ADDIS ABABA UNIVERSITY

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Effect of maternal characteristics during pregnancy on birth weight of neonates in private and public health facilities of Addis Ababa: a crossectional study

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Abstract

Background: Birth weight is a good indicator of the newborn‟s chances for survival, long-term health, growth, and psychosocial development. Low birth weight increases the risk for certain adulthood chronic disorders which may increase risk of morbidity and mortality. The present study was intended to determine the effect of maternal characteristics during pregnancy on birth weight of neonates in health facilities.

Objective: to determine the effect of maternal characteristics during pregnancy on birth weight of neonates and occurrence of LBW in private and public health facilities of Addis Ababa.

Methods: A facility based cross sectional study was conducted on a total of 881women coming to health facility seeking delivery service. The study was performed in selected public and private health facilities of the city from February to march 2016. Data was collected using a structured questionnaire in a face to face interview. Data concerning condition of the mother during time of pregnancy were also collected by reviewing antenatal care (ANC) chart. Epi-Info version 7.0 and stata version 12 was used for data entry and analysis .Univarate analysis was used to measure the magnitude of LBW, Bivariate analysis was used to assess the strength of an association between low birth weight and list of independent variables and test significance of the association. Multivariate logistic regression model was used to identify the important determinants by controlling for possible confounding variables and statistical significance was considered at p-value <0.05.

Result The proportion of low birth weight was 14.7%[95% CI:(12.2,17) and among maternal determinants place of antenatal care visits, level of hemoglobin, gestational age, previous history of low birth weight, pregnancy induced hypertension and weight at third trimester were significantly associated with low birth weight.

Conclusion and Recommendation: The proportion of low birth weight was high and most of them were associated with maternal obstetric and medical condition which can be prevented by improvement public health intervention on ANC follow up, and giving more attention for mothers history of past adverse outcome and with medical illness.

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Acronyms and Abbreviations

LBW	low birth weight
ANC	Antinatal care
HC	Health center
DM	Diabetes mellitus
HTN	Hypertension
WT	weight
GA	Gestational age
UNICEF	United Nations Children‟s Fund
WHO	World Health organization
IUGR	Intrauterine growth restriction

1. INTRODUCTION

1.1. Background

According to the world health organization (WHO) Low birth weight(LBW) is defined as a birth weight of less than 2500 grams irrespective of the gestational age of the neonate[1].A Child‟s chances of survival and its susceptibility to the risk of childhood illnesses are indicated by birth weight. Children whose birth weight is less than 2.5 kilograms, have a higher than average risk of early childhood death [2].

About 3.6 million infants die during the neonatal period [3]. More than 20 million infants are born every year with low birth weight worldwide which is one of the highest rates of adverse pregnancy outcomes and 95% of them born in developing country [3].Being born with low birth weight, it also increases the risk for certain chronic disorders such as diabetes, cardiac disease and hypertension in adult life in addition it may lead to problems in child development problem on society, government due to health cost [2]. But, not enough attention is given in order to improve birth weight as a means of decreasing child mortality[4].Birth weight of an infant is dependent on amount of growth during pregnancy the consequences of poor nutritional status and inadequate nutritional intake not only directly affects women‟s health status, but also may have a negative effect on births weight and early development and the gestational age and these are related to infant growth and mothers lifestyle and health status [5]Low birth weight contributes 60 to 80 percent of all neonatal deaths[3] LBW is a major cause of morbidity and mortality. Even though neonatal mortality rate declining from 49 deaths per 1,000 live births in 2000 to 39 deaths per 1,000 live births in 2005, as reported in the 2011 EDHS it has since remained stable at 37 deaths per 1,000 [2].

Different studies have shown that causes of LBW is associated with many socio-economic factors such as, residence, the family‟s income also with maternal conditions like, educational status, health status, marital status ,previous history of low birth weight, mother‟s age, occupation and birth order [6, 7]. It also includes maternal or fetal illnesses, sex multiple pregnancy, parity and antenatal care visits[8].

1.2. Statement of the Problem

LBW is a leading cause of childhood morbidity and mortality and it also increases the risk for non-communicable diseases such as diabetes, hypertension and cardiovascular disease later in life[2, 9].Majority of low birth weight births occur in low- and middle-income countries and especially in the most vulnerable populations There is considerable variation in the prevalence of low birth weight across regions and within countries, Regional estimates of LBW include 28% in south Asia, 13% in sub-Saharan Africa and 9% in Latin America, the incidence of LBW also increased in developing countries like Ethiopia, 17.1% that is why LBW has drawn attention as public health issue[4, 10].

Even if there are some studies done in Ethiopia, there are discrepancies on determinants of maternal characteristics on birth weight and recent evidence regards to the magnitude and Factors associated with LBW are insufficient in the country. It is important to know the prevalence and risk factors for LBW in different areas More evidence based institutional data are important to identify determinants associated with the magnitude of the problem and most of mothers in Addis Ababa give birth at health facilities so institutional data is more representative The present study is intended to bridge the information gap, by compressively assessing health centers, private and public hospitals by documenting the level of occurrence and major determinant characteristics during pregnancy on low birth weight among mothers who give birth in health facilities.

1.3. Rationale of the Study

The result of the study is helpful to know common and modifiable determinants of LBW and design appropriate intervention strategies, to improve wellbeing of mothers and children in Addis Ababa. This can be achieved by providing a useful programmatic approach using pregnancy as one of the inter-generational phase and indicating potential intervention points for stakeholders, health professionals, regional health bureaus and health institutions to prevent/ minimize LBW.

2. Literature Review

2.1. Magnitude of LBW

Representing more than 20 million births a years, it is estimated that 15% to 20% of all births worldwide are LBW. GloballyLBW remains to be a significant public health problem and is associated with a range of both long and short term consequences[11]. The incidence of low birth weight in Africa is four times developed and least progress in reducing neonatal deaths has been made in southern Asia and sub-Saharan Africa in which two thirds of these deaths account [12].

LBW is common in undernourished populations in low- and middle-income countries, predominantly because of intrauterine growth restriction, and is associated with increased prenatal mortality and childhood stunting, poorer childhood cognitive function and increased adult chronic disease [13, 14].An estimated 18 million babies worldwide are born each year with low birth weight of which about 3.1 million are in sub-Saharan Africa[15].LBW in 2013 was 8.02% and almost same with 7.99% for 2012 but decreases by 3% from 2006[16].

According to 2011 Ethiopian reported to be 11 percent weighed less than 2.5 kilograms. Low birth weight is more common among children of the youngest mothers, age less than 20 (13 percent) and older mothers, age 35-49 (17 percent), and children of birth order six and above (16 percent). The birth weight of a child also varies by place of residence. Seventeen percent of births in rural areas, compared with 9 percent in urban areas, have a reported birth weight less than 2.5kg[2].

A study done in Pokhara, Nepal shows that 34.37% of the infant weighing less than 2.50 kg [17]. The study conducted in Turkey on 500 patients who presented at the clinic, birth weight n<2500g among housewives (14.8%) was more common than working mother (5.2%)[18]. Another Hospital based cross sectional study conducted in Tamilandu showed that the prevalence of LBW was 11.67 %[19].The study done in India showed that the incidence of LBW was 23.8% [20]. A study conducted in Addis Ababa showed the incidence of low birth weight was 5.6%[21], while another study in northwestern Ethiopia Gonder LBW was found to be (17.1%) [4] A facility based cross-sectional study of northWollo Zone, from the total live births,(12.8%) were

LBW [22]. While a cohort study done in Kersa showed that the incidence of LBW 28.3%[23].

2.2. Determinants of low birth weight

2.2.1 Obstetric and Maternal condition for the occurrence of LBW

A cohort study done in Pokhara, Nepal showed maternal education, occupation and percapita income of the family per month were found to be significantly associated with birth weight of the newborn also the birth weight was found to be significantly associated with birth interval in relation to previous birth, maternal age, parity and BMI were found to be significantly associated with LBW. Out of the total, 65 (25.39%) mothers had history of past adverse outcome of which 56.92% delivered LBW newborns; history of past adverse outcome was found to be significantly associated with LBW [17]. Another study in turkey shows that mothers during pregnancy who suffered from at least one disease like anemia, hypertension, inflammatory disease, or gestational diabetes (n=286; 57.2%) had more deliveries of under 2,500g.The mothers whose first child was delivered with a birth weight <2.500g were more likely to deliver their latest baby with a birth weight but tobacco use during pregnancy did not affect the birth weight[18].

A Cross-sectional Retrospective study was carried out in Obiaruku Hospital found in Midwestern of Nigeria showed that maternal age, maternal weight and gestational age has significant relationship on birth weight of neonate, but sex has no effect on birth weight [24]. In Tamilandu study shows that mothers less than 20 years of age with infants of LBW were 8.33%. The socio demographic variables such as residence of the mother, maternal age less than 20 years, mother literacy status, husband education and occupation, type of family and per capita income less than 2000 rupees had no significant association with low birth weight[19].

A study conducted in India showed that risk of delivering LBW babies is almost twice among the mothers who were aged below 20 years and who were aged 30 years and above. The LBW rate was high for parity i.e. the association was found to be highly significant. The odds ratio for parity one and two was 3.21 and also the association between inter-pregnancy interval and low birth weight was found to be

significant. The highest rate (34.5%) of LBW babies belonged to mothers whose interpregnancy interval was less than 12 months. [20].

The maximum numbers of LBW babies (47.7%) were delivered by mothers whose gestational weight at third trimester was < 45 Kg (odds ratio 8.2). This indicates that the association between gestational weight and LBW babies was statistically significant. The relationship between bad obstetric factors and LBW was found to be highly significant [20].

A hospital based cross sectional study at Mekelle, northern Ethiopia showed there was statistically significant association between the age of the mothers and mean BW. Mothers who belong to the age category of 15-19 years had babies weighing 1.41+0.47 kg. Whereas mothers in the range of 20-34 years old gave birth to babies weighing 2.14+0.15 kg.There was also statistically significant association between baby sex and BW that is; female newborn babies had a lower BW (1.74+0.44) than male babies (1.95+0.48). A Significant association was found between parity and BW[25].

A study in Gonder showed that the incidence of LBW was 61.9%, 14.3% and 9.4% among the preterm, term and post-term babies respectively. Five of the eight (62.5%) mothers with pre-eclampsia/eclampsia delivered LBW babies. More than half (53.8%) of the HIV positive mothers delivered LBW babies. HIV positive mothers had a fivefold increased likelihood of delivering LBW babies when compared to HIV negative mothers [4].

2.2. 2.Antenatal care

A study done in Pokhara Nepal Utilization of antenatal care was adequate (≥ 3 antenatal visits) in 58.20% mothers. There was significant association between birth weight and utilization of antenatal care by mothers [17].

A study done in turkey the antenatal care (ANC) was received by all participant mothers. But only 144(48%) mothers were attended more than three ANC visits. Even with more than three ANC visits, there were 17(12.06%) mothers with LBW babies. Number of babies with LBW was found with mothers consuming more than 50 iron folic acid tablets (IFA). The mothers with ANC checkups, IFA tablets

consumption, and hard physical work during pregnancy had no significant association with LBW, [18].

A hospital-based study conducted in Nepal of 255 mothers 0n 2015 showed that Prevalence of LBW was 23.1% and 96.9% had taken iron tablets during pregnancy. The proportion of LBW of previous baby was 3.9% of the respondents had preterm delivery. Nearly one-third (36.1%) of the respondents had 2 years‟ gap after the previous delivery. Mothers who did not take rest at daytime during pregnancy were more likely to have LBW babies than those who had taken rest. However, no single variable was significantly associated with LBW [26].

A study done in Mekelle mothers who had ever attended ANC follow up gave birth to babies with higher mean BW (2.16+0.14) than the mothers who had never attended (1.45+0.42) and this was statistically significant. Significant association was also found between gestational age and BW, BW was directly proportional to birth order and the association was found to be significant [25].

A study done in University of Gondar Referral Hospital, the number of ANC visits was one of the factors there was a 21% reduction in the risk of delivering a LBW baby and also Mothers who had no history of ANC follow up were almost three times as likely to deliver LBW babies when compared to those who had at least one ANC follow up for each ANC visit. There was a statistically significant difference in the birth weights between primiparous and multiparous mothers [4].

Mothers who didn‟t attend ANC were more than 3 times to have poor birth outcome, than mothers who attended ANC follow up. Northeast Ethiopia the predictors of low birth weight baby found to be Monthly family income, HIV status and marital status than other factors. Mothers who had no history of UTI and/or any documentation for bacteruria during that pregnancy were 90% less likely to deliver low birth weight baby than mothers who had urinary tract infection[4]. More LBW babies were observed among women who never followed antenatal care than those who attended one or more time.

2.4.Conceptual Framework

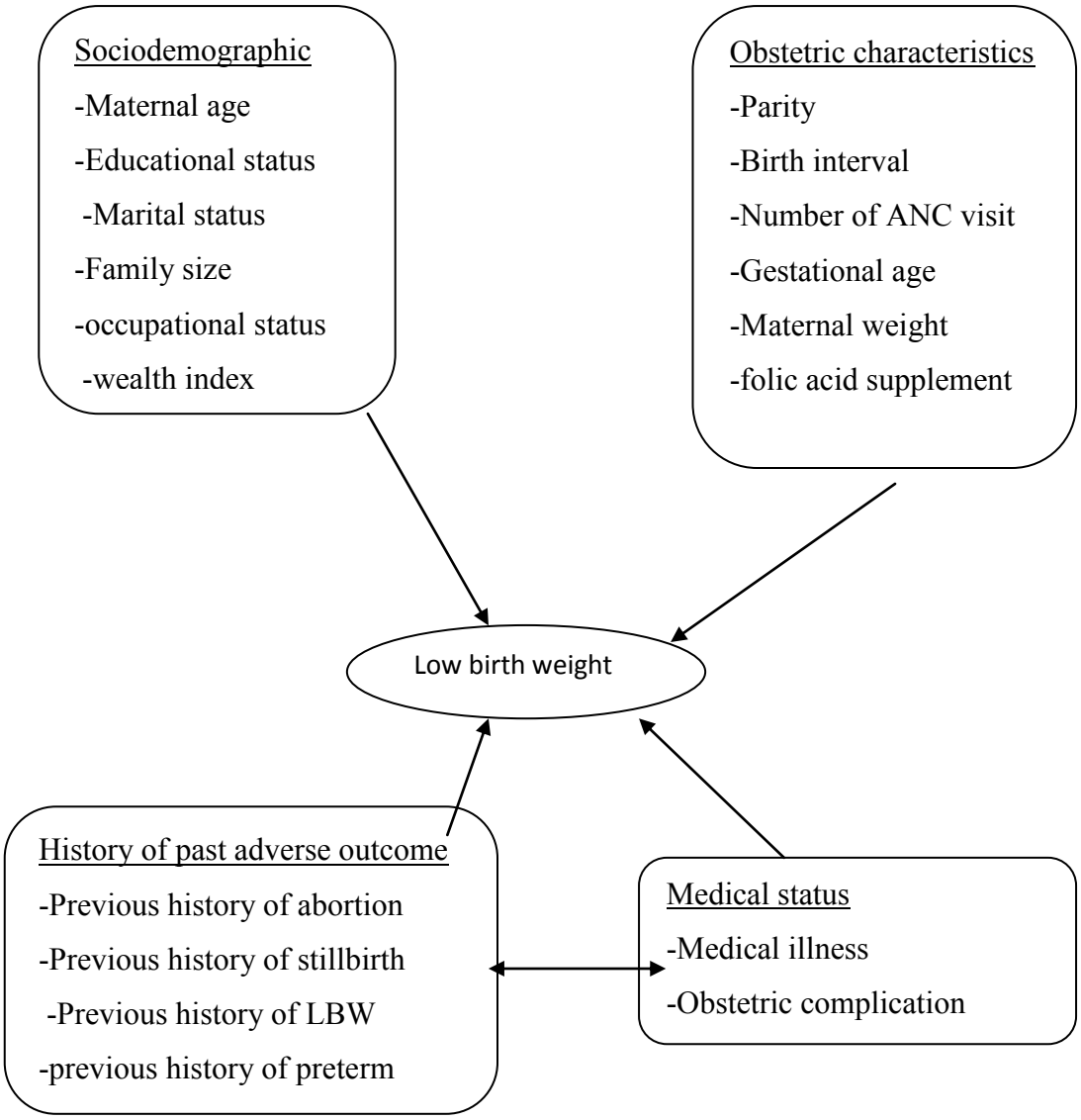

Figure 1.A conceptual framework for effect of maternal characteristics on birth weight of neonate in health facility, A.A, Ethiopia, 2016. (Developed by reviewing different literatures)

3. Objectives

3.1. General Objective

- ✓ To determine the proportion of LBW and the effect of maternal characteristics during pregnancy on birth weight of neonates in private and public health facilities of Addis Ababa.

3.2. Specific Objectives

- ✓ To determine the proportion of low birth weight neonates in private and public health facilities of Addis Ababa.
- ✓ To identify the determinant factors for LBW of neonates in private and public health facilities of Addis Ababa.

4. Methods and Materials

4.1. Study Area and Period

Addis Ababa is the capital city of Ethiopia. Administratively, the city is divided in to10 sub cities and 116 districts with an area of 540 sq. km. According to the 2014 Population projection, the total population count of Addis Ababa is 3,195,000, where, 1,680,000 are female population. In the city 82% of deliveries take place in public health facilities. There are 6 hospitals owned by Addis Ababa health bureau, 4 by Federal Ministry of Health and 1 by Addis Ababa University, 3 by non-governmental Organizations, 3 by defense force and police and 34 are private hospitals. There are 84 public health centers and 700 private clinics out of which 75 are higher clinics[2, 27, 28].The study was conducted from July 2015 -June 2016 in the selected public and private health facilities that provide ANC and delivery services.

4.2. Study Design

Facility based crossectional study was conducted in selected health facilities.

4.3. Population

4.3.1. Source Population

All pregnant women who gave birth at health facilities in Addis Ababa.

4.3.2. Study population

Woman who gave birth at the selected health facilities for delivery during the time of data collection.

4.4. Sample Size Determination

The sample size for objective one is calculated using single proportion formula assuming population proportion with LBW of Addis Ababa 11.4 %[2], number of the study subjects as n, 95% level of confidence and margin of error 5%. Since the procedure is stratified sampling, considering design effect of 1.5 is needed.

$n=z^2p\ (1-p)/d^2= (1.96)^2(0.114x0.886)/\ (0.05)^2 = 129$

After 10%contingency the final sample size=142

The final sample size multiplies to give a total sample of 213.

The sample size for the second objective is determined using a formula for two population proportions and calculated by Epi info version7 statistical software package by considering different variables. Based on the following assumptions [23].

$$n1 = \left[\frac{z\alpha}{2}\sqrt{\left(1+\frac{1}{r}\right)p(1-p)} + z\beta\sqrt{p1(1-p1)+\frac{p2}{r(1-p2)}}\right]2/(p1-p2)^2$$

Where, 95%CI =the Z score at 95 % confidence interval, 1.96

P1 = 20.6 %(Proportion of LBW among ANC attendant)

P2 = 31.6 %(Proportion of LBW among who has no ANC), ratio=1:1

r =the ratio between exposed and non-exposed

n1=sample size before addition of non-response rate

By considering 10%non-response rate and design effect of 1.5 n total =881

Specific objective 1

LBW of Addis Ababa 11.4%	$n=z^2p\ (1-p)/d^2= (1.96)^2(0.114x0.886)/\ (0.05)^2 = 129$ The calculated sample size is142; After adding 10% contingency. considering design effect 1.5: 1.5*142 = 213

Specific objective 2

	Zα/2 of 1-B(power)	Zα/2 of 95% certainty	P1	P2	Ratio	n1	n total
ANC attendant	0.84	1.96	0.206	0.316	1:1	534	881

The total sample size is 881

4.5. Sampling Procedure

There are 6 public hospitals, 13 private and 88 health centers under Addis Ababa health bureau which gives delivery and antenatal care services. After Randomly selecting 30% of health institutions in Addis Ababa , from 6 public hospitals 2 public hospitals were randomly selected, from 13 private hospitals 3 hospitals were randomly selected and from 88 health centers 26 health centers were randomly selected.

Second, proportionally allocate the sample to the size of women who give birth in those public and private health institutions.Based on number of deliveries prior to data collection (second quarter report). Systematic random sampling was used to select mothers. The sampling interval (K) was obtained by dividing the expected total number of deliveries (N) 3122 to the number of sample 881 (n) at each data collection site. Every (K) clients who fulfills the inclusion criteria was included until the required sample size is reached. K=3

Sampling procedure

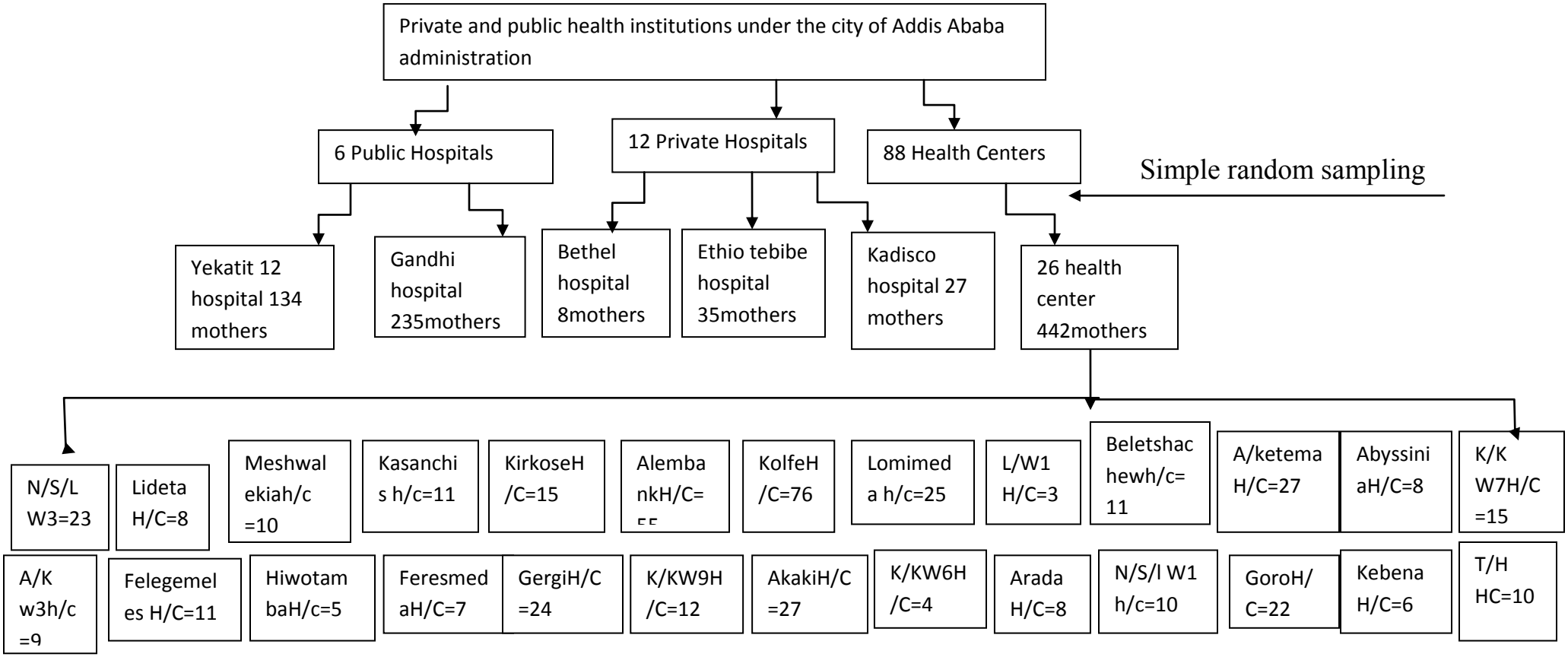

Figure 2 Schematic presentation of the sampling procedure to be used in the study, Addis Ababa, Ethiopia, 2016

4.6. Inclusion and exclusion criteria

4.6.1. Inclusion criteria

-Those women who came for delivery by the time of the data collection at selected health facility.

4.6.2. Exclusion criteria

-Those women who were seriously ill or have problems of communication.

-Those women who were unwilling to participate.

- Those women with still birth and congenital anomalies

- Those women with twin birth

4.7. Study Variables

4.7.1. Dependent variable

- Birth Weight of neonate

4.7. 2. Independent variables

- Socio-demographic variables; Age, marital status, educational status, occupational status, family size and wealth index
- Variables related to obstetric and maternal medical status: parity, gestational age previous history of lbw, history of abortion, history of still birth, history of preterm, birth space, gestational age, HIV status, anemia, maternal weight, iron supplementation

4.8. Data collection procedures

Data collection was done using pre-tested structured questionnaire adopted from different literatures. The data was collected before discharge. Mothers were provided with brief orientation on the purpose of the study and its significance then the data collector conducts the interview. Information for the study variables maternal medical, obstetric and new born weight were taken reviewing records from ANC follow up chart,

Data collectors were recruited from the selected hospitals and HC who are midwifes.Datacollectors and supervisors were given training for a day about the objectives of the study, data collection instruments, data collection procedures and the ethical considerations by the principal investigator and an additional training for supervisor on data completeness and cross checking. The data collection was supervised by two health officers and by the principal investigator

4.9. Data quality control

Before the data collection the questionnaire was translated to Amharic and to further assure the data quality, the questionnaire was pre-tested by taking about 5% of study subject before the actual data collection. The data was reviewed and checked for errors, legibility of handwriting, completeness and consistency by principal investigator and supervisor during data collection.

4.10. Standard definitions

Low birth weight: babies who are born weighing less than 2,500 grams

Preterm birth: Preterm birth is the birth of an infant before 37 weeks of pregnancy.

Still birth: death of fetus after the 28 completed week of gestation

Abortion- a fetus born before 28 week of gestation

Previous history of delivery of LBW: babies were only subjectively assessed from the mothers speaking of "small or very small baby".

4.11. Data entry analysis and interpretation

Data was checked for completeness and consistencies, and then cleaned, coded and entered using Epi Info version 7, then exported to Stata version12 and checked for missing values before analysis. (Univarate analysis) descriptive statistics using measure of central tendency and dispersion, frequencies, proportions and diagrams were used varibles. Logistic regression analysis was carried out to assess determinants on birth weight and to control for possible confounders. Bivariate analysis was used to assess the strength of an association between dependent variable (low birth weight) and list of independent variables and test significance of the association was tested. Odds ratio with 95% confidence interval used to measure strength of association. In conducting these tests Statistical significance was considered at a p- value of less than 0.05.Multivariate logistic regression model used to identify the important determinants by controlling for possible confounding effects and was conducted to calculate for adjusted odds ratios with a 95% confidence interval. Two logistic regression models were developed for sociodemographic and nutrition related variables and for the obstetric characteristics then variables with p value <0.05 were taken to the model.

4.12. Ethical considerations

Ethical clearance was obtained from Research Ethics Committee (REC) of School of Public Health at College of Health Sciences of Addis Ababa University. Following the endorsement by the REC, Addis Ababa health bureau were informed about the objectives of the study through a support letter from School of Public Health and then written permission from Addis Ababa health bureau and accordingly it was presented to respective health facilities. The purpose and importance of the study was explained to the participants. Data were collected after full informed verbal consent is obtained and confidentiality of the information was maintained by omitting their names and personal identification.

4.13. Dissemination of result

After completion of research, the results of the study will be presented during thesis defense and the final result will be submitted to Addis Ababa University School of Public Health. In addition to this the final result document will be presented to Addis Ababa health bureau and other responsible bodies. And also, the findings of the study will be published and disseminated through different journals and scientific publication.

5. RESULTS

5.1. Socio demographic characteristics of mother

Out of the total 881 sampled mothers who gave birth at two Public Hospitals, twenty six health centers and three private hospitals in Addis Ababa, a total of 853 participants responded to the questionnaire. This makes the response rate 96.8%.The remaining 3.2% were excluded due to incompleteness and non-response.

Out of 853 birth 14.7% [95% CI :(12.2, 17) low birth weight, the mean birth weight of new born was 3043±593gm.With minimum of 1100 and maximum of 5000gm. The highest proportion of respondents 276(32.4%) were age group 27–30yrs, the range between 17-41years with a mean and SD of 27.45±4.745 years. The largest proportion of mothers were married 789(92.5%), about 397(46.5%) were living in the family size of four to five. Most of the mothers 548 (64.2%) were Orthodox Christian religion followers about 387 (45.4%) were housewives. The largest proportion of mothers were Primary school complete 259 (30.4%), hence, as for wealth index quintile, 171 (19.98%) And 187 (21.86%) of study participants were from second and middle socio economic index category, respectively (Table1).

Table-1: Socio-demographic characteristics of the mothers participating in the study public and private health institution deliveries in Addis Ababa, Ethiopia, 2016(n=853)

Variables	categories	No (%)
Residence	Addis Ababa	788(92.4)
	Out of Addis Ababa	65(7.6)
Age	15-18	16(1.9)
	19-22	113(13.2)
	23-26	249(29.2)
	27-30	276(32.4)
	31-34	116(13.6)
	≥35	83(9.7)
Marital status	Single	41(4 .8)
	Married	789 (92.5)
	Separated(divorced)	15(1.8)
	Widowed	8(.9)
Educational status	illiterate	71 (8.3)
	Read and write	53 (6.2)
	Primary school (1-8)	259(30.4)
	Secondary SCHOOL (9-10)	215 (25.2)
	Preparatory	81 (9.5)
	Higher education	174(20.4)
Occupational status	Student	23 (2.7)
	Government Employed	111(13.0)
	Private organ employee	153(19.8)
	Self-employed (private business)	120 (14.1)
	House wife	387 (45.4)
	Day laborer	43(5)

Religion	Orthodox	548 (64.2)
	Muslim	202 (23.7)
	Protestant	84 (9.8)
	Catholic	19(2.2)
Family size	2-3	18 (2.1)
	4-5	397(46.5)
	5+	438(51.3)
Wealth index	Lowest	170 (20.09)
	Second	171 (19.98)
	Middle	187 (21.86)
	Fourth	156 (18.21)
	Highest	169 (19.86)

5.2. Obstetric characteristics

Of the total respondents 356 (41.7%) delivered for the first time and almost half of mothers 476(55.8%) had given birth to 2-4 chidren.of the total respondents 63(7.4%) had previous history of still birth .one hundred seventy seven of mothers had previous history of abortion of these 16.4% and 4.3% had one and greater than one abortion respectively. Some of the mothers had history of adverse birth outcome of 18.2%, 5%, and9.5 % prolonged labor, preterm delivery and lbw respectively.

With regard to type of pregnancy nearly all respondents 690(80.9%) said current pregnancies were wanted and planned. All respondents had at least one ANC follow up of which 494(57.9%) of mothers started ANC at first trimester, half of the mothers (50.6%) had ANC at health centers. Majority 90.5% of mothers were supplemented with iron folic during ANCfollow up. Majority of respondents 579(67.9%) were taking additional food whereas 620(72.7%) respondents said they were given counseling about additional food during pregnancy. More than half 536 (62.8%) of mothers delivered normally by spontaneous vaginal delivery and proportion of preterm delivery was 17.9 %.(table2).

Table 2.Obstetric characteristics of the mothers participating in the study public and private health institution deliveries in Addis Ababa, Ethiopia, 2016

Variable	categories	N (%)
Parity	1	356 (41.7)
	2-4	476 (55.8)
	5+	21(2.5)
History of still birth	1	63(7.4)
	2-3	9(1.1)
	0	781(91.5)
History of abortion	1	140(16.4)
	2-3	37(4.3)
	0	676(79.3)
Birth spacing from her last pregnancy	<2years	445(52.3)
	2years	206(24.2)
	≥3years	202(23.6)
History of prolonged labor	Yes	155(18.2)
	No	698(81.8)
History of preterm delivery	Yes	43(5)
	No	810(95)
History of LBW	Yes	81(9.5)
	No	772(90.5)
folic acid supplement	Yes	772(90.5)
	No	81(9.5)
Type of pregnancy	Wanted and planned	690 (80.9)
	Unplanned but wanted	144 (16.9)
	Unplanned and unwanted	19 (2.2)
Place of ANC	Health center	432 (50.6)
	Public hospital	178 (20.9)
	Private hospital	73(8.6)
	Health center & public hospital	112(13.1)
	Public&privatehospital	58(6.8)

Table -2. Continued

Variable	categories	N (%)
ANC started	First trimester	494(57.9)
	Second	332(38.9)
	Third	25(2.9)
Frequency of ANC visits	<3	43(5)
	≥3	810(95)
Counseling about	Yes	620 (72.7)
additional food	No	233(27.3)
Additional food taken	Yes	579(67.9)
	No	274(32.1)
Mode of delivery	Vaginal delivery	536(62.8)
	Assisted delivery	24 (2.8)
	Cesarean session	293 (34.4)
Gestational age	28-36	153(17.9)
	37-41	567 (66.5)
	>42	127 (14.9)
	Not done	6(.7)

5.3. Maternal Medical condition.

Hemoglobin was done for 99.2% of mothers during ANC follow up or before delivery the minimum hemoglobin was 8.2gm/dl and maximum of 17.2gm/dl proportion of anemia was (4.8). From the total mothers 22(2.65%), 122(14.3%), 13(1.5%) and 23(2.7%) of them had Chronic hypertension, PIH, Type II DM, and Gestational DM respectively. Some signs of pregnancy complications were seen in current pregnancy of 26(3%), 45(5.3%), 82(9.6%), 64(7.5), 45(5.3%) and 50(5.9%) of the mothers had bleeding, gush of fluid, headache, blurred vision, fever and severe abdominal pain during pregnancy, respectively (Table-3).

Table-3. Medical condition of the mothers participating in the study public and private health institution deliveries in Addis Ababa, Ethiopia, 2016.

Variables	category	frequency
HIV status	Reactive	12(1.4)
	Non-reactive	827(97)
	Not known	14(1.6)
Hemoglobin level	<11	40(4.8)
	≥11	806(95.2)
Chronic hypertension	Yes	22(2.6)
	No	831(97.4)
Pregnancy induced hypertension	Yes	122(14.3)
	No	731 (85.7)
Diabetes mellitus	Yes	23(2.7)
	No	830(97.3)
Maternal Weight at third trimester	45-55	136(15.9)
	≥56	709(83.1)
	Not registered	8(0.9)
Signs of pregnancy complications		
Bleeding	YES	26(3)
	NO	827(97)
Gush of fluid	YES	45(5.3)
	NO	808(94.7)
Severe headache	YES	82(9.6)
	NO	771(90.4)
Blurring of vision	YES	64(7.5)
	NO	789(92.5)
Fever	YES	45(5.3)
	NO	808(94.7)
Abdominal pain	YES	50(5.9)
	NO	803(94.1)

5.4. Sociodemographic and nutrition related characteristics and low birth weight

In this model only weight of mothers at third trimester showed significant association with low birth weight. Mothers whose weights at third trimester ≥56kg reduce the risk of low birth weight than mothers at third trimester weight 45-55kg (table4).

Table 4: Sociodemographic and nutrition related variables with low birth weight among public and private health institutions deliveries in Addis Ababa, 2016 (n=853).

	LBW status			
variables	**Yes n(%)**	**No N (%)**	**COR 95% CI**	**AOR 95% CI**
Age				
15-18	4(25)	12(75)	1.97(0.545,7.139)	0.79(0.19,3.32)
19-22	18(15.9)	95(84)	1.121(0.508,2.476)	0.73(0.31,1.73)
23-26	39(15.7)	210(84.3)	1.099(0.545,2.214)	0.82(0.38,1.73)
27-30	42(15.2)	234(84.8)	1.062(0.530,2.13)	1.04(0.50,2.18)
31-34	10(8.6)	106(91.4)	0.56(0.23,1.36)	0.62(0.25,1.55)
≥35	12(14.5)	71(85.5)	1	1
Marital status				
Never Married	12(18.8)	52(81.2)	1.38(0.715,2.67)	0.64(0.31,1.33)
Ever married	113(14.3)	676(85.7)	1	1
Educational status				
illiterate	17(24)	54(76)	**2.73(1.3,5.7)***	1.71(0.72,4.03)
Read and write	7(13)	46(87)	1.32(0.52,3.35)	0.83(0.29,2.33)
Primary school (1-8)	47(18)	212(81.9)	**1.92(1.074,3.44)***	1.36(0.68,2.71)
Secondary SCHOOL (9-10)	29(13.5)	186(86.5)	1.351(0.72,2.53)	1.07(0.53,2.19)
Preparatory	7(8.6)	74(91.4)	0.82(0.33,2.05)	0.77(0.29,2.04)
Higher education	18(10.3)	156(89.7)	1	1
Occupational status				
student	6(26)	17(73.9)	**3.209(1.05,9.831)***	2.19(0.63,7.72)
Private organ employee	21(12.4)	148(87.6)	1.290(0.596,2.792)	1.37(0.61,3.09)
Selfemployed(private business)	11(9.2)	109(90.8)	**0.917(0.38,2.209)***	0.96(0.37,2.47)
House wife	68(17.6)	319(82.4)	1.938(0.986,3.808)	1.75(0.80,3.84)
Day laborer	8(18.6)	35(81.4)	2.078(0.773,5.585)	1.54(0.52,4.60)
Government Employed	11(9.9)	100(90.1)	1	1

Family size				
2-3	2(11)	16(88.9)	0.66(0.15,2.92)	0.41(0.08,2.09)
4-5	53(13.4)	344(86.6)	0.81(0.55,1.19)	0.83(0.575,1.35)
5+	70(16)	368(84)	1	1
Wealth index				
Lowest	30(24)	140(19.32)	1.333(0.75,2.43)	1.21(0.84-2.33)
Second	24(19.20)	147(20.21)	1.04(0.56,1.93)	1.01(0.52-1.87)
Middle	28(22.4)	158(21.76)	1.12(0.62,2.04)	0.88(0.61-02.01)
Fourth	20(16)	136(18.70)	0.94(0.49,1.78)	0.87(0.47-1.77)
Highest	23(18.4)	146(20.11)	1	1
folic acid supplement				
No	14(17.3)	67(82.7)	1.244(0.68,2.29)	1.23(0.64,2.36)
Yes	111(14.4)	661(85.6)	1	1
Counseling about additional food				
No	32(13.7)	201(86.3)	0.902(0.58,1.39)	0.80(0.49,1.28)
Yes	93(15)	527(85)	1	1
Additional food taken				
No	46(16.8)	228(83.2)	1.26(0.86,1.90)	1.09(0.71,1.70)
Yes	79(13.6)	500(86.4)	1	1
Weight 0f mothers at third trimester				
45-55	46(33.8)	90(66.2)	4.12(2.70,6.31)*	**4.91(2.98,8.08)***
≥56	79(11.0)	638(89.0)	1	1

5.5. Obstetric characteristics and low birth weight

Mothers who had their ANC follow up in public hospitals had higher proportion of low birth weight (AOR 2.82, 95% CI (1.49, 5.34).The odds of low birth weight were higher among mothers who had previous history of low birth weight than mothers with no previous history of low birth (AOR 7.32; 95%CI (4.19, 12.39). The odds of low birth weight were 4 times higher among preterm deliveries than term deliveries (AOR 4.21; 95% CI (2.58, 6.88)). Among maternal medical conditions, low birth weight was two times more likely among pregnancy induced hypertensive mothers than mothers had no pregnancy induced hypertension (AOR2.07;95% CI(1.20,3.58)). The odds of low birth weight were more likely among anemic mothers (AOR, 3.62; 95%CI (1.60, 8.17) than mothers with normal hemoglobin level (Table5).

Table 5: The association between obstetric characteristics and low birth weight among public and private health institutions deliveries in Addis Ababa, 2016 (n=853).

VARIABLES	LBW status			
	Yes n (%)	No N (%)	COR 95% CI	AOR 95% CI
Parity				
1	61(17)	295(82.9)	1.24(0.35,4.34)	1.84(0.33,10.29)
2-4	61(12.8)	415(87.2)	0.88(0.25,3.08)	1.66(0.3,7.1)
5+	3(14.3)	18(85.7)	1	1
History of still birth				
Yes	15(20.3)	59(79.7)	1.55(0.847,2.82)	1.36(0.62,2.99)
No	110(14.1)	669(85.9)	1	1
History of abortion				
Yes	27(15.3)	150(84.7)	1.06(0.67,1.69)	1.47(0.85,2.56)
No	98(14.5)	578(85.5)	1	1
Birth spacing from her last pregnancy				
<2years	74(16.6)	371(83.4)	1.55(0.94,2.56)	2.01(0.88,4.58)
2years	28(13.6)	178(86.4)	1.22(0.68,2.207)	1.40(0.70,2.80)
≥3years	23(11.4)	179(88.6)	1	1
History of prolonged labor				
Yes	15(9.7)	140(90.3)	0.57(0.32,1.01)	**0**.57(0.29,1.12)
NO	110(15.8)	588(84)	1	**1**
History of preterm delivery				
Yes	17(39.5)	26(60.5)	**6.53(4.003,10.67) ***	1.81(0.73,4.54)
No	108(13.3)	702(86.7)	1	1
History of LBW				
Yes	37(45.7)	44(54.3)	**6.53(4.003,10.67) ***	**7.32(4.19,12.39)***
No	88(11.4)	684(88.6)	1	1

Type of pregnancy				
Unwanted&unplanned	5(26.3)	14(73.7)	2 (0.7,5.7)	0.77(0.23,2.56)
Wanted but unplanned	16(11)	128(88.9)	0.7o(0.40,1.23)	0.45(0.12,1.67)
Wanted planned	104(15)	586(85)	1	1
Place of ANC				
Public hospital	38(21.3)	140(78.7)	**2.66(1.64,4.32) ***	**2.82(1.49,5.34)***
Private hospital	10(13.7)	63(86.3)	1.56(0.74,3.27)	2.10(0.08,5.46)
Health center & public hospital	25(22.3	87(77.7)	**2.82(1.62,4.89) ***	**2.72(1.29,5.73)***
Private&publichealth institution	12(20.7)	46(79.3)	2.56(1.25,5.2) *	2.00(0.83,4.80)
Health center	40(9.3)	392(90.7)	1	1
FIRST ANC VISIT				
First trimester	72(14.6)	422(85.4)	4.09(0.54,30.74)	3.86(0.44,33.89)
Second trimester	52(15.7)	280(84.3)	4.45(0.59,3.6)	4.67(0.53,40.9)
Third trimester	1(4)	24(96.0)	1	1
Frequency of ANC visits				
<3	11(25.6)	32(74.4)	**2.09(1.03,4.28)***	2.03(0.74,5.54)
≥3	114(14.1)	696(85.9)	1	1
Hemoglobin				
<11	14(35)	26(65)	**3.44(1.74,7,573) ***	**3.62(1.60,8.17) ***
≥11	109(13.5)	697(86.5)	1	1
Gestational age				
post term	14(11)	113(89)	1.01(0.55,1.87)	0.96(0.48,1.89)
preterm	49(32)	104(68)	**3.84(2.5,6) ***	**4.21(2.58,6.88)***
Term	62(10.9)	505(89)	1	1
HIV status (839)				
Reactive	1(8.3)	11(92)	0.52(0.67,4.11)	0.69(0.07,6.2)
Non-reactive	122(14.8)	705(85.2)	1	1
Chronic hypertension				
Yes	5(22.7)	17(77.3)	1.74(0.63,4.11)	1.55(0.48.4.95)
No	120(14.4)	711(85.6)	1	1
Pregnancy induced hypertension				
Yes	36(29.5)	69(70.5)	**3.02(1.93,4.7) ***	**2.07(1.20,3.58)***
No	89(12.2)	642(87.8)	1	1
Diabetusmelits				
Yes	7(30.4)	6(69.6)	2.64(1.06,6.55)	2.80(0.94,8.34)
No	118(14.2)	712(85.8)	1	1

5.6. Sociodemographic, nutrition related and obstetric characteristics that are associated with low birth weight.

After controlling all other variables, p value <0.05 were taken in to the final model, Weight of mothers at third trimester, level of maternal hemoglobin, pregnancy induced hypertension, place of ANC, gestational age and previous history of low birth weight were still significantly associated with low birth weight.

6. DISCUSSION

In this study the proportion of low birth weight was [14.7% 95%CI(12.2-17.1)] this is comparable with a study conducted by WHO 15.5% [5] , Unicef 13% to 15% [3]. The result is consistent with study done in Kenya 12.3%[29] ,Ethiopian demographic health survey 2011[2] and a hospital based cross sectional studies done in southern Turkey and Tamilandu[18, 19] ,whereas the proportion of LBW observed in this study was slightly lower than that reported from a hospital based cross sectional study in northwestern Ethiopia, Gonder 17.1% [4] The disparity in the proportion may be due to different in area of study, study period and most pregnant women are referred from different peripheral hospitals and health centers because of high risk pregnancy and in availability of the service

The magnitude of low birth weight in this study setting is not consistent with the findings from community based survey of Kersa, East Ethiopia the prevalence of LBW was 28.3% [23] and a cohort study conducted on pregnant women in Pokhara, Nepal was 34.37% [17].The disparity in the prevalence may be due to different in setting and study design.

In this study various socio-demographic, obstetric complications related factors were assessed for their association with LBW.This study has identified maternal determinants associated with low birth weight. Identifying these factors help to know who are at risk and to minimize low birth weight. This study showed that place of ANC ,level of hemoglobin, gestational age, previous history of low birth weight ,pregnancy induced hypertension and weight at third trimester were associated with low birth weight however birth space ,parity, educational status, family size and wealth index were not significantly associated with low birth weight.

In this study higher number of LBW (21.3%) babies were born to Mothers who had antenatal place of visit public hospital and showed strong association with low birth weight. This may be due to referral from health centers of mothers who had medical complications. This study has also indicated that complications during pregnancy could result in LBW.

The commonest complication is pregnancy induced hypertension (14.3%).In the current study mothers with history of pregnancy induced hypertension had 2 times higher odds of having low birth weight. Increased in blood pressure during pregnancy decrease blood flow to the placenta due to this the baby not able to get enough nutrient and oxygen then it may lead to growth restriction. In addition if the blood pressure is sever the labor started artificially for the sake of mothers safety and babies health and it increased proportion of lbw[30].This is supplemented with a study done in Malaysia and Iran has indicated the Association between pregnancy induced hypertension and low birth weight [31, 32].

The study also identified that anemic mothers had higher odds of low birth weight as compared to those mothers with normal hemoglobin level. Maternal anemia during pregnancy is factor for preterm delivery and low birth weight. Anemia lead oxidative stress to the fetal growth also the mother develop loss of appetite and decrease nutritional status that can decrease birth weight [32-34].similarly study done in turkey showed a significant association between anemia and birth weight[18]

Based on the finding of this study, preterm babies were 4 times odds of low birth weight compared with term babies. Preterm baby has less time in mothers‟ uterus to gain weight and grow. May be the earlier the baby born, the lower birth weight and delayed development [34, 35].This is related with study finding done in Gonder, Mekelle, Nigeria, Tamilandu [4, 19, 24, 25].mothers whose gestational weight at third trimester was ≥56kg,mothers had lower odds of delivering low birth weight . The association between maternal weight and LBW babies was statistically significant[20] This indicates maternal weight at third trimester in relation to birth weight .most gained weight during final stage of pregnancy and decrease intrauterine growth restriction [34]. Similarly, previous history of low birth weight showed that seven times higher odds of low birth weight than had no previous history low birth weight. This is in line with Matched Case Control studies done in Malaysia[36].

Unlike other studies in this study parity doesn‟t show association with low birth weight. however studies done in Dehradun ,north west Ethiopia and mekelle showed high for parity one [4, 20].This is also supported by a study done on Tamilandu of south India[19] the difference could be sample size and study setting.

Similarly birth space had no significant association with low birth weight[20, 25] and in this study it may be due to high number (41.7%) of mothers with first child birth.

7. Strength and Limitation

7.1 Strength

- One of the major strengths of this study is its comprehensiveness through including various health care settings like public and private hospitals as well as health centers. This was very helpful in assessing the possible variation in LBW in these settings due to their organizations, staffing and processes.
- Another important strength of the study was the large sample size taken to investigate the level and determinants of LBW. Furthermore, the data collection which relied heavily on interviewing mothers of newly born babies provided an advantage of getting a lot of information which would otherwise not have been possible to gather from medical records only.

7.2 Limitations

- One of limitations of the study is Being a cross sectional study, it was not possible to show seasonal variation in low birth weight. Additionally, being conducted in health facilities, therefore it was not possible to generalize the results to a particular population as Compared to population based studies.
- The hemoglobin level used to assess anemia as a risk factor in this study was what was available in record. It would have been better to use of hemoglobin level from first trimester to delivery but mothers attend ANC visits at different gestation in their pregnancy.
- Despite the limitations, this study has made an important contribution on identifying the proportion of low birth weight and important maternal determinants of low birth weight in Addis Ababa

8. Conclusion and Recommendation

8.1Conclusion

- The magnitude of low birth weight is 14.7 % the result of this study showed that LBW is still a public health problem in the study area and level of hemoglobin, gestational age, previous history of low birth weight, history of pregnancy induced hypertension and weight at third trimester were associated with low birth weight. Determinants that are mentioned some of them can be prevented with early routine investigation, taking physical examination and obstetric history

8.2. Recommendation

- The policy makers should be strengthening the maternal and child health services and the recent focused ANC program
- The health facilities should give special attention for early recognition of abnormalities while ANC visits and to give special attention to mothers with chronic disease like hypertension and mothers with previous history of lbw.
- Prevention of preterm births is one of the best ways to prevent babies born with low birth weight
- In order to prevent low birth weight maternal anemia should be treated and mothers advised to prevent anemia by taking treatment appropriately.
- Mothers should be advised about proper weight during pregnancy since maternal weight are linked with fetal weight gain and birth weight,
- Population based study would be helpful to know other unmeasured risk factors

9. References

1. UNICEF, *UNICEF global databases*. 2012: New York.
2. Ethiopian Central Statistical Agency, *The 2011 Ethiopian Demographic and Health Survey (EDHS)* 2012, Ethiopian Central Statistical Agency: Addis Ababa, Ethiopia.
3. UNICEF WHO, *Low Birth weight: Country, Regional and Global Estimates*. 2004: New York.
4. Zeleke Berihun Megabiaw, Zelalem Meseret, and Mohammed Nuru, *Incidence and correlates of low birth weight at a referral hospital in Northwest Ethiopia* Pan African Medical Journal, 2012. **12**(4): p. 1-8.
5. WHO World Health Organization *Guide lines on optimal feeding of low birth weight infants in low and middle income countries. Geneva, Switzerland: .* 2011.
6. Megha Sharma and Sunita Mishra, *Maternal risk factors and consequences of low birth weight in Infants* IOSR Journal Of Humanities And Social Science (IOSR-JHSS), 2013. **13**(4): p. 39-45
7. Kelly G. Chester, *Birth Outcomes In Georgia: Socioeconomic and Ecological Analyses of Low Birth Weight,2000-2006* 2010 Georgia Southern University
8. *Care of the Newborn in Developing Countries* Book 2 Chapter 11 Low Birth Weight; Available from: www.oxfordjournals.org/en/help/index.html.
9. Goldenberg rl and culhane jf, *LBW inUnited States.* Am j nutr, 2007 **85**: p. 584-590.
10. Kim D and Saada A, *The social determinants of infant mortality and birth outcomes in western developed nations: a cross-country systematic review.* Int J Environ Res Public Health, 2013. **10**(6).
11. World Health Assembly, *Resolutions WHA65.6. Comprehensive implementation plan on maternal, infant and young child nutrition*. 2012, World Health Organization: Geneva. p. 12-13.
12. Black RE, et al., *Maternal and child under nutrition and overweight in low-income and middle-income countries.* Lancet, 2013(382): p. 427–51.
13. Victora CG, et al., *Maternal and Child Undernutrition Study Group. Maternal and child undernutrition: consequences for adult health and human capital.* Lancet, 2008: p. 340–57.
14. Joyce A.Martin, et al., *Birth:final data for 2013*. 2015, National vital statistics.
15. Bale , J.R., B.J. Stoll , and A.O. Lucas, *Improving birth outcomes Meeting the challenges in the developing world Board on Global Health* Institute of Medicine of the National Academy of Science, The National Academic Press, Washington DC, , 2003.
16. WHO. *WHA Global Nutrition Targets 2025: Low Birth Weight Policy Brief* 2014; Available from: www.who.int/nutrition/trackingtool.
17. Joshi H S, et al., *Risk Factors for Low Birth Weight (LBW) Babies and its MedicoLegal Significance* J Indian Acad Forensic Med, 2010. **32**(3).
18. Nilgun Col-Araz, *Evaluation of factors affecting birth weight and preterm birth in southern Turkey.* J Pak Med Assoc, 2013. **63** (4).
19. Rahul HanumantDandekar, Mohd.Shafee Sati, and Prasad Sinha, *Prevalence and risk factors affecting low birth weight in a district hospital at Perambalur,Tamilnadu.* Global journal of medicine and public health 2014. **3**(2).
20. K.S. Negi, S.D. Kandpal, and M. Kukreti, *Epidemiological Factors Affecting Low Birth Weight.* JK Science, 2006. **8**(1): p. 31-38.
21. Berhanu A, Fikre E, and L. Y., *Birth to pregnancy interval and its effect on perinatal out comes in Addis Ababa Ethiopia.* ethiopian Jornal of Reproductive health 2000:14(2). **4**(1): p. 169-176.

22. Eshete Asmamaw, Birhanu Dereje, and Wassie Belaynew, *Birth outcomes among laboring mothers in selected health facilities of North Wollo Zone Northeast Ethiopia A facility based cross-sectional study.* Health, 2013. **5**(7): p. 1141-1150
23. Assefa Nega, Berhane Yamane, and Worku Alemayehu, *Wealth Status, Mid Upper Arm Circumference (MUAC) and Antenatal Care (ANC) Are Determinants for Low Birth Weight in Kersa, Ethiopia.* PLoS ONE, 2012. **7**(6).
24. E.K. Nwangwa, *Effect of Maternal Indices on Fetal Outcomes in a Primary Health Care Centre.* Asian Journal of Medical Sciences 2012. **4** (1): p. 13-16.
25. Bugssa Gessessew, Dimtsu Balem, and Alemayehu Mussie, *Socio Demographic and Maternal Determinants of Low Birth Weight at Mekelle Hospital, Northern Ethiopia: A Cross Sectional Study.* AJADD [2014]. **2**(5): p. 609-618
26. Arun K Koirana and Dharma n Bhatta, *Low-birth-weight babies among hospital deliveries in Nepal a hospital-based study.* International Journal of Women's Health, 2015. **7**: p. 581–585
27. Bureau, A.A.c.a.H., c.adminstrator,Editor 2014:addis Ababa, Ethiopia.
28. *Finance and Economic Development Bureau and Population Affairs Coordination Sub process. Addis Ababa Population Images*2009 p. 8-9.
29. Muchemi, O.M., E. Echoka, and A. Makokha, *factors associated with low birth weight among neonates born at Olkalou District Hospital Central Region Kenya.* Panafrican medical journal, 2015. **20**(108).
30. Black, H.R. and w. Elliott, *Acompanion to branwalds heart disease hypertension on the risk of lowbirth weight.* 2012.
31. Rahman LA1 and Hairi NN, *Association between pregnancy induced hypertension and low birth weight; a population based case-control study.* Asia Pac J Public Health. , 2008;. **20**(2): p. 152-8.
32. Rafati, S., et al., *maternal determinants of giving birth to low-birth-weight neonates.* arch iranian med 2005. **8** (4): p. 277 – 281.
33. Ahmad MO, et al., *Effect of maternal anaemia on birth weight* J Ayub Med Coll Abbottabad, 2011 Jan-Mar. **23(1)**(77-9).
34. Lindsay H Allen, *Anemia and iron deficiency: effects on pregnancy outcome 1–3.* Am J Clin Nutr 2000 **71**(1280S–4S).
35. US Agency for international Development, p.c.i., *profile of preterm and low birth weight prevention and care*. 2015.
36. Sutan, R., et al., *Determinant of Low Birth Weight Infants A Matched Case Control Study* Scientific Research, 2014. **4** p. 9

10. Annex

Annex1. Information sheet

Principal investigator: Samrawit Sebsibe

Title: Effect of maternal characteristics on birth weight of neonate in private and public health facilities of Addis Ababa: a crossectional study.

Funded by: Addis Ababa university school of public health

Hello! My name is……. I am here on behalf of: Samrawit Sebsibe student of the school of public health in the Addis Ababa University. She is conducting a research for the partial fulfillment of second degree on „„ Effect of maternal characteristics on birth weight of neonate in private and public health facilities of Addis Ababa:‟‟ She has received permission from school of public health at Addis Ababa university and from health bureau to conduct this study.

Objective; to determine the proportion of LBW and the effect of maternal characteristics during pregnancy on birth weight of neonates in health facilities of Addis Ababa

Benefit of the study: the results of this the study will be helpful to indicate potential intervention points for stakeholders by identifying major determinants of maternal characteristics on birth weight of baby to prevent Lbw. The result of the study will be disseminated to concerned bodies including Addis Ababa health bureau.

Respondents' privacy–collected data will be solely used for the stated research objectives.

Risk of the study: Participating in this study will not have any risk or harm.

Rights of Participants: You have full right either to Participate or decline participation in this study as participant. You may respond to all the questions or you may not answer to questions you don‟‟t want to and you may end the interview at any time you want. You can ask any question which is not clear for you.

Confidentiality: Any information forwarded will be kept confidential and names will not be written or specified and all the questionnaires will be coded for anonymity. Only the principal investigator will know the details and she will discard it after completing analysis.

Informed Consent

Now I would like to tell you that your genuine response to the interviews will be very important for the purpose of the study and the interview will take 15-20 minutes At the same time we would like to appreciate your voluntarily participation in the survey after a thorough understanding of the information given to you.

I have read this form or it has been read to me in the language i comprehend and understand all conditions stated above.

Are you willing to participate in this study?

1- No (say thank you) 2- Yes (continue interviewing)

Contact details of principal investigator and the person to whom to contact at any time for further explanation:

Name of principal investigator: Samrawit Sebsibe

Cell phone No – 0912171713 Address of the supervisor- 0921545535

School phone no_0115517701

E-mail: sebsisamri@gmail.com

Name of health facility……..

Name of interviewer_____ signature_____

Date of interview (Ethiopian calendar) _____/_____/_____

Result of interview:

1- Completed…… 2- Refused …….3- Respondent not available…….. 4- Partially completed …….

Checked by supervisor;

Name …….. Signature …… Date ……...

Annex.2 English version questionnaire

1.1. Socio-demographic characteristics of the women participating in the study

Now I am going to ask you some questions regarding your socio demographic information.

Q no	Questionnaire	Responses	Skip
101	Where do you live?	1.AddisAbaba 2.Out of AddisAbaba	
102	How old are you?(last celebrated birthday)	……..years old D….. M….. Yr	
103	What is your Religion?	1.Orthodox 2.Muslim 3.Catholic 4.protestant 5.Others	
104	What is your current educational level?	1.Can‟t read and write 2.Read and write only 3.Primary school(1-8 4.Secondary school(9-10) 5.Preparatory 6.College 7.TVET 8..University	

105	What is your current marital status?	1.Single 2.Married 3.Divorced 4.Widowed 5.Separated		
106	What is your current occupational status?	1.Student 2.Government Employed 3. private organ employee 4.NGOs employee 5.Self-employed(private business 6.House wife 7.day laborer 8.Seeking for job 9.Others Specify		
107			yes	no
		Electricity	1	2
		Watch/clock	1	2
		Radio	1	2
		Television	1	2
		A mobile telephone	1	2
		non-mobile telephone	1	2
		Refrigerator	1	2
		Table	1	2
		Chair	1	2
		bed with cotton/sponge/ spring mattress	1	2
		Electric mitad	1	2

		kerosene lamp/pressure	1	2
		lamp	1	2
		car	1	2
		cement/concrete wall	1	2
		stone with lime/cement walls	1	2
		corrugated iron /metal roofing	1	2
		Animal-drawn cart	1	2
		Car/truck	1	2
		Bicycle	1	2
		floor earth/sand	1	2
108	How many individual live in your household?	……..		

1.2 Maternal Characteristics

Now I am going to ask you about obstetric history

201	Total number of live birth?	in number	
202	Previous History of still birth	1.yes 2.no	Skip If NO for Q204
203	Total number of still birth?	in number	
204	Was there any history of abortion?	1.Yes 2.No	Skip If NO for Q206,
205	Total number of abortion	…….	
206	Was there any history of preterm delivery (≤37wk)?	1.Yes 2.No	

207	Was there any history of prolonged Labor (>12hr)?	1.Yes 2.NO	
208	Was there any history of low birth weight (small baby)?	1.Yes 2.No	

1.3 Antinatalcare

Now I am going to ask you about Antinatalcare

301	What type of pregnancy is it?	1. planned and wanted 2. unplanned but wanted 3. unplanned and unwanted	
302	Have you visited health facility for ANC for current pregnancy?	1.Yes 2.No	Skip if no for Q 307
303	Where did you attend the ANC during current pregnancy?	1.Health center 2.Gov‟t hospital 3.Private hospital 4.Govt hospital &Hc 5.Private hospital and govt hospital 6.Others(specify) /_____/	
304	At what months of the current pregnancy you started ANC?	At _____ months	
305	How many times you visited health facility for ANC?	/_____/ times	
306	Have you been told about signs complications?	1.yes 2. No	

307	Which complications? (more than one response is possible)	1.Vaginal bleeding 2. Vaginal gush of fluid. 3.Severe headache 4.Blurred vision 5.Fever 6.Abdominal pain 7. Don‟t know 9. Other /_____/	
308	Have encountered any of the mentioned complications?	1. Yes 2. No	Skip if no for Q 310
309	Which complications? (more than one response is possible)	1. Vaginal bleeding 2. Vaginal gush of fluid. 3. Severe headache 4. Blurred vision 5. Fever 6. Abdominal pain 9. Other /_____/	
310	Have you been given dietary counseling about the importance and type of additional food intake during pregnancy?	1. Yes 2. No	
311	Have you taken additional food than usual during pregnancy?	1. Yes 2. No	
312	How did you give birth? what is mode of delivery	1.Vaginal delivery 2.Assisted delivery 3.Cesarean section	

313	Have you taken Fefol/iron tablets? Show tablet	1.yes 2.NO 99.Do not remember	Skip If no for Q 314
314	During the whole pregnancy, for How many days did you take the tablets?	No of Days: _____ 99.Do not remember	
315	Have you ever been told that you have chronic hypertension?	1. Yes 2. No 99. Do not remember	
316	During this pregnancy, have you been told that you have developed pregnancy induced hypertension?	1. Yes 2. No 99. Do not remember	
317	Have you ever been told that you have Diabetes Mellitus?	1. Yes 2. No 99. Do not remember	

Finally, I would like to express my heartfelt thanks for your voluntary participation in this interview.

You have contributed your best!

1.4 Document review

Variable	**Measurement**	**Remark**
Gestational age /ultrasound	/_____/ **Weeks**	
Maternal weight at third trimester	/_____/**Kg**	
Hemoglobin	/_____/	
Hiv status of mother	/_____/	
Neonatal weight	/_____/**Grams**	

Annex 4. Amharic version questionnaire

የአማርኛ ቋንቋ መጠይቅ

ጥናት አድራጊ፡- ሳምራዊት ሰብስቤ

ርዕስ፡- **የእናቶች በእርግዝና ወቅት የነበሩበት ሁኔታ በሚወለዱት ልጆች የክብደት መጠን ላይ ያለው ተፅእኖ አዲስ አበባ ከተማ ውስጥ በሚገኙ የመንግስትና የግል የጤና ተቋማት**

ስፖንሰር፡ አዲስ አበባ ዩኒቨርሲቲ ህብረተሰብ ጤና ትምህርት ቤት

ጤና ይስጥልኝ! ስሜ..... ሲሆን ዛሬ እዚህ የተገኘውት የአዲስ አበባ ዩኒቨርስቲየህብረተሰብ ጤና ትምህርት ቤት ተማሪ የሆነችውን ሳምራዊት ሰብስቤን በመወከል ሲሆን ጥናቱም የማስተርስ ዲግሪዋን ለማግኘት የሚጠቅማት ሆኖ **የእናቶች በእርግዝና ወቅት የነበሩበት ሁኔታ በሚወለዱት ልጆች የክብደት መጠን ላይ ያለው ተፅእኖ አዲስ አበባ ከተማ ውስጥ በሚገኙ የመንግስትና የግል የጤና ተቋማት** በሚል ርእስ የሚሰራ ነው ። ጥናቱንም ለማካሄድ ከአዲስ አበባ ዩኒቨርስቲ እና ከአዲስ አበባ ጤና ቢሮ አስፈሊጊውን ፍቃድአግኝታለች፡፡

አላማ፡- ከተገቢው ክብደት በታች ሆነው የሚወለዱ ህፃናትን መጠን መለየት እና የእናቶች የእርግዝና ወቅት ሁኔታዎች በሚወለዱት ልጆች የክብደት መጠን ላይ ያለው ተፅእኖ መግለፅ

ጥናቱ የሚሰጠው ጥቅም :-

የዚህ ጥናት ውጤቶች ለተለያዩ ባለድርሻ አካላት መፍትሄ የሚያስፈልጋቸውን ነጥቦች እናቶች በእርግዝና ወቅት የነበሩበት ሁኔታ በሚወለዱት ልጆች የክብደት መጠን ላይ ያለውን ተፅእኖ በመለየት ያግዛል፡፡ የጥናቱ ውጤት የአዲስ አበባ ጤና ቢሮን ጨምሮ ለሚመለከታቸው አካላት የሚሰራጭ ይሆናል፡፡

ጥናቱ ሊያስከትል የሚችለዉ ጉዳት፡-

በጥናቱ ላይ መሳተፍ ምንም አይነት ጉዳት አያስከትልም፡፡

የተጠያቂው መብቶች

በዚህ ጥናት ላይ የመሳተፍ እንዲሁም ያለመሳተፍ መብትዎ የተጠበቀ ነው፡፡ በጥናቱ ውስጥ ለሚጠየቋቸው ጥያቄዎች በሙሉ መመለስ ወይም ለመመለስ ፍቃደኛ ያልሆኑአቸውን መተው የሚችሉ ሲሆን በቃለመጠይቁ መሃል በማንኛውም ሰአት ማቋረጥ ይችላሉ፡፡

ምስጢራዊነት

በዚህ ጥናት ሂደት የሚሰበሰበው መረጃ ምስጢራዊነቱ የሚጠበቅ ሲሆን የእርስዎ ስም ባለመፃፍ ምስጢራዊነቱን ለመመጠበቅ ለመጠይቁ የቁጥር ኮድ የምንጠቀም ይሆናል፡፡ መረጃዎች በጥናት አድራጊዋ ሃላፊነት ውስጥ የሚቆይና መረጃው ከተቀመረ በኋላ የሚወገድ ይሆናል፡፡

ስምምነት

ሌላው ልነግርዎት የምፈልገው የእርስዎ እውነተኛ መልሶች ለሚደረገው ጥናት በጣም ጠቃሚ እንደሆነ እንዲሁም ጥያቄዎቹን መልሶ ለማጠናቀቅ ከ15-20 ደቂቃ ሊፈጅ እንደሚችልነዉ:: የተሰጥዎትን መረጃ ተረድተው በጥናቱ ለመሳተፍ ፍቃደኛ ቢሆኑልን በቅድሚያ እናመሰግናለን::

ከላይ ያለውን በሙለ በማውቀው ቋንቋ ተነቦልኝ ተረድቼ ገብቶኛል ካሉ:-

በጥናቱ ለመሳተፍ ፍቃደኛ ነዎት?

አዎ (ቃለመጠይቁን እንቀጥል) ☐ አይደለዉም(አመሰግናለው) ☐

ለሚኖርዎት ጥያቄ የሚጠቀሙት አድራሻ እና የጥናት አድራጊዋ መረጃ

የጥናት አድራጊዋ ስም፡ ሳምራዊት ሰብስቤ

ስልክቁጥር፡ 0912171713

የህብረተሰብ ጤና አጠባበቅ ት/ቤት ስልክ: 0115517701

ኢ-ሜይሌ፡ sebsisamri@gmail.com

የጤና ተቋሙ ስም፡---------- የመጠይቁ መለያ ቁጥር፡ ----------

የጠያቂውስምእናፊርማ._____ የተጠየቀበትቀን (በኢትዮጵያ አቆጣጠር)------/-----/--------

የቃለ መጠይቁ ውጤት 1.ተጠናቋል 2.መጠየቅ አልፈለጉም 3.ተጠያቂው አልተገኘም 4.በከፊል የተጠናቀቀ

በሱፐርቫይዘር ተረጋግጧል ስም ---------- ፊርማ---------- ቀን_____

ክፍል 1፡ በጥናቱ የሚሳተፉ ሴቶች ስነ ህዝባዊና ማህበራዊ ሁኔታዎች

ይህ መጠይቅ ዬናቶቸን ስነ ህዝባዊና ማህበራዊ ሁኔታዎች የሚገሌጽ ሲሆን ግሌጽ ካልሆነ ጥያቄ መጠየቅ የሚችለሉ መሆኑን እየገለጽኩ ወደ ጠያቄዎቹ አመራለሁ

መጠ. ቁ	ጥያቄ	መልስ	ዝለል
101			
102	እድሜዎ ስንት ነው?	..... አመት ወር..... ዓ.ም	

103	የየትኛው ሃይማኖት ተከታይ ነዎት?	1. ኦርቶዶክስ ክርስትና 2. ኢስላም 3. ፕሮቴስታንት 4. ካቶሊክ 5. ሌላ (ይጠቀስ)	
104	የትምህርት ደረጃዎ እስከምን ድረስ ነው?	1. ማንበብናመፃፍ የማይችል 2. ማንበብናመፃፍ ብቻ 3. የመጀመሪያ ደረጃ ት/ት (1-8) 4. የሁለተኛ ደረጃ ት/ት (9-10) 5. መሰናዶ (11-12) 6. ቴሙትስ 7.ዩኒቨርሲቲ	
105	የጋብቻ ሁኔታዎ	1. ያላገቡች 2. ያገባች 3. የፈታች 4. የተለያዩ 5. ባለቤቷ ህይወቱ ያለፈ	
106	የስራ መስክዎ ምንድን ነው?	1. ተማሪ 2. የመንግስት ተቀጣሪ 3. የግል ድርጅት ተቀጣሪ 4. የእርዳታ ድርጅት ሰራተኛ 5. የግል ስራ/ቢዝነስ 6. የቤት እመቤት 7. የቀን ሰራተኛ 8. ስራ ፈላጊ 9. ሌላ (ይገለፅ).....	
107	መኖሪያ ቤትዎ ከነዚህ ውስጥ አንዱ ወይም አብዛኛው አለ ወይ?	አዎ የለም ሰአት (የግድግዳ ወይም የእጅ) 1 2 ሬዲዮ 1 2 ቴሌቪዥን 1 2 ተንቀሳቃሽ ስልክ 1 2 መደበኛ ስልክ 1 2 ማቀዝቀዣ 1 2	

		ጠረጴዛ ነ 2 ወንበር ነ 2 አልጋ ሞዝቮልድ ነ 2 የጥጥ/የስፖንጅ/የስፕሪንግ ፍራሽ ነ 2 የኤሌክትሪክ ምጣድ ነ 2 የግል በሞተር የሚሰራ ወፍጮ ነ 2 ከአርማታ/ጡብ የተሰራ ግድግዳ ነ 2 ብሎኬት ግድግዳ ነ 2 የቆርቆሮ ጣራ ነ 2 ብስክሌት ነ 2 ሞተር ሳይክል ነ 2 ባጃጅ ነ 2 በእንስሳት የሚጎተት ጋሪ ነ 2 መኪና/የጭነት መኪና ነ 2 የውሃ መሳቢያ ሞተር ነ 2	
108	ቤትዎ ውስጥ ስንት የቤተሰብ አባል አለ?	.....	

ክፍል 2፡ የእናቶች የወሊድና የእርግዝና ሁኔታ

በመቀጠል የእናቶች የወሊድና የእርግዝና ሁኔታ ጥያቄዎች አመራለሁ

201	ምን ያህል ልጅ ወልደዋል?	.....	
202	በህይወት የተወለዱት ምን ያህሉ ናቸው?	.....	
203	የተቋረጠ ፅንስ ነበር?	1. አዎ 2. የለም	መልስዎ የለም ከሆነ ወደ 205ይዘለል
204	የተቋረጠ ፅንስ ምን ያህል ነበር?	.....	
205	ከጊዜው ቀድሞ የተወለደ ፅንስ ነበር?	1. አዎ 2. የለም	
206	የረዘመ (ከ12 ሰአት በላይ የቆየ) ምጥ አጋጥሞዎት ያውቃል?	1. አዎ 2. የለም	
207	ከተገቢ ክብደት በታች (2.5 ኪግ በታች) ሆኖ	1. አዎ	

	የተወለደ ህፃን ነበርዎት?	2. የለም	
208	የአሁኑ እርግዝና ከበፊተኛው ጋር ያለው የጊዜ ልዩነት ምን ያህል ነው?	1. ከ12 እስከ 23 ወራት 2. ከ24 እስከ 47 ወራት 3. 48 ወራትና ከዚያ በላይ	

ክፍል 3፡ የቅድመ ወሊድ ክትትል,

በመቀጠል የእናቶች የቅድመ ወሊድ ክትትል,ጥያቄዎች አመራለሁ

301	እርግዝናው እንዴት አይነት ነበር?	1. የታቀደና የተፈለገ 2. ያልታቀደ ግን የተፈለገ 3. ያልታቀደና ያልተፈለገ	
302	ለአሁኑ እርግዝናሽ የቅደመ ወሊድ ክትትል ወደ ጤና ተቋም መጥተሻል?	1. አዎ 2. የለም	መልስዎ የለም ከሆነ ወደ 307ይዘለል
303	ለ 302 መልስዎ አዎ ከሆነ፣ የቅድመ ወሊድ ክትትሉን የት አካሄድሽ?	1. ጤና ጣቢያ 2. የመንግስት ሆስፒታል 3. የግል ሆስፒታል 4. ጤና ጣቢያናየመንግስት ሆስፒታል 5. ሌላ (ይገለፅ).....	
304	የቅድመ ወሊድ ክትትል እርግዝናው ምን ያህል ጊዜ ሲሆነው ጀመርሽ?	..... ወራት	
305	ለቅድመ ወሊድ ክትትል ምን ያህል ጊዜ ወደ ጤና ተቋም ሄድሽ	..... ጊዜያት	
306	በቅድመ ወሊድ ክትትል ጊዜ ጤናማ ስላልሆኑ የእርግዝና ምልክቶች ተነግርዎታል?	1. አዎ 2. የለም	

307	መልስዎ አዎ ከሆነ ምን ምን እንደሆኑ ቢነግሩን (ከ አንድ በላይ መልስ መምረጥ ይቻላል)	1. የማህፀን መድማት 2. የማህፀን ፈሳሽ 3. ከባድ ራስ ምታት 4. ብዥታ/ አይን ማጥበርበር 5. ትኩሳት 6. የሆድ ህመም 9. ሌላ (ይገለፅ)/_____/	
308	ከተዘረዘሩት ምልክቶች ውስጥ ኢጋጥሞዎት ያውቃል?	1. አዎ 2. የለም	መልስዎ የለም ከሆነ ወደ 310ይዘለል
309	ለ 308 መልስዎ አዎ ከሆነ፣ የትኛው? (ከ አንድ በላይ መልስ መምረጥ ይቻላል)	1. የማህፀን መድማት 2. የማህፀን ፈሳሽ 3. ከባድ ራስ ምታት 4. ብዥታ/ አይን ማጥበርበር 5. ትኩሳት 6. የሆድ ህመም 9. ሌላ (ይገለፅ)/_____/	
310	በቅድመ ወሊድ ክትትል ጊዜ በእርግዝና ወቅት ሊከተሉት ስለሚገባ አመጋገብ ተነግሮዎታል?	1. አዎ 2. የለም	
311	በእርግዝና ወቅት ተጨማሪ ምግብ ይመገቡ ነበር?	1. አዎ 2. የለም	
312	በየትኛው ዘዴ/መንገድ ነበር የወለዱት?	1. በማህፀን 2. በመሳሪያ እገዛ 3. በቀዶ ጥገና	
313	ቫይታሚንና ማእድን ያለው መድሃኒት (ፊፎል) በእርግዝና ወቅት ይወስዱ ነበር?(የወሰድሽው የደም ማነስ ኪኒን)	1. አዎ 2. የለም 3. አላስተውስም	መልስዎ የለም ከሆነ ወደ 315ይዘለል
314	በእርግዝናዎ ወቅት ኪኒን ለምን ያህል ቀናት ወሰዱ?	1. ---------- 99. አላስታውስም	

315	ከዚህ በፊት የደም ግፊት ህመም እንዳለብዎት ተነግሮዎት ያውቃል?	1. አዎ 2. የለም 3. አላስተውስም	
316	በእርግዝናዎ ወቅት የደም ግፊት ህመም እንዳለብዎት ተነግሮዎት ያውቃል?	1. አዎ 2. የለም 3. አላስተውስም	
317	ከዚህ በፊት የስኳር ህመም እንዳለብዎት ተነግሮዎት ያውቃል?	1. አዎ 2. የለም 3. አላስተውስም	

በመጨረሻም በዚህ ቃለ መጠይቅ ላይ ፈቃደኛ ሆነው በመሳተፍ ላበረከቱት አስተዋፅኦ ከልብ እናመሰግናለን፡፡

Document review

Variable	**Measurement**	**Remark**
Gestational age /ultrasound	/_____/ **Weeks**	
Neonatal weight	/_____/**Grams**	
Maternal weight at third trimester	/_____/**Kg**	
Hemoglobin		
Hiv status of mother		