bank, 2016). According to WHO anemia among under-five defined as hemoglobin value less than 110 g/l at sea level. However, hemoglobin concentration varies based on age, gender, smoking, physiological status and altitude (WHO, 2010). Based on severity anemia classified as mild (10-10.9 g/dl), moderate (7-9.9 g/dl) and severe anemia (< 7 g/dl). WHO declared anemia is public health significance when its prevalence exceeds 5 % and classified as mild (5-19.9 %), moderate (20-39.9 %) and severe (≥ 40 %) public health significance (WHO, 2001).

Anemia is a worldwide public health problem which occurs at all age groups in a life cycle but Women of reproductive age and under five children are mostly affected (WHO, 2001, World Bank, 2016). Anemia reflects overall health and nutritional status of population. It caused for maternal and child mortality has negative impact on motor and cognitive development, high school absenteeism, decrease school performance of children, reduces working capacity of adult life. This in turn affects countries economic development (WHO, 2010). Anemia is frequently presented with fatigue, restless, dyspnea and headache as well as paleness (Lopez et al., 2015).

In a population level, prevalence of anemia is an indicator for severity of iron deficiency (WHO, 2001). Globally one in every four individuals was affected by iron deficiency.

However, preschool children and women are the most affected population groups (UNICEF, 2009).

Prevalence of anemia in field setting determined through hemoglobin concentration test by hemoglobinometry; cyanmethemoglobin method in laboratory and HemoCue system. However, HemoCue method is most reliable system for measuring hemoglobin level in field surveys because it is portable, battery operated, rapid, one-time blood collection and cost effect device in a resource poor setting (WHO, 2001).

1.2. Statement of the Problem

Anemia is a global public health problem both in developed and developing countries which affects one third of the world's population. Globally, it is estimated that 273 million children, 496 million pregnant women and 32 million non-pregnant women were anemic in 2011 (WHO, 2015).

Highest global burden of anemia is found in Asia and Africa regions. In Asia, 25% to 58 % of under-five children had anemia and Africa shared 46 % to 71 % of anemia among under-five (Stevens et al., 2013).Worldwide, anemia cause for 115000 maternal and 591000 perinatal deaths per year (Balarajan et al., 2011). In 2010, anemia was responsible for 8.8 % of the total disability of which 37.5% of disabled were in Asia and 71.9 % disabled in Africa (Kassebaum et al., 2014).

In Ethiopian, anemia has severe public health significance. From children 6-59 months age, 57% suffered from some degree of anemia (hemoglobin levels below 11 g/dl). Twenty-five percent of children are classified with mild anemia, 29% with moderate anemia, and 3% with severe anemia. The highest (83 %) and lowest (66 %) prevalence of anemia among under-five were found in Somali and Oromia regions respectively (EDHS, 2016).

Anemia arises from different factors but mainly it has nutritional, non-nutritional and genetic roots (Balarajan et al., 2011). Globally, fifty percent of anemia attributed to iron deficiency. Efforts have been made at international and at national level to overcome high burden of anemia.

If left untreated, anemia can adversely affect the health, cognitive development, school achievement, and work performance of individuals. Low oxygenation of brain tissues, a consequence of anemia, may lead to impaired cognitive function, growth and psychomotor

development in children. Children under 5-year-old and pregnant women have greater susceptibility to anemia because of their increased iron requirements for rapid body growth and expansion of red blood cells (Walter, De Andraca et al. 2017).

There was no research done in Western Hararghe Zone on anemia and associated factors among children aged 6-59 month also in Oromia Region.. Therefore, this study was assessed anemia and associated factors among children aged 6-59 months in Guba Qoricha District, Western Hararghe Zone, Oromia Region.

1.3. Significance of the Study

Reducing malnutrition, mortality and anemia among infant and young children is one agenda of Federal government of Ethiopia. This study was help to identify the burden of anemia among children age of 6-59 months, to provide appropriate treatment and advice. It also informs the woreda heath office and health professional about the burden and possible associated factors of anemia in the community and to plan necessary intervention measures to promote child health. The finding also was useful for non-governmental organizations (NGOs) working related to infant and young child health in the area. This in turn was benefit to improve the health and nutritional status in the study area. In addition, the information generated from the study was help as a source of information for other researchers to conduct further study to address the problem in the area.

1.4. Objectives

1.4.1. General Objective

To assess the prevalence of anemia and associated factors among children aged 6-59 months in Guba Qoricha District, Western Hararghe Zone, Oromia Region, eastern Ethiopia, from August 1, 2020 to October 10, 2020.

1.4.2. Specific Objectives

To determine the prevalence of anemia among children aged 6-59 months.

To identify factors associated with anemia among children aged 6-59 months.

2. LITERATURE REVIEW

2.1. Prevalence of Anemia among Children aged 6-59 months

Anemia is worldwide public health problem both in industrialized and non-industrialized countries. Different scientific evidence revealed that anemia among children aged 6-59 months were highly prevalent in different parts of the world (WHO, 2015).

Bangladesh Demographic and Health Survey (BDHS 2011conducted in 2011 the prevalence of anemia among children of aged 6–59 months was 51.9% (95 % CI 49.4-54.5)(Khan, Awan et al. 2011) and Togo Demographic and Health Survey(DHS-III) conducted in 2013–2014 the overall prevalence of anemia among children aged from six to 59 months was 70.9% (95% CI = 68.8–73.1) of which 25.6% [95% CI = (23.7–27.5)] had mild anemia,42.7% (95% CI = 40.4–45.0) had moderate anemia and 2.6% (95% CI = 2.0–3.3) had severe anemia(Nambiema, Robert et al. 2013-2014).

The household survey conducted in Namutumba district, in the east-central region of Uganda April to May 2014. One child aged 6 to 59 months was randomly sampled from each selected household. Overall, 58.8% (221) of the children had anemia (hemoglobin level below 11 g/dl). The hemoglobin levels ranged from 4.4 to 13.5 g/dl with mean hemoglobin level of 10.5 g/dl (SD 1.42). The proportion of children who had severe anemia (Hb < 7 g./dl) was 1.3% (5), while those with moderate anemia was 27.7% (104), and mild anemia was 29.8% (112) (Kuziga, Adoke et al. 2017) and the community-based cross-sectional study was conducted in Arusha Rural District, Tanzania 2018 children aged 6–59 months participated in the study, about 85% had anemia (Hb <11 g/dL) (Kejo, Petrucka et al. 2018). The cross sectional study was carried out in Western Province of Kenya outside Nairobi, West of the Eastern Rift Valley 2015 among preschool children aged between 6-59 months, prevalence of anemia was 25% and it was further divided into moderate (Hb between 7-10g/l) was 14.2% and mild (Hb between 10-11g/l) was 10.8%. There were no cases of severe anemia (Hb<7.0g/ (Kisiangani, Mbakaya et al. 2015).

In Ethiopia, anemia among infant and young child aged 6-59 months is a major public health importance. A community-based cross-sectional study was conducted in April 2015 among children aged 6–59 months in Gondar town, northwest Ethiopia shows (28.6%) of children were anemic: (17.5%) were mildly anemic (10.3%) were moderately anemic, and (0.7%) were severely anemic(Melku, Alene et al. 2018) and across-sectional health facility

based study was conducted at Guguftu health center, South Wollo, Northeast Ethiopia 2019 among children aged 6 to 59 months , the overall prevalence of anemia was 41.1% (95% CI;36.6% - 45.8%). Of the anemic under five children, (67.5%) had mild anemia, (31.3%) had moderate anemia, and (1.2%) had severe anemia.

Children who were in the age group of 6–11(AOR = 4.52; 95% CI:1.67–12.34) and 12–23 (AOR = 2.79; 95% CI: 1.04–7.51) months, living in an urban (AOR = 1.83; 95% CI: 1.05–3.18) (GebreweldID, Ali et al. 2019).

2.2. Factors associated with anemia among children aged 6-59 months

2.2.1. The causes of anemia are multifactorial and hierarchically inter related to each other

Mostly, it is an indicator of socio-economic underprivileged. Poorest and less educated have high risk of anemia. Inadequate nutrient intake, malabsorption and infection are the proximal factors for anemia. Other factors including cultural norm and behavior, physiological vulnerability (women and children), access to diversify and fortified food sources, maternal or child caring practice, access to health service, clean water and sanitation also responsible for anemia (Balarajan et al., 2011).

2.2.2. Maternal age and level of education

Across sectional study in Seri-Lanka in (2012) among 334 young children showed that child from mother age less than 28 years had 72 % [AOR=1.72; (95% CI: 1.03, 2.87)] more likely to be anemic (Zuffo et al., 2016) and study done in northeast Ethiopia (2014) stated that child whose mother had no formal education had 2.6 times [AOR=2.6 (95% CI:1.26–5.27)] higher chance of anemia than mother who had secondary education (Haile et al., 2015).

2.2.3. Family size and wealth index

Hospital based cross sectional study in Bangladesh (2010) indicated that children in poor family 74% [AOR=1.74; (95 % CI: 1.08-2.81)] more likely had anemia (Hoque et al., 2015) and Similar study in northeast Ethiopia (2014) also showed that children in household with lowest wealth index were three times [AOR=3.0 (95% CI: 1.01–8.88)]more likely to be anemic as compare to children in household of highest wealth index (Haile et al., 2015).

2.2.4. Sex, age, premature birth and health status of child before two weeks

Study in Bangladesh (2010) revealed that premature children were 5.28 times [AOR=5.28 (95 % CI: 1.44-19.44)] higher chance of anemia than mature children (Hoque et al., 2015).

Institution based study conducted in Seri-Lanka in (2012) estimated that being male had 82 % times [AOR=1.82 (95% CI: 1.08-3.06)] more likely to be anemic than female (Zuffo et al., 2016). Likewise, study done in Ethiopia (2014) among 347 infant and young children to identify, factors associated with anemia declared that male had 3.1 times [AOR=3.1 (95 % CI: 1.6- 5.81)] higher chance of anemia than female (Haile et al., 2015).

Togo Demographic Health and Survey(DHSIII) conducted in 2013-2014 on Two thousand eight hundred and ninety (2890) children aged 6–59 months shows higher proportion of anemia was observed among children younger than 24 months 84.0% [AOR=92.2; (95% CI =81.4–86.5)]; $p < 0.0001$(Nambiema, Robert et al. 2013-2014) while study in Ethiopia (2014) showed that age group 6-8 and 9-11 months were 3.5 times [AOR=9.6 (95% CI: 3.61-25.47)] and 9.6 times [AOR=3.5 (95%CI: 1.46-8.26)] more likely to be anemic than 18-23 months age respectively (Haile et al., 2015).

2.2.5. ANC service utilization, place of delivery, birth interval and birth order

Community based cross-sectional study in Ghana (2014) to see relationship between dietary diversity and hematological level among under-five children asserted that birth interval was significantly associated with anemia in children age 6-59 months. Child with birth interval less than 24 months were 2.5 times [AOR=2.5 (95% CI: 1.17, 5.39)] more likely to be anemic as compared to child with birth interval greater than 24 months. This study also showed that place of delivery was significantly associated with anemia. Children who delivered at home were found to have 1.9 times [AOR= 1.9; (95 % CI: 1.08, 3.26)] higher chance of anemia as compared to their counter parts (Saakaa and Zakaria, 2017).

Community based cross-sectional study conducted on Gondar 2018 show association between anemia and place of birth, being a child delivered at home [AOR = 1.64;(95%CI: 1.03–2.61)]. Frequency of ANC follow up was significantly associated with anemia in infant and young child (Melku, Alene et al. 2018). Cross sectional study done in two agro ecological zone of, Ethiopia (2014) among 216 children aged 6-23 months to identify predictors of anemia revealed that those child paired with mother who had four ANC

follow up were 62% [AOR=0.38; (95% CI: 0.17, 0.84)] less likely to be anemic than mother had less than four ANC follow up (Kedir et al., 2016).

2.2.6. Food insecurity

The study conducted in Seri-Lanka (2010) among 344 infant and young children showed that child did not consume iron rich food sources (meat, DGLVs, beans) were 91 % [AOR=1.91; (95 % CI: 1.06-3.44)] times higher chance of being anemic than they consume (Zuffo et al., 2016). Other cross sectional studies in Ethiopia revealed that child with poor dietary diversity had 3.2 times [AOR= 3.2; (95 % CI: 1.35-7.38)] more chance of anemia than their counter party (Haile et al., 2015) while children achieved minimum meal frequency were 68 % [AOR=0.32; (95 % CI: 0.15, 0.68)] less likely to be anemic as compared with child not achieved (Kedir et al., 2016).

Untimely introduction of complementary food was found to be other predictor of anemia among children less than two years. Study in Bangladesh (2010) showed that children wean early were 2.44 times [AOR=2.44; (95 % CI: 1.18-5.04)] more likely to be anemic than wean timely while those weaning late after six months were 3.47 times [AOR=3.47; (95% CI: 1.56-7.72)] more likely had anemia (Hoque et al., 2015).

Similar surveys in Africa also describe that untimely introduction of complementary food were significant predictors of anemia. Hospital based study done in Egypt (2010) among infant and young child asserted that child wean late were 5.26 times [AOR= 5.26; (95% CI: 2.3-11.9)] more likely to be anemic as compared with those start at six months (Elalfy et al., 2012). In contrast, study in Ethiopia (2014) revealed that child begin complementary food before six months had 11.1 times [AOR=11.1 ;(95 % CI: 4.08, 30.31)] higher chance of to be anemic while late introduction were found 4.3 times [AOR=4.3; (95 % CI: 1.78, 10.18)] more likely to be anemic than children begin at 6-8 months (Haile et al., 2015).

Child nutritional status also correlated with anemia among children aged 6-59 months. The study carried out in Western Province of Kenya outside Nairobi, West of the Eastern Rift Valley among preschool children aged between 6-59 months showed Anemia was also associated with being underweight(AOR=11.13, 95%CI:2.11-58.66, p=0.006) and stunting (AOR=2.92, 95% CI:1.23-6.94, p=0.014) / (Kisiangani, Mbakaya et al. 2015) and study in Ethiopia (2014) asserted that stunted child were 2.7 times [AOR=2.7; (95 % CI: 1.20–6.05)] more likely to be anemic than non-stunted child (Haile et al., 2015).

2.2.7. Fever

Community based study in Ghana in the year (2014) showed that child had fever two weeks before data collection were 2.9 times [AOR=2.9; (95% CI: 1.45, 5.95)] more likely to be anemic than did not has fever (Saakaa and Zakaria, 2017). Other studies in Ethiopia (2014) also revealed that child morbidity status was significantly associated with anemia. Child who were sick two weeks before study period were 5.6 times [AOR= 5.6; (95 % CI: 2.6-12.7)] more likely being anemic than healthy children (Kedir et al., 2016). Likewise, child had diarrhea two weeks before study period were 4.9 times [AOR=4.9; (95% CI: 1.63-14.59)] more likely to be anemic than child did not experience diarrhea (Haile et al., 2015).

2.2.8. Healthy environment and hygiene

Toilet utilization and hand washing after toilet prevents diarrhea and under nutrition associated with parasitic infection. This improves child health and development, prevents micro-nutrient deficiencies associated with infection. Data on 7481 children with ages from 6 to 59 months born in the last 5 years were extracted from 2011 Bangladesh Demographic and Health Survey (BDHS) showed Children from households without access to 'improved' water sources and toilet facilities were 1.34 and 2.48 times more likely than others to be anemic(Khan, Awan et al. 2011) and study in Ethiopia (2014) also identified that child whose mother practice hand washing after toilet were 70 % [AOR=0.3; (95 % CI: 0.12-0.72)] times less likely had anemic than did not practice (Kedir et al., 2016).

2.3. Conceptual Framework

The conceptual framework was developed after reviewing different literatures describes the hierarchal and intertwined relationship of independent variables with the outcome variable. Independent variables influence the risk of anemia among infant and young children directly or indirectly and classified as distal, intermediate and proximal factors.

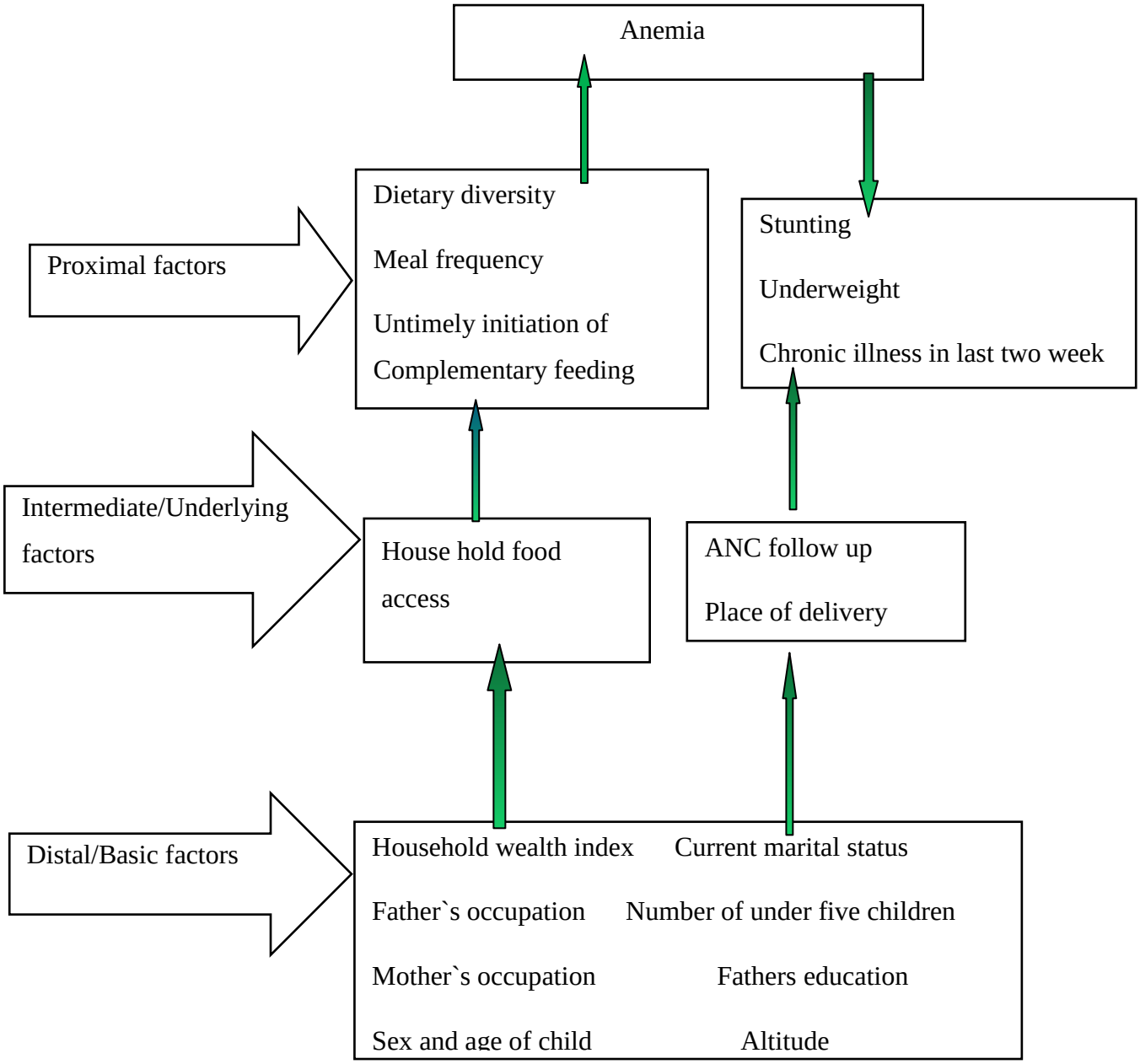


Figure 1: Conceptual framework on prevalence of anemia and associated factors among children aged 6-59 months in Guba Qoricha District, Western Hararghe, Oromia Regional State, and eastern Ethiopia.

3. METHODS AND MATERIALS

3.1. Study Area and Period

This study was conducted in Health Facilities found in Guba Qoricha District, (Kamona health center, Bube health center, Qilxu health center, Laga Arba health center and Hardim health center), Western Hararghe Zone, Oromia region, Ethiopia. Guba Qoricha District located in Western Hararghe zone, which is 78 km away from Chiro town and 340 km from Addis Ababa (Addis Continental Survey 2019). According to 2020 year Guba Qoricha health administrative office report, the woreda has a total population of 138,506 of whom 22,686 were under-five children, 20,790 were 6-59 months and 1,974 were under six months. The health center has less than five outpatient department and other departments (Addis Continental Survey 2019).

The majority (97 %) of the residents were Muslim while 2.32% of and 0.68% are Orthodox and Protestants, respectively. Most of the people were depends on agriculture and few depends on trade. The woreda has 24 kebeles, 22 health post and five health centers (Addis Continental Survey 2019).

The study was conducted from August 1, 2020 to October 10, 2020 in Guba Qoricha Health Facilities, Western Hararghe Zone, Oromia region, eastern Ethiopia.

3.2. Study Design

A cross sectional healthy facility-based study design was used.

3.3. Population

3.3.1. Source Population

All children aged 6-59 months and their mothers/primary caregivers living in Guba Qoricha District were the source of population.

3.3.2. Study Population

Children aged 6-59 months and their mothers/primary caregivers attending selected Guba Qoricha health facilities during the study period and fulfilled the inclusion criteria.

3.4. Inclusion and Exclusion Criteria

3.4.1. Inclusion Criteria

Children between 6 and 59 months who attend under department of Guba Qoricha health facilities and their guardian or parents consented to participate in the study; Children consuming some solid foods were included.

3.4.2. Exclusion Criteria

Children had taken anthelmintic, children who lost blood by traumatic injury or surgery, taking iron and Vitamin-A supplement during the last 3 months were excluded from the study.

3.5. Sample Size determination and sampling procedures

3.5.1. Sample Size determination for first objective

The sample size for the first objective was determined by using single population proportion formula ($n = (Z\ a_{/2})^2 pq/d^2$) by taking previous studies with the following assumption Confidence level at 95% =1.96, margin of error 5% and 5 % for non-response rates.

Where: n = sample size

Z $a_{/2}$ = standard normal distribution corresponding 95% level significance= 1.96

Table 1: Sample size calculation for study on the prevalence of anemia among children 6-59 months of age living in Guba Qoricha, Western Hararghe, Oromia Zone, eastern Ethiopia 2020.

Prevalence of anemia	Calculated sample size with 5% non-response rate	Reference
41.7%	393	(GebreweldID, Ali et al. 2019)
28.6%	330	(Melku, Alene et al. 2018)

3.5.2. Sample size determination for the second objectives

The sample size for the second objective(factors associated with anemia among children6-59month) was determined by considering various factors that were significantly associated with outcome variables, two-sided confidence level of 95%, and power of 80% and ratio of unexposed to exposed as1:1 using open Epi info version 7 (Table 2).

Table 2: Sample size calculation for different factors associated with anemia among infants and young children aged 6-59 months, 2020.

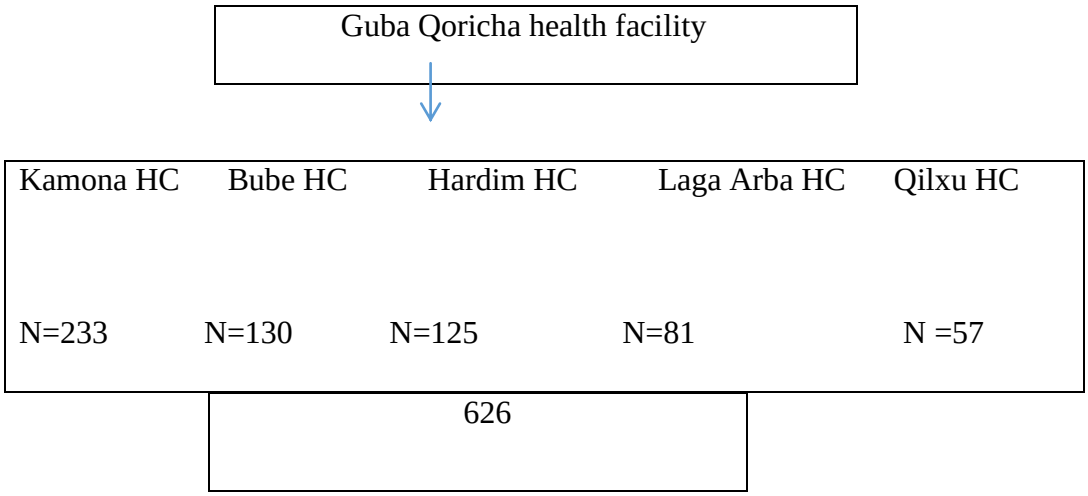
Factors	Prevalence of anemia						
	% of exposed with outcome	% of Unexposed With outcome	AOR	Initial Sample size	5% of Non-response	Final sample size	Reference
Child being breastfed	40.9%(yes)	19.5%(no)	2.86	162	8	170	(Melku,Alene et al. 2018)
Residence	49.6%(urban)	37.9%(rural)	1.6	596	30	626	(GebreweldID, Ali et al.2019)
Introduction of complementary foods	38.5%(>6 month)	73.3%(< 6month)	0.23	74	4	78	(GebreweldID, Ali et al.2019)
ANC visit	27.2%(1-4 visited)	46.8%(never visited)	0.43	210	11	221	(Melku, Alene et al. 2018)

Finally, the required sample size of the study was determined by taking the maximum sample size from the second objective (626) infant and young children aged 6-59 months were included in this study.

3.6. Sampling Procedure

For this study, a simple random sampling technique were used.5 HC were selected through lottery method and the study samples were proportionally allocated to each health center depending on their client flow data from the previous year.

Among the 5-health center (2 urban and 3 rural) found in the woreda, 5 health centers were selected and the study samples were proportionally allocated to each health center depending on their client flow data from the previous year. The study subject was obtained proportionally to the client flow from each facility and all mothers/caregivers with their child 6-59 months who attend the health facility during the data collection period were interviewed subsequently, until the assigned sample size is obtained. The sample size of each health center was counted from registration book of outpatient department of fewer than five children from December 1/12/2019 to February 30/02/2020. Those sample size of each health center was counted, then it was calculated by using PPS to get proportional sample size.



K=constant

Key: PPS=Proportionate population size
HC-Health center

Figure 2: Schematic presentation of the sampling procedure on prevalence of anemia and associated factors among infants and young children aged 6-59 months in Guba Qoricha district health facility, Western Hararghe, Oromia region, Ethiopia, 2020.

3.7. Data Collection Method and Instruments

Pretested and structured questionnaires were used to collect socioeconomic and demographic characteristics of the family and child, feeding practice and other risk factors by interviewing mother/caregivers of the child. The questionnaire was adapted from previous similar literatures. The questionnaire was prepared in English and translated in to Afan Oromo and then back to English to ensure its consistency. The questionnaire was pretested in Kora health center (found in Gumbi Bordode woreda) which is not included in the actual study on 10% of the sample size. Based on the pilot study result, certain revision was made for the questionnaire prior to the actual study. Two trained clinical nurses conducted the interview in Afan Oromo. Data on nutritional status was collected by measuring weight and height of children under age 5 during the health center visit based on WHO recommendations. Length was measured for children aged 6–23months in a recumbent position and standing height was measured for children aged 24–59 months using the measuring board. A Salter scale measured weight of the children. Children were measured without shoes on and wearing only light clothing. In addition, mid-upper arm circumference (MUAC) tape 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. Anthropometric assessment (Height-for-Age, Weight for- Height, and Weight-for-Age) was done using the WHO Anthro software, version 3.2 (WHO Anthro 2009, Geneva, Switzerland). Each of the three measurements was expressed in standard deviation (SD) units of Z-score from the median of WHO-2006, standard population. Children whose height-for-age Z-score <-2 SD from the median of the reference population were considered stunted, weight-for-height z score <−2 SD were considered wasted, and weight-for-age Z-score<−2 SD were classified as underweight. Capillary blood samples were collected from each child to determine hemoglobin concentration using HemoCue Hb 301 analyzer. HemoCue cuvettes were required for the analyzer. The Hb-301+ cuvettes contain a sodium deoxycholate dried reagent that lyses red blood cells to release free Hb and form a stable was detected at 570 nm and 880 nm. One drop of capillary blood was carefully collected in a microcuvette from a finger prick (heel prick in the case of children age 6–11 months) after the first drop of blood was wiped off with cotton wool. The filled microcuvette was loaded in the cuvettes holder of calibrated HemoCue Hb301analyser and after few the hemoglobin measurement displayed. Then the result was recorded on the questionnaire. The HemoCue method was

shown to be comparable in both accuracy and precision to the International Council for Standardization in Hematology (ICSH) reference method(cyanmethemoglobin method) for the photometric determination of Hb. The HemoCue Hb 301 analyzer has an internal electronic self-test every time the analyzer was turned on, it was automatically verify the measurement performance. This test was performed at regular intervals if the analyzer remains switched on. In addition, the performance of the meter was checked on the daily basis by using control standard to increase test reliability. The test was performed by an experienced medical laboratory technologist. Children with Hb level <110 g/L were considered anemic. Anemic children were further categorized as children with mild anemia, moderate anemia and severe anemia which corresponds to Hb value 100–109 g/l, 70–99 g/l, and lower than 70 g/l respectively. A clean plastic container marked with an identification number was distributed to collect a stool sample from each under-five child. Then, stool wet mount smear was prepared using saline and/or iodine solution for direct microscopic identification of intestinal parasites within 30 minutes of sample collection. The direct smear was examined first by 10x and then 40x objective for detection of helminths eggs, larvae and protozoan parasites by experienced medical laboratory technologist.

Dietary assessment: A 24-hour dietary recall method was used to assess the dietary practice. The Dietary Diversity Score of children was calculated by asking mothers/caregivers about the food items their children consumed in the past 24 hours preceding the data collection. All food items consumed by the children in the last 24 hours preceding the data collection were categorized into seven food groups such as (1) grains, roots, and tubers, (2) legumes and nuts, (3) milk and milk products, (4) flesh foods, (5) eggs, (6) vitamin-A rich fruits and vegetables, and (7) other fruits and vegetables. Finally, the food groups consumed by the child were added together to obtain dietary diversity score (WHO, 2010).

Food insecurity: Food insecurity was measured by HFIAS (Household Food Insecurity

Access Scale) tool developed by FANTA (Food and Nutrition Technical Assistant) project. The tool has nine questions asking household's about the three domains of food insecurity:

Feeling uncertainty of food supply, insufficient quality of food and insufficient food intake and its physical consequences in the last month. The households participating in the study were categorized into four levels of food-security (food secure, mildly food insecure,

moderately food insecure and severely food insecure) based on the guideline's recommendation (Jennifer C et al., 2016).

Wealth index: Household wealth index was constructed using household asset data

through based on interview responses adopted from 2016 Ethiopian Demographic and Health Survey. The presence or absence of each household items such as plow oxen, table, animal-drawn cart, chair, etc. were asked and their responses were coded as '0' for No and '1' for Yes. Finally, the common factor score for each household was produced for grouping households as lower, middle and higher.

3.8. Variable

3.8.1. Dependent variable

Anemia

3.8.2. Independent variable

Dietary diversity Households food insecurity

Meal frequency ANC follows up

Untimely initiation of complementary feeding Place of delivery

Stunting Birth interval (index child) Altitude

Maternal occupation Father`s occupation

Chronic illness Father's education

Household wealth index Child's age and sex

History of hookworm infection maternal education

Place of residence Current marital status

3.9. Operational Definition

Altitude: altitude of was approximated from the woreda PHEM record after the child kebele was identified, since the altitude of the Guba Koricha Wored was between 1300

and 2800 meters, it was reclassified as low (<2000 meters) and moderate (2000-3000 meters) (J. Sinex and R. Chapman, 2015).

Anemia: Anemia among under-five defined as hemoglobin value less than 110 g/l.

Hemoglobin: Iron containing oxygen transport metalloprotein in the red blood cell.

Associated factor: Determinant or risk factor which leads to some result like anemia.

Early initiation of breastfeeding: Proportion of children born in the last 24 months who were put to the breast within one hour of birth (WHO, 2008).

Minimum dietary diversity: Proportion of children 6–23 months of age who receive foods from 4 or more food groups (WHO, 2008).

Exclusive breastfeeding under 6 months: Proportion of infants 0–5 months of age who are fed exclusively with breast milk (WHO, 2008).

Minimum meal frequency: Proportion of breastfed and non-breastfed children 6–23 months of age who receive solid, semi-solid, or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more (WHO, 2008).

Birth interval: The time elapsed between a full-term pregnancy and the termination of next pregnancy (Paulhus D L, 2008).

Birth order: The order a child is born in their family **(**Paulhus D L, 2008**)**

3.10. Data Quality Control

Experienced nurses who were qualified to a diploma level or above and public health officer collected data. The four nurses, one public health officer were recruited and trained intensively for 2 days on the methods of data collection and the context of each item included in the questionnaire. In addition, Anthropometric data collectors were given special training and demonstrations about the procedures. For hemoglobin analysis, the blood sample was collected and tested by trained laboratory technologists who have a BSc degree. Five percent of the total study participants' questionnaire was pretested before the actual data collection and the result from this was not be included in the data analysis.

3.11. Method of Data Processing and Analysis

All collected data was entered in to "Epidata version 3.1" and exported to SPSS version 21.0 statistical software for analysis. Normally distributed and continuous variables were expressed as mean±SD, and non-normally distributed variables were presented as medians, Chi-square (×2) test was used to compare proportions. Binary logistic regression was used to calculate adjusted odds ratios (OR) and the corresponding confidence intervals (CI). A p-value was used to indicate statistical significance. Data analysis was done based on the interpretative approach that involves eliciting meanings from the collected information.

3.12. Ethical Considerations

All ethical dimensions in the study were of utmost interest. The study was obtain an ethical approval from the ethics review board at the faculty of Medical and Health Science, Haramaya University prior to collection of data. All necessary measures were taken to guard against any form of harm and discomfort to the study subjects. Before the Commencement of data collection, the study was reviewed and approved by Haramaya University Institutional Health Research Ethics Review Committee (IHRERC), ethically was secured and Official letter is sent to Guba Qoricha Health Office. An informed, voluntary, written and signed consent was taken from each study participant who selected for interview after explaining the purpose, benefits, duration and any possible risk of the study. Consent for infant and young child was taken from mother and or father. Confidentiality of the study participants' information was ensured. Participants who refused to participate in the study were not forced and the collected data was stored in a file, without the name of study participant (anonymously), but code was assigned for each and had not been disclosed to others except to the principal investigators (Confidentiality of the study participants‟ information was also ensured). Anemic child was linked to the nearest health facility for treatment.

There was pandemic of corona virus (COVID-19) throughout the world. Therefore, data collection period protect self and others from COVID-19 through wash hands frequently with soap and water or alcohol-based rub and maintain social distancing were advised.

4. RESULT

4.1. Socio-demographic characteristics

A total of 626 under-five children were selected; of whom 616 participated in the study, with a response rate of 98.4% from August1, 2020 to October 10, 2020. Ten children were not participated in data collection because mothers or caregivers not consent for interview, busy and fear of COVID-19. More than three fourth, 541 (87.8%) of the children came from the rural part of the study area. Majority 334 (54.0%) of caregivers/mothers of the children were aged between 25 and 34 years, 589 (95.3%) were married, 533(86.5%) were Muslim, 443(71.9) had no formal education, and 493(80%) were Housewife with mean (±SD) mothers/caregivers age of 30.9 (± 5.9) years. About 499(81%) of children's fathers were farmer and 331(53.7%) attended education and 422 (68.5%) had a monthly income <750 ETB (Table 3).

Table 3: Socio-demographic characteristics of children under five years and mothers attending Guba Qoricha Health Facility, eastern Ethiopia, (n = 616).

characteristics		Frequencies	Percentage (%)
Age of mother (in years)	18-24	90	14.6
	25-34	334	54.2
	35-44	192	31.2
Religion	Muslim	533	86.5
	Orthodox	60	9.8
	Protestant	23	3.7
Current marital status	Married	589	95.3
	Divorced	18	2.9
	Widowed	11	1.8
Maternal education	No formal education	443	71.9
	Primary education	139	22.6
	Secondary education and above	34	5.5
Maternal main occupation	Housewife	493	80
	Merchant	55	8.9
	Farmer	35	5.7
	Employee	33	5.4

Family size	≤4	116	18.8
	5-8	449	72.9
	≥9	51	8.3
Under five children in the family	≥2	474	76.9
	<2	142	23.1
Monthly income	<750	422	68.5
	750-1500	152	24.7
	≥1500	42	6.8
Heard about child complementary feeding	No	255	41.4
	Yes	361	58.6
Paternal education	No formal education	331	53.7
	Primary education	229	37.2
	Secondary education and above	56	9.1
Paternal main occupation	Farmer	499	81
	Merchant	36	5.8
	Employee	81	13.2
Residence area	Rural	386	62.7
	Urban	230	37.3
Altitude (elevation)	Low	304	49.3
	Moderate	3012	50.7

4.2. Characteristics of study participant

The mean age of the children was 23.94 months. More than half of the children were below two years of age 375 (60.9%) and male 327 (53%).Majority 474 (76.9%) of the mothers had two and more than two children aged under five years, and 229 (37.2%) of the studied children had third birth order. Moreover, 449(72.9%) of the children were living in a family with five and more than five members.

Regarding nutritional status, 315 (51.1%) was wasting. Only 80 (13%) of the children had started complementary foods before 6 months of their age. The stool investigations showed that 8.8% of children suffered from worm infestations (Table 4).

Table 4: Characteristics of children aged 6–59 months who participated in the study, Guba Qoricha Health Facility.

associated Factors		Frequencies	Percentage (%)
Age of child (in months)	6-23	375	60.9
	24-42	149	24.2
	43-59	92	14.9
Sex of child	Male	327	53
	Female	289	47
Birth order	≥4	204	33.1
	<4	412	66.9
Initiation of breast feeding	After 1 hour	68	11
	Within 1 hour	548	89
Exclusive breast feeding during first six months	No	223	36.2
	Yes	393	63.8
Currently breast feeding	No	245	39.8
	Yes	371	60.2
Pre lacteal feeding	Yes	35	5.7
	No	581	94.3
Bottle feeding	Yes	425	69
	No	191	31
Started complementary feeding	No	161	26
	Yes	455	74
Inter-birth interval	At first birth	104	17
	≤24 months	147	24
	>24 months	365	59
Child had fever in the last 2 weeks before interview	Yes	173	28
	No	443	72
	No	403	65.4
	Yes	213	34.6

Child minimum dietary diversity	Low (<4)		
	High (≥4)	60	9.7
Household food access	Insecure	125	20.3
	Secure	491	79.7
Wasting (WHZ/MUAC)	Yes	315	51.1
	No	301	48.9
Stunting (HAZ)	Yes	333	54.1
	No	283	45.9
Underweight(WAZ)	Yes	212	34.4
	No	404	65.6
Stool result	Giardia lamblia	41	6.7
	E.histolytica	8	1.3
	Amoebic	5	0.8
	No parasites	562	91.2

4.3. Prevalence of anemia among under-five children

Types	Number of children	Percent (%)
Normal	385	62.5
Mild	187	30.4
Moderate	44	7.1
Total	616	100

In this study, the overall prevalence of anemia was 37.5% (95% CI; 33.77% - 41.39%). The mean ± SD hemoglobin concentration among the study participants was 12.24 ± 1.51 g/dl. Of the anemic under-five children, 187(30.4%) had mild anemia and 44(7.1%) had moderate anemia.

Among the age groups, the highest prevalence was recorded in the age group of 24–42 months (51.7%) and fever in the last 2 weeks before interview (54%). High prevalence of anemia was observed in children who were rural dwellers (38.4%), in children mothers`

aged 35-44years (52.1%) and had no formal education (47.6%),parent had no formal education (59.2%),preceding birth interval ≤24months (24) and had family size ≥5(44.7%). In addition, the high prevalence rate of anemia was found among children with a family monthly income of less than 750 ETB (51.2%) and the high prevalence rate of anemia was found among children with wasting (51.1%)(Table 4).

4.4. Factors associated with anemia of children aged 6-59 months

During Bivariable analysis, age of mother, maternal education, family size, decision making autonomy, wealth index, paternal education ,child illness in the last 2 weeks, ANC visit, place of last delivery, parity, child minimum dietary diversity, household food security status, wasting and elevation were significantly associated with anemia of children aged 6-59 months at P<0.001; Growth monitoring and promotion service use and sex of child, were significantly associated with anemia of children aged 6-59 months at P<0.01 and age of child, birth interval and wealth index were significantly associated with anemia of children aged 6-59 months at P<0.05.Factors associated with anemia at p-value <0.05 had association. However, at p-value < 0.25 were considered as a candidate for multivariable analysis (Table 5).

In multivariable analysis, age of mother, maternal education, family size, wealth index, paternal education, child illness in the last 2 weeks, breast feeding practice, household food security status, wasting, age of child and preceding birth interval were independently associated with anemia (Table 6).

Table 5: Bivariable logistic regression of factors associated with anemia of children aged 6-659 months in Guba Qoricha district, eastern Ethiopia, 2020 (n=616)

associated factors		Child Anemia		COR (95% CI)	P-value
		Yes (%)	No(%)		
Age of mother (in years)	18-24	10(11.1)	80(88.9)	1	
	25-34	121(36.2)	213(63.8)	1.91(1.33, 2.74)	0.000
	35-44	100(52.1)	92(48.9)	8.70(4.25, 17.79)	0.000
Maternal education	No formal education	211(47.6)	232(52.4)	6.96(4.21, 11.49)	0.000
	Formal	20(11.6)	153(88.4)	1	

	education				
Family size	≥5	201(44.7)	249(55.3)	3.66(2.36, 5.66)	0.000
	<5	30(18.1)	136(81.9)	1	
Wealth index	Poor	105(51.2)	100(48.8)	3.35(2.31, 5.40)	0.000
	Medium	79(38.3)	127(61.7)	2.09(1.36, 3.22)	0.001
	Rich	47(22.9)	158(77.1)	1	
Paternal educational status	No formal education	196(59.2)	135(40.8)	10.37(6.84,15.72)	0.000
	Formal education	35(12.3)	250(87.7)	1	
Residence area	Rural	145(37.6)	241(62.4)	1.01(0.72, 1.41)	0.966
	Urban	86(37.4)	144(62.6)	1	
Age of child (in months)	6-23	122(32.5)	253(67.5)	1	
	24-42	77(51.7)	72(48.3)	0.90(0.56, 1.42)	0.681
	43-59	32(34.8)	60(65.2)	2.01(1.17, 3.43)	0.011
Sex of child	Male	140(42.8)	187(57.2)	1.63(1.17, 2.27)	0.004
	Female	91(31.5)	198(68.5)	1	
Birth order (of the child)	≥4	103(50.3)	101(49.7)	2.26(1.60, 3.19)	0.000
	<4	128(31.1)	284(68.9)	1	
Exclusively breast-feeding practice during first six months[*a]	Poor	101(72.1)	39(27.9)	6.89(4.53, 10.50)	0.000
	Good	130(27.3)	346(72.7)	1	
Child's meal feeding frequency per 24 hours	≤3	26(48.1)	28(51.9)	2.47(1.16, 5.27)	0.091
	>3	205(36.5)	357(63.5)	1	
Birth interval (in months)	At first birth	42(37.8)	69(62.2)	1.70(1.08, 2.69)	0.022
	≤24 months	97(66.0)	50(34)	5.53(3.66, 8.37)	0.000
	>24 months	94(26.0)	264(74)		
Child illness in the	Yes	94(54.3)	79(45.7)	2.66(1.85, 3.81)	0.000

last 2 weeks before interview	No	137(30.9)	306(69.1)	1	
GMP service use	No	170(42.2)	233(57.8)	1.82(1.27, 2.60)	0.001
	Yes	61(28.6)	152(71.4)	1	
ANC visit in the last pregnancy	0	53(47.7)	58(52.3)	2.92(1.80, 4.74)	0.000
	1-3	126(43.9)	161(56.4)	2.50(1.69, 3.68)	0.000
	≥4	52(23.9)	166(76.1)	1	
Place of the last delivery	Home	114(63.0)	67(37)	4.63(3.20, 6.69)	0.000
	Facility	117(25.9)	318(74.1)	1	
Number of previous births (parity)	≥4	217(39.5)	333(60.5)	2.42(1.31, 4.47)	0.004
	<4	14(21.2)	52(78.8)	1	
Utilization of modern contraceptives	No	82(49.1)	85(50.9)	1.94(1.35, 2.79)	0.000
	Yes	149(33.2)	300(66.8)		
Child minimum dietary diversity (7 food groups)	Low (<4)	225(40.5)	331(59.5)	6.12(2.59, 14.46)	0.000
	High (≥4)	6(10.0)	56(90)	1	
Household food access	Insecure	107(85.6)	18(14.4)	17.59(10.26, 30.17)	0.000
	Secure	124(25.3)	367(74.7)	1	
Wasting *b	Yes	218(85.6)	306(14.4)	4.33(2.35, 7.98)	0.000
	No	134(25.3)	79(74.7)	1	
Stunting	Yes	131(39.3)	202(60.7)	1.19(0.86, 1.65)	0.306
	No	100(35.3)	183(64.7)	1	
Underweight	Yes	76(35.8)	136(64.2)	0.90(0.64, 1.27)	0.540
	No	155(38.4)	249(61.6)	1	
Elevation	Low	85(36.8)	146(63.2)	1	
	Moderate	146(46.8)	166(53.2)	0.44 (0.32, 0.62)	0.000

Note: GMP=Growth Monitoring and Promotion COR=Crude odds ratio, ANC=Antenatal care, *a= exclusive breast feeding during first 6 month and *b= Wasting was calculated by either of WHZ or MUAC)

During Multivariable analysis, Children in the age group of 24–42 months were 6.4 times (AOR =6.40; 95% CI: 6.13-7.97) more likely to be anemic than children in the age range of 6–23 months and 43-59 months. Children with mothers age 35-44years were 4 times (AOR= 4.12; 95% CI: 1.13-6.76) more likely to be anemic than children with mothers age 18-24 and 25-34years. Children with poor breastfeeding practice were 8.6 times (AOR=8.60; 95% CI: 4.53-10.50) more likely to be anemic than good breastfeeding practice. Children with a family monthly income of <750 ETB were 5.3 times (AOR = 5.29; 95% CI: 2.45-11.42) more likely to be anemic than children with a family monthly income of 750-1500 and >1500 ETB. Similarly, children with fever in the last 2 weeks before interview were 6.2 times (AOR=6.20; 95% CI: 2.85- 7.50) more likely to be anemic than children with no illness and wasting children were 7.8 times (AOR = 7.82; 95% CI: 2.68- 9.84) more likely to be anemic than children with normal. On another hand the odds of having anemia was decreased by 87% (AOR=0.13; 95%; 0.07- 0.22) among children from moderately altitude elevation compared to that of from low altitude area (Table 4).

Table 6: Multivariable logistic regression of factors associated with anemia of children aged 6-59 months in Guba Qoricha district, eastern Ethiopia, 2020 (n=616)

associated factors		Child Anemia		COR (95%C)	AOR (95% CI)	P-value
		Yes (%)	No (%)			
Age of mother (in years)	18-24	10(11.1)	80(88.9)	1	1	
	25-34	121(36.2)	213(63.8)	1.91(1.33,2.74)	5.90(1.70,20.01)	0.005
	35-44	100(52.1)	92(48.9)	8.70(4.25,17.79)	4.12(1.13,6.76)	0.042
Maternal education	No formal education	211(47.6)	232(52.4)	6.96(4.21,11.49)	1.35(0.49,3.67)	0.058
	Formal education	20(11.6)	153(88.4)	1	1	
Family size	≥5	201(44.7)	249(55.3)	3.66(2.36,5.66)	2.94(1.22,7.35)	0.019
	<5	30(18.1)	136(81.9)	1	1	
Wealth index	Poor	105(51.2)	100(48.8)	3.35(2.31,5.40)	5.32(2.15,11.42)	0.000
	Medium	79(38.3)	127(61.7)	2.09(1.36,3.22)	1.83(0.89,4.39)	0.153
	Rich	47(22.9)	158(77.1)	1	1	

Paternal educational status	No formal education	196(59.2)	135(40.8)	10.37(6.84,15)	8.02(4.59,17.76)	0.000
	Formal education	35(12.3)	250(87.7)	1	1	
Residence area	Rural	145(37.6)	241(62.6)	1.01(0.72,1.41)	2.02(0.48, 6.8)	0.067
	Urban	86(37.4)	144(62.6)	1	1	
Age of child (in months)	6-23	122(32.5)	253(67.5)	1	1	
	24-42	77(51.7)	72(48.3)	0.90(0.56,1.42)	6.40(6.13,7.97)	0.000
	43-59	32(34.8)	60(65.2)	2.01(1.17,3.43)	14.36(4.95,41.65)	0.000
Sex of child	Male	140(42.8)	187(57.2)		1.60(0.86,2.96)	0.135
	Female	91(31.5)	198(68.5)		1	
Birth order	≥4	103(50.3)	101(49.7)		0.52(0.22,1.21)	0.127
	<4	128(31.1)	284(68.9)	1	1	
Exclusive breast-feeding practice during first 6 months[*a]	Poor	101(72.1)	39(27.9)	6.89(4.53,10.50)	8.60(4.53,10.50)	0.000
	Good	130(27.3)	346(72.7)	1	1	
Child's meal feeding frequency per 24 hours	≤3	26(48.1)	28(51.9)		1.13(0.32,3.98)	0.849
	>3	205(36.5)	357(63.5)		1	
Birth interval (in months)	At first birth	42(37.8)	69(62.2)	1.70(1.08,2.69)	12.74(4.44, 36.53)	0.000
	≤24 months	97(66.0)	50(34)	5.53(3.66,8.37)	37.55(14.08,44.09)	0.000
	>24 months	94(26.0)	264(74)	1	1	
Child had fever last 2 weeks before interview	Yes	93(54)	80(46)	2.66(1.85, 3.81)	6.20(2.85,7.50)	0.000
	No	137(30.9)	306(69.1)	1	1	
GMP service use	No	170(42.2)	233(57.8)		2.01(0.80, 5.04)	0.135
	Yes	61(28.6)	152(71.4)		1	
ANC visit in the last	0	53(47.7)	58(52.3)		0.75(0.27, 2.05)	0.572
	1-3	126(43.9)	161(56.1)		0.80(0.37,1.73)	0.573

pregnancy	≥4	52(23.9)	166(76.1)		1	
Place of the last delivery	Home	114(63.0)	67(37)		1.65(0.84, 3.24)	0.142
	Facility	117(25.3)	318(74.7)		1	
Number of previous births (parity)	≥4	217(39.5)	333(60.5)		0.46(0.1,1.94)	0.293
	<4	14(21.2)	52(78.8)		1	
Child minimum dietary diversity (7 food groups)	Low (<4)	225(40.5)	331(59.5		3.32(0.96,11.45)	0.057
	High (≥4)	6(10.0)	56(90)		1	
Household food access	Insecure	107(85.6)	18(14.4)	17.59(10.26, 30.17)	13.84(6.09, 31.36)	0.000
	Secure	124(25.3)	367(74.7)	1	1	
Wasting *b	Yes	218(85.6)	306(14.4)	4.33(2.35, 7.98)	7.87(2.60,9.87)	0.000
	No	134(25.3)	79(74.7)	1	1	
Elevation	Low	85(36.8)	146(63.2)	1	1	
	Moderate	146(46.8)	166(53.2)	0.44(0.32, 0.62)	0.13 (0.07, 0.22)	0.000

5. DISCUSSION

Anemia prevalence data remain to be an important indicator of public health since anemia is related to morbidity and mortality, particularly in more vulnerable preschool aged children and pregnant women (Pasricha SR et al., 2012).

As per WHO and United Nations report on the progress of achieving Millennium development goals (MDG), even though substantial progress has been made towards achieving MDG4to reduce the number of under-five mortality rate worldwide, the rate of decline remains insufficient to meet the stated goal, particularly in sub-Saharan Africa and southern Asia. By the year 2011, children born in sub-Saharan Africa faced a higher probability of dying before the age of five than children born elsewhere (Avison WR, 2015).

This raises questions about the impact and effectiveness of interventions made to reduce the burden of anemia, since anemia prevalence is a useful indicator to assess the impact and effectiveness of interventions (Pasricha SR et al., 2012).

In this study, the overall prevalence of anemia among children aged 6–59 months was found to be 37.5%. It is a moderate public health problem and should be addressed.

This study assessed the prevalence and associated factors of anemia among children aged 6 to 59 months in Guba Qoricha district, eastern Ethiopia. The overall prevalence of anemia was 37.5% (95% CI;33.77% - 41.39%), this finding was similar to prevalence reported for the Oromia Region study conducted in Jimma, Ethiopia (46%)(Getaneh T,et al.,2016) and Guguftu health center, South Wollo, Northeast Ethiopia (41.1%). However, the result of the present study is lower than 2016 EDHS (58%), studies conducted in Bangladesh (52%),Togo(70.9%),Uganda(58.8%),Tanzania (84.6%). In contrary to this, it is higher than studies conducted Gondar Town, Ethiopia (28.6%).The difference in the prevalence might be due to variation in the study design, sampling techniques, and sample size. The difference might also 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.

Regarding the levels of anemic status, in this study, the majority of the anemic children had mild anemia (30.4%) followed by moderate anemia (7.1%) and no severe anemia. This finding is in agreement with studies conducted in Namutumba district, Uganda,

Gondar town, Ethiopia and Guguftu health center, South Wollo, Northeast Ethiopia. However, our result is deviated from EDHS 2016 report and study in Togo demographic and health survey data, 2013–2014 which showed high moderate anemia. In our study, the prevalence of mild anemia was higher than the other types of anemia. This result is consistent with previous studies conducted in Northern Ethiopia (Gebreegziabiher G, 2014) and Western China (Gao W et al., 2013) in which mild anemia was reported as the most common type of anemia among children. This could be due to the fact that children with mild anemia are mostly asymptomatic, and they may not seek medical intervention and may not get treatment. The clinical symptoms may not be presented in children with mild anemia, as the body often compensates for the gradual changes in Hb concentration.. This indicates that anemia is a hidden public health problem that affects a significant number of children.

The present study also found that children with low family income were 5.29 times more likely to be anemic than those with high family income. This finding was similar to studies conducted in other parts of the country and countries, which reported that children from poor families were at risk of anemia compared to their counterparts (Guguftu health center, South Wollo, Wolaita Zone, Southern Ethiopia, Bangladesh, and rural central and western China). A possible explanation for the high prevalence of anemia might be that families with low income are less likely to purchase nutrient-rich foods (like iron, vitamins, and etc), secure food availability, and afford health service during illness for their children. The higher prevalence of anemia among children with less educated mothers and low-income families indicates that anemia is a marker of socioeconomic disadvantage (Allen L et al., 2013).

The odds of child anemia was 3 times higher among participants whose the family had five and more than five family members in the household compared to those family had less than five family members in the household. This study is higher than study conducted in Togo demographic and health survey data, 2013–2014 and study conducted in Namutumba district, Uganda, 2016EDHS. This might be due to low socioeconomic status and ruminations of child. Other reason inadequate intake of nutrients (Melash Belachew et al, 2016).

The odd of child anemia among mothers' age 35-44years four times higher than mothers' age of 18-24 and 25-34years. This study consistent with study conducted in Ethiopia

(2016 EDHS). However, higher than study conducted in Gondar Town. Might be due to poor child care practice (Melash Belachew et al,.2016).

In this study, there was a higher prevalence of anemia among children under two years old and it decreased as the age of the children increased. This finding is supported by other studies conducted in Guguftu health center, South Wollo, Northeast Ethiopia2016 EDHS, Gondar Town, Bangladesh. This might be, and due to high iron demands associated with rapid growth rate and erythropoiesis, diets poor in bio-available iron, and low maternal iron reserve during pregnancy (Tolentino K and Friedman JF, 2007). Similar to study reports in Togo demographic and health survey data, 2013–2014 and Guguftu health center, South Wollo.

The present study found that sex difference did not show association with anemia. However, other studies found a higher prevalence of anemia among boys than girls rural central and western China and also in girls than boys Wolaita Zone, Southern Ethiopia. This inconsistency may be explained by the social norms in differential intake of iron-rich foods between genders; however, subsequent studies are required to better understand this complex issue.

The odd anemia among children with illness in the last 2 weeks before interview was 6.2 times higher than counterparts. This study was higher than study conducted in two agro ecological zones of rural Ethiopia, Bangladesh, and Gondar Town. This might be due to hemolysis of red blood cells, Inadequate food Intake due to loss of appetite (Melash Belachew et al,.2016).

The odds of child anemia was nearly thirty eight times higher among children whose preceding birth interval less than and equal to twenty four months compared to those preceding birth interval first and greater than twenty four months, statistically significant. This result was higher than study conducted in Gondar Town. This might be due to variation of study population.

The odds of child anemia was nearly twenty nine times higher among mothers practice poor breast feeding practice compared to mothers practice good breast feeding practice, statistically significant. This study was similar to study conducted in rural Central and Western China. This might be due to sociocultural practice.

Nutritional status also associated with anemia among children aged 6-59 months. In this study, wasting children were 7.82 times more likely to be anemic than children with

normal. This finding is similar to a study conducted in Northern Ethiopia (Gebreegziabiher G, 2014) and Brazil (Santos RFd et al., 201). Usually, the causes of anemia and wasting are similar and aggravated by poverty and food insecurity. Food insecurity affects the nutritional status of children by compromising the quantity and quality of dietary intake, which contributes for development of anemia (Adish A et al., 2014).

The odd of anemia among house hold food insecure status were 13.81 times higher than house hold of food secure. This study was consistent to study conducted in 2016 EDHS and Wolaita Zone, Southern Ethiopia. This might be due to low income and socioeconomic disadvantage.

Another covariate associated with anemia was elevation above see level. The prevalence of anemia among under five children was decreased by 87% for children from moderate altitude areas compared to those from low altitude areas. The association of anemia and altitude above see level was reported by previous study conducted by Jima et al (Jima D, et al,2007) also in line with our result. In 2011, WHO also recommended the adjustment of hemoglobin cut point for the altitude for public health significance of anaemia in a population. But this recommendation was criticized by current study conducted in Peru as it overestimates the anemia for the low altitude areas among age less than 12 months (Accinelli RA, et al, 2020).

5.1 Strength and Limitation of the Study

Strength: The strength of this study was the use of strong health professionals for collecting sample size. In addition, we used HemoCue Hb 301 analyzer to assess hemoglobin level of children.

Limitation: One of the limitations of this study is the cross-sectional nature of the study design; it does not reveal causal links between independent variables and anemia. Due to constraint of resource, in the present study, altitude and measurement of serum ferritin concentration, soluble transferrin receptor concentration, folate levels, vitamin B12 levels, thalassemia, and G6PD deficiency were not included which could have helped in finding the causes of anemia. The other limitation is that this study is conducted at a health center; hence, further community-based studies should be conducted to have findings more representing the whole population. Finally, the used altitude was secondarily collected from the estimates found at the district level not from the exact place of their resident.

Hence it could not show the exact elevation level of the place they live in. Despite the limitations, determination of the magnitude of anemia and identification of important factors associated with anemia were done among children aged 6-59 months in Guba Qoricha District Health Facility, eastern Ethiopia.

Recall bias and data incompleteness from previous documented file in order to get proportionate sample size.

6. CONCLUSIONS AND RECOMMENDATIONS

Anemia was found to be a moderate public health problem among children aged 6–59 months in Guba Qoricha District, Health Facility. The study revealed that young child age, maternal educational level, parental education, family size, household food insecure, preceding birth interval, monthly income, were factors associated with childhood anemia in the study setting. Therefore, appropriate and tailored interventional strategies are required to reduce the prevalence of childhood anemia. These include improving women's access to education; providing health education on child feeding practices; and strengthening nutritional and social supports. Furthermore, the policymakers should make a strategy that can reduce poverty and increase the awareness of women on breastfeeding, nutrition, and other associated factors to reduce anemia and further in-depth studies need to be conducted using assessment of serum.

Based on the findings of this study, the following recommendations are forwarded:

For Health care providers of Guba Qoricha district:

Work in collaboration with health development and NGO for disseminating essential nutritional information, and strengthening nutritional support to reduce anemia. Should the policymakers should make a strategy focus on sustainable and intensive information dissemination, education and behavioral change communication to providing on child feeding practices, reduce poverty and increase the awareness of women on breastfeeding, nutrition, and other associated factors to reduce anemia.

For Researchers:

To identify core determinants of anemia among children 6-59 months using serum ferritin concentration.

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8.APPENDICES

Appendix A: Informed Voluntary Consent Form for Head of Institution (English Version)

My name is _____. I am working as data collector for the study being conducted in this community by Ahmed Abrahim Adem who is studying his Master's degree at Haramaya University, College of Health, and medical Sciences. I kindly request you to lend me your attention to explain you about the study and your institution being selected as the study setting.

The Study Title: Prevalence of anemia and associated factors among children aged 6-59 Months in Guba Qoricha Woreda Health Facility, Western Hararghe Zone, Oromia Region, Ethiopia.

Purpose of the Study: The findings of this study will have a paramount importance for Guba Qoricha Health Office and Western Hararghe Health Department to plan intervention programs to prevent anemia in children targeting possible factors will be found in this study and thereby improve child health and survival in general.. Moreover, the aim of this study is to write a thesis as a partial requirement for the fulfillment of a Master's program in Public Health Nutrition for the principal investigator.

Procedure and Duration: I will be interviewing the mothers/care givers of the children 6-59 months by using questionnaire, measure your child's length & weight and take one drop of blood from finger tips of child to determine child blood hemoglobin level that provide me with pertinent data helpful for the study. There are 98 questions to answer where I will fill the questionnaire by interviewing the mothers/care givers. The interview on each mothers /care givers will take about 40 minutes.

Risks and Benefits: The risk of being participated in this study is minimal, but only taking a few minutes from the mothers/care givers` time. Weight and height measurement have no risk but taking blood from tips of child finger will has minimal pain and bleeding but this does not cause any health risk for the child. The child will cry due to this procedure. There would not be any direct payment for participating in this study.

However, the findings from this research may reveal important information for Guba Qoricha Health Office and government planners.

Confidentiality: The information we be will provide us will be kept confidential. There will be no information that will identify you or your child in particular. The findings of the study will be general for the study population and will not reflect anything particular of individual person. The questionnaire will be coded to exclude showing names. No reference will be made in oral or written reports that could link participants to the research.

Rights: Participation in this study is voluntary. You have the right to declare to participate or not in this study. If you decide to participate, you have the right to withdraw from the study at any time and this will not label you for any loss of benefit, which you otherwise are entitled. You do not have to answer any question that you do not want to answer.

Contact address: If there, are any questions or enquires any time about the study or the procedures, please contact me:

Ahmed Abrahim Adem: Mobile number (+251)-923-972800

Email Address: ahmedibrahim6823@gmail.com

Institutional Health Research Ethics Review Committee: Phone Number (+251)-025-466-20-11, P.O. Box: 235, Harar

Declaration of Informed Voluntary Consent: I have read the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues to confidentiality, the rights of participating and contact address for any queries. I have been given the opportunity to ask questions for things that may have been unclear. I was informed that the participant have the right to withdraw from study at any time or not to answer any question that they do not want. I am also informed that the health institution has the right to stop this study from being conducted if any misdeeds and unethical procedures are observed during the data collection process in the health institutions` premises.Therefore, I declare my voluntary consent on behalf of ----------health center management to allow this study to be conducted in the health center with my initials (signature).

Name and signature of head of health center: _____ Date:_____

Name and Signature of data collector: _____Date: _____

Appendix B: Participant Information Sheet and Voluntary Consent Form (English Version)

My name is _____. I am working as data collector for the study being conducted in this community by Ahmed Abrahim Adem who is studying his Master's degree at Haramaya University, College of Health, and medical Sciences. I kindly request you to give me your attention to explain you about the study and being selected as the study participant.

The Study Title: Prevalence of anemia and associated factors among children aged 6-59 Months in Guba Qoricha Woreda Health Facility, Western Hararghe Zone, Oromia Region, Ethiopia.

Purpose of the Study: The findings of this study will have a paramount importance for Guba Qoricha Health Office and Western Hararghe Health Department to plan intervention programs to prevent anemia in children targeting possible factors will be found in this study. Moreover, the aim of this study is to write a thesis as a partial requirement for the fulfillment of a Master's program in Public Health Nutrition for the principal investigator.

Procedure and Duration: I will be interviewing you using questionnaire, measure your child's length & weight and take one drop of blood from finger tips of child to determine child blood hemoglobin level that provide me with pertinent data helpful for the study. There are 98 questions to answer where I will fill the questionnaire by interviewing you. The interview will take about 40 minutes, so I kindly request you to give me this time for the interview.

Risks and Benefits: The risk of being participated in this study is minimal, but only taking a few minutes from your time. Weight and height measurement have no risk but taking blood from tips of child finger will has minimal pain and bleeding but this does not cause any health risk for the child. The child will cry due to this procedure. There would not be any direct payment for participating in this study. However, the findings from this research may reveal important information for Guba Qoricha Health Office and government planners.

Confidentiality: The data you will provide us will be confidential. There will be no information that will identify you or your child in particular. The findings of the study will be general for the study population and will not reflect anything particular of individual person. The questionnaire will be coded to exclude showing names. No reference will be made in oral or written reports that could link participants to the research.

Rights: Participation in this study is voluntary. You have the right to declare to participate or not in this study. If you decide to participate, you have the right to withdraw from the study at any time and this will not label you for any loss of benefit, which you otherwise are entitled. You do not have to answer any question that you do not want to answer.

Contact address: If there, are any questions or enquires any time about the study or the procedures, please contact me:

Ahmed Abrahim Adem: Mobile number (+251)-923-972800

Email Address: ahmedibrahim6823@gmail.com

Institutional Health Research Ethics Review Committee: Phone Number (+251)-025-466-20-11, P.O. Box: 235, Harar

Declaration of Informed Voluntary Consent: I have read/was read to me the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues to confidentiality, the rights of participating and contact address for any queries. I have been given the opportunity to ask questions for things that may have been unclear. I was informed that I have the right to stop the study at any time or not to answer any question that I do not want. Therefore, I declare my voluntary consent on the behalf of my child to allow this study to be conducted with my initials (signature) as indicated below.

Name and signature of the participant: _____

Signature of data collector: _____ Date: _____

Appendix C: English Version Questionnaire

The following questionnaire was designed to assess the prevalence of anemia and associated factors among infants and young children in, Guba Qoricha Woreda health facility, Western Hararghe Zone, Oromia Region, Ethiopia, 2020.

Name of data collectors----------sign-------date----------

Question code----------

Part I: Socio-demographic Characteristics

S. No	Variable	Responses	Skip to Q
Q101	Age of mothers /caregivers?	----------years	
102	What is the current educational level of mothers/caregiver's?	1. Unable to read and write 2. Able to read and write 3. Grade 1-8 4. Grade 9-12 5. College and above	
103	What is the current occupational status of mother/caregiver?	1. House wife 2. Merchant 3. Farmer 4. Private employee 5. Government employee	

		6. Other (specify)	
104	Number of individuals in the house hold	1. --------(in number)	
105	Number of under five children in the household	1. ---------(in number)	
106	Does mother involve in decision of child feeding	1.Yes 2. No	
107	Did you heard about child feeding practice	1.Yes 2. No	
108	What is the educational status of your husband/partner? (for married or have partner)	1. Unable to read and write 2. Able to read and write 3. primary education 4. secondary education 5. College and above	
109	What is the occupation of your husband/partner? (for those who are married or have partner)	1. Farmer 2. Merchant 3. Private employee 4. Government employee 5. Others (specify)	
110	What is the sex of your child (name)	1. Male 2. Female	

111	At what month did you deliver your last child?	1.After 37 weeks 2. Before 37 weeks 3.At 32 weeks 4.After 28 weeks 5.Before 28 weeks	
112	Age of recent child (Name)?	---------in completed months	
113	Birth rank of current child (Name)	------- in number	
114	Where is place of residence?	1. Urban 2. Rural	
115	What is family`s monthly income?	1.<750 ETB 2.750-1500 ETB 3.>1500 ETB	
116	What is marital status of mother/caregiver?	1. Married 2. Divorced 3. Widowed 4. Single mother	
116	What is elevation of recent child from sea level?	1. <2000meters 2. 2000-3000meters	
Part II: Infant and Young Child Feeding Practices			
201	Did you ever breast-feed your child?	1. Yes 2. No	If 0, to Q 203

202	How long after birth, did your child first put (name) to the breast?	1. Less than one hour 2. After one hour 3. After 24 hours	
203	Did your child exclusively breastfed for the first six months	1.Yes 2. No	
204	Is your child currently breastfed?	1. Yes 2. No	
205	What was given for your infant before the breast milk?	1. Only breast milk 2. Water 3. Butter 4. Cow milk 5. Others	
206	Did you feed the child with bottle yesterday during day or night? (breast milk/ other foods)	1. Yes 2. No	
207	Do you give additional food to your current child (Name)?	1. Yes 2. No	If no, to Q 301
208	If yes to **Q 207,** at what age you give to your child?	1. Less than 6 months 2. At 6 months 3. > 6 months	
209	How many times did eat Solid, semi solid or soft drinks other than liquids yesterday during	1. One times	

	the day and night?	2. Two times 3. Three times 4. Four times and above	

Part III: Maternal and Child Health Care			Skip to Q
301	Birth interval for recent child (name)	1. First birth 2. < 2 years 3. ≥ 2years	
302	Did your child experience illness in the last two weeks (name)?	1. Yes 2. No	If 0,to Q304
303	If yes for Q.302, which illness?	1. Diarrhea 2. Vomiting 3. Fever 4. Other (specify)	
304	Utilization of child growth monitoring service	1.Yes 2. No	
305	Did you receive advice about child feeding from health extension workers?	1.Yes 2.No	
306	Did you have ante natal care follow up for your current child pregnancy?(Question for 6 mont-36 month age Children)	1. Yes 2. No	If 0, to Q 308

307	If yes to Q. 306, how many times did you receive ante natal care?	-------Visit/s	
308	Where did your delivery your current child (Name)?	1. Home 2. Health facility 3. Others (specify)	
309	Did you encounter illness after delivery of the current child (name)	1.Yes 2. No	
310	Parity of mother	------in number	
311	Did your child have history of malaria	1. Yes 2. No	

Part IV: Child Dietary Diversity Practice		
401	What kinds of foods did you provide to your child yesterday during the day and night? (let the mother mention all kinds of foods consumed by the infant/child at home and outside the home until she says nothing else)	?
402	Yesterday during the day and night, did your child eat porridge, bread, Injera fit fit, rice, pasta, macaroni, biscuit or any food made from cereals and grains?	1. Yes 2. No 3. Do not know
403	Yesterday during the day and night, did your child eat potato, sweet potato or any other food made of tubers or roots?	1. Yes 2. No

		3. Do not know
404	Yesterday during the day and night, did your child consume carrot, pumpkin, spinach, lettuce, red pepper, ripe papaya and or other dark green leafy vegetable?	1. Yes 2. No 3. Do not know
405	Yesterday during the day and night, did your child consume lemon, banana, orange, avocado, mango, tomato, cabbage or any other vegetables and fruits?	1. Yes 2. No 3. Do not know
406	Yesterday during the day and night, did your child consume egg?	1. Yes 2. No 3. Do not know
407	Yesterday during the day and night, did your child consume dairy products (cheese, butter, whey, or yogurt) or infant formula?	1. Yes 2. No 3. Do not know
408	Yesterday during the day and night, did your child consume flesh foods such as meat, poultry, or fish?	1. Yes 2. No 3. Do not know
409	Yesterday during the day and night, did your child consume foods made from beans, peas, lentils, or nuts including plumy nut?	1. Yes 2. No 3. Do not know

Part V: Household Food Security Status (HFIAS)

Q. No	Questions	Response options (encircle one)	skip to Q
501.	In the past four weeks, did you worry that your household would not have enough food?	0 = No 1=Yes	If 0, to Q 503
502	How often did this happen?	1 = Rarely (1 or 2 times in the past 4 weeks) 2 = Sometimes (3 to 10 in the past 4 weeks) 3 = Often (>10 times in the past 4 weeks)	
503	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	0 = No 1=Yes	If 0 , to Q 505
504	How often did this happen?	1 = Rarely (1 or 2 times in the past 4 weeks) 2 = Sometimes (3 to 10 times in the past 4 weeks) 3 = Often (>10 in the past 4 weeks)	
505	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	0 = No 1=Yes	If 0, to Q 507
506	How often did this happen?	1 = Rarely (1 or 2 times in the past 4 weeks) 2 = Sometimes (3 to 10 times in the past 4 weeks) 3 = Often (>10 times in the past 4 weeks)	
507	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	0 = No 1=Yes	If 0, to Q 509
508	How often did this happen?	1 = Rarely (1 or 2 times in the past 4 weeks) 2 = Sometimes (3 to 10 times in the past 4 weeks)	

		3 = Often (>10 times in the past 4 weeks)		
509	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?		0 = No 1=Yes	If 0 to Q 511
510	How often did this happen?	1 = Rarely (1 or 2 times in the past 4 weeks) 2 = Sometimes (3 to 10 times in the past 4 weeks) 3 = Often (>10 times in the past 4 weeks)		
511	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?		0 = No 1=Yes	If 0 to Q 513
512	How often did this happen?	1 = Rarely (1 or 2 times in the past 4 weeks) 2 = Sometimes (3 to 10 times in the past 4 weeks) 3 = Often (>10 times in the past 4 weeks)		
513	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?		0 = No 1=Yes	If 0, to Q 515
514	How often did this happen?	1 = Rarely (1 or 2 times in the past 4 weeks) 2 = Sometimes (3 to 10 times in the past 4 weeks) 3 = Often (>10 times in the past 4 weeks)		
515	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?		0 = No 1=Yes	If 0, to Q 517
516	How often did this happen?	1 = Rarely (1 or 2 times in the past 4 weeks) 2 = Sometimes (3 to 10 times in the past 4 weeks) 3 = Often (>10 times in the past 4 weeks)		
517	In the past four weeks, did you or any household member go a whole day and night without eating		0 = No	If 0, to part VI

	anything because there was not enough food	1=Yes	
518	How often did this happen?	1 = Rarely (1 or 2 times in the past 4 weeks) 2 = Sometimes (3 to 10 times in the past 4 weeks) 3 = Often (>10 times in the past four weeks)	

Part VI: Current Household wealth

Asset Type	**Response**	
Domestic Animals		
Cattle (ox, cow, calf)	1. Yes	2. No
Sheep	1. Yes	2. No
Goat	1. Yes	2. No
Hen	1. Yes	2. No
Horse/donkey/mules	1. Yes	2. No
Durable Assets		
Television	1. Yes	2. No
Refrigerator	1. Yes	2. No
Electricity	1. Yes	2. No
Electric mitad	1.Yes	2. No
Fixed telephone	1. Yes	2. No
Mobile phone	1. Yes	2. No
Computer	1. Yes	2. No
Bajaj	1.Yes	2. No
Car	1. Yes	2. No

Motor cycle	1. Yes	2. No	
Cart	1. Yes	2. No	
Gold	1. Yes	2. No	
Table	1. Yes	2. No	
Chair	1. Yes	2. No	
Bed	1. Yes	2. No	
Own living house	1. Yes	2. No	
Housing Characteristics			
Water source	1. Pipe	2. Non-pipe	
Type of floor	1. Cement/wood	2. Earth	
Type of wall	1. Cement	2. Mud	
Type of roof	1. Concrete	2. Iron sheet 3.Straw	
Toilet facility	1.sanitary/improved pit latrine	2.unsanitary/traditional latrine	

Part VII: Child's Anthropometric Measures

Types of Measurement	Measurement result
Weight of the child	----------Kg
Length of the child	----------cm
Mid upper arm circumference (MUAC)	_____cm

Part VIII: Child's Hemoglobin Measurement and stool examination

Blood level of hemoglobin ————g/dl.

Stool examination result_____

Thank you!

Appendix D: Unka Odeeffannoo Fi Gaaffii Waliigaltee Itti gaafatamaa Dhaabbilee Fayyaa Waliinii (Afan Oromo Version)

Maqaan kiyya _____yommuu ta'u qorannoo fayyaa, hawaasaa kana keessatti barataa digrii lammaffaa Univarsitii Haramaayaa damee Koolleejjii fayyaa Harar kan ta'an obbo Ahmed Abrahim tiin gaggeeffamaa jiruuf funaanaa ragaa ta'uun asitti argamuu kiyyaan ibsa,qorannoo kana irratti murtee hirmaachuu fi hirmaachuu dhabuu fudhachuu keessaniin duratti odeeffannoo dhimma qorannoo kanaa akkan isinii kennuuf gurra akka naaf ergistanan kabajaan gaafadha.

Mata-Duree Qorannoo: Haala tatamsa'inaa, ciminaa fi sababoota dhibee hanqina dhiigaa daa'imman ji'a jahaa hanga waggaa shanii gadii qorachuudha.

Sababa Qorannichaa: Bu'aan qorannoo kanarraa argamu hojiilee fooyya'iinsa fayyaa daa'immanii karoorsuu fi finiinsuu akkasumas fayyaa daa`immanii fooyyeessuu keessatti galtee ta'uudhaan Waajjira Eegumsa Fayyaa Aanaa Gubbaa Qorichaa fi Hooggansa Maayibaasii Aanaa kana keessatti argaman hundaaf kan tajaajilu ta'uu isaatiin dabalataanis akka ulaagaa eebba barnoota sadarkaa olaanoo qorataa qorannoo kanaattis ni fayyada.

Haala Adeemsa Qorannichaa: Turtii waliin taasifnu kana keessatti gargaarsa karaa lamaatiin isinirraa barbaada; kunis, gaaffilee 98 deebii isinirraa deebi'uun guutamanii fi madaallii ulfaatinaa akkasumas safara hojjaa daa'imaa taasisuu keessatti aarsaa yeeroo hanga daqiiqaa 40 akka taasiftan kabajaan gaafadha.

Miidhaa fi Bu'aa Qorannicharraa Argamu: Miidhaan qorannoo kana keessatti hirmaachuun dhufu, akkaan xiqqaadha, kunis, qisaasama yeeroo hanga jedhamee qofa. Qorannoo kana keessatti hirmaachuu keessaniif kaffaltiin kallattiin taasifamu hin jiru; garuu bu'aan qorannoo kanarraa argamu Waajjira Eegumsa Aanaa Gubbaa Qorichaa, PHCU (Kammoona, Hardiim, Bubbee, Qilxu fi Laga Arbaa) fi qaama dhimma fooyya'iinsa fayyaa daa'immanii irratti hojjatu kamiifuu ni fayyada.

Iccitiin Hirmaataa: Iccitiin qaama qorannoo kana keessatti hirmaatee kamuu haalaan eeggamaadha; kunis bu'aan odeeffannoo argame kamuu ida`ama waliigalaa malee kan daa'ima dhuunfaa Kan hintaane, maqaan namaa guca gaaffii irratti Kan hin barroofne fi

duub-deebiin bu’aa qorannoo qaamolee isaan ilaallatuuf kennamu kamuu hawaasa naannoo kanaa akka waliigalaatti malee nama dhuunfaa kan hin akeekne ta’uun mirkanaa’a.

Mirga Hirmaataa: Qorannoo kana keessatti hirmaachuun fedhii irratti kan hundaa’edha. Hirmaachuufis ta’ee hirmaachuu dhabuuf murteessuun mirga keessani. Hirmaachuu dhabuun rakkoon namarra gahu hin jiru, hirmaachuuf eyyamnaanis sa’aatii isinitti toluu baatetti addaan kutuu mirga qabdu; akkasumas gaaffii deebii isaa hin beekne yookan deebisuuf fedhii hin qabne akka deebiftaniif dirqamni hin jiru.

Qaama Qunnamtii yeeroo rakkoo: Ahmed Abrahim Lakk. Bilbilaa: (251)-923972800Email: ahmedibrahim6823@gmail.com

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Labsii Waliigaltee Odeeffannoon boodaa: Unka Odeeffannoo fi gaaffii Waliigaltee hirmaataa dubbise/naaf dubbifamerraa mata-duree qorannoo kanaa, Sababa qorannichaa, haala adeemsa qorannichaa, miidhaa fi bu’aa qorannicharraa argamu, iccitiin hirmaataa eeggamuu, qorannoo kana keessatti hirmaachuun fedhii irratti kan hundaa’e ta’uu. Hirmaachuufis ta’ee hirmaachuu dhabuuf murteessuun mirga akka ta’e, hirmaachuu dhabuun rakkoo namarraan gahu akka hin qabne, hirmaachuuf eyyamnaanis sa’aatii natti toluu baatetti addaan kutuuf mirga akkan qabu; akkasumas gaaffii deebii isaa hin beekne yookan deebisuuf fedhii hin qabne deebisuuf akkan hin dirqamne hubachuu danda`eera. Kanaafuu, qorannoo kana keessatti haati daa’ima ishee qorannoo kana keessatti hirmaachisuuf fedhinnaa qabdu mallattoo isheen eeyyamamtuu tahuu mirkaneeffachuu ni dandeessi.Gama keenyaan nuti eeyyamamoo tahuu maqaa fi mallattoo aramaan gadiin isinii mirkaneessina.

Maqaa fi Mallattoo Ittigaafatamaa Buufata Fayyaa: _____Guyyaa_____

Maqaa fi Mallattoo Ragaa Funaana: _____Guyyaa_____

Appendix E: Unka Odeeffannoo Fi Gaaffii Waliigaltee Hirmaataa(Afan Oromo Version)

Maqaan kiyya _____yommuu ta'u qorannoo fayyaa, hawaasaa kana keessatti barataa digrii lammaffaa Univarsitii Haramaayaa damee Koolleejjii fayyaa Harar kan ta'an obbo Ahmed Abrahim tiin gaggeeffamaa jiruuf funaanaa ragaa ta'uun asitti argamuu kiyya ibsaa,qorannoo kana irratti murtee hirmaachuu fi hirmaachuu dhabuu fudhachuu keessaniin duratti odeeffannoo dhimma qorannoo kanaa akkan isinii kennuuf gurra akka naaf ergistanan kabajaan gaafadha.

Mata-Duree Qorannoo: Haala tatamsa'inaa, ciminaa fi sababoota dhibee hanqina dhiigaa daa'imman ji'a jahaa hanga waggaa shanii gadii qorachuudha.

Sababa Qorannichaa: Bu'aan qorannoo kanarraa argamu hojiilee fooyya'iinsa fayyaa daa'immanii karoorsuu fi finiinsuu keessatti galtee ta'uudhaan Waajjira Eegumsa Fayyaa Aanaa Gubbaa Qorichaa fi Hooggansa Maayibaasii Aanaa kana keessatti argaman hundaaf kan tajaajilu ta'uu isaatiin dabalataanis akka ulaagaa eebba barnoota sadarkaa olaanoo qorataa qorannoo kanaattis ni fayyada.

Haala Adeemsa Qorannichaa: Turtii waliin taasifnu kana keessatti gargaarsa karaa lamaatiin isinirraa barbaada; kunis, gaaffilee 98 deebii isinirraa deebi'uun guuttamanii fi madaallii ulfaatinaa akkasumas safara hojjaa daa'imaa taasisuu keessatti aarsaa yeeroo hanga daqiiqaa 40 akka taasiftan kabajaan gaafadha.

Miidhaa fi Bu'aa Qorannicharraa Argamu: Miidhaan qorannoo kana keessatti hirmaachuun dhufu, akkaan xiqqaadha, kunis, qisaasama yeeroo hanga jedhamee qofa. Qorannoo kana keessatti hirmaachuu keessaniif kaffaltiin kallattiin taasifamu hin jiru; garuu bu'aan qorannoo kanarraa argamu Waajjira Eegumsa Aanaa Gubbaa Qorichaa, PHCU (Kammoona, Hardiim, Bubbee, Qilxu fi Laga Arbaa) fi qaama dhimma fooyya'iinsa fayyaa daa'immanii irratti hojjatu kamiifuu ni fayyada.

Iccitiin Hirmaataa: Iccitiin qaama qorannoo kana keessatti hirmaatee kamuu haalaan eeggamaadha; kunis bu'aan odeeffannoo argame kamuu ida`ama waliigalaa malee kan daa'ima dhuunfaa Kan hintaane, maqaan namaa guca gaaffii irratti Kan hin barroofne fi

duub-deebiin bu’aa qorannoo qaamolee isaan ilaallatuuf kennamu kamuu hawaasa naannoo kanaa akka waliigalaatti malee nama dhuunfaa kan hin akeekne ta’uun mirkanaa’a.

Mirga Hirmaataa: Qorannoo kana keessatti hirmaachuun fedhii irratti kan hundaa’edha. Hirmaachuufis ta’ee hirmaachuu dhabuuf murteessuun mirga keessani. Hirmaachuu dhabuun rakkoon namarra gahu hin jiru, hirmaachuuf eyyamnaanis sa’aatii isinitti toluu baatetti addaan kutuu mirga qabdu; akkasumas gaaffii deebii isaa hin beekne yookan deebisuuf fedhii hin qabne akka deebiftaniif dirqamni hin jiru.

Qaama Qunnamtii yeeroo rakkoo: Ahmed Abrahim Lakk. Bilbilaa: (251)-923972800 ,Email: ahmedibrahim6823@gmail.com

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Labsii Waliigaltee Odeeffannoon boodaa: Unka Odeeffannoo fi gaaffii Waliigaltee hirmaataa dubbise/naaf dubbifamerraa mata-duree qorannoo kanaa, Sababa qorannichaa, haala adeemsa qorannichaa, miidhaa fi bu’aa qorannicharraa argamu, iccitiin hirmaataa eeggamuu, qorannoo kana keessatti hirmaachuun fedhii irratti kan hundaa’e ta’uu. Hirmaachuufis ta’ee hirmaachuu dhabuuf murteessuun mirga kiyya akka ta’e, hirmaachuu dhabuun rakkoo namarraan gahu akka hin qabne, hirmaachuuf eyyamnaanis sa’aatii natti toluu baatetti addaan kutuuf mirga akkan qabu; akkasumas gaaffii deebii isaa hin beekne yookan deebisuuf fedhii hin qabne deebisuuf akkan hin dirqamne hubachuu danda`eera. Kanaafuu, qorannoo kana keessatti daa’imnikoo akka hirmaatuuf eyyamuukoo mallattoo armaan gaditti mallatteesseniin mirkaneessa.

Maqaa fi Mallattoo Hirmaataa: _____ Guyyaa_____

Maqaa fi Mallattoo Ragaa Funaana: _____Guyyaa_____

Appendix F: Guca Gaaffii Afaan Oromoo (Afan Oromo Version)

Guca gaaffii qorannoo haala tatamsa'inaa, ciminaa fi sababoota dhibee hanqina dhiigaa, daa'imman ji'a jahaa hanga waggaa shanii gadii PHCU Guba Qorichaa, Godina Harargee Dhihaa, Oromiyaa,2020.

Maqaa Funaanaa Ragaa_____ Mallattoo_____ Guyyaa_____

Koodii Guca Gaaffii_____

Kutaa I: Gaaffiilee Hawaaasummaa

S. No	**Gaaffii**	Deebii	**Gara gaaffi-ttii darbi**
Q101	Umrii haadhaa /guddistuu?	----------amataan	
102	Sadarkaa barnoota Haadhaa/Guddiftuu?	1. Dubbisuu fi barreessuu dadhabuu 2. Dubbisuu fi barreessuu 3. Kutaa 1-8 4. Kutaa 9-12 5. Koolleejjii fi isaa ol	

103	Gosa dalagaa yeeroo ammaa haadhaa/guddistuu/	1. Haadha warraa 2. Daldaltuu 3. Qotee bulaa 4. Hojjettuu dhunfaa 5. Hojjettuu mootummaa 6. Kan biroo (adda baasi)	
104	Baay`ina maatii keessanii	1. --------(lakkoofsaan)	
105	Baay`ina daa`ima waggaa shanii gadii	1. ---------(lakkoofsaan)	
106	Daa`ima kee nyaata nyaachisuu keessatti hirmaataa?	1.Eeyye 2. lakkii	
107	Haala daa`iima itti sooran/ nyaachisan dhageessanii beektuu?	1.Eeyyee 2. Lakkii	
108	Sadarkaa barnoota abbaa mana keetii? (kan heerumteef)	1 Dubbisuu fi barreessuu dadhabuu 2.Dubbisuu fi barreessuu. 3. Barnoota sadarkaa tokkoffaa 4. Barnoota sadarkaa lammaffaa 5. Koolleejjii fi isaa ol	
109	Gosa dalagaa Dhirsaa/Hiriyaa? (warra heeruman ykn Hiriyaa qaban qofaaf)	1. Qotee bulaa 2. Daldala	

		3. Hojii dhuunfaa 4. Hojjataa Mootummaa 5. Kan biroo (adda baasi	
110	Saala daa`imaa (maqaa)	1. Dhiira 2. Dubara	
111	Daa`ima kee kan dhumaa torbaan hangamitti deesse?	1. Torbaan 37 booda 2. Torbaan 37 dura 3. Torbaan 32 irratti 4. Torbaan 28 booda 5. Torbaan 28 dura	
112	Umrii daa`imaa yeeroo ammaa (maqaa)?	---------ji`a hanga inni gahe	
113	Daa`imni amma dhalatee meeqaffaa (maqaa)	------- lakkoofsaan	
114	Iddoon jireenya keessanii eessa?	1. Magaala 2. Baadiyyaa	
115	Galiin ji`aan argattan qarshii Etopiyaa meeqa ta`uu danda`a?	1. <750 2. 750-1500 3. >1500	
116	Haala gaa`ila haadhaa/guddiftuu?	1. . Heerumte 2. Hiikte 3. Dhiirsi irraa du`e 4. Hin heerumne	

117	Bakka olka`iinsa daa`imni yeroo ammaa jiraatuu meeqa?	1. <2000meters 2. 2000-3000meters	
Kutaa II: Gochaalee nyaata daa'immanii			
201	Daa'ima kee harma hoosiftee beektaa?	1. Eeyyee 2. Lakki	Gaaffiin 201 yo lakki taate, gara gafi 205 darbi
202	Daa'ima kana, akkuma dhalateen turtii hangamii keessatti harma hoosiftee?	1Sa`aa tokkoo gadi 2. Sa`aa tokko booda 3. Sa`aa 24 booda	
203	Daa`ima hanga ji`a 6 harma qofa hoosiftee?	1.Eeyyee 2.Lakkii	
204	Yeeroo ammaa kanatti, daa'imtikee harma hodhaa jiraa?	1. Eeyyee 2. Lakkii	
205	Osoo harma hin jalqabiin duratti, daa'ima keetiif maaltu kennameefii ture?	1. Harma haadhaa qofa 2. Bishaan 3. Dhadhaa 4. Aannan loonii 5. Kan biroo	

206	Kaleessa halkan ykn guyyaa, daa'imtikee Xuuxxoon sooratee jiraa? (Aannan harmaa/ Nyaata biroo)	1. Eeyyee 2. Lakkii	
207	Daa'ima dhuma dhalate, nyaata dabalataa jalqabsiiftee jirtaa (Maqaa)?	1. Eeyyee 2. Lakki	Yo gafin 207 laki tahe gara gafi 301 darbi
208	Deebiin gaafii 207 Eyyeen taanaan, Umrii meeqatti jalqabsiifte?	1.Ji'a jahaa gadi 2. Ji'a jahatti 3. Ji'a jahaa oli	
209	Daa'imtikee Kaleessa Halkanii fi Guyyaa walumaagalatti, dhangala'oon ala nyaata jajjaboo, lallaafoo fi dhangala'aa mi'aawaa si'a meeqa soorate?	1.Yeroo tokko 2. Yeroo lama 3. Yeroo sadii 4. Yeroo afurii fi sanii ol	

Kutaa III: Tajaajila Fayyaa Haadholee Fi Daa'immanii			Sk to Q
301	Daa`ima ammaa kana hagam turtee deesse? Maqaa	1.First birth 2. < 2 years 3. ≥ 2years	
302	Torban lamaan dabran kana keessatti daa'imni	1. Eyyeen	Yo laki

	kee dhukkubsatee beekaa? Maqaa	2. Lakkii	tahe garaG304 darbi
303	Yoo deebiin G302 Eyyeen ta'e, dhukkuba kami?	1. Garaa kaasaa 2. Haqqisaa 3. Gubaa qaamaa 4. Kan biro--	
304	Daa`ima kee ulfaatinaa madaaltee?	1.Eeyyee 2.Lakkii	
305	Haala soorannaa daa`imaa gorsa ooggeeyyii eekisteeshinii irraa fudhattee?	1.Eeyyee 2.Lakkii	
306	Yeeroo ulfa daa'ima kanaa hordoffii kunuunsa da'umsaan duraa gootee beektaaa? (Gaaffii Daa`ima baatii 6-36 jiraniif)	1. Eeyyee 2. Lakkii	Yo laki, gara G 308 darbi
307	Gaaffin 306 eeyyen yo tahe yeeroo meeqa? Lakofsan	---------- hordoffii	
308	Daa'ima kana eessatti deesse? Maqaa	1. Mana 2. Dhaabbata fayyaa 3. Kan biroo	
309	Daa`ima ammaa kana efa deesse dhukkubsate beektaa? Maqaa	1.Eeyyee 2. Lakkii	
310	Waliigala daa`imameeqa deesse	------lakkoofsaan	

311	Daa`imni kee Bookee busaan qabamee beekaa?	1.Eeyyee 2.Lakkii 3.Hin beeku	

Part IV: Gochaalee Daneessa nyaataa		
401	Kaleessa yeeroo guyyaa fi halkanii guutuu akaakuu nyaataa daa'imti nyaate? (hanga haati maqaa nyaata daa'imti manaa fi manaan alatti fayyadame tarreessitee fixxutti eegi)	??
402	Kaleessa yeeroo guyyaa fi halkanii keessa daa'imti kee Marqaa, Daabboo, Laaffisoo biddeenaa, Ruuzii, Paastaa, Biskutii fi gosa nyaataa ''cereals'' fi ''grains' 'irraa hojjatame kamuu nyaate jiraa?	1. Eyyeen 2. Lakkii 3. Ani hin beeku
403	Kaleessa yeeroo guyyaa fi halkanii keessa daa'imti kee Dinnichaa, Mixaaxishaa fi gosa nyaataa ''tubers'' fi ''roots' 'irraa hojjatame kamuu nyaatee jiraa?	1. Eyyeen 2. Lakkii 3. Ani hin beeku
404	Kaleessa yeeroo guyyaa fi halkanii keessa daa'imti kee Kaarota, Dabaaqula, Qaccee fi gosa nyaataa ''Kuduraalee baala gurraacha magariisawaa''irraa hojjatame kamuu nyaatee jiraa?	1. Eyyeen 2. Lakkii 3. Ani hin beeku
405	Kaleessa yeeroo guyyaa fi halkanii keessa daa'imti kee Shunkurta, Muuzii, Birtukaana,	1. Eyyeen 2. Lakkii

	Avokaadoo, Nyaanyaa (Timaatima), Raafuu ykn gosa nyaataa ‘’Kuduraalee fi Muduraalee biroo’ ’irraa hojjatame kamuu nyaatee jiraa?	3. Ani hin beeku
406	Kaleessa yeeroo guyyaa fi halkanii keessa daa’imti kee Buuphaa/killee nyaatee jiraa?	1. Eyyeen 2. Lakkii 3. Ani hin beeku
407	Kaleessa yeeroo guyyaa fi halkanii keessa daa’imti kee Aannanii fi Bu’aa Aannanii (Shalalaa, Dhadhaa, Baaduu, Itittuu) akkasumas ‘’Foormulaa daa’imaa’’ fayyadamee jiraa?	1. Eyyeen 2. Lakkii 3. Ani hin beeku
408	Kaleessa yeeroo guyyaa fi halkanii keessa daa’imti kee nyaata foonii kan akka foon loonii, foon lukkuu, ykn foon qurxummii nyaatee jiraa?	1. Eyyeen 2. Lakkii 3. Ani hin beeku
409	Kaleessa yeeroo guyyaa fi halkanii keessa daa’imti kee nyaata akka baaqelaa, atara, missira, ykn ocholonii ‘plumpy nut’ dabalatee nyaatee jiraa?	1. Eyyeen 2. Lakkii 3. Ani hin beeku

Kutaa V: Sadarkaa Wabii Nyaata Mana Keessaa

Q. No	**Gaaffii**	**Deebii**		**skip to Q**
501.	Torbee afran dabran kana keessatti, hanqinni midhaan nyaataa mana keessatti nuqunnamuu danda’a jettee cinqamtee jirtaa?		0 = Lakkii 1=Eeyyee	yo 0, gara G 502
502	Yoo Eyyeen ta’e, yeeroo meeqa simudate?	1. Si’a 1 ykn 2		

		2. Si’a 3 hanga 10 3. Si’a 10 oli		
503	Torbee afran dabran kana keessatti, sis haa ta’uu miseensi mana kanaa biroo Sababa dhabamiinsa gosa nyaataa irraa kan ka’e nyaata qalbiin isin feete osoo hin nyaatiin haftanii beektuu?		0 = Lakkii 1=Eeyyee	yo 0, gara G 505
504	Yoo Eyyeen ta’e, yeeroo meeqa isin muudate?	1. Si’a 1 ykn 2 2. Si’a 3 hanga 10 3. Si’a 10 oli		
505	Torbee afran dabran kana keessatti, sis haa ta’uu miseensi mana kanaa biroo Sababa hanqina gosa nyaataa irraa kan ka’e gosa nyaataa nyaachuuf fedhii hin qabne nyaachuuf dirqamtanii beektuu?		0 = Lakkii 1=Eeyyee	Yo 0, gara G 507
506	Yoo Eyyeen ta’e, yeeroo meeqa isin muudate?	1. Si’a 1 ykn 2 2. Si’a 3 hanga 10 3. Si’a 10 oli		
507	Torbee afran dabran kana keessatti, sis haa ta’uu miseensi mana kanaa biroo Sababa hanqina midhaan nyaataa irraa kan ka’e osoo hin quufin nyaata dhiiftanii beektuu?		0 = Lakkii 1=Eeyyee	yo 0, gara G 509
508	Yoo Eyyeen ta’e, yeeroo meeqa isin muudate?	1. Si’a 1 ykn 2 2. Si’a 3 hanga 10 3. Si’a 10 oli		
509	Torbee afran dabran kana keessatti, sis haa ta’uu miseensi mana kanaa biroo Sababa hanqina midhaan nyaataa irraa kan ka’e nyaata qusachuuf		0 = Lakkii 1=Eeyyee	Yo 0, gara G 511

	jecha xiqquma xiqqoo nyaachuuf dirqamtanii beektuu?			
510	Yoo Eyyeen ta'e, yeeroo meeqa isin muudate?	1. Si'a 1 ykn 2 2. Si'a 3 hanga 10 3. Si'a 10 oli		
511	Torbee afran dabran kana keessatti, midhaan nyaataa mana kana Keessaa dhabamee beekaa?		0 = Lakkii 1=Eeyyee	yo 0, gara G513
512	Yoo Eyyeen ta'e, yeeroo meeqa isin muudate?	1. Si'a 1 ykn 2 2. Si'a 3 hanga 10 3. Si'a 10 oli		
513	Torbee afran dabran kana keessatti, sis haa ta'uu miseensi mana kanaa biroo Sababa hanqina midhaan nyaataa irraa kan ka'e osuma beeloftanuu gara siree deemsaa dirqamtanii beektuu?		0 = Lakkii 1=Eeyye	Yo 0, gara G 515
514	Yoo Eyyeen ta'e, yeeroo meeqa isin muudate?	1. Si'a 1 ykn 2 2. Si'a 3 hanga 10 3. Si'a 10 oli		
515	Torbee afran dabran kana keessatti, sis haa ta'uu miseensi mana kanaa biroo Sababa hanqina midhaan nyaataa irraa kan ka'e guyyaa fi halkan guutuu beeloftanii beektuu?		0 = Lakkii 1=Eeyyee	yo 0, gara G 517
516	Yoo Eyyeen ta'e, yeeroo meeqa isin muudate?	1. Si'a 1 ykn 2 2. Si'a 3 hanga 10 3. Si'a 10 oli		
517	Torbee afran dabran kana keessatti, sis haa ta'uu miseensi mana kanaa biroo Sababa hanqina midhaan nyaataa irraa kan ka'e guyyaa fi halkan		0 = Lakkii 1=Eeyyee	yo 0, gara kutaa

	guutuu beeloftanii beektuu?		VI
518	Yoo Eyyeen ta'e, yeeroo meeqa isin muudate?	1. Si'a 1 ykn 2 2. Si'a 3 hanga 10 3. Si'a 10 oli	

Kutaa VI: Qabeenya Manaa

Gosa Qabeenyaa	**Deebii**	
Qabeenyaa Beeyladaa		
Horii (Qotiyyoo, Sa'a, Jibicha)	1. Eeyyee	2. Lakkii
Hoolaa	1. Eeyyee	2. Lakkii
Re'ee	1. Eeyyee	2. Lakkii
Hindaaqqoo	1. Eeyyee	2. Lakkii
Harree/Gaangee	1. Eeyyee	2. Lakkii
Qabeenya Dhaabbataa		
Televisinii	1. Eeyyee	2. Lakkii
Firija	1. Eeyyee	2. Lakkii
Ifaa elektriki	1. Eeyyee	2. Lakkii
Eelee ifaa/elektririkii	1.Eeyyee	2. Lakkii
Silkii manaa	1. Eeyye	2. Lakkii
Moobaayilii	1. Eeyye	2. Lakkii
Kompiitara	1. Eeyyee	2. Lakkii
Bajajii	1.Eeyyee	2. Lakkii

Konkolaataa	1. Eeyyee	2. Lakki	
Dukduqqee	1. Eeyyee	2. Lakkii	
Karoollaa	1. Eeyyee	2. Lakkii	
Warqii	1. Eeyyee	2. Lakkii	
Minjaala	1. Eeyyee	2. Lakkii	
Teessoo Manaa	1. Eeyyee	2. Lakkii	
Siree	1. Eeyyee	2. Lakkii	
Mana jireenyaa (dhuunfaa)	1. Eeyyee	2. Lakkii	
Housing characteristics			
Madda bishaanii	1. Ka bombaa	2. Kan bombaa hin ta`in	
Gosa Lafa keessoo manaa (Floor)	1. Simiintoo/Muka	2. Biyyee	
Gosa Dhaaba manaa/Gidaara	1. Simiintoo	2. Biyyee/Dhoqqee	
Gosa Baaxii manaa	1.Bulukeeta	2. Qorqoorroo 3.Citaa	
Tajaajila mana fincaanii	1.Kan sadarkaa eeggate/improved pit latrine	2.Kan sadarkaa hin eegganne/traditional latrine	

KutaaVII: Safarrii Antiroometrikii Daa'immanii

Gosa Safarrii	**Bu'aa Safarrii**
Ulfaatina Daa'immanii	_____Kg
Dheerina Daa'immanii	_____cm
Hamma safara irree Daa`immanii	_____cm

Kutaa VIII: Hamma gulantaa dhiigaa daa`immanii fi bu`aa Laabaraatoorii kan udaanii

Gulantaa hamma dhiigaa qaama keessaa hemogilobiniin ————g/dl.

Bu`aa laabaraatoorii udaanii _____

Hirmaannaa Taasiftaniif Galatoomaa!