JIMMA UNIVERSITY

COLLEGE OF HEALTH SCIENCE DEPARTMENT OF EPIDEMIOLOGY

MATERNAL AND FETAL OUTCOMES OF ANEMIA DURING PREGNANCY IN KARAMARA HOSPITAL, JIGJIGA, ETHIOPIAN SOMALI REGIONAL STATE

BY: EBRAHIM DAWUD

A THESIS SUBMITTED TO JIMMA UNIVERSITY, COLLEGE OF HEALTH SCIENCE, DEPARTMENT OF EPIDEMIOLOGY, IN PARTIAL FULFILLMENT OF MASTERS OF PUBLIC HEALTH IN EPIDEMIOLOGY

APRIL, 2016

JIMMA, ETHIOPIA

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Abstract

Background: Anemia is one of the factors that can lead to adverse maternal and prenatal outcomes. Although, the prevalence of maternal anemia in Ethiopian Somali Regional state is unacceptably high, there are no adequate documented studies quantifying its adverse pregnancy outcomes.

Objective: The objective of the study was to determine the association between anemia during pregnancy and maternal and prenatal complications in Karamara Hospital, Jigjiga, Ethiopian Somali Regional State

Methods: Facility based prospective cohort study was conducted between October 1, 2015 and January 1, 2016. 264 pregnant women participated in the study (132 with anemia and 132 without anemia). Data were collected using structured interviewer guided questionnaires and clinical examination check lists. Anemia was defined based on WHO definition (Hb<11g/dl). Hb estimation was done using HemoCue301 in the third trimester at the 4^{th} ANC visit by two qualified medical laboratory technicians. Descriptive statistics, bivariate and multivariate Cox regression analysis was performed. The outcome variables were postpartum blood loss, prolonged labor, obstructed labor, low birth weight, preterm birth and Low Apgar score. The results were reported using both p-value and HR with 95% CI. Data were analyzed using SPSS version 20.0 statistical software.

Result: Anemia during pregnancy was associated with low birth weight and preterm birth (AHR = 2.23, CI = 1.06-4.70) and (AHR = 3.03, CI = 1.10-8.34) respectively. Anemia during pregnancy was not significantly associated with mode of delivery, duration of second stage labor, low Apgar score, post partum blood loss as well as obstructed labor.

Conclusion and recommendation: Anemia during pregnancy was significantly associated with low birth weight and preterm birth. Anemia control programs including nutritional counseling and routine iron supplementation should be strengthened.

Key words: anemia, low birth weight, preterm birth, low Apgar score, post partum blood loss, prolonged labor, obstructed labor, Ethiopian Somali region.

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Table of Contents

List of tables

List of figures

Acronyms

AHR	Adjusted Hazard Ratio
ANC	Antenatal Care
AOR	Adjusted Odds Ratio
APGAR	Appearance, Pulse, Grimace, Activity, Respiration
CI	Confidence Interval
ETB	Ethiopian Birr
G/DL	Gram Per Deciliter
Hb	Hemoglobin
HR	Hazard Ratio
IDA	Iron Deficiency Anemia
LBW	Low Birth Weight
LNMP	Last Normal Menstrual Period
OR	Odds Ratio
RR	Relative Risk
SPSS	Statistical Package For The Social Sciences
UN	United Nations
UNICEF	United Nations Children's Fund
VLBW	Very Low Birth Weight
WHO	World Health Organization

1. INTRODUCTION

1.1. Background

Pregnancy is associated with certain risk to health and survival both for the woman and for the infant she bears (1). Globally, approximately half a million maternal deaths occur every year (2). Every day at least 1600 women die from the complication of pregnancy and childbirth globally (1, 2). Specifically in the low income countries, maternal deaths due to pregnancy and childbirth-related complications are the major causes of death of women in the reproductive age group (3). In developing countries, 37% of women had problems during pregnancy, 21% during labor and 6% during the postpartum period. Approximately from 9 to 15% of deliveries require higher-level care for serious complication in the women or her baby (4).

Most common adverse pregnancy outcomes for new born in developing countries include perinatal/neonatal mortality, low birth weight and preterm baby (5). Perinatal mortality remains globally unacceptably high with up to three million stillbirths and three million neonatal deaths every year (6, 7)

The underlined direct causes of these maternal and prenatal deaths relate to the health and nutritional status of the woman during pregnancy, the quality of care during pregnancy and delivery and the immediate care of the newborn (8). Among others, anemia is one of the factors that can lead to adverse maternal and prenatal outcomes.

Anaemia is a condition in which the number of red blood cells (and consequently their oxygen-carrying capacity) is insufficient to meet the body's physiologic needs which may vary with a person's age, gender, residential elevation above sea level (altitude), smoking behavior, and pregnancy (49).The mean minimum acceptable Hb level during pregnancy by WHO criteria is taken to be 11 g/dL(9). WHO divides anemia in pregnancy into: mild anemia (Hb 10-10.9 g/dL), moderate anemia (Hb 7.0-9.9 g/dL) and severe anemia (Hb <7 g/dL(9).

A common etiological classification of anemia identifies different causes of anemia; Nutritional anemia, hemolytic diseases, malaria, hookworm infestation, bone marrow suppression, chronic blood loss and underlying malignancies (9, 10). Nutritional anemia is by far the most common

type of anemia worldwide and mainly includes iron, folate and vitamin B12 deficiencies. According to WHO, around half of anemia cases in pregnant women are due to iron deficiency anemia. Folate deficiencies and other causes account for the major proportion of the remaining anemia (9).

Anemia is a global public health problem affecting both developing and developed countries with major consequences for human health as well as social and economic development (9). There are more than 2 billion people in the world with anemia – one third of the world's population. It occurs at all stages of life cycle, but is more prevalent in pregnant women and young children. Anemia is one of the most frequent complications related to pregnancy (10). Nearly half of the pregnant women in the world are estimated to be anemic, 52% in non-industrialized - as compared with 23% in industrialized – countries (45). According to United Nation's (UN) 6th report on the world nutrition situation, anemia prevalence is highest in developing countries. The estimated prevalence on pregnant women in Africa, Asia and America and Caribbean was 55.9%, 48.3% and 28.5% respectively (46).

Anemia in developing countries is not only common but can also be severe. Estimates of hemoglobin (Hb) level < 7.0 g/dl ranged between 0.0-0.4% for high income regions, 0.8-1.7% for East Africa, 0.7-2.4% for South Asia and 1.1-3.2% for Central and West Africa (47). Nonetheless, the risk of developing anemia is 2 to 7 times greater in developing countries than industrialized countries (48).

Although the prevalence at the national level is considered to be mild, some regions in Ethiopia exhibited extremely high prevalence of anemia. In Ethiopian Somali region nearly 50% of the women were anemic in 2011. Trend in the prevalence of anemia among pregnant women has remained high and unchanged in the region (15).

Anemia can affect psychological and physical behavior. Even very mild forms influence the sense of well being, lessen resistance to fatigue, aggravate other disorders and affect work capacity. For pregnant women anemia can result in severe morbidity and mortality and reduces the resistance to blood loss which results death from blood loss associated with delivery.

1.2. Statement of the problem

Anemia is a global public health problem affecting human health as well as social and economic development of both developing and developed countries. It occurs when the concentration of hemoglobin falls below what is normal for a person´s age, sex and environment, resulting in the oxygen carrying capacity of the blood being reduced (10).

Around 57% of pregnant women in Africa are anemic with severe consequence on health, social, and economic development (12-14). Maternal anemia is considered a risk factor for adverse pregnancy outcome (16). It is associated with negative consequence for both the woman and neonate. Fetal anemia, low birth weight (LBW), preterm birth, low APGAR score, intrauterine growth restriction, and prenatal mortality have been associated with anemia (17-19). In the women themselves it may cause low physical activity and increased risk of maternal morbidity and mortality, especially in those with severe anemia (20, 21).

Maternal anemia during pregnancy can result preterm delivery. According to separate studies conducted in India, Pakistan and Nepal, pregnant women with anemia had up to 4 times higher risk of preterm birth (22, 23, 24, 25, 37). Studies conducted in developed countries such as United States and Singapore also showed a higher risk of premature delivery in anemic women than non anemic (26, 28). The risk of preterm delivery increased significantly with severity of anemia (31, 32).

Maternal anemia during pregnancy significantly increases the risk of LBW (18, 34, 35, 38). Pregnant women with anemia had up to 2-folds higher risk of delivering LBW baby than non anemic women (22, 23). Severe anemia is also significant predictor of LBW, increasing risk up to 2.4 times (35, 37). The risk of LBW also increased significantly with severity of anemia (31). Maternal anemia was also associated with lower Apgar scores in some studies (22, 23, 33).

Different studies report a significant relationship between severe anemia and increased risk of complications during pregnancy and of maternal death (20, 40). Separate studies in Pakistan, Nepal, and Uganda indicated severe anemia as a predictor of postpartum hemorrhage (20, 21, 41). In a study in Zimbabwe, cases of pregnant women who develop postpartum hemorrhage were 2.2 times more likely to be anemic as compared with non-postpartum hemorrhage controls

(64). The risk of abruptio placenta also increases by 4.5 times in anemic women than non anemic (20, 42). The risk of pregnancy induced hypertension can increase up to 5 times more in severe anemic mothers than non-anemic mothers (20). Severely anemic mothers develop infection of caesarean section/ episiotomy wound far more commonly as compared to non anemic (69). Anemia is responsible for 40 – 60 % of maternal deaths in developing countries (21).

Anemia prevalence in Ethiopian Somali Regional State is unacceptably high (50%) as compared to the national average (22%) (15). It is widely recognized that anemia is a serious obstacle not only to a healthy and productive life of the mother, but also to the proper growth and development of her infant. Despite the fact that there is high prevalence of anemia, there are no adequate data quantifying the degree of maternal and perinatal complications associated with maternal anemia in the study area. Data are inadequate to determine the extent to which maternal anemia might contribute to maternal and prenatal morbidity and mortality. Most of the studies about maternal anemia in the area are only on its prevalence and associated factors. Therefore, this study will attempt to determine association between anemia during pregnancy and maternal and prenatal complications in Karamara Hospital.

2. LITERATURE REVIEW

2.1. Anemia prevalence

According to World Health Organization, anemia has been defined as a condition in which the number of red blood cells or their oxygen-carrying capacity is inadequate to meet physiologic demands of the body, which may vary by sex, age, altitude, smoking, and pregnancy status (49). Anemia is a major public health problem and one of the most common nutritional disorders worldwide. It has major consequences for human health, economic and social development (9, 10).

Anemia is one of the most common diseases complicating antenatal women worldwide, particularly in the developing countries (45, 46). It is more common during pregnancy; hence pregnant women are at higher risk than non-pregnant women (10). Statistics indicate that, anemia affects around 50% of pregnant women globally, with the highest prevalence in Africa. Developing countries accounts for about 52% while in the developed world about 23% (45). Around 56% of pregnant women in Africa are anemic, with severe consequence on health, social, and economic development (46).

The common causes of anemia in pregnancy include iron deficiency which is the commonest cause of anemia during pregnancy, folate deficiency vitamin B12 deficiency, hemolytic diseases, malaria, hookworm infestation, bone marrow suppression, chronic blood loss and underlying malignancies (9). Iron Deficiency Anemia (IDA) is one of the most common nutritional disorders and it has public health importance in developing countries like Ethiopia (9, 45). About 2 billion people are iron deficient globally, with half of them manifesting clinical signs of anemia (45).

Pregnancy causes important changes in iron metabolism that include expansion of red cell mass and deposition of iron in fetus and placenta which increases iron demand by the body (22, 27). That is why iron deficiency is most common among pregnant women as compared with non pregnant (22).

Anemia in pregnancy is related to different socio-demographic, nutritional and economic factors (72, 73). Mother's age < 20 years, educational status and economic status significantly associated

with anemia during pregnancy in a study conducted in India (72). Reproductive health factors, different parasitic infections and other medical conditions also have been found to be significantly associated with anemia during pregnancy (72, 73).

2.2. Anemia and Perinatal complications

There is a substantial amount of evidence showing that maternal anemia during pregnancy can result in low birth weight subsequent to preterm delivery. Pregnant women who were first diagnosed with anemia had 1.7 times higher risk of preterm birth (<37 weeks) with a statistically significant association (95% CI= 1.3-2.1) (17). In another prospective cohort study conducted in Nagpur India, the risk of preterm deliveries was 4.2 times in anemic women than non-anemic (22).Similar result was obtained in a cohort study in Pakistan where the risk of preterm delivery was 4 times greater among the anemic women than the non-anemic with a statistically significant association (95% CI: 2.5–6.3) (23).Other retrospective and prospective studies conducted in Pakistan also showed similar findings (24, 25).

When numerous potentially confounding factors were taken into consideration, analysis of data from low-income, predominantly young black women in the United States showed a risk of premature delivery (< 37 wks) and subsequently of having a low birth weight infant that was 3 times higher in mothers with iron deficiency anemia on entry to care (26).Similar relations were observed in women from rural Nepal, in whom anemia with iron deficiency in the first or second trimester was associated with a 1.87-fold higher risk of preterm birth (27).In an analysis of 3728 deliveries in Singapore, 571 women who were anemic at the time of delivery had a higher incidence of preterm delivery than did those who were not anemic (28). Thus, the results of several studies are consistent with an association between maternal iron deficiency anemia in early pregnancy and a greater risk of preterm delivery.

Studies conducted on the effect of anemia on preterm delivery showed a high risk of preterm delivery with anemia during the first trimester but not during the third trimester. A prospective cohort study conducted in three provinces of China, anemia in the first trimester was associated with slightly increased risks for all preterm birth. However, third trimester anemia was associated with reduced risk for all preterm birth (29).Contrary to this finding a prospective cohort study conducted in India showed significant increase in incidence of preterm deliveries in

anemic mothers compared to non-anemic mothers, except in the first trimester. The difference was more than 5% overall, with maximum difference in the third trimester (30).

The risk of preterm delivery increased significantly with severity of anemia with ORs of 1.4, 1.4 and 4.1 for women with mild, moderate and severe anemia, compared with women with normal hemoglobin levels (31).Similar findings were also obtained in a case control study conducted in Kassala hospital, eastern Sudan (32).In a cohort study conducted in Yahyanejad Hospital in Iran, the incidences of preterm and prolonged delivery were 6.6% and 2% respectively. Women with moderate anemia (hematocrit 25%-33.9%) had a significantly high risk of preterm infants compared to those with normal hematocrit values (AOR 3.9 with CI 1.6-9.6). But maternal hematocrit values higher than 40% was not associated with increasing risk of preterm delivery (33).

Many study findings showed significant association between maternal severe anemia and adverse pregnancy outcomes (18, 34, 35). Presence of severe anemia during pregnancy significantly increased the risk of LBW. High Hb concentrations also appeared to increase the risk of LBW. Abnormally high hemoglobin concentrations usually indicate poor plasma volume expansion, which is a risk for low birth weight(36).An inverse U-shaped association was noted between Hb concentrations and birth weight, suggesting that risk of LBW is increased by abnormally low or high Hb concentrations.

In a cohort study in Pakistan, the risk of LBW in the anemic group was 1.9 times higher (95% CI: 1.0–3.4) than the non-anemic group (23).A study in India also showed a strong association between anemia during pregnancy and LBW. In a prospective cohort study conducted in India, there was a 2.8 times risk of low birth weight in the anemic group as compared non-anemic group (95% CI=2.1-3.8)(17). In a prospective cohort study conducted in Nagpur India, There were 1.8 and 1.3 times greater risk of low birth weight and intrauterine growth restriction in anemic women (22).

Severe anemia was a significant predictor of LBW, increasing risk by 2.48 (95% CI = 1.31 – 4.68) in rural Bangladesh (37).Higher rates of both LBW and preterm delivery were also observed among anemic women compared to non-anemic women in a retrospective population-based study in Israel(38).Similarly, in a hospital-based study in Kathmandu, Nepal, women with

severe anemia had a significantly increased risk of delivering LBW (AOR = 2.4; 95% CI = 1.01 – 5.8) and preterm (AOR = 3.5; 95% CI = 1.3 – 9.2) infants compared to the reference category (non-anemic group) (35).

In a prospective cohort study conducted in India, the proportion of children who were of low birth weight was marginally higher in mothers who had anemia. The difference (6.5% with 95% CI 10.4% and 2.5%) was significant for anemia in the third trimester (30).

The risk of LBW increased significantly with severity of anemia with ORs of 1.2, 1.7 and 3.8 for women with mild, moderate and severe anemia respectively compared with women with normal hemoglobin levels(31).In a study conducted in India, the risk of low birth weight was 2.077 times more in anemic pregnant women than non-anemic pregnant women. But in comparison of severely anemic and moderately anemic pregnant women, low birth weight was 3.478 times more in severely anemic pregnant women (39). In another retrospective study, severe anemia was associated with a higher risk for preeclampsia and poor perinatal outcomes. The risk of LBW was 2.5 time higher in women with mild/moderate anemia (95% CI: 1.1-5.7), and 8.0 times higher in women with severe anemia (95% CI: 3.8-16.0) (32).

An association between maternal anemia and lower infant Apgar scores was reported in some studies. In a retrospective study on maternal hemoglobin concentration and pregnancy outcome in El Alto, Bolivia, when mean Apgar scores recorded at 1 and 5 minutes were plotted against Hb levels, Apgar score appears to increase gradually from low to high maternal Hb levels. At lower Hb levels, Apgar score increases significantly as maternal Hb levels increase. At higher maternal Hb levels, Apgar scores tend to increase less drastically and the trend curve levels off. ANOVA also showed a statistical significant association between increasing Hb levels and infant Apgar scores at 1 minute (P=0.000) and at 5 minutes (P=0.002) (19).In a cohort study conducted in Yahyanejad hospital in Iran, women with low (25-33.9%) as well as high (>40%) hematocrit values had the highest proportions of infants with low Apgar score ($p<0.001$)(33).

In a cohort study in Pakistan, the anemic group had 1.8 times higher risk of giving birth to a baby with an Apgar score ≤ 5 at 1 minute (95% CI: 1.2– 3.7) (23).Similar result was also reported in a study on maternal anemia and its impact on prenatal outcome (23).A prospective cohort study conducted in Nagpur India also showed the association between anemia during pregnancy and

low Apgar score at 1 minute (22).In another prospective cohort study in India, the risk of an APGAR score <5 at 1 min was 1.6 times (95% CI=1.2-2.2) for anemic women(17).

2.3. Anemia and maternal complications

Mothers with severe anemia are at increased risk of complications during pregnancy and of maternal death. Some data show an association between a higher risk of maternal mortality and severe anemia. The United Nations Children's Fund (UNICEF) estimates that anemia alone may contribute to as much as 20 percent of maternal mortality worldwide (40). A retrospective cohort study conducted in Nepal has demonstrated a significant relationship between severe anemia and various maternal and prenatal complications (20). A cohort study on severe anemia and adverse pregnancy outcome in Karachi, Pakistan also reported that all complications were more frequent in severely anemic women than in non-anemic women, but statistically significant difference was found in post-partum hemorrhage (P=0.013) (21). Similarly in a retrospective cohort study conducted in Nepal, significant proportion of anemic pregnant women had postpartum hemorrhage OR=3.09 (P=0.0299) (20).A study in Uganda has also indicated severe anemia as a predictor of postpartum hemorrhage (41).

A retrospective observational study conducted in Pakistan showed a high risk of postpartum hemorrhage in anemic women as compared to non-anemic (Adjusted RR 5.6 with 95% CL 1.9-16.2). The risk of abruptio placenta was also high (Adjusted RR 4.5 with 95% CL 2.1-9.6) (42). The study in Nepal also identified pregnancy induced hypertension was five times more in severe anemic mothers than non-anemic mothers (< 0.001) (20).

Anemia increases the risk of postpartum hemorrhage and the two conditions together contribute to 40–43% of maternal deaths in Africa and Asia (62). Anemia may weaken uterine muscular strength or lower resistance to infectious diseases, contributing to postpartum hemorrhage and subsequent maternal mortality (63).

The impact of anemia on the extent of blood lost at childbirth and postpartum is not well-understood. In a case control study in Zimbabwe, cases of postpartum hemorrhage were 2.2 times more likely to have hemoglobin levels of <120 g/L than those of non-postpartum hemorrhage controls (64). In contrast, a study conducted in Nigeria reported that, no association

between maternal anemia and postpartum hemorrhage (65) and another study in Ghana reported no difference in risk of postpartum hemorrhage between severe and non-severe anemia (66).

Studies demonstrated association between severe anemia and uterine atony which is the main cause of PPH accounting for about 90% in most studies (67). In a cross sectional study in Al Thawra General Hospital in Yemen, the correlation between Hb values and blood loss was inversely significant (Pearson R = .619 at P< 0.00) indicating the more severe the anemia, the more likely of greater blood loss (68).

A study reported that, severely anemic patients develop infection of caesarean section/ episiotomy wound far more commonly as compared to non anemic. It also proposed that, anemia to be a predisposing factor for puerperal pyrexia (69). Another study found out that, amongst patients with puerperal sepsis, 69.2 % were anemic (70). A population based study conducted in Israel found that, abruption placenta was more common in anemic subjects than non anemic (71).

2.4. Other factors related to maternal and perinatal complications

Adverse pregnancy outcome can occur as a result of numerous inter-related as well as independent factors. These factors are socio-demographic & economic factors, reproductive history & medical factors, reproductive health behavior during pregnancy or complications during pregnancy and process of care

Socio demographic factors: Socioeconomic status of mothers has an impact on birth outcome. Lack of education and income can contribute to delays in seeking care during pregnancy. Poor mothers are at high risk of developing delivery related complications. Maternal age has also an impact on increasing the risk of complication, thus pregnant women below 18 years and older than 35 years are more likely to have complications. The socio demographic factors, age, religion, educational status, occupational status and income can also affect birth outcome indirectly through influencing reproductive health behavior during pregnancy (Complications during pregnancy)

Reproductive & medical factors: Reproductive histories of the mother and medical factors can directly or indirectly cause adverse pregnancy outcome. The higher the number of gravidity and parity, the greater the risk of delivery related complication. Past obstetric history of the

mother can be an indicator of current complication. Pregnant women with height of <150 cm are at higher risk of developing a negative birth outcomes due to cephalo-pelvic disproportion. Reproductive history such as gravidity, existing maternal health condition and nutritional status of the women can be associated with maternal anemia which ultimately result adverse pregnancy outcome

Process of care: Adverse pregnancy outcomes can be prevented or reduced if women have access to appropriate ANC care and delivery care. Therefore lack or limited number of ANC visit and lack of appropriate delivery care can influence birth outcome.

2.5. Conceptual framework

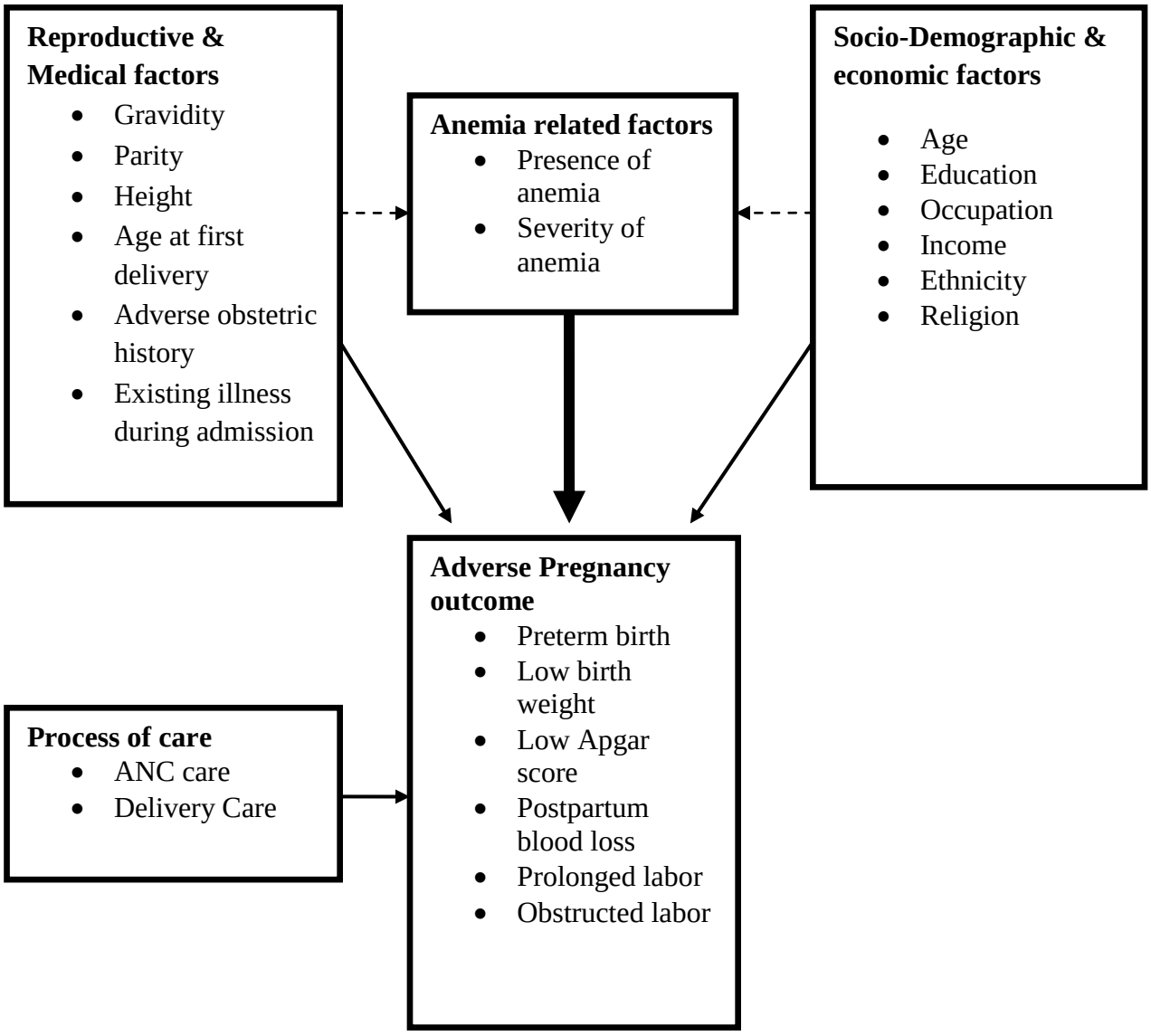

Figure 1: Conceptual framework showing the proposed relationship between the dependent and independent variables (designed by principal investigator based on literature review and scientific facts) (22-28).

3. OBJECTIVES

3.1. General objective

To determine the association between anemia during pregnancy and maternal and prenatal complications in Karamara Hospital, Jigjiga, Ethiopian Somali Regional State, Eastern Ethiopia, 2015.

3.2. Specific objectives

- To determine the difference in risk of maternal complications among pregnant women with and without anemia during pregnancy
- To determine the difference in risk of fetal complications among pregnant women with and without anemia during pregnancy

4. METHODS AND MATERIALS

4.1. Study area and period

The study was carried out at Karamara Hospital. It is a government owned General Hospital located in Jigjiga town, Ethiopian Somali Regional State, eastern Ethiopia.

Karamara Hospital has a 193 bed capacity and offers full range of comprehensive health services including outpatient, inpatient, surgical and maternal and child health services. The hospital's MCH clinic consists of under-five, ANC, Labor, postnatal care and family planning units.

The hospital has a total of 285 health professionals including 14 specialist doctors, 17 general practitioners, 86 clinical nurses and 24 midwifery nurses. The catchment population is not fixed, as the hospital is providing major referral service to the whole of eastern part of Ethiopia including Ethiopian Somali region, part of Oromia region and even to some part of Somali land. The average monthly attendances for ANC and labor are 400 and 300 respectively. Data were collected from October 1, 2015 to January 1, 2016.

4.2. Study Design

The study design was a facility based prospective cohort study which used primary data with structured interviewer guided questionnaire and checklists for clinical examination and laboratory analysis.

4.3. Population

4.3.1. Source population

The source populations were all pregnant women registered and attended their ANC service in Karamara hospital and came to the hospital for the fourth ANC visit. The source populations were identified by using the ANC card.

4.3.2. Study population

The study populations were all pregnant women registered and attended their ANC service in Karamara hospital and came to the hospital for the fourth ANC visit during the study period and

fulfilled the inclusion criteria. Pregnant women with anemia during the 4th ANC visit were taken as exposed and those with normal hemoglobin level as unexposed.

4.4. Inclusion and Exclusion criteria

4.4.1. Inclusion criteria

Singleton pregnancy

4.4.2. Exclusion Criteria

Women with known chronic diseases such as tuberculosis and malignancy as reported by the women themselves were excluded from the study.

4.5. Sample size determination and sampling technique

4.5.1. Sample size determination

Sample size was calculated manually using the formula of sample size determination for two population proportions for cohort study assuming 95% confidence level, power of 80% and exposed to unexposed ratio of 1:1. The entire outcome variables from different literatures (50-52) were considered for calculation of the required sample size and LBW was chosen, as it gives maximum sample size as compared to other outcome variables. Since there was no published study obtained in this area in Ethiopia, incidence of LBW among women with and without anemia during pregnancy was taken from a study done in Pakistan (52), with incidence of LBW among exposed (P_1) 13.4% and among non-exposed (P_2) 6.0%.

$$n = \frac{(Z_{1-\alpha/2}+Z_{1-\beta})^2\{P_1(1-P_1)+P_2\ (1-P_2)\}}{(P_1-P_2)^2}$$

Where:-

n- The minimum sample size required for the study

$\mathbf{Z}_{1-\alpha/2}$ -value of the standard normal distribution corresponding to a significance level (1.96 for a 2-sided test at the 0.05 level)

$\mathbf{Z}_{1-\beta/2}$ -value of the standard normal distribution corresponding to the desired level of power=0.84

$\mathbf{P_1}$- proportion of outcome among pregnant women with anemia (exposed)

$\mathbf{P_2}$- proportion of outcome among pregnant women without anemia (non-exposed)

Table 1. Calculated Sample sizes for all outcome variables from different literatures (50, 52)

S/n	Study area	Variables	P1 (%)	P2 (%)	Sample size
1	Sudan	Preterm birth	7.6	2.3	240
		LBW	14.2	3.3	200
2	Pakistan	Preterm birth	25.2	6.3	56
		LBW	13.4	6.0	250

The maximum calculated sample size gave a total of 250 study subjects, 125 exposed and 125 non-exposed groups. Adding 5 % for non-response rate, the sample size was 132 exposed and 132 non-exposed.

4.5.2. Sampling technique

Both the exposed and un-exposed groups were selected from all pregnant women visiting the hospital for ANC service using consecutive sampling technique. Pregnant women with anemia during the fourth ANC visit were assigned as exposed group.

4.6. Data collection instrument and procedure

4.6.1. Data collection instrument

Structured interviewer guided questionnaire and checklists for collection of data on the type of maternal and prenatal complications and laboratory analysis were employed

An interviewer guided structured questionnaire was developed after reviewing different relevant literatures of similar studies. The questionnaire contains questions on women's background information, past obstetric history and current pregnancy history

Observation checklist was developed to collect information on the type of maternal complications (prolonged labor, obstructed labor, postpartum blood loss) and prenatal complications (low birth weight, preterm birth, low Apgar score). In addition, checklist was also used to collect information from laboratory analysis (to estimate hemoglobin level).

Additional data on Hb level in the previous ANC follow follow-up were reviewed from integrated antenatal, labor, delivery, newborn and postnatal care card.

4.6.2. Data collection procedure

During the fourth ANC visit, a questionnaire was administered to a pregnant women attending to the hospital for ANC service. Data on women's Socio demographic and economic characteristics past obstetric history and current pregnancy history were collected.

Blood sample was taken to estimate hemoglobin level. Based on the hemoglobin level, pregnant women were classified as exposed or un-exposed group using WHO classification system.

Additional data on Hb level in the previous ANC follow follow-up were reviewed from ANC card. Finally the women were followed until delivery and data on maternal and prenatal complications were collected using checklists.

To reduce lost to follow-up, the addresses of the women were taken and continuous close contact were maintained through telephone every two days. Furthermore, only up to four pregnant women per data collector per week were enrolled in the study and followed up to pregnancy.

4.6.2.1. Data collector

Four diploma graduated midwives (birth attendants) and 2 diploma graduated laboratory technicians were recruited as data collectors. One BSc midwife was recruited for supervision throughout the data collection time.

4.6.2.2. Anemia Assessment and Classification

Hemoglobin (Hb) concentration was used to determine level of anemia because of its relatively easy and inexpensive and is the most reliable indicator of anemia. Further, Hb concentration is considered as the most reliable indicator of anemia at the population level.

Anemic cases were classified as mild, moderate or severe based on Hb threshold used to define anemia in pregnant women. The hemoglobin estimation was done using HemoCue301 (HemoCue AB, Angelholm, Sweden). HemoCue has a sensitivity 95% and a specificity of 99.5% (43, 44). Anemia in the study was defined by using the world health organization and classified into mild anemia (10–10.9g/dl), moderate anemia (7.0–9.9 g/dl) and severe anemia (< 7.0 g/dl).

4.7. Study Variables

4.7.1. Dependent variables

Maternal complications: (Postpartum blood loss**,** Prolonged labor, Obstructed labor)

Prenatal complications: (Low birth weight, Preterm birth, Low Apgar score)

4.7.2. Independent Variables

- Maternal anemia
- Age
- Ethnicity
- Religion
- Income
- Education
- Occupation
- Residence
- Marital status
- Plan for pregnancy
- Parity
- Gravidity
- Number of ANC visit
- Age at first delivery
- Height
- Existing illness during admission
- Adverse obstetric history
- Life-style/personal habits

4.8. Data processing & analysis

Consistency of the Data was checked, coded separately, cleaned and entered into EpiData version 3.1 to reduce entry error. Then the data were exported to SPSS version 16.0 statistical software for analysis. The data were explored using frequency tables and graphs for outliers and missed values and to check assumptions for statistical analysis. For outliers and missed values found during data exploration, causes of outliers and missed values were determined

Frequency tables, graphs and numerical summaries measures were used to describe the study variables. Bivariate analysis was done to test the association between independent and outcome variables. All explanatory variables that were associated with the outcome variable at a P-value of <0.25 were candidates for multivariable Cox proportional hazards regression. P-value less than 0.05 was used as cut off point for statistical significance.

All groups of explanatory variables were fitted to a single multivariable Cox proportional hazard regression models to each outcome variable. Independent variables with p-value less than 0.05 under 95% CI were considered as having significant association with dependent variable and were reported using both p-value and hazard ratios (HR). Linearity of continuous covariates and proportional hazards assumption were checked by using histogram plots and Kaplan-Meier curve respectively.

As the study was a prospective cohort study with a follow up time from enrolment up to the ascertainment of the final event of interest, Cox proportional hazard regression is the preferred model. Furthermore, Cox regression is best method of analysis to directly estimate risk using HR unlike that of logistic regression which only measures risk indirectly using OR.

In the Cox proportional hazard regression model, the follow up time (as time), maternal and perinatal complications (as status) and anemia status and other confounding variables (as covariates) were fitted. The occurrence of maternal and perinatal complication during delivery was considered as event whereas, mothers who delivered without maternal and perinatal complications were considered as censored.

4.9. Data quality management

To assure quality of data, the questionnaire was prepared in English and translated into Somali language. The translated Somali version of the questionnaire was also translated back to English looking for a possible gap in the contents of the original and the second translated versions. The same procedure was followed to develop the Amharic version of the questionnaire. In addition detail training for data collectors and supervisor was given for one day by the principal investigator. Furthermore, the principal investigator and supervisor made frequent checks on the data collection process to ensure the completeness & consistency of the gathered information. Any errors, ambiguity, incompleteness encountered were addressed on the following day before starting next day activities.

4.9.1. Pre-test

Pre-testing of the developed structured questionnaire was done on 5% of the total sample size in Dire Hospital, which is located in Jigjiga town. During pre-testing the questionnaire was assessed for its clarity, understandability, length, completeness, and reliability. Accordingly amendment was made before the actual data collection.

4.10. Ethical consideration

The technical proposal of this study was presented to the ethical review committee of Jimma University, Collage of Health Sciences. After obtaining ethical clearance, official letter was written to Somali National Regional Health Bureau. The bureau also wrote a formal letter to Karamara Hospital administration to allow execution of the research. Then, data collection was started after getting written consent from the Hospital administration. Informed verbal consent of subjects to participate in the study was secured before conducting the interview. Confidentiality was kept at each step of data collection and processing. The participants were assured that they have full right to participate or withdraw from the study at any time. Iron supplementation was given to anemic women and nutrition education was provided to all study subjects.

4.11. Dissemination of the findings

The report of the study will be submitted to Jimma University College of Health Science, department of Epidemiology. The copy of this report will also be submitted to Somali Regional Health Bureau and Karamara Hospital. Publication on peer reviewed journals will also be considered.

4.12. Operational definitions

Gestational age is defined as the duration of the pregnancy in weeks, i.e. from the first day of the last normal menstrual period (LNMP) to the date of delivery.

Preterm delivery is defined as gestational age <37 weeks (<259 days), post-term delivery gestational age ≥42 weeks (≥294 days) and term delivery gestational age of 37 - 41 completed weeks (259 - 293 days)

Low birth weight (LBW) and very low birth weight (VLBW) are defined as birth weight <2,500 g and <1,500 g respectively.

Apgar score was assessed at 1 and 5 minutes after birth.

Obstructed labor: Labor is considered obstructed when the presenting part of the fetus cannot progress into the birth canal, despite strong uterine contraction

5. RESULT

5.1. Participant characteristics

A total of 264 pregnant women whereof 132 anemic and 132 non anemic were included in this study. Table 1 presented about socio-demographic and economic characteristics of the study participants. Majority of the pregnant women 230 (87.1%) were from urban area while 34 (12.9%) were from rural areas. From pregnant women who came from urban area, around half of them 111 (48.3%) were anemic. For those who came from rural areas, 21(61.8%) were anemic.

The mean age of pregnant women for both anemic and non anemic was 28.5 (±4.2) years. The mean ages separately for anemic and non anemic groups were 28.2 (±4.2) and 28.7 (±4.2) respectively. More than 50% of the pregnant women were between 25-29 years old and around 70% were below the age of 30 years.

The majority of pregnant women were married 247(93.6%) of which 120(48.6%) were anemic while, 127(51.4%) were non anemic. Muslims account 242(91.7%); 120(49.6%) anemic and 112(50.4%) non anemic. Majority of the women are Somali by ethnic group 225(85.2%), 109(48.4%) anemic and 116(51.6%) non anemic. Two hundred and eight (78.8%) mothers were housewives and 158(59.8%) were unable to read and write of which 80(50.6%) were anemic. Of the total 264 pregnant women, only 17(6.4%) attended higher education out of which, 4(23.5%) were anemic and 13(76.5%) non anemic respectively.

The average monthly family income of the study participants was 1650.57(±660.67) ETB, separately for anemic 1479.17(±620.97) ETB and for non anemic 1821.97 (±656.88) ETB respectively.

Table 2: Socio-demographic and economic characteristics of pregnant women in Karamara Hospital, Jjijiga, Eastern Ethiopia, 2015

Baseline characteristics	Non anemic (N=132) Number (%)	Anemic (N=132) Number (%)	Total (% from total)
Age			
≤24	11(35.5)	20(64.5)	31(11.7)
25-29	80(52.3)	73(47.7)	153(58.0)
≥ 30	41(51.2)	39(48.8)	80(30.0)
Mean(SD)	28.78(4.23)	28.23(4.21)	28.50(4.22)
Residence			
Urban	119(51.7)	111(48.3)	230(87.1)
Rural	13(38.2)	21(61.8)	34(12.9)
Educational Status			
Unable to read & write	78(49.4)	80(50.6)	158(59.8)
Primary education	26(46.4)	30(53.5)	56(21.2)
Secondary education	15(45.5)	18(54.5)	33(12.5)
Higher education	13(76.5)	4(23.5)	17(6.4)
Religion			
Muslim	112(50.4)	120(49.6)	242(91.7)
Orthodox	7(41.2)	10(58.8)	17(6.4)
Protestant	3(60.0)	2(40.0)	5(1.9)
Ethnicity			
Somali	116(51.6)	109(48.4)	225(85.2)
Amhara	9(45.0)	11(55.0)	20(7.6)
Oromo	4(36.4)	7(63.6)	11(4.2)
Others	3(37.5)	5(62.5)	8(3.0)
Marital Status			
Not married	5(29.4)	12(70.6)	17(6.4)
Married/Living as married	127(51.4)	120(48.6)	247(93.6)
Occupation			
Housewife	106(51.0)	102(49.0)	208(78.8)
Merchant	11(55.0)	9(45.0)	20(7.6)
Employed	11(61.1)	7(38.9)	18(6.8)
Daily laborer	1(7.7)	12(92.3)	13(4.9)
Others	3(60.0)	2(40.0)	5(1.9)
Monthly family income (ETB)			
≤1000	10(21.3)	37(78.7)	47(17.8)
1001-1500	40(45.5)	48(54.5)	88(33.3)
1501-2000	41(55.4)	33(44.6)	74(28.0)
>2000	41(74.5)	14(25.5)	55(20.8)

5.2. Past obstetric history

The mean ages at first delivery for anemic and non anemic pregnant women were 20.3(±1.7) and 20.7(±2.2) years respectively. For 87(33.0%) of the pregnant women, age at first delivery was ≤19 years. One hundred sixty three (61.7%) of the women gave their first birth between the ages of 20-24 years while the remaining 14(5.3%) of the women at the age of 25 or older.

The average number of pregnancy per women for anemic and non anemic women were 4.1(±2.3) and 3.6(±2.1) respectively. Out of all 264 pregnant women, 15(5.7%) were primigravida, 151(57.2%) had between one to four previous pregnancies, while the remaining 98(37.1%) pregnant women had five or more pregnancies.

Parity for anemic women was 3.9(±2.2) whereas, for non anemic was 3.6 (±2). Of all pregnant women 15(5.7%) were nulliparous, 159(59.0%) had between one to four deliveries and 91(34.5%) had five or more deliveries.

Among 164 pregnant women, 19(7.2%) had a history of still birth, of these 12(63.2%) were anemic. Only 7of the women had history of abortion, 2 anemic and 5 non anemic respectively. Past obstetric history of the study population are summarized in Table 2.

Table 3: Past obstetric history of pregnant women in Karamara hospital, Jjijiga, Eastern Ethiopia, 2015

Characteristics	Non anemic (N=132) Number (%)	Anemic (N=132) Number (%)	Total (% from total)
Previous pregnancy			
0	5(33.3)	10(66.7)	15(5.7)
1-4	86(57.0)	65(43.0)	151(57.2)
≥ 5	41(41.8)	57(58.2)	98(37.1)
Parity			
0	5(33.3)	10(66.7)	15(5.7)
1-4	88(55.7)	70(44.3)	159(59.0)
≥ 5	39(42.9)	52(57.1)	91(34.5)
Age at first pregnancy			
≤19	42(48.3)	45(51.7)	87(33.0)
20-24	80(49.1)	83(50.9)	163(61.7)
≥25	10(71.4)	4(28.6)	14(5.3)
History of still birth			
Yes	7(36.8)	12(63.2)	19(7.2)
No	125(51.0)	120(49.0)	245(92.8)
History of abortion			
Yes	5(71.4)	2(28.6)	7(2.7)
No	127(49.4)	130(50.6)	257(97.3)

5.3. Current pregnancy condition

A total 247(93.6%) pregnant women had planned their pregnancy. Pregnancies mistimed or unwanted were 17(6.4%). The majority of pregnant women had attended at least two antenatal care visits during their current pregnancies. Only 7 of the women attended all 4 ANC visits.

Of all 264 pregnant women, only 6 of the women had hypertension, all 6 of them were non anemic. Diabetes mellitus were reported only by 2 women, both of them were non anemic too. Trauma/injury were reported by 30(11.4%) of the women, of which 20(66.7%) were anemic while the remaining 10(33.3%) were non anemic. Two pregnant women reported alcohol use during their current pregnancies whereas, 4 reported khat chewing. The median heights for anemic and non anemic pregnant women were 166.0(±3.4) and 165.0(±3.5) respectively. Current pregnancy characteristics of the study population are summarized in Table 3.

Table 4: History of current pregnancy of pregnant women in Karamara hospital, Jjijiga, Eastern Ethiopia, 2015

Current pregnancy characteristics	Non anemic (N=132) Number (%)	Anemic (N=132) Number (%)	Total (% from total)
Planned Pregnancy			
Yes	123(49.8)	124(50.2)	247(93.6)
No	9(52.9)	8(47.1)	17(6.4)
ANC visits			
<3	86(50.6)	84(49.4)	170(64.4)
≥ 3	46(48.9)	48(51.1)	94(35.6)
Hypertension			
Yes	6(100.0)	0(0.0)	6(2.3)
No	126(48.8)	132(51.2)	258(97.7)
History of DM			
Yes	2(100.0)	0(0.0)	2(0.8)
No	130(49.6)	132(50.4)	262(99.2)
History of Trauma/injury			
Yes	10(33.3)	20(66.7)	30(11.4)
No	122(52.1)	112(47.9)	234(88.6)
Height(cm)			
<160	7(63.6)	4(36.4)	11(4.2)
160-164	33(51.6)	31(48.4)	64(24.2)
165-169	71(48.3)	76(51.7)	147(55.7)
≥ 170	21(50.0)	21(50.0)	42(15)
Mean(SD)	165.98(3.53)	166.08(3.46)	166.03(3.49)
Alcohol drinks			
Yes	2(100.0)	0(0.0)	2(0.8)
No	130(49.6)	132(50.4)	262(99.2)
Khat chewing			
Yes	3(75.0)	1(25.0)	4(1.5)
No	129(49.6)	131(50.4)	260(98.5)

5.4. Maternal and fetal complications

Two hundred forty one (91.3%) pregnant women have delivered through spontaneous vaginal delivery, while the remaining 23(8.7%) delivered through cesarean section. Of 23 pregnant women delivered through cesarean section, 10(43.5%) were anemic and 13(56.5%) non anemic respectively. The duration of second stage labor was reported less than 60 minutes for 40(15.2%) of the women and 60 minutes or more for 224(84.8%) women.

Post partum blood loss was reported by 8 of the women, 5 were anemic and 3 non anemic. Similarly obstructed labor was reported by 23(8.7%) of the women, of these 10 were anemic. Among all 264 pregnant women, 38(14.4%) delivered to low birth weight baby (birth weight <2500 g). Of these, majority 28(73.7%) were anemic women. Two hundred twenty six (85.6%) women delivered to normal birth weight baby of which, 122(54.0%) were anemic and 104(46.0%) non anemic. Very low birth weight baby was not observed.

The mean gestational age at delivery for both anemic and non anemic women was 39.0(±1.2) weeks. Preterm delivery (gestational age <37 weeks) was observed on 20(7.6%) of the women. Two hundred forty two (91.6%) pregnant women delivered on term and post term delivery was observed only on 2 of the women. Of 20 preterm births, 15(75.0%) were from anemic women. Low Apgar score at 1 minute (Apgar score <7) was observed on 21(8.0%) babies, of these 12(57.1%) were delivered by anemic women. Apgar score ≥7 was reported for 243(92.0%) babies.

On the bivariate Cox regression analysis, anemia during pregnancy was significantly associated with only low birth weight and preterm birth. Hazard ratios with 95% CI for low birth weight and preterm birth are (HR = 2.02, with 95% CI = 1.03 - 3.96) and (HR = 3.06, with 95% CI = 1.11 - 8.42) respectively. On multiple cox regression analysis Anemia during pregnancy was significantly associated with low birth weight and preterm birth (AHR = 2.23, with 95% CI = 1.06 -4.70) and (AHR = 3.03, with 95% CI = 1.10 - 8.34).

Anemia during pregnancy was not significantly associated with mode of delivery (HR = 1.03, with 95% CI = 0.43 - 2.47), duration of second stage labor (HR = 1.04, with 95% CI = 0.79 - 1.35), low Apgar score at 1 minute (HR = 1.68 with 95% CI = 0.67 - 4.17), post partum blood loss (HR = 1.90 with 95% CI = 0.44 - 8.18) as well as obstructed labor (HR = 1.03 with 95% CI

= 0.43 - 2.47). Maternal and fetal complications of the study population are summarized in Table 4.

Table 5: Maternal and fetal complications among pregnant women in Karamara hospital, Jjgjiga, Eastern Ethiopia, 2015

Anemia status	Maternal and fetal complications Num (%)		HR (95%CI)	P value
	Mode of delivery			
	Vaginal delivery	**Cesarean section**		
Non anemic	119(49.4)	13(56.5)	1.00	
Anemic	122(50.6)	10(43.5)	1.03(0.43, 2.47)	0.937
Total (%)	241(91.3)	23(8.7)		
	Duration of second stage labor in min			
	<60	**≥60**		
Non anemic	19(47.5)	113(50.4)	1.00	
Anemic	21(52.5)	111(49.6)	1.04(0.79, 1.35)	0.772
Total (%)	40(15.2)	224(84.8)		
	Postpartum blood loss			
	No	**Yes**		
Non anemic	129(50.4)	3(37.5)	1.00	
Anemic	127(49.6)	5(62.5)	1.9(0.44, 8.18)	0.389
Total (%)	256(97.0)	8(3.0)		
	Obstructed labor			
	No	**Yes**		
Non anemic	119(49.4)	13(56.5)	1.00	
Anemic	122(50.6)	10(43.5)	1.03(0.43, 2.47)	0.937
Total (%)	241(91.3)	23(8.7)		
	Birth weight			
	≥2500	**<2500**		
Non anemic	122(54.0)	10(26.3)	1.00	
Anemic	104(46.0)	28(73.7)	2.93(1.42, 6.04)	**0..004**
Total (%)	226(85.6)	38(14.4)		
	APGAR score at 1 minute			
	≥7	**<7**		
Non anemic	123(50.6)	9(42.9)	1.00	
Anemic	120(49.4)	12(57.1)	1.68(0.67, 4.17)	0.263
Total (%)	243(92.0)	21(8.0)		
	Gestational age at delivery in weeks			
	≥37	**<37**		
Non anemic	127(52.0)	5(25.0)	1.00	
Anemic	117(48.0)	15(75.0)	3.06(1.11, 8.42)	**0.030**
Total (%)	244(92.4)	20(7.6)		

HR = Hazard ratio

Table 6: Relationship between low birth weight and anemia during pregnancy in Karamara Hospital, Jjijiga, Eastern Ethiopia, 2015

Baseline characteristics	Low birth weight		Crude HR (95%CI)	P value	Adjusted HR (95%CI)	P value
	No (N=226) Num (%)	Yes (N=38) Num (%)				
Age						
≤24	20(64.5)	11(35.5)	**3.19(1.41, 7.23)**	**0.005**	**2.63(1.14, 6.06)**	**0.023**
25-29	139(90.8)	14(9.2)	0.63(0.29, 1.36)	0.245	0.63(0.29, 1.35)	0.236
≥ 30	67(83.8)	13(16.2)	1.00		1.00	
Parity						
0	10(66.7)	5(33.3)	**3.59(1.25, 10.29)**	**0.017**	0.45(0.09, 2.29)	0.341
1-4	138(87.9)	19(12.1)	0.91(0.45, 1.83)	0.805	0.73(0.29, 1.83)	0.404
≥ 5	78(84.8)	14(15.2)	1.00		1.00	
ANC visits						
<3	148(87.1)	22(12.9)	0.59(0.30, 1.13)	0.113	0.70(0.32, 1.52)	0.375
≥ 3	78(83.0)	16(17.0)	1.00		1.00	
History of still birth						
Yes	18(94.7)	1(5.3)	0.30(0.04, 2.20)	0.238	0.31(0.04, 2.34)	0.259
No	208(84.9)	37(15.1)	1.00		1.00	
Height(cm)						
<160	9(81.8)	2(18.2)	0.66(0.14, 3.05)	0.669	0.90(0.17, 4.75)	0.903
160-164	56(87.5)	8(12.5)	0.41(0.16, 1.06)	0.067	0.49(0.18, 1.36)	0.174
165-169	129(87.8)	18(12.2)	**0.43(0.19, 0.94))**	**0.035**	0.66(0.28, 1.56)	0.354
≥ 170	32(76.2)	10(23.8)	1.00		1.00	
Mean(SD)	166.0(3.4)	166.2(3.1)	1.03(0.93, 1.13)	0.530	1.00(0.91, 1.11)	0.850
Anemia Status						
Non anemic	122(92.4)	10(7.6)	1.00		1.00	
Anemic	104(78.8)	28(21.2)	**2.93(1.42, 6.04)**	**0.004**	**2.23(1.06, 4.70)**	**0.034**

Table 7: Relationship between preterm birth and anemia during pregnancy in Karamara Hospital, Jjijiga, Eastern Ethiopia, 2015

Baseline characteristics	Gestational age at delivery in weeks		Crude HR (95%CI)	P value	Adjusted HR (95%CI)	P value
	≥37 (N=244) Num (%)	<37 (N=20) Num (%)				
Age						
≤24	26(83.9)	5(16.1)	2.63(0.76, 9.10)	0.125	2.54(0.41, 15.54)	0.311
25-29	143(93.5)	10(6.5)	1.04(0.35, 3.06)	0.934	1.35(0.42, 4.27)	0.607
≥ 30	75(93.8)	5(6.2)	1.00		1.00	
Monthly family income (ETB)						
≤1000	41(87.2)	6(12.8)	3.50(0.70, 17.38)	0.124	2.25(0.43, 11.76)	0.336
1001-1500	81(92.0)	7(8.0)	2.16(0.45, 10.42)	0.335	1.53(0.30, 7.79)	0.607
1501-2000	69(93.2)	5(6.8)	1.84(0.35, 9.51)	0.464	1.36(0.25, 7.26)	0.718
>2000	53(96.4)	2(3.6)	1.00		1.00	
Previous pregnancy						
0	12(80.0)	3(20.0)	2.20(0.59, 8.13)	0.236	0.41(0.05, 3.17)	0.398
1-4	143(94.7)	8(5.3)	0.56(0.21, 1.47)	0.244	0.34(0.11, 1.06)	0.064
≥ 5	89(90.8)	9(9.2)	1.00		1.00	
ANC visits						
<3	115(87.8)	16(12.2)	**4.20(1.40, 12.57)**	**0.010**	**3.86(1.29, 11.57)**	**0.0.016**
≥ 3	129(97.0)	4(3.0)	1.00		1.00	
Anemia Status						
Non anemic	127(96.2)	5(3.8)	1.00		1.00	
Anemic	117(88.6)	15(11.4)	**3.06(1.11, 8.42)**	**0.030**	**2.81(1.02, 7.75)**	**0.045**

6. DISCUSSION

Anemia is a common health problem in pregnant women in Ethiopian Somali region. It is responsible for increased incidence of maternal and fetal complications (15). In this study the presence of anemia at the forth ANC visit significantly increased the risk for LBW and preterm delivery. Prolonged labor, Post partum blood loss, obstructed labor, low Apgar score and mode of delivery were not significantly associated with anemia during pregnancy.

The incidence of low birth weight in the present study was 14.4% which is similar with a hospital based study in Tigray, Northern Ethiopia in which the prevalence of LBW for 308 pregnant women attending 3 zonal hospitals was 14.6% (53). Very low birth weight baby was not observed in this study. This may be due to the fact that, a relatively smaller sample size has been used in the study which made difficult to get adequate number of pregnant women who gave birth to a very low birth weight baby in both anemic and non anemic groups.

The study found out that anemia was significantly associated with birth weight. The risk of delivering low birth weight baby was 2.02 times greater among the anemic pregnant women than non anemic (AHR = 2.23, with 95% CI = 1.06 - 4.70). The possible explanation is that, the fetus depends on the mother blood, so the lack of iron in women blood during pregnancy may affect the fetal growth and development. Due to this anemia leads to increased risk of premature delivery and low birth weight. Many study findings showed significant association between maternal anemia and adverse pregnancy outcomes (18, 34, 35). Similar cohort studies conducted in Pakistan, Nepal and India respectively reported that the risk of LBW increased by 1.9, 2.4 and 2.8 times in anemic women as compared to non anemic (17, 23, 35)

Other Study also showed that, an inverse U-shaped association between Hb concentrations and birth weight, suggesting that, the risk of LBW is increased by abnormally low or high Hb concentrations. (36) However, this kind of association was not observed in the current study. This may be due to the few numbers of pregnant women who had very low and abnormally high Hb level. The numbers of cases with very high and very low Hb level under low birth weight and normal birth weight were so few (some even 0 & 1) that analysis was practically impossible.

This study also revealed that the risk of LBW increased significantly with the severity of anemia. In the current study the risk of LBW increased by 2.57 and 3.74 times for mild and moderate/severe anemia respectively as compared with non anemic women. This finding also supported by other studies conducted in Sudan and in Tanzania that reported, the risks of LBW were 2.5 time higher in women with mild/moderate anemia (32) and 3.8 times for severe anemia compared with women with normal hemoglobin levels (31) respectively.

Low birth weight was also associated with maternal age. Parity and maternal height were associated with low birth weight on bivariat analysis but the association was not significant on multivariate analysis.

In this study, the risk of delivering low birth weight baby was 2.6 times greater in women with age 24 or less compared with women with age 30 or more. The association was statistically significant on both bivariate and multivariate analysis (AHR = 2.63, with 95% CI = 1.14 - 6.06). Other studies also showed that young mothers in their early reproductive life are at high risk of giving birth to LBW babies (54). In a study of risk factors for low birth weight in Bale zone hospitals, South-East Ethiopia, Mothers who were in the age group of less than 20 years were 3.1 times more likely to deliver low birth weight babies (55).

A possible explanation proposed by researchers for this could be that mothers in their early reproductive life are still growing and may be competing for nutrients with their fetuses, leading to LBW or preterm babies. Psychological factors can also be causes of LBW in babies whose mothers are in their early reproductive life, since many pregnancies that occur at this age are unplanned, unwanted or discovered late (56). In addition, women who face early pregnancy may lack emotional maturity needed to carry such pregnancies to term (54).

This study revealed that, nulliparous women were at a 3.5 times increased risk of delivering low birth weight baby compared with pregnant women who had five or more deliveries but this association was not statistically significant on multivariate regression analysis (AHR = 0.45, with 95% = 0.09 - 2.29). A study conducted in Tigray region reported that, increase in parity was associated with increase in birth weight (53).

Maternal height was significantly associated with birth weight on bivariate analysis in this study. Pregnant women between 165 to 169 cm high had 57% lower risk of delivering low birth weight

baby than women with a height of 170 cm or high but this association was not statistically significant on multivariate analysis (AHR = 0.66, with 95% CI = 0.28 = 1.56). The association between maternal height and low birth weight was also reported by other studies (53, 60). In a study on maternal risk factors associated with LBW in Tigray region, the risk of delivering a baby with LBW was more than fivefold for women with height of less than 150 cm than mothers with greater than 150 cm, even though the difference was not significant (53). Another longitudinal study in India reported a significant difference in the mean birth weight in different categories of maternal height except among those with maternal height between 150 to 160 cm when compared to women with height of 160 cm or more (60).

The other outcome variable which was found to have significant association with the main explanatory variable i.e. anemia, in this study was preterm birth. On bivariate cox regression analysis, anemia was significantly associated with gestational age at delivery. All possible explanatory variables for preterm birth were fitted on multivariate Cox proportional hazard model. Based on the analysis, only ANC visits and anemia status were significantly associated with gestational age at delivery.

The study revealed that, the risk of preterm delivery was 3.8 times higher in pregnant women who had visited the hospital for ANC service less than three times as compared with women who had visited for three or more times. The association was statistically significant on both bivariate and multivariate analysis (AHR = 3.86, with 95% CI = 1.29 - 11.57). Other studies also showed similar association between ANC visit during pregnancy and preterm delivery. In a study on preterm birth and associated factors among mothers who gave birth in Debremarkos town health institutions, the risk of preterm delivery was 75% lower in pregnant women who visited the hospital for ANC service as compared with women who had no any ANC follow up (61).

The possible explanation for the association between ANC visit and preterm birth is that, ANC incorporates a range of interventions that have been shown to be effective for the detection, treatment or prevention of conditions associated with serious morbidity or mortality such as, monitoring of chronic conditions, screening for and treatment of infections, including sexually transmitted infections. It is also viewed as an important point of contact between health workers and women and an opportunity for provision of health education including early identification of

risk factors associated with preterm birth and early sign of preterm labor which might help to prevent, diagnose, and treat preterm birth and other adverse pregnancy outcomes.

Preterm delivery was also significantly associated with anemia on multivariate analysis (AHR = 2.81, with 95% CI = 1.02 - 7.75). The anemic women were at a 2.8 times increased risk of preterm delivery as compared with non anemic women. The finding from this study is within the range reported by other studies in India and Pakistan where the risk of preterm deliveries were 1.7 and 4 times higher in anemic women than non-anemic respectively (17, 23).

Different studies reported that, the risk of preterm delivery increased significantly with severity of anemia. A study reported the risk of preterm birth 1.4, 1.4 and 4.1 for women with mild, moderate and severe anemia, compared with women with normal hemoglobin levels (31).Similar findings were also obtained in a case control study conducted in Kassala hospital, eastern Sudan (32). Though, the association between preterm birth and mild anemia was not significant in this study, the risk of preterm delivery increased by 2.47 and 4.21 times for mild and moderate/severe anemia respectively as compared with non anemic women. This finding also supported by a cohort study conducted in Yahyanejad Hospital in Iran, women with moderate anemia (hematocrit 25%-33.9%) had a 3.9 times higher risk of preterm infants compared to those with normal hematocrit values but maternal hematocrit values higher than 40% was not associated with increasing risk of preterm delivery (33).

6.1. Strengths and limitations of the study

To minimize information bias, the instrument was developed in the local language i.e. Somali and Amharic and female data collectors were used to decrease non-response rate. In addition, information regarding past obstetric history are the most unforgettable event of a woman which minimize recall bias. Furthermore, all women were asked the same questions in the same way, regardless of their anemia status.

Selection of anemic and non-anemic group was based on hemoglobin concentration, as it is the most reliable indicator of anemia. In addition, experienced midwifes were recruited to measure outcome variables i.e. adverse pregnancy outcomes. These minimize differential misclassification of exposure and outcome. Hemoglobin values of pregnant women were prospectively ascertained before pregnancy outcomes were determined, which also eliminates

the possibility of differential misclassification of anemia and establish temporal relationship between exposure and outcome. Risk of adverse pregnancy outcome was directly estimated using hazard ratio and there was no lost to follow up. Multivariate Cox regression analysis was employed to control the effect of confounders.

As the study was conducted on a relatively smaller sample of anemic and non anemic pregnant women, the precision with which the association between anemia and adverse pregnancy outcome observed was questionable. Additionally, iron supplementation was prescribed to pregnant women during the ANC follow-up which may have effect on the associations between exposure and outcomes noted in this study. Moreover, estimation of gestational age was largely based on menstrual dates that are prone to some degree of inaccuracy. Finally, as the study lack follow-up for six weeks post delivery, all early and late maternal and neonatal complications could not be evaluated.

7. CONCLUSION AND RECOMMENDATIONS

In conclusion, anemia during pregnancy was associated with increased risk for LBW and preterm birth. In addition to anemia, number of ANC follow up and maternal age were also found to be associated with LBW and preterm birth. Therefore, prevention strategy for low birth weight and preterm birth should be designed to tackle multiple risk factors for these problems.

Pregnant women should be monitored for abnormally low Hb concentrations and clinical interventions should be promoted to prevent occurrence of anemia during pregnancy to minimize the risk of adverse pregnancy outcomes. Linking anemic women to the appropriate maternal health services including nutritional counseling services and routine antenatal iron tablet supplementation should be strengthen.

As this study highlights the fact that pregnancy at early reproductive age is at high risk for giving birth to low birth weight babies; community-based awareness for prevention of early pregnancy i.e. teenage pregnancies, carries important role in reducing low birth weight babies

Adverse pregnancy outcome in this study was associated with inadequate number of ANC follow up. Therefore, sensitizing women on the benefits of ANC, reducing ANC dropout, provision of quality ANC follow up with better health care services with well-trained health care personnel; may lead to decrease adverse maternal and fetal outcomes including preterm birth. Health professionals should strengthen screening and counseling of pregnant mothers who are at risk of maternal and fetal complications and ensure that women have access to essential health information on the causes of anemia, low birth weight and preterm birth

Future studies with larger sample size and longer study period are needed on both early and late maternal and prenatal complications of anemia, effectiveness of prevention strategies including iron supplementation, and similar studies at population level.

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ANNEX 1: QUESTIONNAIRE

JIMMA UNIVERSITY

COLLEGE OF HEALTH SCIENCE

DEPARTMENT OF EPIDEMIOLOGY

Questionnaire developed for the Study on maternal and fetal outcome of anemia during pregnancy in Karamara hospital, Ethiopian Somali Regional State, Jigjiga town

Introduction: Good morning/afternoon, my name is _____and I am a midwife/nurse working in this hospital. I am also member of a research team conducted by an Epidemiology Postgraduate student from Jimma University. The purpose of the study is to determine the association between anemia during pregnancy and maternal and prenatal complications in Karamara Hospital.

Confidentiality and consent: You have been selected to participate in this study. Your participation is purely voluntary, and you can withdraw from the study any time without compromising the services you ought to get from the hospital. I am going to ask you some very personal questions. You can refuse to answer any question if you are uncomfortable.

However, I would like to assure you that all the information you give us will be kept completely confidential and will be used only in scientific reports without mentioning of your personal identification. Any information given will be recorded under a code rather than your actual name.

There is no harm to you in participating or no incentive paid but your honest answer to these questions will help us better understand the situation. In addition the Information gathered from the study will be used to improve programs that promote maternal and child health. We appreciate your help in responding to these questions. Do you have any questions?

Would you be willing to participate?

Yes_____ (continue) No_____ (Thank and stop)

Section 1: Hemoglobin Assessment

S.No	ANC visit	Haemoglobin level in g/dl	Date
Q101	At first visit		
Q102	At second visit		
Q103	At third visit		
Q104	At fourth visit		

Name of the lab technician _____signature _____Date [___/___/___]
CHECKED BY SUPERVISOR: Name _____Signature _____ Date [___/___/___]

Section 2:- Respondent background information

S.No	Question	Coding categories	Skip to
Q201	How old are you? (E.C)	_____ Years	
Q202	Where is your residence?	1. Urban 2. Rural	
Q203	What is the highest level of School you completed?	1. Unable to read & write 2. Able to read & write Grade completed _____	
Q204	What is your religion	1. Muslim 2. Orthodox 3. Protestant 4. Catholic 5. Others(Specify)_____	
Q205	What is your ethnicity?	1. Somali 2. Amhara 3. Oromo 4. Grurage 5. Other (Specify)_____	
Q206	What is your marital status?	1. Never Married 2. Married/Living as married 3. Divorced 4. Separated 5. Widowed	
Q207	What do you do for living? {Or What is your occupation?}	1. Housewife 2. Student 3. Daily laborer 4. Merchant 5. Government Employee 6. Private employee 7. Other (specify) _____	
Q208	How much is the average family income per month?	_____ Birr 1. No income 99. Don't now	

Section 3: Past obstetric history

S.No	Question	Coding categories	Skip to
Q301	Have you had any pregnancy before?	1. Yes 2. No →	Go to Q303
Q302	How many pregnancies have you had?	Number of pregnancies _____	
Q303	How many times did you give birth? (Parity)	Number of times_____	
Q304	What was your age at your first delivery?	Age in years _____	
Q305	Have you ever-experienced still birth?	1. Yes 2. No →	Go to Q307
Q306	How many times did you have still births?	Number of still births _____	
Q307	Have you ever-experienced miscarriage/ abortion?	1. Yes 2. No →	Go to Q401
Q308	How many times did you have abortions?	Number of times_____	

Section 4:- Current pregnancy history

S.No	Question	Coding categories	Skip to
Q401	Have you planned this Pregnancy?	1. Yes 2. No	
Q402	How many times in total did you go for antenatal care during this pregnancy?	No of visit_____	
Q403	During this pregnancy have you been told that you have hypertension?	1. Yes 2. No	
Q404	Have you ever been told that you have DM?	1. Yes 2. No	
Q405	Did you have any history of trauma or injury, in the current pregnancy period?	1. Yes 2. No 99. Don't remember	
Q406	What is the height of the mother?	_____cm (height in cm	
Q407	During your pregnancy, did you take alcohol drinks?	1. Yes 2. No → 99. Don't remember	Go to Q409
Q408	How often were you taking alcohol drinks? One unit of alcohol means 1, One glass of beer, Wine etc. or 2, one cup of arekie, gin, whisky etc.	_____number of times/day _____number of times /week _____number of times /month _____number of times /during pregnancy 99. Don't remember	
Q409	During your pregnancy, did you ever chew khat?	1. Yes 2. No → 99. Don't remember	End of interview
Q410	How often were you chewing khat?	_____number of times/day _____number of times /week _____number of times /month _____number of times /during pregnancy 99. Don't remember	

Section 5:- Information on delivery outcome (Observational)

Notes: This observational checklist should be filled at the end of delivery

S No	Question	Observation	Skip to
Q501	Date of delivery	_____	
Q502	What was the mode of delivery	1. Spontaneous vaginal delivery → Go to Q503 2. Spontaneous vaginal delivery assisted by episiotomy → Go to Q503 3. Instrumental delivery → Go to Q503 4. Cesarean section	
Q503	What was the indication for caesarean section?	1. Prolonged/Obstructed labor 2. Cephalopelvic disproportion 3. Foetalmalpresentation 4. Other (specify) _____	
Q504	What was duration of second stage of labor?	Duration in mints_____	
Q505	Is there Postpartum blood loss?	1. Yes 2. No → Go to Q507	
Q506	Amount of blood lose	_____estimated volume in ML	
Q507	Is the labor obstructed?	1. Yes 2. No	
Q508	Is the child born alive?	1. Yes 2. No	
Q509	Birth weight of the baby in grams?	Weigh in gram _____	
Q510	Apgar score at 1 minute	_____	
Q511	Apgar score at 5 minute	_____	
Q512	Gestational age at delivery	_____wks	

Thank you for your participation

INTERVIEWER:

Name _____signature _____Date [___/___/___]

CHECKED BY SUPERVISOR: Name _____Signature _____ Date [___/___/___]

Lifaaqa 1: Su'aalaha (Questionnaire Somali Version)

JAAMACADA JIMMA

KULIYADA CAAFIIMADKA

WAAXDA IBIDHIMOOLAJIGA

Foomaka xog ururinta loosameeyay in lagu ogaado dumarka lagu sameeyay gudniinka fircoonigaa iyo dhibaatooyinka uu ku keeno xiliga dhalmada marka ay kudhalayaan xarun Caafimaad Deegaanka Ismaamulka Soomalida Itoobiya magalada Jigjiga

Hordhac: Subax wanaagsan/Galab wanaagsan,magacaygu waa _____Waxaan ahay kalkaaliye kashaqeeya cuspitaalkan ana Waxaan kamid ahay Koox Arday Ibidhi-molojistayaal Shahaadada Sare ee Masters ka dhigta Jaamacda Jimma Kuwaaso Daraasad cilmibaadhis kuhawlan. Ujeedada daraasadkan aya waxay tahay in lagu xaqiijiyo xidhiihka ka dhexeeya Gudniinka fircooniga iyo foosha adkaata.Waxaan rumaysanahay inay natiiijada kasoo baxaysa cilmi baadhistan ay gacan ka gaysndoonto tayanta adeega caafimadka hooyoyinka lasiiyo.

Xog dhawrista iyo ogolaanshaha : Waxaad kamidtahay Dumarka loo xushay inay kaqayb qaatan darasadka cilmi baadhista..Waxaan ku su'ali doonaa su'aalo aad uh mid shaqasiyeed. Waxaa kubaanaan inaadan kajawaabin su'asha ama su'alaha kuu cuntami waaya. .Ogalaanshahaaga kaliya ayay kuxidhantay inaan kaqaybqaato,takale waxaa kuu banana inaad kabixi kartid daraasadkan markasta iyadoon wax caqabada ah ku yeelanayn adeega aad cuspitalka ka heshid.Lakiin waxaan kuu xaqiijinayaa in xogtaada ladhawri doono iyadoon wax magaca iyo Sumada lagaa qorayn, kaliya xogtaada loo isticmaali doono daraasad cilimi baadhis oo kaliya.Wax khatar caafimad ah kugu ma yeelan doonto inaad ka qayb qaadatid daraasadkan.Mana laha wax guno kharash ah,lakiin xogta sugan eed bixinayso ayaa ah mid muhiimad uleh inay gacan ka gasato tayaynta adeega caafiaamdka hooyoynka.Waxaan ku rajo waynahay inaad nasiin doonto warbixin sugan.Waanad ku mahadasatnay inaad xogta nasiisid.Hadii ay jirto wax su'all ah way kufurantahay.

Ma kuqanacsantahy inaad ka qayb qaato?"

Haa _____ (Siiwad) maya_____(Umahad celi kadibna jooji)

Qaybta 1: Baadhitaanka Hemogloobiinta

S.No	Booqashada xanaanada hooyada	**Heerka hemogloobiinta (g/dl)**	Taariikhda
Q101	Booqashada 1aad		
Q102	Booqashada 2aad		
Q103	Booqashada 3aad		
Q104	Booqashada 4aad		

Magaca xirfadlaha shaybaadhka_____Saxeexa _____Taariikhda [___/___/___]
Waxaa xaqiijiyay: Magaca _____ Saxeexa _____Taariikhda [___/___/___]

Qaybta2:- War bixin kusaabasan shaqsiga

Tir	Su;aasha	Summada	ka gudub
S201	Da'daadu waa imisa? (T.I.)	_____ Jir/sanadood	
S202	Waa xagee meesha aad dagantahay?	1. Magallo 2. Miyiga	
S203	Waxbarshada halkeed ka gaadhay?	1, Waxaba aan qorin iyo akhrinakhrinaba 2, Wax qori kara akhrina kara Fasalkaad gaadhay _____	
S204	Diinteed haystaa?	1. Muslim 2. Ortodhogos 3. Borotestan 4. Kaatolik 5. Tukale(Cadee)_____	
S205	Qoomiyadeed tahay?	1. Soomali 2. Axmaar 3. Oromo 4. gurage 5. Tukale(Cadee)_____	
S206	Ma guursatay?	1. Wali aan guursan 2. Guursaday/Reer leh 3. Carmal ah 4. Kalatgay 5. Dumaal	
S207	Maxaad ka qashaqaystaa?	1. Marwo 2. Ardayad 3. Xoogsato 4. Ganacsto 5. Shaqaale dawladeed 6. Shaqale aan dawli ahyn 7. Wax kale (Halkan ku qor) _____	

S208	Waa intee dakhliga qooyskiina bishaba?	_____ Birr 1, Wax kharsha ah ma heli 88. Ma garankaro	

Qaybta 3: Xogta Taranka Hooyada ee wakhti hore

Tir	**Su;aasha**	**Summada**	**Ugudub**
S301	Hada ka hor uur ma yeelatey?	1. Haa 2. Maya →	**ugudub,S303**
S302	Ilaa hada Imisa jeer ayaad Uur qaaday/Yeelatay?	Tirada Uur ka_____	
S303	Imisa jeer ayaadse umashay?	Tirada _____	
S304	Imisa jirr ayaad ahayd marki kugu horaysay eed Umusho?	Da'da oo sanad _____	
S305	Waligaa ma umashay ilmo aan shinkiisa(waqtigiisu) gaadhin?	1. Haa 2. Maya →	**ugudub,S307**
S306	Imasa jeer ayaad umashay ilmo aan shinkiisa(waqtigiisa) gaarin	Tirada _____	
S307	Waligaa maad umashay ilmo dhicis ah?	1. Haa 2. Maya →	**ugudub,S401**
S308	Imisa jeer ayaad umashay ilmo dhicis ah?	Tirada_____	

Qaybta 4:- Xogta Taranka Hooyada ee Hada

Tir	Su'aasha	Summada	Ugudub
S401	Uurkan ma mid aad qorshaystay baa?	1. Haa 2. Maya	
S402	Imisa gor ayaad tagtay Daryeelka xanaanada Urkan dhaxdis	Tirada _____	
S403	Mudadii uurkan dhaxdiisa ma lagugu sheegay calamdo cudurka dhiig karka	1. Haa 2. Maya	
S404	Waligaa malagugu sheegay cudurka macaanka ama sonkrowga?	1. Haa 2. Maya	
S405	Wax dhaawac ama shil ah ma lakulantay mudadan uurka? Tusale;Shil baabuur IWM.	1. Haa 2. Maya 88. Ma xuusto	
S406	Waa imasa cabirka dhererka hooyada?	_____Dherarka oh SM	
S407	Wax khamri ah ma cabtay urkan dhaxdiisa?	1. Haa 2. Maya 88. Ma xuusto	
S408	Ilaa xilima ayaad khamrida cabaysay? Hal cadad ah waxay udhigantaa 1, Hal galas oo biir, wayn,Tella,Tej bordi 2, Hal galas oh ARAKE,JIIN,WISKI,Iwm.	1. Maalinkasta 2. 5-6 Jeer Todobaadkiiba 3. 3-4 jeer todobaadkiba 4. 1 jeer todobaadkiiba 5. Bishi hal mar 6. 3-8 jeer mudadii uurkan 7. 1-2jeer mudadi uurkan t 2. Ma xusuusto	
S409	Waligaa jaad maqayishay adoo uurleh?	88. Ma xusuusto	
		1. Maalinkasta	

S410	Ilaa xilimaad qayilaysay jaadka?	2. 5-6jeer todobaadkiiba 3. 3-4 jeer todobaadkiba 4. 1 jeer todobaadkiiba 5. Hal mar 6. 3-8 jeer mudadii Uurkan 7. 1-2 jeeer mudadii uurkan 88. Ma xuusto	

Qaybta 5:- Xogta dhalmada kadib buuxi(Fiiri)

FG: Foomkan waa mid labuuxinayo kadib dhalmada adoo arkaya

Tir	**Su'aasha**	**Dhawrida**	**Ugudub**
Q501	Taariikhda	_____	
Q502	Hab nooce ah ayay ku umushay hooyadu?	1. Dhalmo caadi kutimid → 2. Hooyo ku dhashay si caadiya laakin lagu gargaaray jeexdin yar oo xubinka taranka → 3. Hooyo lagaga dhaliyay qalabka dumarka lagaga umuliyo → 4. Hooyo lagaaga umuliyay qalitaan calaasha ah	**ugudu,S 503**
Q503	Maxaa sababay inay qaliin ku dhasho hooyadu?	1. Foosha oo raagtay ama adkaatay 2. Madaxa ilmaha iyo miskaha hooyada oo kala waynaaday 3. Ilmaha oon usoo dhalanayn sidii caadiga ahayd 4. Kuwo kale (cadee)_____	
Q504	Mudo intee ah ayay qaadatay foosha heerka labaad?	Daqiidaha _____	
Q505	Hooyadu ma leedahay wax dilaaca dhanka xubinta?	1. Haa 2. Maya	
Q506	Dhalmada kadibWax dhiig baxa ma leedhay hooyadu?	1. Haa 2. Maya →	**ugudu,S 503**

Q507	Cadad ka dhiiga kabaxay hooyada	Qiyaastii _____ ML	
Q508	Fooshu may adkayd?	1. Haa 2. Maya	
Q509	Ilmo nolol ma kudhashay	1. Haa 2. Maya	
Q510	Miisanka ilma oo giraam ah?	_____giraam	
Q511	Qiyaasta Apgar 1 daqiiqo kadib	_____	
Q512	Qiyaasta Apgar 5 daqiiqo kadib	_____	

Waan ku mahad celainayaa inaad ka qayb qadato

Qofka warystaha:

Magaca _____Saxeexa _____Tarikhda [___/___/___]

Masuulka hubiyay:

Magaca _____ Saxeexa _____ Tarikhda [___/___/___]

QUESTIONNAIRES –AMHARIC VERSION

በጅማ ዩኒቨርሲቲ የጤና ሳይንስ ኮሌጅ

የኢፒዲሞሎጂ ትምህርት ክፍል

በኢትዮጵያ ሶማሌ ክልላዊ መንግስት ካራማራ ሆስፒታል በእናቶችና በሚወለዱ ህጻናቶች ላይ በደም ማነስ ምክንያት የሚከሰቱ ችግሮችን ለማጥናት የተዘጋጅ መጠይቅ

መግቢያ፡- እንደምን አደሩ ዋሉ አመሹ ስሜ_____ ይባላል እኔ በዚሁ ሆስፒታል የምስራ አዋላጅ ነርስ ስሆነ በተጨማሪም በጅማ ዩኒቨርስቲ የህብረተሰብ ጤና እና ህክምና ሳይንስ ኮሌጅ የኢፒዲሞሎዲ ትምህርት ክፍል የሚማር ተማሪ በሚያካሂደው ጥናታዊ ዳስሳ መረጃ ስብሳቢ ነኝ፡፡ የዚህ ጥናት ዋና አላማ በካራማራ ሆስፒታል በእናቶችና በሚወለዱ ህጻናቶች ላይ በደም ማነስ ምክንያት የሚከሰቱ ችግሮችን ለማወቅ ነው፡፡

ሚስጥርን መጠበቅና የፈቃደኝነት መግለጫ፡፡ እርሶን በዚህ ጥናት እንዲሳተፉ መርጦነዎታል፡፡ የእርሶ ተሳትፎ ሙሉ በሙሉ በፈቃደኝነትዎ ላይ የተመሰረት ነው፡፡ በጥናቱ ላየ መሳተፍ ጀምረው በፈለጉበት ሰዓት የማቋረጥ መብት አለዎት ይህን በማድረግዎ ከሆስፒታሉ ሊያገኙት የሚገባዎትን አገልግት አያጓደልቦትም፡፡ በጣም የግል የሆኑ ጥያቄዎችን መጠይቁ ማካተቱንና የምንጠይቅዎ መሆኑን እንገልጻለን፡፡ ለማይፈልጉት ጥያቄ መልስ ያለመስጠት ይችላሉ፡፡ ሆኖም የሚሰጡንን ማንኛውንም አይነት መልሶች በሚስጢር እንደሚየያዙና ስምዎን ወይም የእርስዎን ማንነት የሚገልጽ ማንኛውም አይነት ነገር እንደማይጻፍ በጣም ሊረዱልን እንፈልጋለን:: ::

እዚህ ጥናት ላይ መሳተፎ በእርሶ ላይ ምነም አይነት ጉዳት አያስከትልም እንዲሁም ምንም አይነት ክፍያም አይከፈሎትም፡፡ ሆኖም በጥናቱ ላይ በመሳተፍ የሚሰጡን ቅንነተ የታከለበት መልስ የችግሩን ደረጃ በትክክል እንድንውቀው ይረዳናል፡፡ በተጨማሪም ከእረሶዎ የምናገኝው መረጃ የእናቶችና ህጻናትን ጤና ለማነልበት ለሚሰሩ ስራወች ይጠቅማል፡፡ ለሚያደርጉልን ትብብር ከወዲሁ እናመሰግናለን፡፡ ጥያቄ አለዎት?

ለመሳተፍ ፈቃደኛ ነዎት?

ፈቃደኛ ነኝ_____ (አመስግነህ ቀጥል) ፈቃደኛ አይደለሁም_____ /ከሆነ አመስግነህ/ሽ እለፍ/ፊ

Section 1: Hemoglobin Assessment

S.No	ANC visit	Haemoglobin level in g/dl	Date
Q101	At first visit		
Q102	At second visit		
Q103	At third visit		
Q104	At fourth visit		

Name of the lab technician _____signature _____Date [___/___/___]
CHECKED BY SUPERVISOR: Name _____Signature _____ Date [___/___/___]

ክፍል ሁለት: የግለሰቧ ማህበራዊና ኢኮኖሚያዊ ሁኔታ

ተ .ቁ	ጥያቄዎች	መልስና ኮድ	እለፍ ወደ
ቁ201	እድሜዎ ስንት ነው?	_____አመት	
ቁ202	በአሁኑ ጊዜ የት ነው የሚኖሩት?	1. ከተማ 2. ገጠር	
ቁ203	ያጠናቀቁት ከፍተኛ የትምህርት ደረጃ ስንት ነው?	1. ማንበብና መጻፍ የማትችል 2. ማንበብና መጻፍ የምትችል ያጠናቀቀችው የትምህርት ደረጃ_____	
ቁ204	ሀይማኖትዎ ምንድን ነው?	1. ሙስሊም 2. አርቶዶክስ 3. ፕሮቲስታንት 4. ካቶሊክ ሌላ/ይገለጽ/_____	
ቁ205	የየትኛው ብሄረሰብ አባል ነዎት?	1. ሶማሌ 2. አማራ 3. አሮሞ 4. ጉራጌ ሌላ/ይገለጽ/_____	
ቁ206	በአሁኑ ሰዓት የትዳር ሁኔታዎ እንዴት ነው?	1. ያላገባች 2. ያገባች 3. አግብታ የፈታች 4. የተለያዩ 5. በሞት የተለየ	
ቁ207	በአሁኑ ጊዜ ስራዎ ምንድን ነው?	1. የቤት እመቤት 2. ተማሪ 3. የቀን ተቀጣሪ 4. ነጋዴ 5. መንግስት ሰራተኛ 6. የግል ድርጅት ሰራተኛ 7. ሌላ/ይገለጽ/_____	

ቁ208	አጠቃላይ የቤተሰብዎ የወር ገቢ ስንት ነው? /በግምት/	_____ኢት ብር 1. ምንም ገቢ የለንም 99. አላውቅም	

ክፍል ሦስት: ቀደምት የስነ ተዋልዶ ሁኔታ

ተ .ቁ	ጥያቄዎች	መልስና ኮድ	እለፍ ወደ
ቁ301	ከዚህ በፊት አርግዘው ያውቃሉ?	1. አዎ 2. አይደለም →	ወደ ቁ 303
ቁ302	ስንት ጊዜ አረገዙ?	የእርግዝና ብዛት_____	
ቁ303	በህይዎት ዘመንዎ ስንት ልጆች ወልደዋል?	የወለዱዋቸው ልጆች ብዛት_____	
ቁ304	በመጀመሪያ ወሊድ ወቅት እድሜዎ ስንት ነበር?	_____ አመት	
ቁ305	በወሊድ ወቅት የሞተቡት ወይም ሞቶ የተወለደ ህጻን ነበሮት?	1. አዎ 2. አላጋጠመኝም →	ወደ ቁ 307
ቁ306	መልስዎ አዎ ከሆነ ለምን ያህል ግዜ ነው ያገጠሞት?	_____ ግዜ	
ቁ307	በህይወት ዘመንዎ ውርጃ ኣጋጥሞት ያውቃል?	1. አዎ 2. አላጋጠመኝም →	ወደ ቁ 401
ቁ308	መልስዎ አዎ ከሆነ ለምን ያህል ግዜ ነው ያገጠሞት ?	_____ ግዜ	

ክፍል አራት: በአሁኑ እርግዝና ወቅት የነበሩ ሁኔታዎች

ተ .ቁ	ጥያቄዎች	መልስና ኮድ	እለፍ ወደ
ቁ401	የአሁኑን እርግዝና አቅደውበት ነበር	1. አዎ 2. አላቀድኩበትም	
ቁ402	በዚህ የእርግዝና ወቅት የቅድመ ወሊድ ክትትል ስንት ግዜ አድርገዋል ?	_____ ግዜ	
ቁ403	በዚህ እርግዝና ወቅት የደም ግፊት ለቦት ተብለው ነበር ?	1. አዎ 2. አልተነገረኝም	
ቁ404	በዚህ እርግዝና ወቅት የስኳር በሽታ እንዳለቦት ተነግሮዎታል?	1. አዎ 2. አልተነገረኝም	
ቁ405	በዚህ እርግዝና ወቅት አደጋ ለምሳሌ ግጭት መውደቅ አገጥሞት ነበር ?	1. አዎ 2. አላገጠመኝ 99. አላስታውስም	
ቁ406	የናትየው ቁመት ምን ያህል ነው ?	_____ ቁመት በሴሜ	
ቁ407	በእርግዝናሽ ወቅት አልኮል መጠጥ ትጠቃሚ ነበር?	1. አዎ 2. አልተጠቀምኩም →	ወደ ቁ 409
		99. አላስታውስም	
ቁ408	መልስዎ አዎ ከሆነ በየስንት ግዜ ነበር የምትጠጪው? አንድ መለኪያ አልኮል ማለት 1. አንድ ጠርሙስ ቢራ ,ወይን ,ጠላ,ጠጅ 2. አንድ መለኪያ አረቄ, ጅን ውስኪ የመሳሰሉ	_____ግዜ በየቁኑ _____ግዜ በሳምንት _____ግዜ በወር _____ግዜ በእርግዝና ወቅተ 99. አላስታውስውም	
ቁ409	በእርግዝናሽ ወቅት ጫት ትቅሚ ነበር ?	1. አዎ 2. አልቅምም →	የመጠይቁ ማብቂያ
		99. አላስታውስም	
ቁ410	መልስዎ አዎ ከሆነ በየስንት ግዜው ነበር የምትቅሚው?	_____ግዜ በየቁኑ	

		_____ግዜ በሳምንት _____ግዜ በወር _____ግዜ በእርግዝና ወቅት 99. አላስታውስውም	

Section 5:- Information on delivery outcome (Observational)

Notes: This observational checklist should be filled at the end of delivery

S No	Question	Observation	Skip to
Q501	Date of delivery	_____	
Q502	What was the mode of delivery	5. Spontaneous vaginal delivery → Go to Q503 6. Spontaneous vaginal delivery assisted by episiotomy → Go to Q503 7. Instrumental delivery → Go to Q503 8. Cesarean section	
Q503	What was the indication for caesarean section?	5. Prolonged/Obstructed labor 6. Cephalopelvic disproportion 7. Foetalmalpresentation 8. Other (specify) _____	
Q504	What was duration of second stage of labor?	Duration in mints_____	
Q505	Is there Postpartum blood loss?	3. Yes 4. No → Go to Q507	
Q506	Amount of blood lose	_____estimated volume in ML	
Q507	Is the labor obstructed?	3. Yes 4. No	
Q508	Is the child born alive?	3. Yes 4. No	
Q509	Birth weight of the baby in grams?	Weigh in gram _____	
Q510	Apgar score at 1 minute	_____	
Q511	Apgar score at 5 minute	_____	
Q512	Gestational age at delivery	_____wks	

Thank you for your participation

INTERVIEWER:

Name _____signature _____Date [___/___/___]

CHECKED BY SUPERVISOR: Name _____Signature _____ Date [___/___/___]