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Birth Weight for Gestational Age and Associated factors Among Neonates Born Atpublic Health Facilities in Bahir Dar City, Northwest Ethiopia

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BAHIR DAR UNIVERSITY
COLLEGE OF MEDICINE AND HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF REPRODUCTIVE HEALTH AND
POPULATION STUDIES

BIRTH WEIGHT FOR GESTATIONAL AGE AND ASSOCIATED
FACTORS AMONG NEONATES BORN AT PUBLIC HEALTH
FACILITIES IN BAHIR DAR CITY, NORTHWEST ETHIOPIA

BY: ABAYNEH CHEKOL (BSc)

A THESIS RESEARCH SUBMITTED TO THE DEPARTMENT OF
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Abstract

Background: Birth weight and duration of gestation are important indicators to predict the future health and survival of newborns. Inappropriate birth weight-for-gestational age can be small-for-gestational-age or large-for-gestational-age. Eventhough inappropriate birth weight for gestational-age is the major cause of neonatal mortality and morbidity little is known about the risk factors. In previous studies, a large birth weight for gestational age was analyzed as normal weight, and this could have resulted in biased estimates.

Objective: To assess birth weight for gestational age and associated factors in neonates born at Public Health Facilities in Bahir Dar City, Northwest Ethiopia, 2020.

Methods: Institution based cross-sectional study was conducted among 731 neonates from November 28, 2020 to January 1, 2021. Participants were selected using systematic random sampling technique. A pre-tested interviewer administrative questionnaire was used. Data were entered into Epi data version 3.1 and exported to SPSS version 23 for further analyses. A multinomial logistic regression model was fitted to identify the associated factors. Variables with P-value <0.05 in multivariable analysis was used to declare as statistically significant. The odds ratio (OR) with at 95% confidence interval (CI) was used to measure the strength of association.

Results: Over all, inappropriate birth weight for gestational age was 36.9% (95% CI: 33.4%-40.4%). Small for gestational age and large for gestational age was 23.8 % (95%CI: 20.7%-26.9%) and 13.1 % (95% CI: 10.5%-15.5%) respectively. Neonates whose mothers' rural resident (AOR= 2.21, 95% CI: 1.37-3.58), being female (AOR=1.46, 95% CI: 0.99-2.05), and whose mothers had took additional food during index pregnancy (AOR=0.63, 95% CI:0.44-0.91) were more likely to be small for gestational age, neonates whose mothers had medical illness during index pregnancy(AOR =2.32, 95% CI: 1.13-4.77), were more likely to be large for gestational age.

Conclusion: The proportions of small-for-gestational-age and large-for-gestational-age were high. Rural resident, being female and took additional food during the index pregnancy were associates of small for gestational age and medical illness during the index pregnancy were assocaites of large birth weight. Health Care Professionals should give nutritional advice for rural residence women during antenatal care

Keywords: -Small, large, gestational age, birth weight, Bahir Dar city

Abbreviation and Acronyms

ABGA	Appropriate Birth Weight for Gestational Age
ANC	Antenatal care
AOR	Adjusted Odds Ratio
APGAR	Appearance, Pulse, Grimace, Activity and Respiration
BMI	Body Mass Index
CI	Confidence Interval
COR	Crud Odds Ratio
DM	Diabetes Mellitus
EDHS	Ethiopian Demographic and Health Survey
IBWGA	Inappropriate Birth Weight-for-GestationalAge
IUGR	Intrauterine Growth Retardation
LBW	Low Birth Weight
LGA	Large-for-Gestational Age
LMIC	Low and Middle-Income Countries
MAS	Meconium Aspiration Syndrome
MUAC	Mid Upper Arm Circumference
SDG	Sustainable Development Goal
SGA	Small-for-Gestational Age
SPSS	Statistical Product and Social Sciences
UNICEF	United Nations Children’s Fund
WHO	World health Organization

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1. Introduction

1.1 Background

Birth weight and duration of gestation are important indicators to predict the future health and survival of newborns. Birth weight is the first weight recorded after birth, ideally measured within the first hours after birth, before significant postnatal weight loss has occurred(1). Inappropriate birth weight-for-gestational age (IBWGA) can be small-for-gestational age (SGA) and large-for-gestational age (LGA). Neonates in the $\leq 10^{\text{th}}$ percentile of birth weight given their gestational age were considered to be small for gestational age (SGA), those in the $\geq 90^{\text{th}}$ percentile to be large for gestational age (LGA), and the remainder was considered to be appropriate for gestational age (AGA)(2).

Infants born with low birth weight (LBW) are highly vulnerable to childhood infection and under-nutrition (3) , and they are more prone to non-communicable diseases such as diabetes and cardiovascular diseases which have high rates of morbidity and mortality. LBW can arise as a result of a baby being born too soon or too small for gestational age. Babies born prematurely, who are also small for their gestational age, have the worst prognosis (4).

In low- and middle-income countries (LMIC) SGA/low birth-weight stems primarily from poor maternal health and nutrition. Three factors have the most impact: poor maternal nutritional status before conception, mother's short stature (due mostly to under-nutrition and infections during childhood), and poor nutrition during pregnancy (4).The majority of low birth weight in developing countries is due to intrauterine growth retardation(IUGR), while most low birth weight in industrialized countries is due to preterm birth (5, 6).

From 1999 to 2016 under-five mortality was reduced by 62% but neonatal mortality is only decreased by 49%, so neonatal mortality take great share from under-five mortality is increasing. Neonatal mortality is still unacceptably high in Sub Saharan Africa (SSA) including our country Ethiopia(4).One of the main priorities of sustainable development goal 3 (SDG) is continues reduction of neonatal mortality(7).

1.2 Statement of the problem

Globally, low birth weight accounts 60% to 80% of neonatal death (8). Low birth weight is a still continued global public health problem and it has an association both short term and long term health impact(9).In 2015, about 20.5 million newborns, an estimated 14.6 % of all babies born globally that year, suffered from low birth weight(10).Globally, the prevalence and burden of inappropriate birth weight for gestational age neonates are increased (11).The prevalence of LBW in 2015 was estimated to be in worldwide (14.6%), and SSA (14.0%)(12). WHO estimates that worldwide, 15-20 % of all births each year are considered LBW, which is about 20 million births(13).As far as LBW prevalence rates changing over time, there has been a slight decrease from 7.9% (1970) to 6.8% (1980), then a slight increase to 8.3% (2006), to 8.2% (2016)(14).

Most low birth weight occurs in LMICs, however it is also a public health problem in some high income countries like Spain, the United Kingdom of Great Britain(UK) and the United States of America (USA) (9). The birth weight of a baby is notable because very low birth weight babies are 100 times more likely to die compared to normal birth weight babies(14).In LMICs more than 23 million (19%)neonates were SGA (22% of them were dying) (15). More than 96.5% of low birth weight babies are born in developing countries around the world(16).

The prevalence of LBW in Africa, Asia, and Latin America accounts 38%, 34%, and 9% respectively (17).The prevalence of LGA in East African countries was 16-34% with approximately 33.3 % of preterm LGA death(15, 18). In SSA, the SGA neonates were 16.5%, since two third of LBW babies and 26-28.7% of neonatal mortality (up to 58.3% preterm SGA death)(16).

According to WHO and UNICEF in 2015 the prevalence of low birth weight in developing countries; Mauritania, Yemen, Pakistan, Sudan and including Ethiopia are higher. The prevalence of LGA neonates accounts 10% of all newborns and SGA was twice the prevalence of LBW and death of their AGA(19).LGA neonates experience higher rates of acute perinatal complications than their appropriate-weight counter parts, including neonatal hypoglycemia, shoulder dystocia, and admission to the neonatal intensive care unit(20).According to WHO's 2014 estimation, 4.53% of total deaths in Ethiopia were due to LBW(21). Hence, by the end of

2025, World Health Assembly(WHA) set a policy target to reduce LBW by 30%(17).LBW newborns have a higher risk of dying in the first 28 days of life. Those who survive are more likely to suffer from stunted growth and lower intelligence quotient (IQ)(22).

According to the Ethiopian Demographic and Health Survey (EDHS) report, 23% of babies born in the rural setting were LBW. Neonatal mortality decreased from 39 to 29 between the 2005 and 2016 EDHS, but has remained stable since the 2016 EDHS(23). By 2030, end preventable deaths of newborns and children under five years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1000 live births and under-five mortality to at least as low as 25 per1000 live births(24).

Infants born LGA have an increased lifetime risk of obesity, diabetes, chronic disease(25).In-depth analyses of the EDHS of 2011 showed that 29.3% of new born in Ethiopia were LBW, indicating a major public health problem of the country(17). According to Amhara regional Health Bureau low birth weight is the major cause of neonatal mortality.

The government of Ethiopia also incorporates the issue of low birth weight reduction in its five-year growth and transformation plan II.In Ethiopia LBW is among the leading causes of neonatal morbidity and mortality.In Ethiopia, there are some studies about SGA but not on LGA, which mean that they considered large birth weight as normal birth weight, however, large baby weight is the one major cause for obstructed and prolonged labor resulting still birth and maternal mortality. Therefore, the aim of this study is to assess the proportion and associated factors of inappropriate birth weight for gestational agein the study area. Thus, identifying the associated factors of inappropriate birth weight is important and may provide insights into how to reduce modifiable risk factors of neonatal morbidity and mortality and improve their survival.

1.3 Significance of the study

This study is important to provide crucial information about the proportion and modifiable associated factors of the low birth weight for gestational age and large birth weight for gestational age neonates born at Bahir Dar city. This should help to reduce neonatal morbidity, mortality, and as well as predisposing factors to chronic disease in later life in Amhara region at Bahir Dar City public health facilities.

Therefore, preventing this risk by identifying modifiable risk factors will benefit many stakeholders. First; this study will help to improve maternal and neonatal health by showing to mothers, their major modifiable risk factors associated with low birth weight for gestational age and large weight for gestational age babies.

This study will help to governmental and non-governmental bodies who are working on maternal and child health to put emphasize on prevention and treatment of complications following inappropriate birth weight for gestational age babies early. Finally, the result of this thesis will also serve as one reference for further similar studies.

2. Literature Review

2.1 Proportion of birth weight for gestational age

A systematic and meta-analysis research in Iran showed that the prevalence of LBW was 7.95%. The prevalence of LBW in girls and boys was 8.14% and 6.67% respectively(26). In 2010 32.4 million babies were born SGA in low- and middle-income countries, constituting 27% of all live births. India has the world's largest number of SGA births, 12.8 million in 2010, due to the large number of births and the high proportion, 46.9%, of births that are SGA(27). The prevalence of low birth weight in Iran was 9.4%(28). The study conducted in Thailand show that, the prevalence of SGA was 2.6% and LGA was 10.5%(29). The prevalence of macrosomia in India was 23.2%(30).The prevalence of low birth weight was 8.2% in Ghana(31) and the frequency of small-for-gestational-age new borns in Brazil was 17.9% (32).

Studies in Ethiopia show that the time-trend analysis showed that the prevalence of LBW is decreased from 55.9% in 1989 to 10.4% in 2017, the prevalence of term low birth weight was 10% in Adwa(33). A systematic review and meta-analysis study in Ethiopia show that the prevalence of LBW was 17.3%(34), Tigray (14.6 %)(35),northwest Ethiopia 14.9%(36) magnitude of low birth weight in Dangla was 10.3 %(37) and in Jimma University Specialized Hospital the prevalence of LBW,AGA and SGA was 14.6%,68.9% and 30.5% respectively(38).The prevalence of inappropriate birth weight for gestational age at Dessie referral hospital was 34.6%(39). The incidence of LBW in Kersa,Oromia regional state was 28.3%(40).The incidence of macrosomia and low birth weight in Tigray region were 6.68% and 10.5%respectively(41).

2.2 Associated factors of birth weight for gestational age

2.2.1 Socio-demographic related factors

Age

Studies show that LBW babies mostly come from the mother of age <18 and >30 years old (26, 42),and maternal age < 20 years were identified factors of LBW (34).The prevalence of having small size babies varied inversely and significantly across maternalage groups. As the maternal age group increasedfrom 15-19 to 45-49, the risk of having small sizebabies declined(43).

Marital status

A woman who was unmarried marital status was positively associated with low birth weight(38). A study in Tigray region show that early marriage (<18 years) was the predictors of low birth weight(41).

Occupation

From the maternal occupation housewife occupation was a factor that significantly affects neonatal birth weight(26). A study found in northwest part of Ethiopia that neonates born from employed mothers were less likely to be born with below normal birth weight(36).

Residence

Studies in Iran identified that rural residence was predictors of LBW (26, 28). Similarly in Ethiopia Tigray region show that living in rural area affects neonatal birth weight(41). In Brazil, newborns from rural areas had a higher prevalence of very low-birthweight, low Apgar score, and malformation(44).

Income

Neonatal birth weight was significantly affected by family income, financial poverty mothers gave LBW neonates(45). Studies show that LBW neonates mostly come from the mother belongs to the family of below-average per capita yearly income(26, 42) and poverty (40).

Educational level

Studies show that LBW babies mostly come from the mother of without education or low maternal educational level (26, 28, 42). In Iran the neonatal birth weight was significantly affected by low maternal education levels(45). In Ethiopia maternal literacy level, not educated, was also statistically associated with the size of babies at birth. As the maternal literacy level improved from none to partially or fully able to read and write, the probability of having small size babies significantly declined by 19% and 22% respectively(43).

2.2.2 Maternal Obstetrics and Gynecological related factors

Parity and Gravida

A study in southern India showed that frequency of LBW babies had a significant association with mother's prim(46). Studies show that multiparity and twinning significantly associated with

LBW(47), but null parity was not a factor of macrosomia neonates(48).Prim parity and multiple pregnancies were associated with birth weight for gestational age (49).

Type of pregnancy

A study in Iran showed that unwanted pregnancy and caesarian section was not a factor of macrosomia neonates(48).The study in Kersa showed that, pregnancy interval < 24 months(40),spacing less than 36 months significantly associated with low birth weight(49).

Mode of delivery

Newborns who were born from delivery by cesarean section, delivery by an obstetrician, were more frequent in LBW than normal birth weight(28).

ANC follow up

The factors associated with the birth weight of babies were inadequate prenatal care(32),lack of proper prenatal care(50, 51), less than 4 ANC visits, and inadequate or late commencement of antenatal care(49).However, in Southern India, the mother's number of antenatal visits had no significant relation withlow birth weight(46). In Colombia weight gain and the absence of prenatal care were among the factors associated with low birth weight(52).

In Ethiopia, a woman not attending ANC follow-up was significant affected neonates birth weight (40, 41).Study in Assossa and Pawi, northwest Ethiopia absence of ante-natal care follow-up was a predisposing factor to LBW(36). In the same way,pregnant women not attending ANC reported 40% higher risk of small-sizebabies than those who attended at least onceduring the immediate pregnancy(43).

Previous history

Cohort study in Italy showed that, the odds of being born SGA were greater in the offspring of mothers who had a previous miscarriage(53).The factors associated with the birth weight of babies were positive history of another small-for-gestational-age child(32).

In Ethiopia, a previous history of LBW was independent predictors of low birth weight (37) and macrocosmic birth history was the main predictor of macrosomia(48). Previous SGA baby, and previous preterm birth were associated with LBW (30, 49).

Maternal weight, height, MUAC and BMI

A study conducted in Thailand showed that pre-pregnancy BMI and gestational weight gain were significantly higher in the LGA than in the SGA group. Inadequate and excessive gestational weight gain significantly increased the risk of SGA and LGA respectively. However inadequate gestational weight gain reduced the risk of LGA(29). Higher maternal pre-pregnancy BMI is associated with increased newborn adiposity(54). In India, higher pre-pregnancy BMI, and more gestational weight gain were significant risk factors for macrosomia neonates(30).

Studies show that women who had less than 18.5 kg/m² BMI(40), short maternal stature (less than or equal to 157 cm), underweight pre-pregnancy BMI, inadequate weight gain/ weight gain less than 60kg(49), and MUAC less than 23 cm were more likely to give birth to LBW babies than their counterparts(40, 47). A study in Tigray region showed that high BMI was the main predictor of macrosomic neonates(41).

2.2.3. Maternal medical illness-related factors

Diabetes mellitus

In Australia babies born to women with type 1 diabetes have significantly higher rates of being LGA, macrosomia, and neonatal hypoglycemia(55). In Iran gestational diabetes the main predictor of macrosomia neonates(48).

In northwest Ethiopia study found that a significantly higher risk of developing adverse neonatal outcomes among newborns from gestational diabetes mellitus mothers was observed for macrosomia and large for gestational age. The incidence of composite adverse neonatal outcome was significantly higher among newborns from mothers with gestational diabetes mellitus (51.7%) than among newborns without gestational diabetes mellitus (25.8%)(56).

Infection

In Greece low birth weight is associated with nosocomial infection (57). Infection were more susceptible to small for gestational age (49). Presence of periodontal disease(49), maternal infection(50, 51), and malaria infection the during period of pregnancy was significantly associated with low birth weight(47). In northwest Ethiopia study found amalaria attack during pregnancy was predisposing factors to low birth weight(36).

Pre-eclampsia/ eclampsia

Studies in Iran show that the birth weight of the neonate is affected by complications of pregnancy pre-eclampsia(50, 51).Hypertensive disorders of pregnancy (preeclampsia, chronic hypertension(49),andwas associated with birth weight.

In Italy shows that the odds of being born SGA were greater in hypertensive mothers and the odds of being born LGA were greater in gestational diabetes mothers (53).A study in Iran show that preeclampsia in the pregnancy period due to diabetes were the main predictors of macrosomia but hypertension was not a factor of macrosomia neonates(48).

HIV/AIDS

Women with HIV significantly associated with birth weight (58).A meta-analyses of prospective cohort study show that maternal HIV infection is associated with an increased risk of preterm birth, low birth weight, small for gestational age and still birth. Retrospective cohort studies also suggest an increased risk of term low birth weight and preterm low birthweight(59).

Anemia

Anemia during pregnancy associated with birth weight (49). In Ethiopia, anemic mothers whose hemoglobin level was <11 during pregnancy had 15% more risk of giving small sized babies than non-anemic mothers(43).Study found that anemia during pregnancy was predisposing factors to low birth weight(36).

2.2.4 Behavioral factors

Smoking

Study show that the odds of being born SGA were greater in the offspring of mothers who smoked tobacco during pregnancy,and the odds of being born LGA were greater in those born to mothers with who did not smoke during pregnancy(53).In 2014, 13% of children exposed to smoke were born with low birth weight compared with 7.5% of those children born to non-smokers(14). Another study found that, smoking during the last pregnancy was significantly affects neonatal birth weight (32, 50, 51). Study found that smoking, and pollutant exposures was associated with birth weight(49).

Physical violence

Studies found that mother's experience of physical violence during pregnancy(40), and intimate partner violence(49) were significantly affects neonates birth weight(37).

Alcohol drinking

In Ghana study showed that, mothers who consumed alcoholic beverages, those who had food taboos during pregnancy, and not having additional meals during pregnancy the risk of giving birth to a LBW baby was high (31).

Additional food intake

Studies found that, additional food intake during the last pregnancy,were significantly affects neonates birth weight(37).Study in Dangla, Amhara regional state, additional food intake during the last pregnancy was independent predictors of low birth weight (37).

Iron and folic acid supplementation

Study found that lack of iron supplementation during pregnancy was predisposing factors to low birth weight(36).

2.2.5 Neonatal related factors

Neonatal sex

Studies revealed that female neonates was associated with birth weight(28, 32), the girls to boys odd ratio of LBW was 1.25 times higher(26).Being female neonates was more susceptible to small for gestational age(49).Study in India show that male infant were significant risk factors for macrosomia(30), while in Southern India sex of child had no significant relation with low birth weight(46).Female babies had low birth weight compared to male babies. In South Africa, male infants were less likely to be LBW(58).In Ethiopia, female sex was associated with LBW while having male neonate was predictors of macrosomia(41).

Prematurity

Seventy (57.8%) of all low birth weight neonates were term births. In Tigray region, prematurity was associated with low birth weight and post-maturity was the predictors of macrosomia neonates(41).Neonates born from preterm labor frequently associated with LBW(28, 49-51) and being preterm were predisposing factors to LBW(36).Similarly in Dangla primary hospital

preterm delivery was the independent predictors of low birth weight (37).The occurrence of LBW was 61.9%, 14.3% and 9.4% among the preterm, term and post-term neonates respectively(60).

Congenital abnormality

Congenital anomaly were more susceptible to small for gestational age (49). Studies in Iran show that the birth weight of the neonate is affected by complications of pregnancy such as, IUGR(50, 51). In Latvia the neonatal mortality risk was significantly higher in the cases of neonatal LBW and congenital abnormalities(61).

2.3 Conceptual framework

Factors affecting birth weight

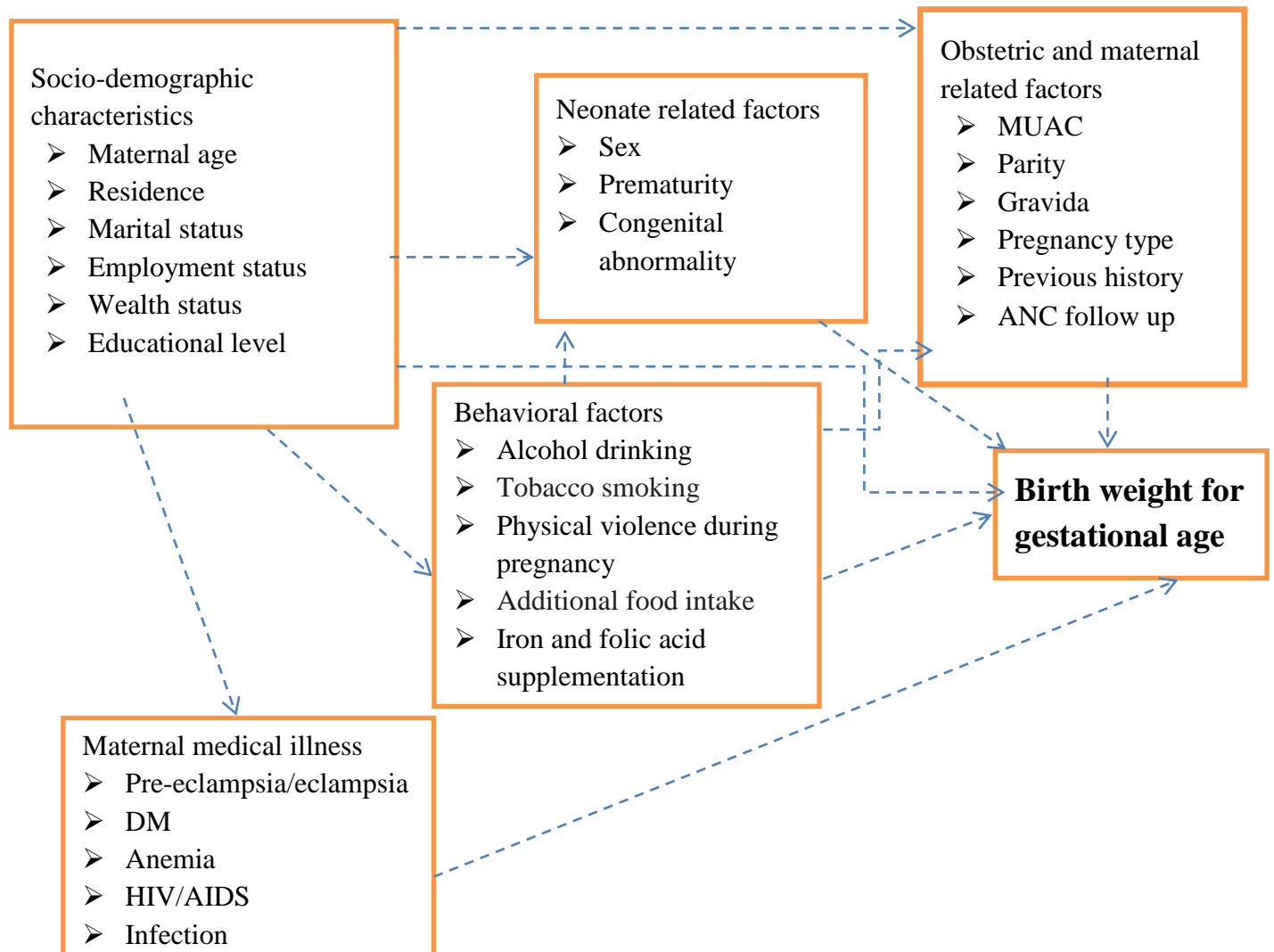


Figure 1:- Conceptual frame work for birth weight for gestational age

[33-36, 40, 48]

3. Objectives

3.1 General Objective

- To assess birth weight for gestational age and associated factors among neonates born at Bahir Dar city Public Health Facilities, Northwest Ethiopia, 2020

3.2 Specific Objectives

- To determine the proportion of small birth weight for gestational age, appropriate birth weight for gestational age and large birth weight for gestational age among neonates born at Bahir Dar city Public Health Facilities, Northwest Ethiopia
- To identify factors associated with small birth weight for gestational age among neonates born at Bahir Dar city Public Health Facilities, Northwest Ethiopia
- To identify factors associated with large birth weight for gestational age among neonates born at Bahir Dar city Public Health Facilities, Northwest Ethiopia

4. Methods

4.1 Study area and Period

The study was conducted in Bahir Dar city Public Health Facilities from November 28, 2020 to January 1, 2021. In Bahir Dar city is a capital city of Amhara regional state, found in northwest Ethiopia, 565 Km far from Addis Ababa; capital city of Ethiopia. In 2020 the total population is more than 389,177; of this 49.5% male and 50.5% females.

Bahir Dar city, there are three hospitals; one general (Addis Alem) and two referral hospitals (Felege Hiwot Comprehensive and Referral Hospital (FHCRH) and Tibebe Gion Comprehensive and teaching Hospital (TGCTH)), ten health centers. A Bahir Dar city public health facility serves for more than 5 million populations.

According to Amhara regional health bureau report for the last six month 4596 neonates were born in FHCSH(2695), Han(364), Shimbt(163), and Bahir Dar(1374) health center(62).

4.2 Study Design

An institution based cross-sectional study was conducted

4.3 Population

4.3.1 Source population

All newborn neonates at Public Health Facilities in Bahir Dar city

4.3.2 Study population

All neonates born the time between November 28, 2020 to January 1, 2021 at selected Public Health facilities.

4.4 Inclusion and exclusion criteria

4.4.1 Inclusion criteria

All live neonates born at public health facilities in Bahir Dar city were included.

4.4.2 Exclusion criteria

A mother who has unable to communicate and severely ill women were excluded.

4.5 Variables of the Study

4.5.1 Dependent variables

Birth weight for gestational age (SGA, Appropriate birth weight, LGA)

4.5.2 Independent variables

- Maternal socio-demographic characteristics including; age, residence, marital status, employment status, monthly family income, and educational level
- Obstetric and maternal behavior related factors including; Previous history, MUAC, parity, gravida, type of pregnancy, iron and acid supplementation, and ANC follow up
- Demographic characteristics of the newborn; age, sex, prematurity, congenital abnormality
- Maternal medical related factors, Anemia, HIV, DM, Pre-eclampsia/eclampsia and infection

4.6 Operational definition and term definitions

Appropriate birth weight for gestational age: - Newborns' birth weight for gestational age between 10th and 90th percentiles recorded on maternal chart that fulfills the cross checking by using hospitals' birth weight for gestational age reference graph(2).

Small birth weight for gestational age: - Newborns' birth weight for gestational age below 10th percentiles recorded on maternal chart that fulfills the cross checking by using hospitals' birth weight for gestational age reference graph(2).

Large birth weight for gestational age:- Newborns' birth weight for gestational age above 90th percentiles recorded on maternal chart that fulfills the cross checking by using hospitals' birth weight for gestational age reference graph(2).

Alcohol use: a mother who took any unit of alcohol during the current pregnancy such as locally prepared alcoholic drinks (Tela, Teje, Areke), beer, wine or any alcoholic-liquors beverages.

4.7 Sample size determination and sampling procedure

4.7.1 Sample size determination

The sample size for the first objective was determined for both small for gestational age and large for gestational age by using single population proportion formulas by considering 95% confidence level, 5 % marginal error and 34.6 % the prevalence of inappropriate birth weight for gestational age(39).

Where; n=desired sample size

$Z_{\alpha/2}$ = the value of standard score at 95% confidence level (1.96),

P= proportion of inappropriate birth weight for gestational age(34.6%),

d= marginal error= 5% (0.05)

$$n = \frac{(Z_{\alpha/2})^2 PQ}{d^2} = \frac{(1.96)^2 (0.346)(1-0.346)}{(0.05)^2} = \frac{(3.8416)(0.232824)}{(0.0025)} = 347.72 \approx \underline{348}$$

Then by adding 10% to compensate for non-response (348*10%=34.8≈35) design effect 2(348*2=696). Finally, the adjusted sample size was 696+35=731

Sample size for objective two was determined by using Epi info version 3.1 considering the following assumptions: 95% confidence level, and power 80%. Factors will be taken from explore previous studies conducted.

Table 1:-Sample size determination using associated variables of birth weight in Bahir Dar city Public Health Facilities, Northwest Ethiopia 2020

Variables	% of outcome exposed	% of outcome in unexposed	AOR	Sample size
Anemia	21.0%	9.0%	2.69	308(36)
Maternal age ≥35 year	48.8	31.3%	2.079	272
Maternal anemia	48.7%	33.3%	2.001	296

Therefore the adjusted sample size to assess the prevalence and associated factors of inappropriate birth weight for gestational age was 731.

4.7.2 Sampling technique and procedure

Multistage sampling technique was used. There are three public hospitals and ten health centers in Bahir Dar city. By lottery method one hospital and three health centers were included. The calculated sample was allocated proportionally based on the population of newborn neonate's in the study period. Systematic random sampling technique was used to select study participants. To determine K^{th} value one month total number of neonates prior to data collection was used. Then the total study population was divided by the sample size means that $1532/731$ is equal to 2, it means K-value. Then by using lottery method 2 is voted up by third person to avoid selection bias. Finally every other neonate was included.

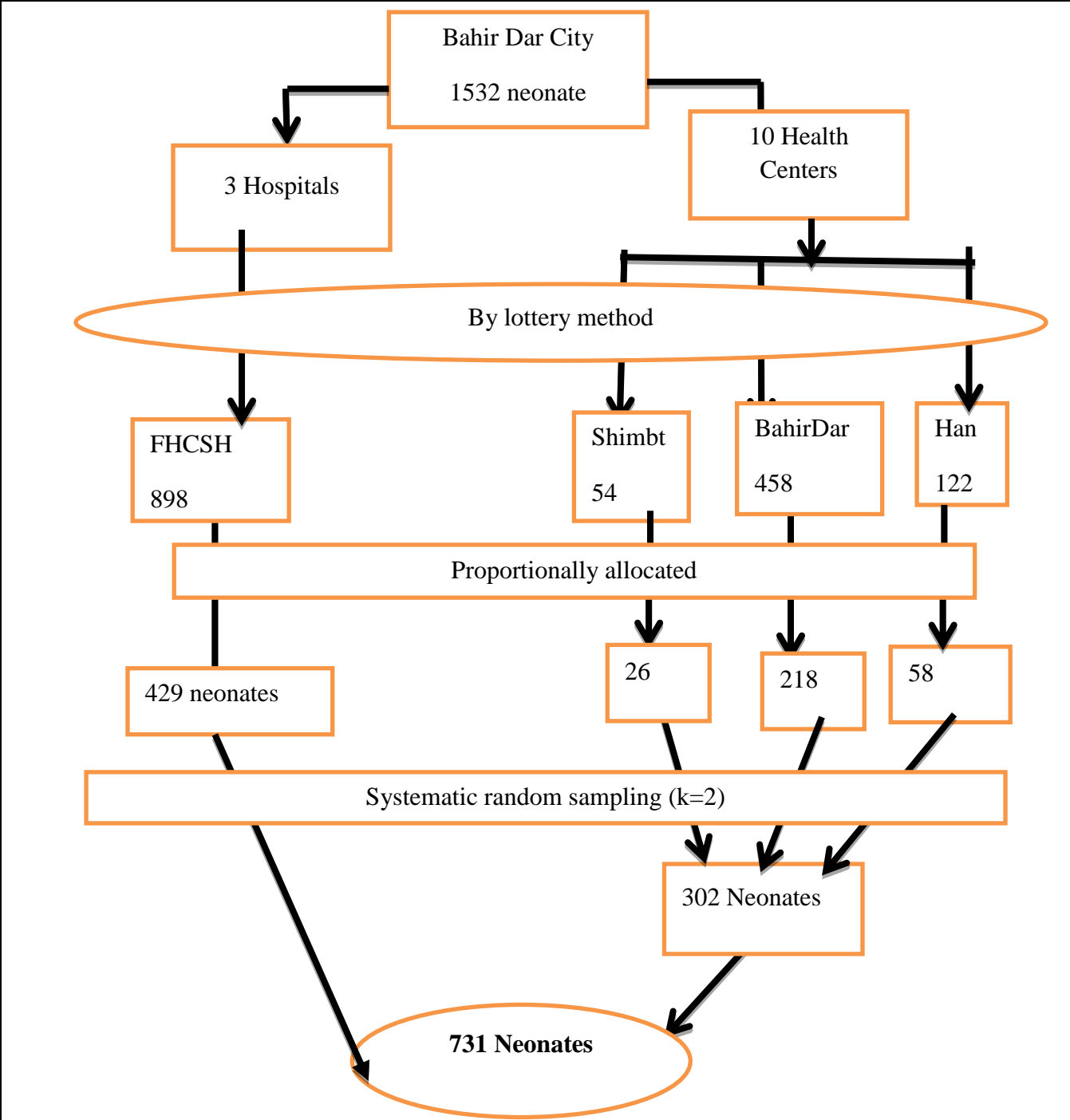


Figure 2:- Schematic presentation of sampling procedure

4.8 Data collection tools and Procedures

Data were collected by using structured pre-tested questioner and checklist from the mothers and her neonate charts. The Amharic language version questionnaires and English language version checklist was used that developed from different pieces of literature (34-37, 41, 47). The questionnaire and checklist contain; maternal and neonatal socio-demographic, maternal obstetrics and gynecological factors, maternal medical illness, behavioral and neonatal related factors. Four diploma Nurses data collectors and two BSc Nurses supervisors were carrying out the data collection by giving training before 3 days of data collection. After took training the trained data collectors collect valuable data and supervisors carried out supervision. The interview took 20-30 minute.

4.9 Data quality control

Before the actual data collection, the data collectors and supervisors were trained intensively on the contents of the tools, collection methods, and ethical issues. Therefore; data collectors become familiar with the questionnaire. The questioner was translated from Amharic to English and back to Amharic to maintain consistency.

Five percent of the sample was pre-tested and the questionnaire was modified and edited based on the findings. During data collection, both the supervisors and the principal investigators checked the data for its completeness and missing information at each point. Further more, data were checked during entry and compilation before analysis.

4.10 Data Processing and Analysis

The collected data were entered into EPI data version 3.1 software, and exported to SPSS version 23 software packages for analysis. Descriptive statistics was used to summarize the data in the form of frequency, mean, standard deviation (SD), and cross-tabulation. A multinomial logistic regression analysis was carried out to identify the association between the outcome variable and independent variables.

A p-value <0.05 was considered statistically significant. Adjusted odds ratio (AOR) with 95% confidence intervals (CI) was used. The fitness of the model was tested by Chi-Square (130.515) and the p-value was 0.873.

The wealth index was analyzed by principal component analysis (PCA); the rural and urban residencies were separately analyzed. For rural a total of two factors (mobile, and bed), which explained 65.0% of the variance, were extracted based on the (Kaiser-Meyer-Olkin test=0.53; all communalities >0.5). For urban a total of four factors (house owner, toilet, main source of cooking and, Refrigerator), which explained 65.3% of the variance, were extracted based on the (Kaiser-Meyer-Olkin test=0.788; all communalities >0.5). Finally, the wealth status was categorized into three groups; rich, medium and poor.

4.11 Ethical Consideration

Ethical clearance was obtained from the Institutional Review Board (IRB) of College of Medicine and health sciences, Bahir Dar University, Ethiopia. Then legal official letters were written to the Ethiopian public health institute (EPHI). Finally, a legal official clearance letter was written for all health facilities.

Confidentiality was secured by avoiding writing the client's name and the data was not shared with the third persons except the advisors. The interview and data extraction were conducted in a separate room. Moreover, confidentiality was secured during analyzing and reporting.

4.12 Dissemination of the Result

The plan of dissemination of this thesis result includes a presentation at Bahir Dar University College of Medicine and Health Sciences, Research Conferences. The report paper will also be disseminated to, Bahir Dar city health administration and regional health bureau. Publication in Scientific journal and online dissemination will also be considered

5. Result

5.1 Socio-demographic characteristics of the participants

A total of 715 participants with a response rate of 97.8% were included in the study. The neonates' maternal mean age was 27.23 ± 4.91 years (Mean \pm SD) with a range of 17-44 years. About 382(53.4%) of neonates whose mothers age were below the mean age, and 70(9.8%) were younger than 20 years. Almost all neonates mothers, 685(98.5%) were married, 503(70.3%) were housewives, 614(85.9%) were urban residents, and 80 (11.2%) were can't read and write. Three hundred fifty nine (50.2%) neonates were male neonate. About 259(36.3%) of the household wealth status was rich (Table 2).

Table 2: Maternal and neonatal socio-demographic characteristics of birth weight for gestational age in Bahir Dar city Public Health Facilities, Northwest Ethiopia 2020(N=715)

Variables	Categories	Frequency	Percentage (%)
Residence	Urban	614	85.9
	Rural	101	14.1
Sex of neonate	Male	359	50.2
	Female	356	49.8
Maternal age	Less than 20	70	9.8
	21-25	199	27.8
	26-30	292	40.8
	31 and above	154	21.5
Marital status	Married	685	95.8
	Unmarried	30	3.4
Educational level	Can't read and write	80	11.2
	Can read and write	86	12.0
	Primary education(1-8)	199	27.8
	Secondary education(9-12)	213	29.8
	Diploma and above	137	19.2
Working status	Housewife	503	70.3
	Self-employed	83	11.6
	Gov't employed	71	9.9
	Others ^a	58	8.1
Household wealth	Poor	262	36.6
	Medium	194	27.1
	Rich	259	36.3

^adaily labor, student, unemployed, NGO, private employed

5.2 Maternal Obstetrics and Gynecological related factors

Four hundred (55.9%) and 382(53.4%) of neonates whose mothers were multigravida and multipara, respectively. The mean gestational age was 39.48±1.83 (SD). Ninety eight percent of neonates mothers (701) had ANC visits, 300(42.8 %) of neonates mothers were starting ANC visit at first trimester, and 545(76.2%) neonates mothers had four and above visits. The mean gravidity was 1.94 while the mean parity was 1.85 children including the index child. Five hundred twenty one (70.9%) of delivery were SVD, 654(91.5%) pregnancies were planned, and 682(95.4%) women were TT vaccinated (Table 3).

Table 3:Maternal obstetrics and gynecology related characteristics of women who delivered in Bahir Dar city Public Health Facilities, Northwest Ethiopia 2020(N=715)

Variables	Categories	Frequency	Percentage (%)
MUAC	<23 cm	47	6.6
	≥23 cm	668	93.4
Gravida	Primigravida	315	44.1
	Multigravida	400	55.9
Parity	Primipara	333	46.6
	Multipara	382	53.4
ANC follow up	Yes	701	98.0
	No	14	2.0
Starting ANC visit(n=701)	1 st trimesters	300	42.8
	2 nd trimesters	375	53.5
	3 rd trimesters	26	3.7
Number of ANC visit	No	14	2.0
	1-3 visit	156	21.8
	≥4 visit	545	76.2
Status of pregnancy	Single	703	98.3
	Multiple	12	1.7
Mode of delivery	SVD	521	72.9
	CS	149	20.8
	Instrumental	45	6.3
Planned pregnancy	Yes	654	91.5
	No	61	8.5
TT vaccinated	Yes	682	95.4
	No	33	4.6
Number of TT vaccine(n=682)	T1 and T2	391	57.3
	T3 and T4	291	42.7

5.3 Maternal medical illness-related factors

Fifty seven (8.0%) of neonates mother had history of obstetric complication, of this 35(61.4%) have been abortion and 16(2.2%) of women have obstetric health problems during the current pregnancy. From obstetric health problems 10(62.5%) of neonates mother had preeclampsia/eclampsia (Table 4).

Table 4: Maternal obstetric related disease of women who delivered in Bahir Dar city, Northwest Ethiopia 2020(N=715)

Variables	Categories	Frequency	Percentage (%)
History of obstetric complication	No	658	92.0
	Yes	57	8.0
Previous obstetric complication(n=57)	Abortion	35	61.4
	Macrosomia	15	26.3
	LBW	7	12.3
Obstetric health problem during current pregnancy	No	699	97.8
	Yes	16	2.2
Obstetric health problem (n=16)	Preeclampsia/eclampsia	10	62.5
	APH	6	37.5
Medical health problem	No	660	92.3
	Yes	55	7.7
Medical health problem (n=55)	HIV	12	21.8
	DM	6	10.9
	Infection	12	21.8
	Anemia	15	27.3
	Asthma	4	7.3
	Hypertension	6	10.9

5.4 Behavioral factors

Six hundred seventy one (93.8%) of the neonates mothers were got iron and/or folic acid supplementation during the current pregnancy. Only 88(12.3%) women have been taking alcohol during the current pregnancy, of this 45(51.1%) of women drunken often (Table 5).

Table 5: Maternal behavioral characteristics of women who delivered in Bahir Dar city, public health facilities, Northwest Ethiopia 2020(N=715)

Variables	Categories	Frequency	Percentage (%)
Received Iron and/or folic acid supplementation during pregnancy	Yes	671	93.8
	No	44	6.2
Alcohol drinking during current pregnancy	No	627	87.7
	Yes	88	12.3
How many times you drink in a week?(n=88)	Sometimes	43	48.9
	Often	45	51.1
Taking additional food during index pregnancy	Yes	431	60.3
	No	284	39.7
Physical violence during index pregnancy	No	691	96.6
	Yes	24	3.4

5.5 Neonatal related characteristics

Ninety five point nine percent (686) and four percent (29) of neonates were term and preterm birth respectively. The mean (\pm SD) birth weight was 3046.36 ± 582.03 gram. 598 (63.5%) were normal birth weight neonates (Figure 3).

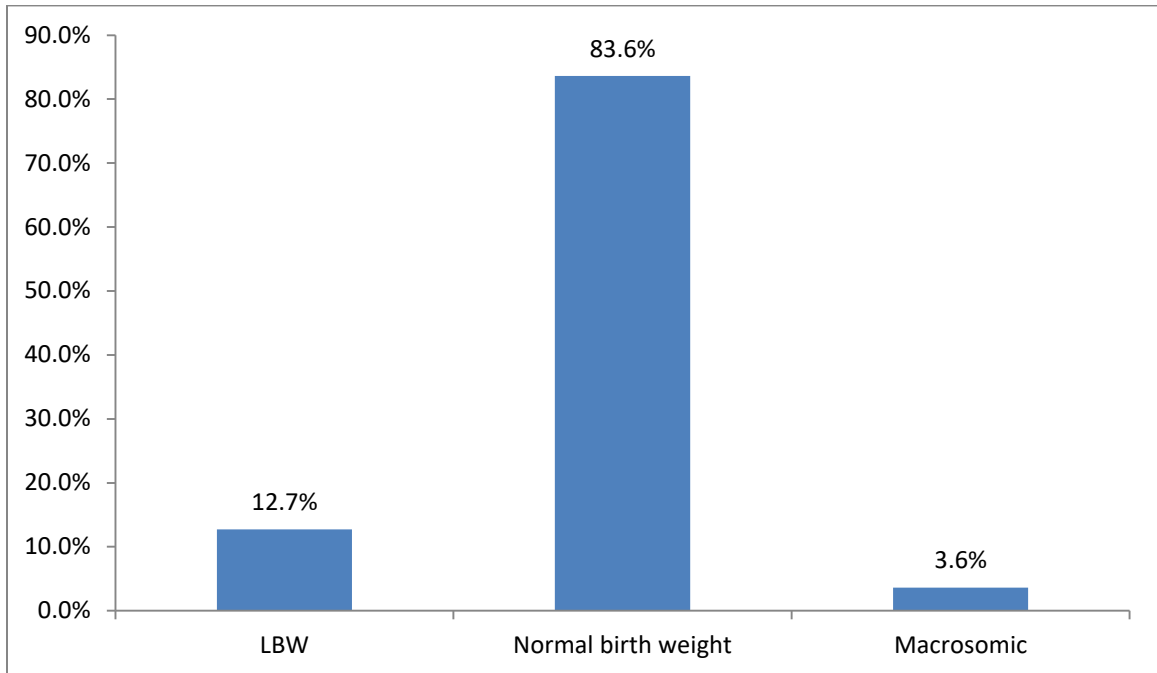


Figure 3: Birth weight of neonates in Bahir Dar city Public Health Facilities, Northwest Ethiopia 2020

The magnitude of inappropriate birth weight for gestational age was 264(36.9% (95% CI: 33.4%-40.4%) and proportion of small for gestational age and large for gestational age were 170(23.8%) (95% CI: 20.7%-26.9%) and 94(13.1%) (95% CI: 10.5%-15.5%) respectively (Figure 3).

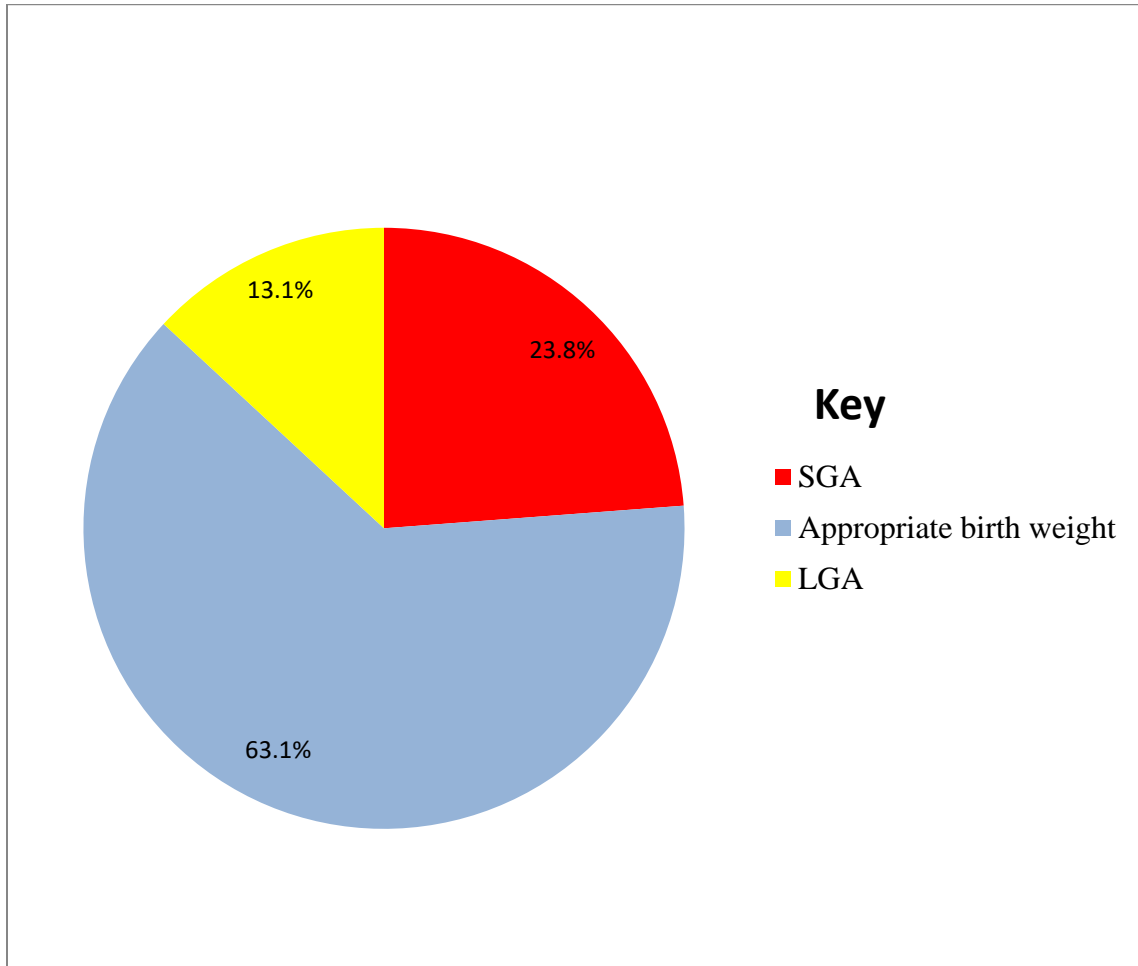


Figure 4: Percentile of distribution of birth weight for gestational age in Bahir Dar city Public Health Facilities, Northwest Ethiopia 2020

5.6 Factors affecting Birth Weight

On bi-variate analysis; residences, sex of neonate, marital status, parity, gravida, status of pregnancy, TT vaccinated, presence of medical illness and additional food intake during the index pregnancy were associated with SGA and LGA.

On multivariate analysis; residence, sex of neonate and taking additional food during the index pregnancy were significantly associated with SGA, and medical illness during the index pregnancy was significantly associated with LGA.

The odds of being SGA among neonates whose mothers from rural resident were 2.21 times higher as compared to neonates whose mother from urban resident (AOR= 2.21, 95% CI: 1.37-3.58) when the reference category was appropriate birth weight. The odds of being SGA neonates whose mothers gave female neonates were 1.46 times higher as compared to male neonates (AOR=1.46, 95% CI: 1.02-2.11) when the reference category was appropriate birth weight. Neonates whose mothers had took additional food during their pregnancy were 37% less likely to be SGA compared to their counter parts (AOR=0.63, 95% CI: 0.44-0.91) when the reference category was appropriate birth weight.

The odds of being LGA among neonates whose mother had medical illness during the index pregnancy were 2.32 times higher as compared to neonates whose mothers have not medical illness (AOR=2.32, 95% CI: 1.13-4.77) when the reference category was appropriate birth weight(Table7).

Table 6: Factors associated with birth weight for gestational age neonates born at Public Health Facilities in Bahir Dar city, Northwest Ethiopia 2020(N=715)

Variables	Categories	SGA Vs appropriate birth weight		LGA Vs appropriate birth weight	
		COR with 95% CI	AOR with 95% CI	COR with 95% CI	AOR with 95% CI
Residence	Urban				
	Rural	2.07(1.31-3.28)	2.21((1.37-3.58)**	0.67(0.31-1.46)	0.66(0.30-1.46)
Sex of neonate	Male				
	Female	1.48(1.03-2.11)	1.46(1.02-2.11)*	0.72(0.46-1.13)	0.74(0.46-1.17)
Marital status	Married				
	Unmarried	2.41(1.12-5.12)	1.83(0.69-4.87)	0.63(0.14-2.81)	2.51(0.41-15.50)
Gravida	Primigravida				
	Multigravida	0.79(0.55-1.12)	0.52(0.16-1.65)	2.41(1.46-3.97)	0.49(0.08-3.01)
Parity	Prim ipara				
	Multipara	0.84(0.59-1.20)	1.46(0.46-4.68)	2.75(1.67-4.54)	5.21(0.85-31.88)
Planned pregnancy	No				
	Yes	0.47(0.27-0.82)	0.84(0.39-1.80)	3.75(0.89-15.89)	3.70(0.67-20.53)
TT vaccinated	No				
	Yes	0.41(0.20-0.83)	0.59(0.25-1.38)	3.64(0.48-27.71)	2.54(0.32-20.54)
Taking additional food	No				
	Yes	0.62(0.43-0.88)	0.63(0.44-0.91)*	1.53(0.94-2.49)	1.50(0.91-2.46)
medical health problem	No				
	Yes	1.65(0.85-3.21)	1.94(0.98-3.87)	2.98(1.49-5.98)	2.32(1.13-4.77)*

Key* P< 0.05, **P<0.01,

6. Discussion

This study showed that 36.9% (95% CI: 33.4%-40.4%) of neonates were inappropriate birth weight for gestational age. Of these 23.8 % (95% CI: 20.7%-26.9%) and 13.1% (95% CI: 10.5%-15.5%) of neonates were SGA and LGA respectively.

The findings of this study revealed that the proportion of IBWGA was similar to study done in Dessie Referral Hospital(39) The reason might be most of the participants were share similar culture and living style as well as design of study done at both findings . However this study was lower than study done in Jimma University Specialized Hospital(38). This study revealed that proportion of SGA was higher than study in Thailand(29), and Brazil(32). The proportion of LGA was lower than study in Thailand(29). This difference might be due to socio-cultural variations, living style and differences in study population.

This study also identified that rural residence; being female sex and taking additional food during the index pregnancy were significantly associates to SGA and, medical illness during the index pregnancy were significantly assocaites to LGA.

This study revealed that neonates whose mothers from the rural resident were more likely to be SGA. This finding was higher than studies in Ethiopia Tigray region (35, 41), in Iran(26, 28), Brazil(44).This might be due to lack of the accessibility of health information, and nutritional awareness during pregnancies which are more important for women lives in rural resident than urban resident. Those neonates' mothers had took additional food during the index pregnancy were less likely to be SGA as compared to counterpart. It is due to the fact that, healthy and optimal intra uterine fetal growths rely heavily on maternal nutritional status.

In LGA neonates, those mothers who gave female neonates were less likely to have LGA neonates as compared to male neonates. This is supported by the study done in China (64), in developing countries (16), in Brazil tertiary public maternity hospital in the city of São Paulo(31).The reason for this sex difference is not known, but, some role of androgens secreted by fetal testes in male fetuses might increase the weight

In LGA neonates, those mothers who had medical illness during the index pregnancy gave were more likely to have LGA neonates as compared to those mothers who had no medical illness. This study was supported by other studies in Austral(55), Iran(48), and Ethiopia(56). The possible reason might be most of this study neonates were delivered poste date, and thus incease the birth weight. Another possible reason might be possibly due to higher incidences of diabetes mellitus during pregnancy. Mothers have adverse effects on their fetus in respect to weight as well as in their weight for gestational age and women older than 35 are more likely to have a LGA.

6.1 Limitation

Mothers were required to recall events as far back as nine months prior to the interview, and therefore, recall bias is a possible limitation.

The study unable to include mothers who delivered at home because the study was conducted in the hospital.

7. Conclusions and Recommendations

7.1. Conclusions

This study showed that the proportion of SGA and LGA neonates in Bahir Dar city were high.

The finding of this study identified that rural residence and taking additional food during the index pregnancy were a significant associates of SGA neonates and multipara, being female sex and taking additional food during the index pregnancy were a significant associates of LGA.

7.2. Recommendations

For MOH: prepare nutritional guideline for pregnant women and distribute for each health care facilities.

For health Care Professionals; should give nutritional advice for rural residence women during ANC.

For researcher: wanted to recommend for further study especially using strong study design (cohort).

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ANNEX

Annex I: - Participant Information Sheet

Good morning/ afternoon?

My name is Abayneh Chekol. Currently I am a post graduate student at Bahir Dar University, College of medicine and Health Sciences, School of Public health, Department of Reproductive health and population studies. And now I am conducting a research to assess birth weight for gestational age and associated factors among neonates born at Bahir Dar city Public Health Facilities.

Title of the research: Birth weight for gestational age and associated factors among neonates born at Bahir Dar city Public Health Facilities, Northwest Ethiopia

Objective: To assess birth weight for gestational age and associated factors among neonates born at Bahir Dar city Public Health Facilities, Northwest Ethiopia, 2020

Participants: Systematically selected neonates' mother in selected hospital and health centers.

Potential Risks: There is no foreseen risk by being participating in this study.

Benefits: No financial benefits are related with this study. But by participating in this study, you will acquire or have information about inappropriate birth weight for gestational age and associated factors.

I would like to ask you few questions. Your honest response to the questions can make the study to achieve its objective. All the information that you give will be kept confidential and private. You are kindly requested to respond voluntarily. You can also choose not to participate in this study or if you become uncomfortable during the study, you will be allowed to leave the study at any time. At any time if you have questions, you can contact me by using the following addresses.

Abayneh Chekol ; Mob: - +251928506552, e-mail:- abaynehchekol01@gmail.com

Annex II: Informed consent

Bahir Dar University

College of medicine and Health Sciences

School of Public Health

Department of Reproductive Health and population study

I understand that participation in this study is completely voluntary and that I may withdraw at any time without supplying reasons. I agree to participate in this study to be interviewed, provided my privacy is guaranteed. When signing this consent form to participate in the study, I promise to answer honestly to all reasonable questions and not provide any false information or in any other way purposely mislead the researcher.

Signature of the participant _____ date _____

Name of interviewer: _____ Signature _____ Date: _____

Questionnaire code -----

Annex III: English version questionnaire and checklist

Instruction: - Circle the responses for questions with alternatives and write for open ended questions on the space provided.

Part I: Socio-demographic characteristics

S/n	Questions	Response	Skip
101.	Residence	1. Urban 2. Rural	
102.	Sex of neonate	1. Male 2. Female	
103.	Age of neonate	_____in days	
104.	Mother's age	_____ in years	
105.	Marital status	1. Married 3.Divorced 2. Never married 4.Widowed	
106.	Educational level	1. Can't read and write 4. Secondary education(9-12) 2. Can read and write 5. Diploma and above 3. Primary education(1-8)	
107.	Working status	1. Housewife 4. Private employee 2. Self-employed 5. NGO 3. Government employed 6. Other (specify)_____	

Part II: Maternal characteristics

201	Maternal height	_____cm	
202.	Maternal weight	_____kg	
203.	Maternal MUAC	_____ cm	
204.	Gravidity	_____	
205.	Parity	_____	
206.	Did the mother have any ANC follow up during the last pregnancy?	1. Yes 2. No	If no go to Q209
207	If the answer is yes to Q206, when you start ANC?	_____week of gestation	
208.	If the answer is yes to Q206, what was the number of ANC follow-ups?	_____ (in number)	
209.	Did you have any history of TT vaccination during the last pregnancy?	1. Yes 2. No 3. Unknown	

210.	If your answer is yes to Q209, what was the number of vaccinations?	_____ (in number)	
211	Did you get iron and/or folic acid supplementation during pregnancy	1. Yes 2. No	
212.	What is the status of your pregnancy?	1. Single 2. Twin 3.Others(mention)_____	
213.	What was your current mode of delivery?	1. SVD 2.CS 3. Instrumental	
214.	Did you plan to get pregnancy?	1. Yes 2. No	
215.	Does the mother experience obstetric complication history?(see chart)	1. Yes 2. No	
216.	If the answer was yes to Q215, which of the following she was diagnosed?(see chart)	1. Abortion 3. Macrosomia 2. LBW	
217.	Did the mother diagnose with any of obstetric health problem during current pregnancy? (see chart)	1. Yes 2. No	
218.	Which of the following she was diagnosed? (see chart)	1. Preeclampsia/eclampsia 3. APH 2. PROM 4. Others (mention)_____	
219.	Did the mother diagnose with any medical problem in her life?	1. Yes 2. No	
220.	Which of the following she was diagnosed? (see chart)	1. HIV 4. Infection 2. DM 3. Anemia 5. Others(mention) _____	
221.	Do you drink alcohol during last pregnancy?	1. Yes 2. No	
222	If the answer was yes to Q221, how many times a week?	1. Always 3. Often 2.Sometimes	
223.	Do you smoke cigarette during last pregnancy?	1. Yes 2. No	
224	If the answer was yes to Q223, how many cigarettes per day?	_____ (in number)	
225.	Do you experience physical violence during the last pregnancy?	1. Yes 2. No	
226.	Do you take additional food during the last	1. Yes 2. No	

	pregnancy?		
Part III: Neonatal characteristics			
301.	Birth weight(see chart)	_____gram	
302.	Gestational age(see chart)	_____ in weeks	
303.	Admission duration	_____ in days	

Part IV: - Wealth Indexes for Urban residence

S/N	Question	Response
401.	Owner of the house	1. Private 3. Rents 2. kebele 4. Other_____
402.	House floor	1. Soil 3. cement 2. Muck 4.ceramics
403.	House roof	1. Corrugated iron 2. Grass 3. Other
404.	Houses outside the wall	1. Stone with mud 3. stone/brocket with cement 2. Wood with mud 4. Others _____
405.	Berth (how many)	In Number_____
406.	Which of the following types of fuel does your household used mainly	1. Electricity 4. Animal Dug 2. Charcoal 5. Gas 3. Wood 6. Others_____
407.	What types of toilet do your household use?	1. Flush or pour-flush latrine dwelling 4. Public latrine 2. Ventilated improved pit latrine 5. Space field 3. Traditional latrine
408.	Kitchen house	1.Yes 2.No
409.	Source of water	1. Piped water into the compound 2. Public Borehole 3. Public tap 4.Borehole with hand pump into the compound 5. Dam from rain source 6. pond/river/race/head 7. Borehole without hand pump into the compound 8. Dam from the river source
410	Do any of your household members have the following? If the answer of Table and Chair were yes how many?	
	Radio	1. Yes 2. No
	Television	1. Yes 2. No

	non-mobile telephone	1. Yes	2. No
	Refrigerator	1. Yes	2. No
	Bed/cotton/sponge/spring matters	1. Yes	2. No
	Table	1. Yes _____	2. No
	Chair	1. Yes _____	2. No
411	Do any of your household members have the following? If yes how many?		
	Mobile Phone	1. Yes _____	2. No
	Motor Cycle	1. Yes _____	2. No
	Bajaj	1. Yes _____	2. No
	Animal draw cart	1. Yes _____	2. No
	Car or truck	1. Yes _____	2. No
	oxen/cow	1. Yes _____	2. No
	Horse/mule	1. Yes _____	2. No
	Goat/Sheep	1. Yes _____	2. No
	Hen	1. Yes _____	2. No
	Beehives	1. Yes _____	2. No
	Bank account/ Saving Book	1. Yes _____	2. No

<i>Only for rural residence</i>		
S/N	Question	Response
501	House roof	1. Corrugated iron 2. Grass/wood 3. Others _____
502	House outside wall	1. Stone with mud 3. stone/blocket with cement 2. Wood with mud 4. Others____
503	The main source of houses' cooking	1. Electricity 4. Animal Dug 2. Charcoal 5. Gas 3. Wood 6 Others_____
504	Does the household own separate house for domestic animals	1. Yes 2. No
505	Kitchen house	1 Yes 2. No

506	Source of water	1. Piped water into the compound 2. public 3 Public tap 4. Borehole with hand pump into the compound 5. Dam from rain source 6.pond/river/race/headwaters 7. Borehole without hand pump into the compound 8. Dam from the river source Borehole
507	Does any member of your household have the following? If yes how many?	
	Radio or Tape	1. Yes 2. No
	Bed/ cotton/ sponge/spring/ mattress	1. Yes 2. No
	Mobile Phone	1. Yes 2. No
	Water generator	1. Yes 2. No
	Solar energy	1. Yes 2. No
	Other(specify) _____	
508	Domesticated animals	
	Ox/cow	1. Yes _____ 2.No
	Calf	1. Yes _____ 2.No
	Donkey	1. Yes _____ 2.No
	horse/mule	1. Yes _____ 2.No
	Goat/sheep	1. Yes _____ 2.No
	Hen	1. Yes _____ 2.No
	Beehives	1. Yes _____ 2.No
509	Does the following agricultural production products in the last years (2020)? If yes how much in quintal?	
	Teff	1. Yes _____ 2.No
	Barley/Wheat	1. Yes _____ 2.No
	Maize	1. Yes _____ 2.No
	Millet	1. Yes _____ 2.No
	Bean/Pea	1. Yes _____ 2.No
	Chickpea	1. Yes _____ 2.No

	Lentil	1. Yes _____ 2.No
	Dagusa	1. Yes _____ 2.No
510	If there are other productions (list)	
	1. _____	3. _____
	2. _____	4. _____

Thank you for your cooperation!

ማጣቀሻዎች

ማጣቀሻ IV፡ የተሳታፊ የመረጃ ወረቀት

እንደምን አደርሻ/ ዋልሽ?

ስሜ አባይነህ ቸኮል ይባላል። በአሁኑ ወቅት በባህርዳር ዩኒቨርሲቲ የድህረምረቃ ፣ የህክምና እና የጤና ሳይንስ ኮሌጅ፣ የህብረተሰብ ጤና አጠባበቅ ትምህርት ቤት፣ የስነ ተዋልዶ ክፍል ተማሪ ነኝ። እናም አሁን በባህር ዳር ከተማ ውስጥ ካሉ የህዝብ ጤና ተቋም የጨቅላ ህፃናት ክብደት ከእርግዝና ግዜው ጋር ያለውን ዝምድና እና ተጓዳኝ ሁኔታዎችን ለመገምገም ምርምር አደርጋለሁ።

የጥናቱ ርዕስ- የጨቅላ ህፃናት ክብደት ከእርግዝና ግዜው ጋር ያለውን ዝምድና እና የግንኙነት ምክንያቶችን በባህር ዳር ከተማ ውስጥ ካሉ የህዝብ ጤና ተቋም፣ ስሜን ምዕራብ ኢትዮጵያ፡

አላማ- በባህር ዳር ከተማ ውስጥ ካሉ የህዝብ ጤና ተቋም የጨቅላ ህፃናት ክብደት ከእርግዝና ግዜው ጋር ያለውን ዝምድና እና የግንኙነት ምክንያቶችን ለመገምገም።

ተሳታፊዎች፡- የተመረጡ ባህር ዳር ከተማ ውስጥ ካሉ የህዝብ ጤና ተቋም የተወለዱ ህጻናት ሊኖሩ የሚችሉ አደጋዎች -በዚህ ጥናት ውስጥ በመሳተፍ አስቀድሞ የታሰበ አደጋ የለም።

ጥቅሞች: ከዚህ ጥናት ጋር ምንም የገንዘብ ጥቅሞች አይኖሩትም። ነገር ግን በዚህ ጥናት ውስጥ በመሳተፍ ትክክል ያልሆነ የጨቅላ ህፃናት ክብደት ከእርግዝና ግዜው ጋር ያለውን ዝምድና እና የግንኙነት ምክንያቶችን መረጃ ያገኛሉ።

ጥቂት ጥያቄዎችን ስለ ህፃናዎ ልጠይቅዎት እፈልጋለሁ። ለጥያቄዎችዎ በሐቀኝነት ምላሽ መስጠት የጥናቱን ዓላማ እንዲሳካ ያደርገዋል። የሚሰጡት መረጃ ሁሉ በሚስጥር የተጠበቀ ይሆናል። በፍቃደኝነት ምላሽ እንዲሰጡ በደግነት ተጠየቁ። በተጨማሪም በዚህ ጥናት ውስጥ ላለመሳተፍ መምረጥ ይችላሉ ወይም በጥናቱ ወቅት የማይመችዎት ከሆነ በማንኛውም ጊዜ ጥናቱን ትተው ሊወጡ ይችላሉ። ጥያቄዎች ካሉዎት በማንኛውም ጊዜ የሚከተሉትን አድራሻዎች በመጠቀም እኔን ማነጋገር ይችላሉ።

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ማጣቀሻ V: መረጃ የማግኘት ስምምነት

በዚህ ጥናት ውስጥ ለመሳተፍ ሙሉ በሙሉ ፈቃደኛ እንደሆነና ምክንያቶችን ሳልሰጥ በማንኛውም ጊዜ መልቀቅ እንደምችል አውቃለሁ። ግላዊነቴ የተረጋገጠ እስከሆነ ድረስ በዚህ ጥናት ላይ ለመሳተፍ እስማማለሁ። በጥናቱ ለመሳተፍ ይህን የፍቃድ ቅፅ ሲፈርሙ እኔ ለምጠይቅዎት ጥያቄዎች ሁሉ በሐቀኝነት መልስ ለመስጠት ቃል እገባለሁ እናም ማንኛውንም የውሸት መረጃ አልሰጥም ወይም በሌላ መንገድ ሆን ብሎ ተመራማሪውን የሚያሳስት።

የተሳታፊዎ ፊርማ _____ ቀን _____

የጠያቂው ስም: _____ ፊርማ _____ ቀን: _____

መጠይቅ ኮድ -----

ማጣቀሻ VI: የአማረኛ ስሪት መጠይቅ

መመሪያ:- ከአማራጭዎች መካከል ምላሾቹን ያክብቡ እና በተሰጡት ክፍት ቦታዎች ላይ ክፍት ለሆኑ ጥያቄዎች ይጻፉ።

ክፍል 1: ሥነ-ህዝብና ማህበራዊ ጉዳዮች

ተ.ቁ	ጥያቄ	ምላሽ	
101.	አድራሻ	1. ከተማ 2. ገጠር	
102.	የህፃንዎትጾታ	1. ወንድ 2. ሴት	
103.	የህፃንዎትዕድሜስንትነው?	_____ በቀን	
104.	የእናትዕድሜዎትስንትነው?	_____ በዓመት	
105.	የጋብቻሁኔታዎትምንድንነው?	1. ያገባች 3. የፈታች 2. ያላገባች 4. ባልዎየሞተባት	
106.	የትምህርትደረጃዎትምንድንነው?	1. ማንበብእናመጻፍየማትችል 4. ሁለተኛደረጃ (9-12) 2. መጻፍእናማንበብየማትችል 5. ዲፕሎማእናከዚያበላይ 3. የመጀመሪያደረጃ (1-8)	
107.	ሙያዎትምንድንነው?	1. የቤትእመቤት 4. ከግልተቀጥራየምትሰራ 2. በግለሰብሙያ 5. የመንግስትየልሆነድርጅት 3. የመንግስትሰራ 6. ሌላ(ግለፅ)_____	

ክፍል 2: ከእናትደምጋርተዛማጅ የሆኑ ጥያቄዎች

201.	የእናትቁመት	_____ ሳሜ	
202.	የእናትክብደት	_____ ኪ.ግ	

203.	የእናትMUAC	_____ ሰሜ	
204.	ስንትጊዜእርግዝናኢጋጥሞዎትይሆን?	_____	
205.	ስንትጊዜወልደዋል?	_____	
206.	በእርግዝናወቅትየቅድመወሊድአገልግሎትአግኝተዋል?	1. አዎ 2. የለም	
207.	(ጥያቄ 206 መልስዎአዎከሆነ) መቼክትትልጀመሩ	-----ኛሰምንት	
208.	(ጥያቄ 206 መልስዎአዎከሆነ) ስንትጊዜክትትልአድርግዋል?	_____ ቁጥር	
209.	በእርግዝናወቅትየመንጋጋቆልፍክትበትተከትበውያውቃሉ(ቢያንስ 2 ጊዜ)	1. አዎ 2. የለም 3. አላስታውስም	
210.	ጥያቄቁ209 መልስዎአዎከሆነስንትጊዜተከትበዋል ?	-----	
211.	በእርግዝናወቅትየምግብብረትናፎሊክአሲድወስደዋል?	1. አዎ 2. የለም	
212.	የእርግዝናሁኔታምንነበር?	1. አንድ 2. መንታ 3. ከሁለትበላይ _____	
213.	አሁኑበምንነበርየወለዱት?	1. ሲቪዲ 2. በአፕሬሽን 3. በመሳሪያ	
214.	የእርግዝናዎትዓይነትምንነበር?	1. የታቀደ 2. ያልታቀደ	
215.	እናትመጥፎየወሊድታሪክገጥሞታል? (ቻርቱንይዩ)	1. አዎ 2. አይደለም	
216.	የቁ215 መልስዎአዎከሆነመጥፎየወሊድታሪክምንነበር? (ቻርቱንይዩ)	1. ፅንሰማስወረድ 2. ከ4000ግበላይ 3. ከ2500ግበታች	
217.	በአሁኑየእርግዝናወቅትከእርግዝናጋርየተያያዘሀመምኢጋጥሞዎትነበር?(ቻርቱንይዩ)	1. አዎ 2. አይደለም	
218.	የትኛውበሽታነበረብዎት?(ቻርቱንይዩ)	1. ፕሪይክላፕጂያ/ይክላፕጂያ 2. በእርግዝናጊዜደምመፍሰስ 3. የቅድመማሀፀንመተርተር 4. ሌላ(ግለፅ) _____	
219.	ከዚህበፊትየጤናችግርኢጋጥሞትያዉቃልወይ?	1. አዎ 2. አይደለም	
220.	ከሚከተሉትየትኛውአዎዎትነበር?(ቻርቱንይዩ)	1. ኤችአይቪ 2. የስኳርበሽታ 3. የደምማነስ 4. ኢንፌክሽን 5. ሌላ(ግለፅ) _____	
221.	በአሁኑእርግዝናአልከልይጠጣሉ?	1. አዎ 2. አይደለም	
222.	መልሱአዎከሆነበሰምንትስንትጊዜይሆናል	1. ሁልጊዜ 2. አልፎአልፎ	
223.	በአሁኑእርግዝናሲጋራያጨሳሉ?	1. አዎ 2. አይደለም	

224.	መልሱአዎከሆነበሰምንትስንትጊዜይሆናል	1.ሁልጊዜ	2. አልፎአልፎ	
225.	አካላዊጥቃትገጥሞዎትያውቃል?	1. አዎ	2. አይደለም	
226.	በእርግዝናወቅትተጨማሪምግብይወስዱነበር?	1. አዎ	2. አይደለም	
ክፍል 3:ከሀፃኑጋርተዛማጅቅጽ				
301.	የልደት ክብደት (ቻርቱን ተመልከት)	_____ ግራም		
302.	የእርግዝና ዕድሜ (ቻርቱን ተመልከት)	_____ ሰዎች		
303.	የመግቢያቆይታ	_____ ቀን		

ክፍል 4:- የከተማሀብትሁኔታን የሚመለከት ጥያቄ

ተ.ቁ	ጥያቄ	ምላሽ
401.	የቤቱ ይዘታ የማን ነው?	1. የግል 2. የቀበሌ 3. የክራይ 4. ሌላ _____
402.	የቤቱ ወለል	1. አፈር/ጠጠር 2. በዕበት የተለቀለቀ 3. ሲሚንት 4. ሴራሚክ
403.	የቤቱ ጣራ	1. ቆርቆሮ 2. ሳር 3. ሌላ
404.	የቤቱ የውጭ ግድግዳ	1. ድንጋይ በጭቃ 2. ዕንጨት በጭቃ 3. ድንጋይ/ብሎኬት በስሚንት 4. ሌላ _____
405.	ለመኝታ የሚያገለግል ክፍል ብዛት	በቁጥር _____
406.	የቤቱ ዋና የምግብ ማብሰያ	1. ኤሌክትሪክ 2. ከሰል 3. እንጨት 4. ኩባት 5. ጋዝ 6. ሌላ _____
407.	የሚጠቀሙት መጻዳጃ ቤት ምን ዓይነት ነው	1. የውሃ መልቀቂያና ማፋሰሻ ያለው የግል 2. የተሻሻለ ሽታ አልባ የጉድጓድ 3. ባህላዊ የጉድጓድ 4. የጋራ 5. ሜዳ ላይ
408.	የምግብ ማብሰያ ቤት አልዎት	1. አወ 2. የለም
409.	የሚጠቀሙበት የውኃ ምንጭ ምንድን ነው	1. በግቢው ውስጥ ካለ ቧንቧ 2. የጋራ ጉድጓድ 3. የጋራ ቧንቧ 4. ግቢው ውስጥ የጉድጓድ ውኃ ከነጋንጉ 5. የጉድጓድ ውኃ ፓምፕ ያለው 6. የተጠራቀመ የዝናብ ውኃ 7. ኩሬ/ወንዝ/ወራጅ/ምንጭ 8. የጉድጓድ ውኃ ፓምፕ የሌለው
410.	ቤት ውስጥ ከዚህ በታች የተዘረዘሩት አሉ?	
	ሬዲዮ	1. አወ 2. የለም
	ቴሌቪዥን	1. አወ 2. የለም
	የቤት ስልክ	1. አወ 2. የለም
	ፍሪጅ	1. አወ 2. የለም
	አልጋ/የጥጥ/ ስፖንጅ/ስፕሪንግፍራሽ	1. አወ 2. የለም

	ጠረጴዛ	1. አወ	2. የለም	
	ወንበር	1. አወ	2. የለም	
411	ከቤተሰብዎ ውስጥ ከሚከተሉት ያለው አለ? መልስዎ አወ ከሆን			ቁጥር
	የዕጅ ስልክ	1. አወ	2. የለም	
	ሞተር ሳይክል	1. አወ	2. የለም	
	ባጃጅ	1. አወ	2. የለም	
	ጋሬ	1. አወ	2. የለም	
	መኪና	1. አወ	2. የለም	
	በሬ/ላም	1. አወ	2. የለም	
	ፈረስ/በቅሎ	1. አወ	2. የለም	
	ፍየል/በግ	1. አወ	2. የለም	
	ደሮ	1. አወ	2. የለም	
	የንብ ቀፎ	1. አወ	2. የለም	
	የባንክ/የቁጠባ ደብተር	1. አወ	2. የለም	

ከገጠር ለመጡ ብቻ የሚሞላ		
ተ.ቁ	ጥያቄ	ምላሽ
501.	የቤቱ ጠራ	1. ቆርቆሮ 2. ሳር/ዕንጨት 3. ሌላ _____
502.	የቤቱ የውጭ ግድግዳ	1. ድንጋይ በጭቃ 3. ድንጋይ/ብሎኬት በስሚንቶ 2. ዕንጨት በጭቃ 4. ሌላ _____
503.	የቤቱ ዋና የምግብ ማብሰያ	1. ኤሌክትሪክ 4. ኩባት 2. ከሰል 5. ጋዝ 3. እንጨት 6. ሌላ _____
504.	ለእንስሳቱ መኖሪያ የሚሆን የተለየ ቤት አልወት	1. አወ 2. የለም
505.	የምግብ ማብሰያ ቤት አልወት	1. አወ 2. የለም

506.	የሚጠቀሙበት የውኃ ምንጭ ምንድን ነው	1. በግቢው ውስጥ ካለ ቧንቧ 6.ኩሬ/ወንዝ/ወራጅ/ምንጭ 2. የጋራ ጉድጓድ 7. የጉድጓድ ውኃ ፓምፕ የሌለው 3. የጋራ ቧንቧ 8. የተገደበ ውሃ 4. ግቢዎ ውስጥ የጉድጓድ ውኃ ከነፓንፑ 5. የተጠራቀመ የዝናብ ውኃ 9. ሌላ _____
507.	ቤት ውስጥ ከዚህ በታች የተዘረዘሩት አሉ? አወ ካሉ ቁጥራቸው ምን ያህል ነው	
	ሬዲዮ ወይም ቴፕ	1. አወ _____ 2. የለም
	አልጋ/የጥጥ/ ስፖንጅ/ስፕሪንግፍራሽ	1. አወ _____ 2. የለም
	የሞባይል ስልክ	1. አወ _____ 2. የለም
	የውኃ ጄኔሬተር	1. አወ _____ 2. የለም
	የሶላር ሀይል	1. አወ _____ 2. የለም
	ሌላ ካለ ይጥቀሱ	_____
508.	የቤት እንሰሳ	
	በሬ/ላም	1. አወ _____ 2. የለም
	ጥጃ	1. አወ _____ 2. የለም
	አህያ	1. አወ _____ 2. የለም
	ፈረስ/በቅሎ	1. አወ _____ 2. የለም
	ፍየል/በግ	1. አወ _____ 2. የለም
	ደሮ	1. አወ _____ 2. የለም
	የንብ ቀፎ	1. አወ _____ 2. የለም
509.	ከዚህ በታች የተጠቀሱት የእርሻና የጓሮ ምርት ባለፈው አመት(2012) አምርተዋል አወ ካሉ በኩንታል ምን ያህል አመረቱ	
	ጤፍ	1. አወ _____ 2. የለም
	ገብስ/ስንዴ	1. አወ _____ 2. የለም
	በቆሎ	1. አወ _____ 2. የለም
	ማሽላ	1. አወ _____ 2. የለም
	ሰሊጥ	1. አወ _____ 2. የለም

	ባቄላ/አተር/ሽንብራ	1. አጠቃላይ _____ 2. የሰው ጤንነት
	ምስር	1. አጠቃላይ _____ 2. የሰው ጤንነት
	ዳገት	1. አጠቃላይ _____ 2. የሰው ጤንነት
510.	ሌሎች ምርቶች ካሉ የጥቀሱ	
	1. _____ 2. _____	3. _____ 4. _____

አመሰግናለሁ

Approval of examiner(s):

1. External examiner

Name -----

Signature: _____ date _____

2. Internal examiner

Name -----

Signature: _____ date _____

3. Modulator

Name -----

Signature: _____ date _____