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THE LINK BETWEEN CONTENTS AND PERCEIVED QUALITY OF ANTENATAL CARE WITH LOW BIRTH WEIGHT AMONG TERM NEONATES IN PUBLIC HEALTH FACILITIES OF BAHIR DAR SPECIAL ZONE, NORTH WEST ETHIOPIA

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Declaration

The undersigned declared that this thesis work is my original work in partial fulfillment of the requirement for the degree of Master in Public Health. All source of materials used for this thesis work and all people and institutions who gave support during this thesis work are fully acknowledged.

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Abbreviations and Acronyms

ANC --Antenatal Care

AOR---Adjusted odd ratio

BMI --Body Mass Index

CI ---Confidence Interval

COR --Crude Odd Ratio

EDHS ---Ethiopian Demographic and Health Survey

HAFAS--Household Food Insecurity Access Scale

HIV --Human Immune Deficiency Virus

IUGR ---Intra Uterine Growth Retardation

LBW --Low Birth Weight

LNMP ---Last Normal Menstrual Period

MDG --Millennium Development Goal

MUAC ---Mid Upper Arm Circumference

SSA --Sub Sahara Africa

STI --Sexually Transmitted Infection

NNN-- National nutrition program

UTI --Urinary Tract Infection

WASH ---Water, Sanitation and Hygiene

WHO --World Health Organization

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Abstract

Background: Low birth weight is not only an indicator of neonatal mortality and morbidity but also a morbidity risk in later life. Antenatal care is one of the evidence based interventions to decrease the probability of adverse birth outcomes such as low birth weight and preterm births. The effectiveness of antenatal care, however, relies on the quality of care and specific contents provided during each antenatal care visits. But, little information is available whether antenatal care contents and perceived quality are linked with weight at birth. Therefore, this study is aimed to assess the link between contents and perceived quality of antenatal care with low birth weight among term neonates in selected health facilities of Bahir Dar, North west Ethiopia.

Methods: Facility based unmatched case control study was conducted among mother-newborn pairs in Bahir Dar special zone selected public health facilities. One referral hospital and four public health centers were selected for this study. The health centers were selected by random sampling technique whereas the referral hospital was selected without undergoing further sampling procedures (as it is the only public hospital in the study area). The sample size was calculated by using EPI info version 7.0 by considering ratio of control to case 2:1, power of 80%, confidence level of 95%, precision level of 5%, odd ratio of 2.014 and percentage of control exposed 21.39. Cases were selected consecutively where as two controls were assigned for each cases. Data was entered by using Epidata version 3.1 and then exported to statistical package for social science version 21 for analysis. Bi variant analysis was done to compare birth weight by each explanatory variable using binomial logistic regression. The adjusted odd ratio was used to determine strength of the association and the corresponding confidence interval was used to decide whether there was a statistical significant between the explanatory and outcome variables.

Result: Among the contents of antenatal care, dietary advice AOR 2.29(CI 1.03-5.11) and iron intake of ≥30 days AOR 2.93(CI 1.34-6.42) were significantly associated with low birth weight at term. However, no significant association was observed between antenatal care level of satisfaction and low birth weight at term. Additionally, wealth, household food insecurity, number of ANC<4 and poor nutritional status of the mothers were significantly associated with low birth weight at term.

Conclusion and recommendation: In this study setup, the risk of LBW at term was significantly associated with lack of antenatal care contents such as dietary advice and iron intake. It was also associated with other modifiable risk factors such as household food insecurity, wealth and nutritional status. Therefore, public health interventions targeting on antenatal dietary advice and iron intake preferably ≥ 30 days by giving special emphasis for poor and food in secured women during pregnancy is recommended to reduce LBW at term in this study setup.

1. Back ground

1.1 Introduction

Pregnancy is one of the most important periods in the life of a woman and it can provide an opportunity to identify existing health risks to prevent future health problems for women and their child [1]. However, it may end up with complications and result in adverse birth outcomes such as low birth weight, preterm and still births. Low birth weight is one of the worldwide public health indicators and defined by World Health Organization as weight at birth less than 2500 gm [2]. According to WHO technical consultation report on promoting optimal fetal development, birth weight of an infant is dependent on amount of growth during pregnancy and gestational age, and these factors are related to the genetic makeup of the infant and the mother, her lifestyle, her status of health and health care services [3]. It is a complex syndrome that includes preterm and small for gestational age neonates at term. These two groups (preterm neonates and small for gestational age neonates at term) are linked to different causal factors and their long term effects/sequels are also different [4, 5, and 6]. Therefore, Understanding and differentiating the various categories of LBW is an essential first step in preventing these conditions [7,8].In Ethiopia, Adverse birth outcomes (LBW, preterm and still birth) are still a major public health problems which are responsible for neonatal and infant morbidity and mortality [9-14]. Accessible and quality antenatal care is important for preventing these major public health problems [15]. In Ethiopia, it is clearly documented that the quality of maternal, newborn and child care is one of the guiding principle to implement the national new born and child survival strategy [16]. It is widely acknowledged that the contents and quality of ANC are more prominent in preventing adverse birth outcomes (LBW and preterm birth) than simply increasing the frequency of ANC [15, 17]. However, at what extent the quality of ANC and which contents of ANC are linked to adverse birth outcomes particularly to birth weight is not well explored in Ethiopia and in this study setup. Hence, this study aims to fill the identified knowledge gap by assessing the link between the specific contents and perceived quality of antenatal care with low birth weight among term neonates delivered at selected public health institutions of Bahir-Dar special zone.

11.2 Statement of problem

Low birth weight is one of a significant public health problem globally and is associated with a range of both short and long-term consequences. Globally, it is estimated that 15% of all births are LBW, representing more than 20 million births a year. The great majority of low birth weight births occur in low and middle-income countries and especially in the most vulnerable populations such as in sub-Saharan Africa which accounts 13% of LBW [18]. Low birth weight contributes 60 to 80 percent of all neonatal deaths [2]. Infants born with very low weight are more than 100 times more likely to die in the first year of life than are infants of normal birth weight [19].

As a national representative survey and various institutional based studies showed, the incidence of low birth weight is high and still major public health problem in Ethiopia [9-14].The recent EDHS report revealed that 11% of births weigh less than 2.5 kg. On the other hand, based on mothers' subjective assessment of the size of the baby, 21% of live births were very small. Of these, 1/3(28%) very small children were contributed by the Amhara region [10]. As recent unpublished zonal annual report [20], showed low birth weight is still an important health problem in this study area. The prevalence ranges 11-13% in Felege-Hiwot referral hospital and 5-10% in health centers with variation among health centers. In the annual report, it was also reported that 81% of mothers attended at least on ANC visiting during pregnancy. However, a study conducted on the quality of antenatal care in this study setup showed that the specific contents provided during ANC visiting were very low. For instance, a study conducted by Ejigu T and his co-authors which was published in 2013 showed that 41.1% and 64% of mothers didn't get dietary counseling and iron [21] respectively during ANC visiting which are known to be associated with low birth. Generally, the trends of LBW were declining in Ethiopia from 14.6% in 2005 to 11 % in 2011[10]. However, if this trend continues in this way, Ethiopia will not achieve the global nutrition target of LBW reduction by 30% in 2025. A 30 %(3.9 % annual) reduction of LBW is one of the global nutrition target for 2025 endorsed by world health assembly in 2012 [15].

Ethiopia has achieved millennium development goal 4 three years earlier to 2015 deadlines [22]. It was also reported that the current trends of infant mortality has declined to 59% in 2011 from 97% % in 2002.However, neonatal mortality which accounts 42% of under five mortality was declined marginally compared to other child health indicators[10].

The national newborn and child survival strategy has targeted to decrease neonatal mortality from 28% to 11% by 2020[16].Thus, to address the challenges associated with neonatal mortality reduction, the contribution of adverse birth outcomes such as LBW and preterm births to neonatal morbidly and mortality should not be ignored. As the process of infant under nutrition begins during the prenatal period, prevention strategies at this critical period is crucial and serves as an entry point to improve maternal nutrition and subsequent low birth weight reduction [23, 24]. The national nutrition program of Ethiopia also focused on the life cycle approach to break the inter-generational cycle of malnutrition and one of the strategic objective of NNP was to improve the nutritional status of pregnant and adolescents women by providing ANC and necessary micronutrient supplementations during pregnancy [25].

1.3 Justification/rationale of the study

Given that low birth weight is an important health problem responsible for neonatal mortality and future morbidity risks, Public health measures targeting on the reduction of low birth weight is essential. Antenatal care is one of public health interventions believed to decrease the probability of low birth weight and other adverse birth outcomes such as preterm birth and still births. However, the contribution of access to antenatal care on low birth weight reduction is equivocal and study findings about the effect of ANC on the subsequent lowbirth weight reduction were with some methodological flaws [17]. One of the methodological flaws is an introduction of bias related to gestational age by studying term and preterm low birth weight together which have different causes, squeals and preventions [4, 5, and 6]. The second bias is attributed to adverse selection of mothers to ANC due to pregnancy related complications which may compromise the significant contribution of ANC on low birth weight reduction. Without considering these methodological flaws, several studies in the world including Ethiopia reported a controversial dose response relationship between access to ANC and low birth weight [11-14, 16, 26]. In Ethiopia, it is widely acknowledged and recommended that enhancing the adequacy and quality of antenatal care contributes to the reduction of LBW [9, 13, 27 and 28]. The quality of ANC in turn is depending on the specific contents provided and taken by pregnant mothers and their satisfaction with the care received during ANC.

However, none of these study findings identify which components of ANC are linked to LBW. To the best of investigators knowledge, no study has yet been done to elucidate the link between components of ANC and perceived quality with LBW in Ethiopian context and in particular to this study setup. Thus, it is justifiable to study the relationship between the specific contents provided during ANC visiting and perceived quality of ANC with low birth weight along with controlling biases related to gestational age and adverse selection of pregnant mothers to ANC.

1.4 Significance of the study

Generally, identifying the risk factors associated low birth weight is important for policymakers, planners and other collaborators to design well-timed and contextual based interventions to tackle this important public health problem.

In particular, determining the link between the already implementing maternal care such as antenatal care (frequency, content and quality) with low birth weight may be important for improving and restructuring the contents and process of care for women who are at risk of low birth weight. This study is also believed to fill the identified knowledge gap on the relationship between ANC contents and perceived quality of ANC with LBW. Furthermore, it can be used as a base line for further study.

2. Literature review

2.1 General overview of ANC and its link with LBW

Modern antenatal care was introduced by Scottish physician J.W Ballantyne in 1902 and the basic frame for our current approach of prenatal care was introduced in 1929. The original focus of prenatal care was prevention and treatment of preeclampsia. However, After World War II, its focus extended to infant mortality, and gradually it was considered as a means of reducing prematurity and low birth weight [29].

Antenatal care is believed to detect and manage conditions during pregnancy that have the potential to lead to adverse maternal and neonatal outcomes [30, 31]. However, the efficacy of ANC on prevention of adverse birth outcomes (low birth weight and preterm birth), infant and maternal mortality has been questioned and resulted in several flaws [17].

It was found that prenatal care alone was not an effective prematurity prevention strategy [32], and should not be given whole hearted endorsements [17]. Recent study on Adequacy of antenatal care and its relationship with low birth weight in Botucatu, São Paulo, Brazil found no significant association between the modified Kessner Index as a measure of adequacy of ANC and LBW [26]. A Study on the determinants of the use of prenatal care and the role of care contents in rural China also depicts a positive but feeble association between the number of antenatal visits and low birth weight [33].

On the contrary, several studies in sub-Saharan Africa found a dose response relationship between access to antenatal care and low birth weight in which an increase the number of ANC results in improved birth weight [9, 28, 34-36]. But, these findings had several limitations. In these studies, the characteristics of mothers at the time of enrolment and the contents of ANC she encountered were missed from the dose response equation. In addition, term low birth and preterm low birth weight were studied together despite they have different risk factors, squeals and intervention [4.5, 6].

Alexander and Kotelchuck recommended that not only the availability and the frequency of prenatal care but also the contents and quality of ANC need to be addressed to conclude that ANC has a significant effect on adverse birth outcome reduction such as low birth weight and preterm births [17].

2.2 Quality and Contents of antenatal care with low birth weight

As part of antenatal care many countries are implementing the contents of antenatal care recommended by WHO which includes counseling on balanced and additional diet; counseling on reduction and cessation of alcohol and cigarette smoking; counseling on recommended weight gain; supplementation of vitamins and minerals; tetanus immunization; de-worming; routine investigations (urine and blood testing) and counseling on danger sign of pregnancy [37].

While, there were controversial findings, antenatal dietary counseling, daily supplementation of iron, counseling on cessation of alcohol and cigarette smoking, de-worming in hookworm endemic areas were found to be associated with weight at birth [38].

Nutrition education and counseling is a widely used strategy to improve the nutritional status of women during pregnancy that significantly influences fetal, infant and maternal health outcomes [38]. Nutritional counseling and education should focus on the quality and quantity of the diet .it can also include counseling on the use of micronutrients supplements recommended during pregnancy [39]. The effect of nutritional advice during pregnancy is controversial. A systematic review and Meta analysis of 34 studies including 11 studies in low and middle income countries with and without nutritional support found that nutritional education and counseling improved gestational weight gain by 0.45 kg reduce the risk of anemia in late pregnancy by 30%, increase birth weight by 105 gm [40]. However, in low income countries where household food insecurity is compromised, nutritional education and counseling alone may not be sufficient for pregnant mother to improve their diet and subsequent birth weight [40]. An interventional study conducted by Aashima Garg and Sushma kashap in New Delhi revealed that individual nutritional counseling with weekly reinforcement results a significant increase in the quality and quantity of dietary consumption. They further found that mean hemoglobin level significantly increased and anemia prevalence was reduced among the intervention group [41]. A supporting finding was reported in a study finding conducted among poor urban in Bangladish in which nutritional education provided during the third trimester improved weight gain during pregnancy and reduced 78% of low birth weight [42].

Iron supplementation is an integral part of ANC and it is one of the most widely public health measure practiced during ANC. Early iron supplementation with a dose around 100gm/day improves the biochemical status of the mother independently of her pregnancy iron status and supplementation during pregnancy improves newborn weight in those women who start pregnancy with iron deficiencies [43].A double blinded randomized community trial in Nepal revealed that iron folic acid supplementation increase mean birth weight by 39 gm and reduces the percentage of low birth weight babies by 16%. However, no significant association was reported among preterm babies [44]. A positive relationship between total iron intake from food and supplements in early pregnancy and birth weight was also found among a cohort of pregnant women in Britain [45].A large population based study in India also revealed that iron folic acid supplementation was significantly associated with 23% reduction in the odds of LBW [46] which is supported with another national survey in Nepal where mothers not consuming iron supplementation during their pregnancy were more likely to have LBW infants[47].In most public clinics iron is provided in combination with folic acid. Studies found that iron but not folic acid supplementation reduces the risk of low birth weight among pregnant women [44, 48].
The patho-physiological mechanisms of iron supplementation on low birth weight reduction are not clearly under stood. However, there are two hypotheses about improvements in birth weight due to iron supplements. First, iron deficiency anemia leads to change in norepinephrine, cortisol and corticotrophin hormones resulting in oxidative stress to fetal growth which is reduced by iron supplementation. Second, iron supplementation helps to improve appetite leading to improvement in the overall nutritional status of mother. Improved maternal nutritional status in turn contributes to an increase in infant birth weight [49].In addition to antenatal dietary education and iron supplementation public health practices targeted to pregnant women that address the behaviors of pregnant women, including smoking cessation, reducing or quitting drug use, and appropriate weight gain are promising approaches to reducing LBW [50].
Though the contents of ANC provided during ANC follow-up has significance influence on birth weight, many women missed this opportunities during their ANC follow up. For instance a study conducted in North West Ethiopia (Bahir- Dar) found that nearly 64% and 41.1% of pregnant mothers didn’t get iron supplementation and dietary advice during ANC visiting respectively.

It was also documented that almost half of (47.7%) the study participants were not satisfied with service provided during ANC [21]. Clients' perspective is very important because satisfied clients often are more likely to comply with the ANC services such as dietary advice and supplements which are in turn potential determinants of LBW as documented in other studies [39-48].

2.3 Scio- demographic, obstetric, co-morbidity and other potential risk factors of LBW

The cause of LBW is multi factorial. Term small for gestational age is associated with socio-economic factors [51]. Socio- economic conditions such as education status [52], wealth status [53, 54], and marital status [55, 11] were found to be associated with LBW. Wealth status is one of the strong predictor of LBW. Studies conducted in developing countries including sub-Saharan Africa showed that women from poor households would have poor feeding patterns and failure to achieve adequate weight gain during pregnancy eventually affecting birth weight [56, 57, and 58]. In Ethiopia poor socioeconomic status was also identified as potential determinants of LBW [53, 54]. Nega and his co-authors found in eastern Ethiopia that poor women were 2.1 times higher to develop LBW as compared to women from rich and middle income catagories with crosponding CI of 1.42-3.3.05 [53]. The effect of poor economic status on birth weight was also observed in a study conducted in southern Ethiopia [54]. In southern Ethiopia, it was found that births from poor households were more likely to be of LBW than from better off.

The influences of food insecurity on health outcomes during pregnancy are important concern. A paradoxical finding was reported about the effect of food insecurity on birth weight. Study finding in America [59] revealed that living in food in secured households during pregnancy increase the risk of greater weight gain and pregnancy complication such as gestational diabetic and it was also found that food insecurity was not significantly associated with anemia and pregnancy induced hypertension which are found a potential determinants of LBW in other studies[13, 14, 27, 28]. On the other hand, a study conducted in Tehran found that food insecurity in family and existence of stress during pregnancy independently contributes to LBW and it was reported that the risk of LBW in families who experience food insecurity was 2.34 times higher than household with food security with p value of >0.001[60].

As study finding in Ethiopia showed, the more distal factors such as urban rural difference, maternal occupational and educational status; religion and marital status were not found statistically associated with low birth weight [9, 13, 28, 29, and 53].

In contrary to this, a study finding in rural hospital from Gambia showed the pattern of low birth weight varies with geographical difference and low birth weight was significantly associated with being rural residence [61]. Pertaining to the link between maternal age and low birth weight, controversial study findings were reported. Some studies reported Infants born to adolescents and women above 35 years tend to be smaller [62, 12]. On the contrary, some studies revealed that there is no significance association between maternal age and low birth Weight [9, 28, and 53]. The risk of low birth weight is also significantly linked with the obstetric profiles of mothers such as parity [63], and pregnancy intention [29, 54].

Gestational hypertension has a major influence on maternal and neonatal morbidity and mortality. As institutional based studies in Ethiopia showed approximately 3% - 4% of all pregnancies were complicated by pregnancy induced hypertensive disorders [13, 28]. Studies in Ethiopia and other countries also showed that pregnancy induced hypertension is significantly associated with weight at birth [13, 14, 27, and 28]. HIV/AIDS during pregnancy was also identified as potential and significant factors that contribute to LBW [9, 11, and, 27]. In other studies, maternal exposure to urinary tract infection and malaria attack during pregnancy were also reported as risk factor for low birth [14, 28, and 63].

Maternal nutritional status measured as in terms of maternal pre-pregnancy body mass index(BMI) and MUAC were associated with LBW at birth [64].Mothers who gained weight lower than the recommended weight were significantly associated with LBW [65]. A study conducted in eastern, and south western Ethiopia also highlighted that women with MUAC less than 23 cm were more at risk of developing low weight at birth [53, 54].

Women's behavior during pregnancy such as avoidance of alcohol drinking and cigarette smoking is also important for fetal growth. Despite this many women drink alcohol during pregnancy. For instance in America (in 2012) nearly 50% of pregnant women continue to drink alcohol despite many advisory bodies recommends alcohol avoidance[66].There were some studies on the link between alcohol consumption during pregnancy and low birth weight [67,68].

Regus P and his coauthors found that maternal alcohol consumption in early pregnancy did not show significant association with low birth weight [67]. The effect of alcohol consumption on adverse birth outcome is inconsistence. For instance, a systematic and Meta analysis by Patra and his coauthors found that alcohol consumption had no effect on low birth weight up to 10g/day (average of about 1 drink/day) [68].

In addition to individual level risk factors the burden of adverse birth outcomes (preterm and low birth weight) deliveries is also associated with modifiable neighborhood-level risk factors. Neighborhood-level risk factors (sanitation, residential accommodations) were weakly associated with LBW and significantly associated with preterm birth [69]. A study conducted on maternal and environmental factors influencing infant birth weight in Nigeria also found the likelihood of having infants with low birth weight is higher among mothers who lived in households with one or two rooms for sleeping, whose source of drinking water was well or surface water and mothers who used pit latrine or bush toilet facilities [70]. The pattern and risk of low birth weight is not only attributed to individual and neighborhood level risk factors but also linked with genetic factors such as the sex of new born. In some studies being female sex was identified as a significant and independent risk factor of low birth weight [28, 71].

Investigator questions

- ✓ Are the contents of ANC significantly associated with low birth weight among term neonates in selected health facilities of Bahir Dar?
- ✓ Does ANC level of satisfaction have a significant association with low birth weight among term neonates in selected health facilities of Bahir Dar?

Hypothesis

- ✓ **H_{A1}:** There is a significant association between the content of ANC and LBW at term among neonates born in selected health facilities of Bahir Dar.
- ✓ **H_{A2}:** There is a significant association between ANC level of satisfaction and LBW at term among neonates born in selected health facilities of Bahir Dar.

3. Conceptual frame work

To identify the proximal and distal factors associated with the outcome variable (low birth weight) in the context of this study area, an analytical approach similar to the conceptual framework used by Bolajoko.O and his coauthors [69] was adopted and modified to fit in to this study. Under this frame work Bolajoko.O and his coauthors hypothesized that neighborhood context (sanitation and access to improved water) affects and affected by Scio-economic circumstances. These factors directly or indirectly through maternal and infant factors influence birth outcome. Infant gender was included being an independent predictor of low birth weight. In this study, the conceptual frame work used by Bolajoko.O and his coauthors is modified as Bolajoko.O and his coauthors didn't include contents, perceived quality of ANC and food insecurity as potential determinants of LBW. Considering this, the investigator hypothesized that sanitation and food insecurity influences and influenced by socio economic and demographic factors. These variables directly or indirectly through maternal and service related characteristics determine the outcome variable. The sex of infant independently determines the dependent variable.

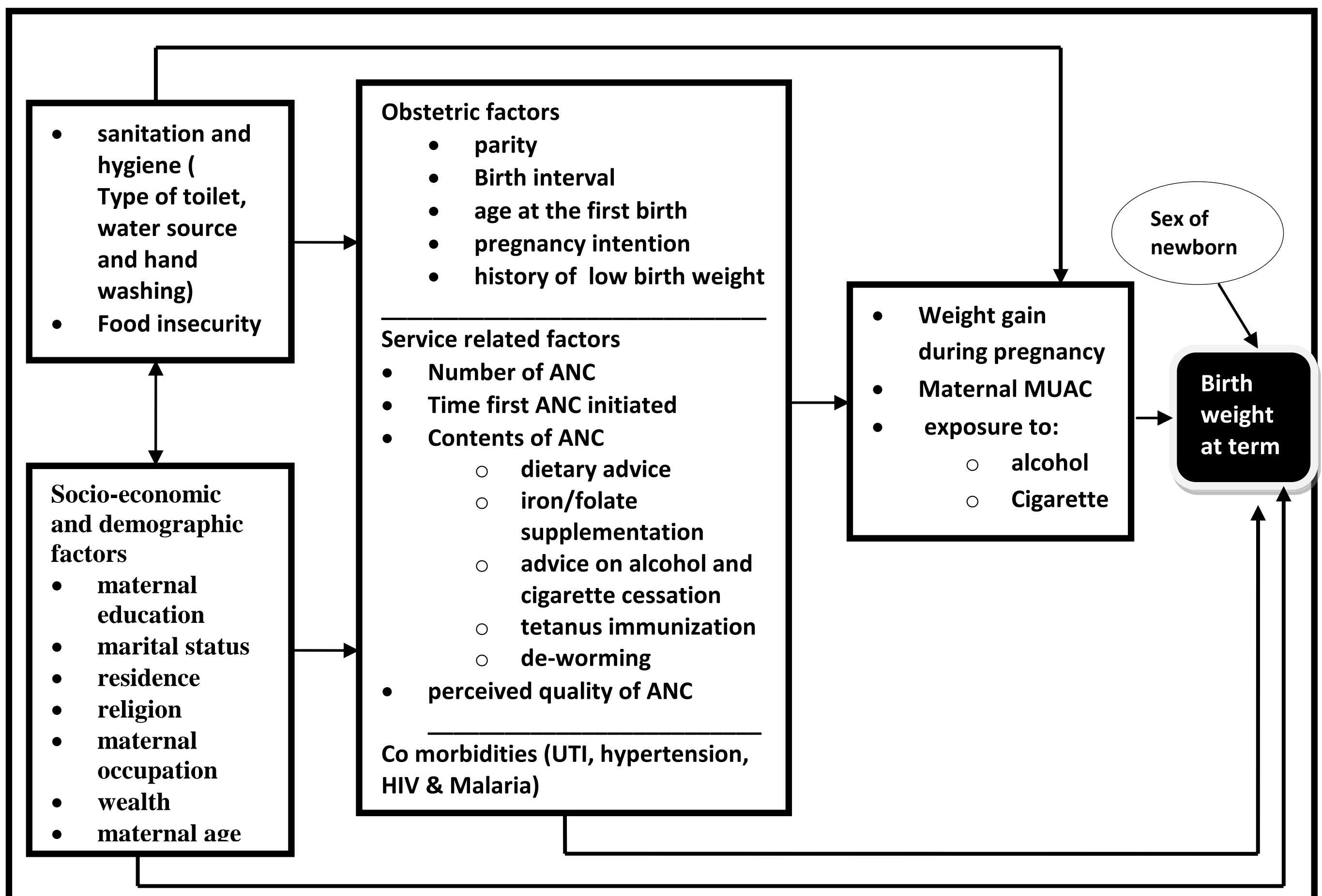

Figure-1: conceptual frame work for the link between the contents and perceived quality of ANC with LBW in selected health facilities Bahir Dar, North west Ethiopia

4. Objectives

General objective:

- ✓ To assess the link between contents and perceived quality of antenatal Care with low birth weight among term neonates in public health facilities of Bahir Dar, North West Ethiopia.

Specific objectives:

- ✓ To determine the association between contents of antenatal care and low birth weight among term neonates in public health facilities of Bahir Dar, North West Ethiopia.

- ✓ To determine the association between perceived quality of antenatal care and low birth weight among term neonates in public health facilities of Bahir Dar, North West Ethiopia.

5. Methods and materials

5.1 Study area and period

This study was conducted in Bahir Dar special zone among selected public health facilities starting from February to April. Bahir Dar city is located in the Northern part of Ethiopia 565 km from the capital city of Ethiopia. The total 2014/15 projected population of the zone was 297749(141245 males and 150504 females). Nearly 80% of the population resides in urban areas. There are eight old and two newly constructed public health centers and one public referral hospital. The antenatal care coverage (at least one ANC) of the zone in 2014/15 was 81%. Whereas, institutional delivery accounted for 31% [15].The study was conducted among four randomly selected public health centers (Bahir Dar, Abay, Han and Messentiy health centers) and one public referral hospital (Felegehiwot Hospital).

5.2 Study design

Facility based unmatched case-control study was employed among mother- new born pairs to assess the link between antenatal care contents and perceived quality with low birth weight among term neonates.

Cases and controls

Cases were mothers who had term babies weighing <2500grams and controls were mothers who had term babies weighting ≥2500grams.

Case ascertainment and control selection

- ✓ All cases were ascertained prospectively (i.e. only incidence cases were included).
- ✓ Exposure information was obtained retrospectively.
- ✓ Only health facility based cases and controls were included (i.e. cases and controls were selected for only who delivered at public health institutions).
- ✓ All cases and controls should have at least one ANC visiting.
- ✓ Exposure information from ANC (integrated ANC, delivery and postnatal card) card was gathered for both cases and controls.

5.3 Study population

The study populations were all eligible mother-newborn pairs (term births) that took place in the selected health facilities during the study period among mothers who had at least one antenatal care visiting during pregnancy by skill provider (including health extension workers).

5.4 Inclusion and exclusion criteria

Mother who gave term neonate; had at least one antenatal care visiting; lived in Bahir-Dar special zone for at least six months and provided consent was included in this study. Whereas, Neonates who have congenital anomalies, still births and neonates from multiple pregnancies were excluded in this study as they are a known contributor to low birth weight. Furthermore, Mothers whose gestational ages unknown at the time of interview were excluded.

5.5 Sample size determination

The sample size was computed by using Epi-info version 7.0 by considering the following assumptions; a ratio of controls to cases 2:1, power 80, confidence level 95%, and precision level 5%, odd ratio of 2.014 and by considering different factors that have linked with low birth weight from previous studies.

Table 1: Tabular presentation of total sample size needed for each exposure variables

Factors	Confidence Level	power	Percent of controls exposed	Case	Control	Total Sample	References
TT vaccination during pregnancy	95%	80%	28.4%	114	227	341	Zafar,A &his coauthors 2012
Dietary counseling	95%	80%	25.7%	105	209	314	Adane, AA &his coauthors 2014
Level of satisfaction	95%	80%	47.7	108	216	324	Ejigu,T &his coauthors 2013
Number of ANC	95%	80%	32.6%	109	217	326	Adane, AA &his coauthors 2014
Iron intake during pregnancy	95%	80%	21.39%	129	258	387	Vishnu,K &his coauthors 2014

From the above table, the final sample size was taken from the last factor which gives maximum sample size. After 10% addition of non-response rate, the final sample size for cases was 142 and for controls was 284 making the total sample size of 426.

5.6 Sampling Techniques and procedures

There are 10 public health centers and one public referral hospital in this study setup. Among ten public health centers eight of them were functional to provide delivery services for twenty four hours and the remaining two were not functional to provide delivery services during the study period (hence, they were not included in this study). Among the eight functional health centers four of them were selected by using simple random (lottery) technique. Since there is only one referral public hospital in this study area, it was selected without undergoing further sampling procedures. Furthermore, this hospital was selected to get maximum number of cases within the specified data collection period. Then, cases were selected consecutively and two controls were assigned for each case. In case, where there were more than two controls for one case at the same time of case ascertainment; two of them were selected randomly by using lottery method. This procedure continued until the desired sample size was obtained.

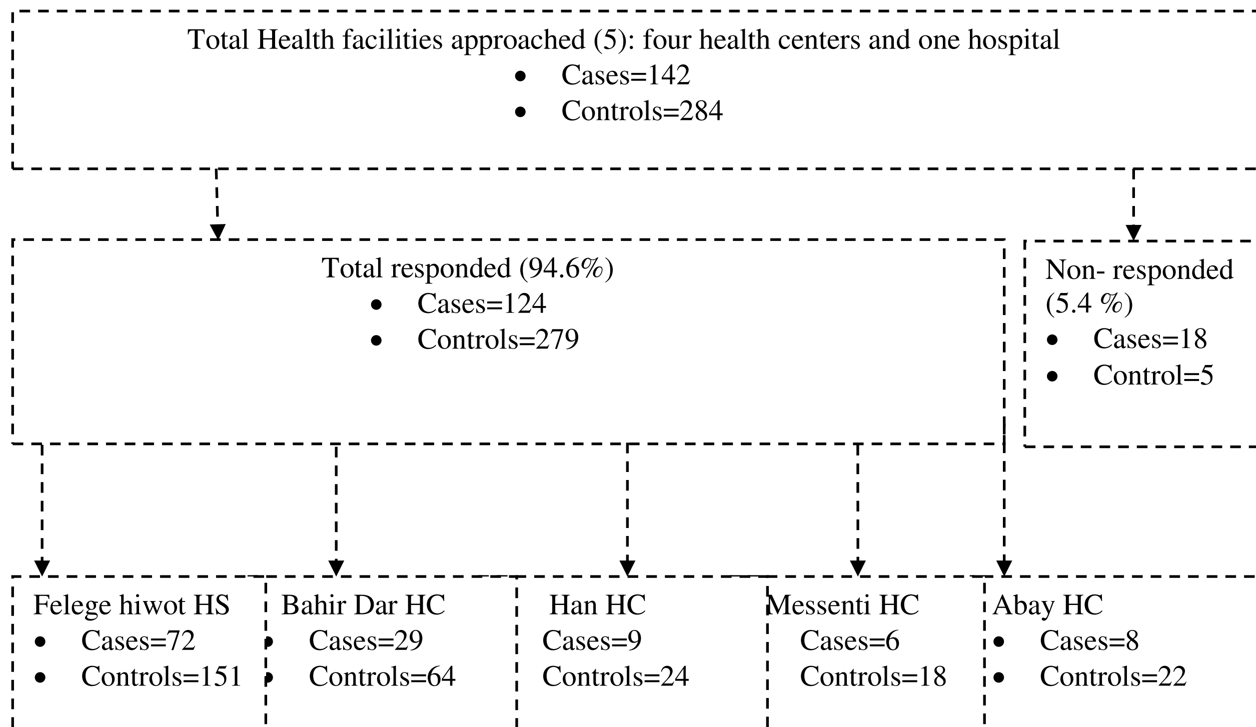

Figure-2: recruitment summary of study populations among selected health facilities in Bahir Dar, North west Ethiopia, 2015

Note:

HC= health center
HS= hospital

5.7 Study variables

Outcome variable: low birth weight was the outcome variable in this study and defied as birth weight less than 2500gm.

Explanatory variables: the explanatory variables in this study were: maternal education, residence, maternal age, occupation,religion, marital status ,wealth, food insecurity, improved water sources, washed at all critical times, birth interval, age at the first birth, Parity, history of low birth weight, hypertension, anemia, HIV, UTI ,malaria, MUAC, maternal height, weight gain during pregnancy,number of ANC,time of first ANC intiated, Counseling on smoking and alcohol drinking cessation, dietary counseling, iron/folate supplementation, tetanus immunization,de-worming, satisfaction of ANC, alcohol drinking, cigarette smoking and sex of infant.

5.8 Operational definitions

Satisfaction to ANC: respondents were categorized as satisfied with ANC if they scored below the mean satisfaction score questions and satisfied if they scored ≥ the mean satisfaction score questions [21].

Improved sources of water: a household that commonly used water sources from piped water, borehole, protected well and springs.

Non improved sources of water: households that commonly used water sources from pond, stream, open/unprotected well and springs.

Improved latrine: households that commonly used a toilet connected to a public sewer or septic tank system or hygienic pit toilet with cover.

Nonimproved latrine: households that commonly used Open pit toilet, Public or shared toilet, open defecation/defecation in bush.

Food security status: household experiences none of the food insecurity access conditions or just experience worry Once or twice in the past four weeks preceding the survey were categorized as secured whereas household experiences one of the food insecurity access conditions, but not just experiences worry Once or twice in the past four weeks preceding the survey were categorized as in secured [73].

Washed at critical times: if respondents washed their hand at all four critical times (before meal, after meal, after toilet, and after bathing child).

5.9 Data collection procedures and instruments

Interview administered questionnaires developed after relevant literature reviews were used to collect data on socioeconomic, behavioral, obstetric, food security and service related factors. The neonate's weight was measured by using standard beam balance in the delivery room immediately after birth (preferably within one hour) by trained diploma nurses.

Anthropometric measurement (maternal MUAC) was also taken to estimate the nutritional status of mothers (as a proxy indicator of maternal nutritional status). Clients chart were reviewed by using data extraction format to retrieve medical information and mother's test results that could not be captured by the interview. Interview and maternal anthropometric measurements were taken after delivery when the mother was stable. The data was collected by five diploma nurses and supervised by principal investigator. All eligible cases and controls present during the study were approached in the postpartum recovery room following the birth. Mothers of the cases and controls were interviewed face to face using a specially designed questionnaire which was structured in to five logical sequences (socio-economic, obstetric, service related, satisfaction with service and food insecurity). The questionnaire is prepared first in English then translated in to Amharic. The Amharic version of the questionnaire was used to collect the data.

Measurements

MUAC: mid-upper arm circumference was taken from the mothers' left extended and relaxed arm just at the midpoint of the tip of shoulder girdle and elbow by using Shakir strip tape. It was measured to the nearest 0.1cm following standard procedures**.**

Baby weight: the weight of naked neonates was taken right after birth (preferably within one hour) by using standard beam balance to the nearest 100g following standard techniques

Height of mother: the height of the mother was taken by using studio meter in standing and head in Frankfurt position with her occipit, shoulder, buttocks and her bare foot heel touched the vertical stand using a fixed (marked by 0.5 cm) intervals in the postnatal ward after delivery.

Last normal menstrual (LNMP) was confirmed from her chart and through interview and then gestational age was estimated based on her LNMP or based on ultrasound report from chart review.

5.10 Data quality control

The quality of data was ensured before, during and after data collection. Before the actual data collection, the questionnaire was pretested among 5 % of the sample size. The pretest was done to ensure clarity, wordings, logical sequence and skip patterns of the questionnaire. Based on finding from pretest, an amendment of the questionnaire was made. Training was also given to data collectors including practical demonstration about how to weigh the neonate and how to measure MUAC and height of the mother. Data collectors were also trained how to minimize recall bias during interview. They were informed to use local events, celebrity days and color of drugs when they interview exposure variables that are prone to recall bias. During data collection, supervision of data collectors by the principal investigator was done. The weight measurement instrument was checked and adjusted at zero level before each baby was measured. Non-stretchable MUAC tape was used to measure the nutritional status of mother. Codes were given to the questions during the times of data collection so that an identified error was traced. Furthermore, incomplete questioners was checked and refilled. Finally we attempted to minimize the possibility of introduction of courtesy bias while asking satisfaction questions with adequate assurance of confidentiality of information.

5.11 Data analysis

Data were entered into Epidata version 3.1 and exported to SPSS Version 21 for cleaning, recoding, categorizing and analyzing.

5.11.1 Categorizations and recoding of explanatory variables

The socio-economic profile of the study participants which were assessed by maternal level of education(categorized as no formal education, primary education ,secondary and higher education);marital status(categorized as single and married); residence(categorized as rural and urban); occupation (categorized as farmer, merchants, housewife, government workers and others) ; age (categorized as ≤19,20-24,25-29,≥30). The wealth index was computed from ownership of the following assets: electric, electric mitad, television, refrigerator, radio, car, cart, bicycle, motor, cow, ox, sheep, goat, hen, horse/mule, land and availability of sanitation. Principal component analysis was used to compute wealth index. Before doing principal component analysis the value of each wealth variables were recorded as 0 and 1.The resulting index was divided in to five categories representing lowest, second, middle, fourth and highest.

Food insecurity was assessed by using household food insecurity access related prevalence. Nine questions with dictums (yes/no) response options and nine questions with quantitative response options were used to assess the household food security. The response of the household in this case mother was re categorized as **secured** (household experiences none of the food insecurity access conditions or just experiences worry Once or twice in the past four weeks) and **in secured** (household experiences one of the food insecurity access conditions, but not just experiences worry Once or twice in the past four weeks). Perceived quality of ANC was assessed by maternal level of satisfaction for the service they had got during ANC. The level of satisfaction was categorized as **not satisfied** (if they score below the mean satisfaction score questions) and **satisfied** (if they score ≥ the mean satisfaction score questions). Client satisfaction was rated by 10 items each having 3 scales from not satisfied, neutral to satisfy (which has internal reliability of 0.782(Cronbachs alpha)).Dietary advice was grossly assessed if the women were given counseling about balanced and additional food during pregnancy and it was categorized as yes if women get counseling no if she didn't. Obstetric characteristics of the mother was assessed by parity (categorized as 1, 2-4,>4); birth interval (categorized as <3 and≥, 3); age at the first birth (categorized as<18 years and ≥18 years). Previous history of low birth weight was only subjectively assessed from the mothers' report of small or very small baby. Mid upper arm circumference was measured by MUAC tape and re-categorized as <23cm and≥23cm. Other explanatory variables such as morbidities during pregnancy and exposure to alcohol drinking and cigarette smoking during pregnancy were categorized as yes and no.

5.11.2 Univariate, bivariate and multivariate analysis

Descriptive statistics like mean, frequency and percentage were calculated as univariate analysis. Crude odds ratio (COR) with 95% confidence interval was estimated to assess the association between each independent variables and the outcome variable. Variables with p value less than 0.05 in the bivariate analysis were included in to the multivariate model. Adjusted odd ratio with corresponding 95% confidence interval was retrieved from the multivariate model. The adjusted odd ratio was used to determine strength of the association and the corresponding 95% CI was used to decide whether there was a statistical significant between the explanatory and outcome variables. The goodness of fit of the final model was evaluated with the Hosmer-Lemeshow goodness of fit test and Multi co-linearity in the logistic regression was checked by standard error for beta coefficients.

5.12 Ethical consideration

Ethical clearance was obtained from Research ethics committee (REC) of Addis Ababa University. Permission letter was obtained from Bahir Dar special zone health bureau. Verbal consent was taken from each participant after the purpose of the study was explained. They were told to withdraw at any time and/or to refrain from responding to questions they may not like to respond. Participants were also informed that all the data obtained from them will be kept confidential using codes instead of any personal identifiers.

5.13 Dissemination of findings

The result of the study will be submitted to Addis Ababa University, school of public health, Bahir Dar health office and to organizations who work on maternal and neonatal health program. The findings of this study will be also presented to scholars. After incorporating comments from scholars, it will be sent for publication in one of scientific journals.

6. Results

A total of 426 mother newborn pairs (142 cases and 284 controls) were planned to be included in this study. However, 403 mother- new born pairs (124 cases and 279 controls were agreed to give response which gave us the overall response rate of 94.6%. The mean birth weight of the neonate was 2078.40 gm (S.D± 313.50) for the neonates with low birth weight and 3094.10gm (S.D± 383.61) for the neonates with normal birth weight.

6.1 Results from univariate analysis

6.1.1 Socio-demographic and economic characteristics of study participants

More than half of cases (62.3%) and controls (69.8%) were with the age range of 20-29 years old. Majority of the controls (88.4%) and cases (86.3%) were Christian religion followers and 56.9% cases and 73.6 % controls were living in urban residence. More than half of the cases (55.8%) and nearly three fourth of controls (73.6%) attended formal education. Among those who attended formal education more than fifty percent of cases (53.8%) and controls (66.3%) attended above primary school.

More than eighty percent of cases (83.1%) and 86.2%) of controls were currently married (living in union with her husband) and more than sixty percent (63.7%) of cases and nearly half of controls (49.8%) gave female births. Looking at the occupation status of mothers, majority of them were either housewife or farmer. Thirty eight point five cases and 20.9% of controls were farmers whereas, 28.7% of cases and 41.45 of controls were housewife. Nearly one fourth (26.4%) of the cases and only 17.4% of controls were within the lowest wealth quintiles. Nearly a quarter of cases (25.8%) and 7.2% of controls reported some form of household food insecurity in the last four weeks preceding the study. In Terms of access to improved water, 65.3% of cases and 72.5% of controls reported that they commonly used improved sources of water and more than half of cases (65.9%) and controls(71.1%) responded that they washed their hand at all four critical periods.

Table 2: socio- demographic and economic profile of study participants among selected health facilities in Bahirdar, North West Ethiopia, 2015

	Birth weight status		Total	
Variables	Low	Normal	frequency	Percent
Age				
≤19	12(9.8%)	12(4.4%)	24	6.0
20-24	37(30.3%)	95(34.5%)	132	33.2
25-29	39(32.0%)	97(35.3%)	136	34.3
≥30	34(27.9%)	71(25.8%)	105	26.4
Missed values	2(1.6%)	4(1.4%)	6	1.5
Religion				
Christian*	107(86.3%)	243(88.4%)	350	86.8
Muslim	17(13.7%)	32(11.6%)	49	12.2
Missed values	0(0.0%)	4(1.4%)	4	1.0
Residence				
Rural	53(43.1%)	73(26.4%)	126	31.3
Urban	70(56.9%)	204(73.6%)	274	68.0
Missed values	1(0.8%)	2(0.7%)	3	0.7
formal Education				
No	53(44.2%)	73(26.4%)	131	32.5
Yes	67(55.8%)	204(73.6%)	266	66.0
Missed values	4(3.2%)	2(0.7%)	6	1.5
Level of formal education				
primary	31(46.3%)	69(33.7%)	98	24.3
secondary	20(29.9%)	73(36.7%)	93	23.1
higher education**	16(23.9%)	59(29.6%)	75	18.6
Missed values	57(46.0%)	80(28.7%)	137	34.0
Occupational status				
Government worker	11(9.0%)	50(18.0%)	61	15.1
Merchant	11(9.0%)	31(11.2%)	42	10.4
Housewife	35(28.7%)	115(41.4%)	150	37.2
Farmer	47(38.5%)	58(20.9%)	105	26.1
Others***	18(14.8%)	24(8.6%)	42	10.4
Missed values	2(1.6%)	1(0.4%)	3	0.7
Current marital status				
Single	21(16.9%)	38(13.8%)	59	14.6
Married	103(83.1%)	237(86.2%)	340	84.4
Missed values	0(0.0%)	4(1.4%)	4	1.0
Sex of infant				
Female	79(63.7%)	139(49.8%)	218	54.1
Male	45(36.3%)	140(50.2%)	185	45.9
Wealth				
Lowest	32(26.4%)	48(17.4%)	80	19.9
Second	23(19.0%)	48(17.4%)	71	17.6
Middle	16(13.2%)	81(29.3%)	97	24.1
Fourth	16(13.2%)	55(19.9%)	71	17.6
Highest	34(28.1%)	44(15.9%)	78	19.4
Missed values	3(1.3%)	3(1.3%)	6	1.5
food insecurity				
yes	32(25.8%)	20(7.2%)	52	12.9
no	92(74.2%)	259(92.8%)	351	87.1
Missed values	0(0.0%)	0(0.0%)	0	0.0
Water sources				
Non-improved	42(34.7%)	75(27.6%)	117	29.0
Improved	79(65.3%)	197(72.4%)	276	68.5
Missed values	3(2.4%)	7(2.5%)	10	2.5
Washed at critical time				
No	42(34.1%)	79(28.9%)	121	30.0
Yes	81(65.9%)	194(71.1%)	275	68.2
Missed values	1(0.8%)	6(2.2%)	7	1.7

*=protestant, catholic **=includes college ,vocational ***= student ,daily laborers and private employed

6.1.2 Obstetric profile of study participants

Nearly half of the cases (50.8%) and controls (50.5%) were primipara (gave their first birth). Among mothers who had more than one previous birth only 13.7% of cases and 8.2% of controls reported previous small/very small births. Very few, (2.4%) of cases and 4.7 of controls reported previous still births. In terms of years of first birth, 24.6% of cases and only 14.5% controls gave their first birth before 18 years old. Nearly fifteen percent (15.3%) of mothers among cases and only 10.0 % among controls gave the current birth before birth interval of 3 years.

Unwanted pregnancy accounted 10.6 %. It was higher among cases (20.2%) than controls (6.2%). More than half of the controls (68.2%) and 42.6% of the cases attended four and above antenatal care during their current pregnancy. However, only 49.2% controls and 36.4 % cases started their ANC visiting during the first trimester. Around twenty (21.1%) of cases and 10.5% of controls reported that the result of their first antenatal care was not linked to the service itself rather to other medical purpose.

Table-3: obstetric profile of mothers among selected health facilities in Bahir Dar, North West Ethiopia, 2015

	Birth weight status		Total	
Variables	Low	Normal	Frequency	percent
Parity*				
1	63(50.8%)	141(50.5%)	204	50.6
2-4	44(35.5%)	119(42.7%)	163	40.4
>4	17(13.7%)	19(6.8%)	36	8.9
Missed values	0(0.0%)	0(0.0%)	0	0.0
Previous Still birth				
Yes	3(2.4%)	13(4.7%)	16	4.0
No	118(95.2%)	259(92.8%)	377	93.5
Missed values	3(2.4%)	7(2.5%)	10	2.5
Small/very small baby of pervious birth				
Yes	17(13.7%)	23(8.2%)	40	9.9
No	42(33.9%)	112(40.1%)	154	38.2
Missed values	65(52.4%)	144(51.6%)	209	51.9
Birth spacing in a year				
<3	19(15.3%)	28(10.0%)	47	11.7
≥3	39(31.5%)	108(38.7%)	147	36.5
Missed values	66(53.2%)	143(51.3%)	209	51.9
Age at first birth				
<18	30(24.6%)	39(14.5%)	69	17.1
≥18	92(75.4%)	230(85.5%)	322	79.9
Missed values	2(1.6%)	10(3.6%)	12	3.0
Pregnancy type				
Unwanted	25(20.2%)	17(6.2%)	42	10.6
Wanted	99(79.8%)	257(93.8%)	356	89.4
Missed values	0(0.0%)	5(1.8%)	5	1.2
No of ANC				
<4	70(57.4%)	88(31.8%)	158	39.2
≥4	52(42.6%)	189(68.2%)	241	59.8
Missed values	2(1.6%)	2(0.7%)	4	1.0
Time of first ANC				
Third trimester(≥28weeks)	13(11.8%)	11(4.2%)	24	6.0
Second trimester (16-27 Weekes)	57(51.8%)	122(46.6%)	179	44.4
First trimester (<16 Weekes)	40(36.4%)	129(49.2%)	169	41.9
Missed values	14(11.3%)	17(6.1%)	31	7.7
Reason of first ANC				
For other**	26(21.1%)	29(10.5%)	55	13.6
For ANC	97(78.9%)	248(89.5%)	345	85.6
Missed values	1(0.8%)	2(0.7%)	3	0.7

*=includes this birth **=medical purpose

6.1.3 Contents of antenatal care

More than half of cases (71.0%) and controls (92.5%) reported that they were given iron during their ANC follow up. However, only 45.5% of cases and 87.0% controls reported that they took the iron provided for more than 30 days. Nearly three fourth (74.8%) of cases and nearly ninety percent (87.1%) of controls reported that they were given TT immunization. However, less than twenty percent (18.0%) of cases and nearly one third of (31%) of controls reported that they were de-wormed during current pregnancy. In terms of dietary advise 60.5 % of cases and 79.9 % of controls responded that they had got dietary advice during ANC visiting .More than half of cases(61.3%) and controls(69.2%) also reported that they had got advise on cessation of alcohol drinking during ANC visiting. Generally , there was 10- 20 % of miss opportunity of antenatal care services among mothers who had low birth weight babies as compared to mothers with normal weight babies at birth.

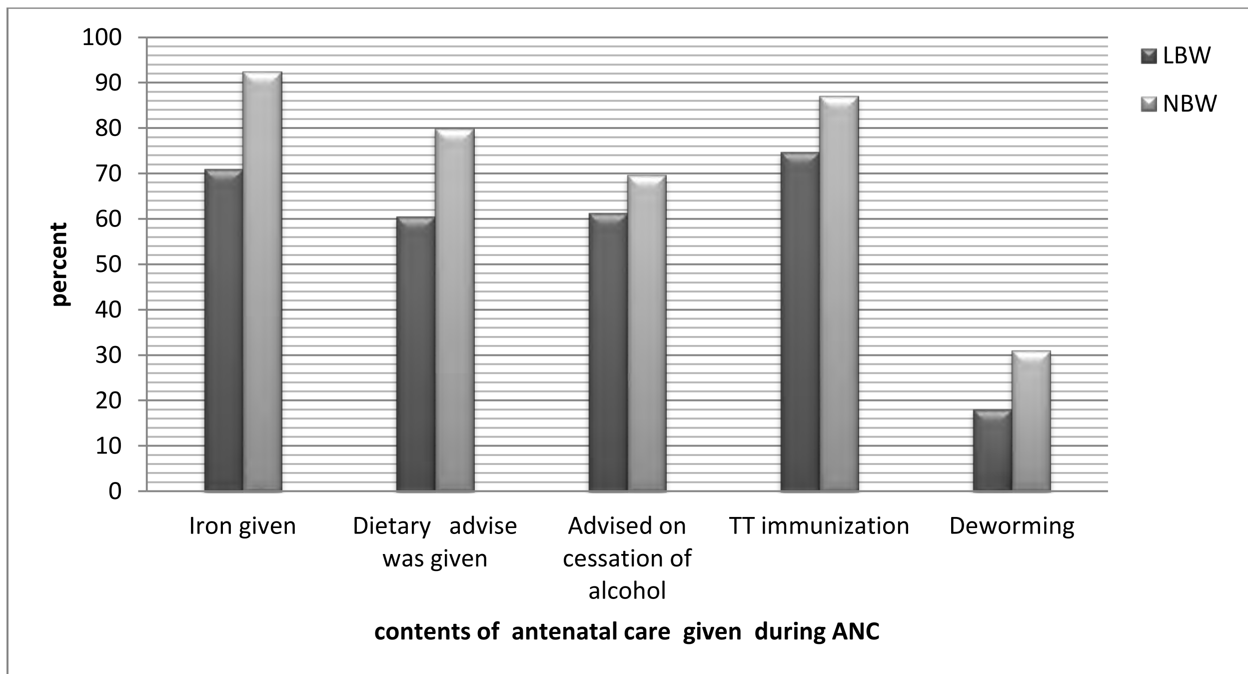

Fig 3:contentes of antenatal care given for mothers among mothers who provided low and normal weight babies in selected health facilities of Bahir Dar, North west Ethiopia,2015

6.1.4 Level of satisfaction

The mean score of satisfaction was 26.94 ± (SD 3.974). Overall, 67.5% of mothers score above the mean satisfaction score. More than half of the cases (62.1) and controls (70.1%) were satisfied with ANC services. There was no much difference in the overall satisfaction between the cases and controls. There was less than ten percent (8%) differences in the overall satisfaction between mothers who gave LBW babies and who gave normal birth weight babies.

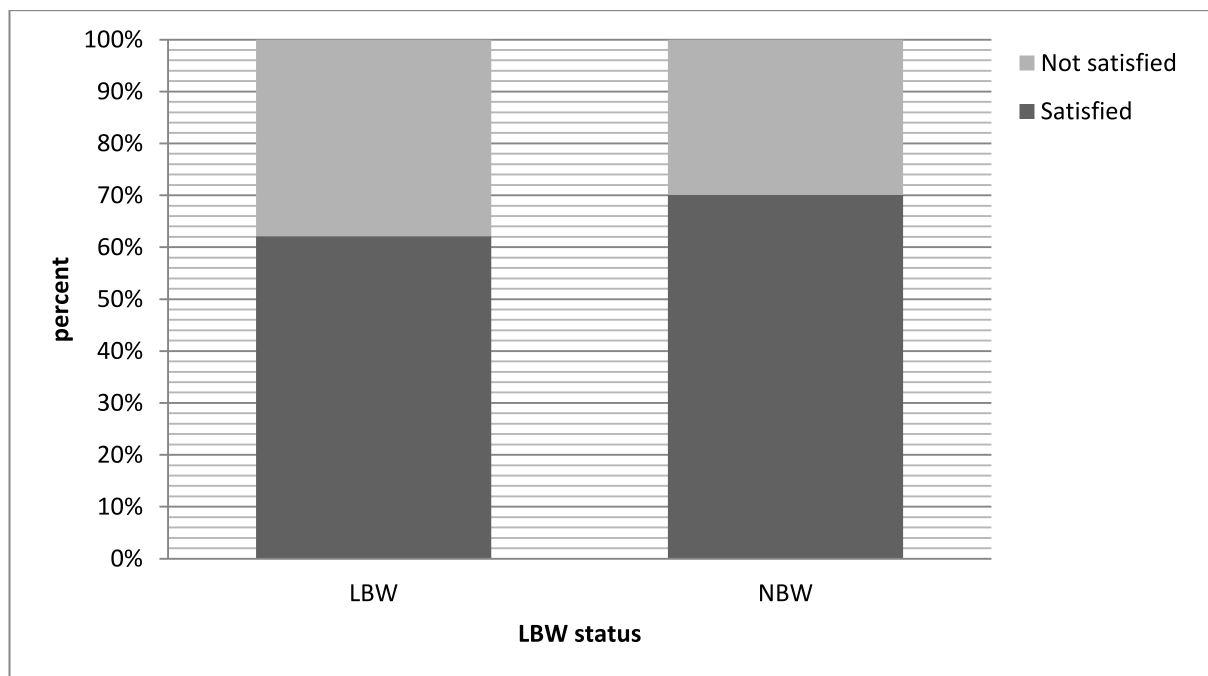

Fig 4: satisfaction of mothers with the ANC service among mothers who provided low and normal weight baby in selected health facilities of Bahir Dar, North west Ethiopia, 2015

6.1.5 Frequency distribution of items of ANC satisfaction

Table-4: frequency distribution of items of ANC satisfaction among selected health facilities in Bahir Dar, North West Ethiopia, 2015

Variable	Birth weight status		Total	
	Low	Normal	frequency	Percent
Provider's greeting was good				
Disagree	16(12.9%)	27(9.7%)	43	10.7
Neutral	5(4.0%)	13(4.7%)	18	4.5
Agree	103(83.1%)	239(85.7%)	342	84.9
provider was easy to understand				
Disagree	22(17.7%)	24(8.6%)	46	11.4
Neutral	3(2.4%)	8(2.9%)	11	2.7
Agree	99(79.8%)	247(88.5%)	346	85.9
Waiting time was fair				
Disagree	36(29.0%)	24(8.6%)	60	14.9
Neutral	1(0.8%)	8(2.9%)	9	2.2
Agree	87(70.2%)	247(88.5%)	334	82.9
Waiting area was adequate & with seats				
Disagree	38(30.6%)	50(17.9%)	88	21.8
Neutral	3(2.4%)	11(3.9%)	14	3.5
Agree	83(66.9%)	218(78.1%)	301	74.7
ANC clinic had clean latrine and adequate water				
Disagree	33(26.6%)	41(14.7%)	74	18.4
Neutral	9(7.3%)	18(6.5%)	27	6.7
Agree	82(66.1%)	220(78.9%)	302	74.9
The procedure was performed with cleanliness & sanitation				
Disagree	21(16.9%)	17(6.1%)	38	9.4
Neutral	3(2.4%)	9(3.2%)	12	3.0
Agree	99(79.8%)	253(90.7%)	352	87.3
expense incurred during ANC was fair				
Disagree	17(13.7%)	57(20.4%)	74	18.4
Neutral	13(10.5%)	9(3.2%)	22	5.5
Agree	94(75.8%)	213(76.3%)	307	76.2
received full information about ANC				
Disagree	17(13.7%)	22(7.9%)	39	9.7
Neutral	5(4.0%)	17(6.1%)	22	5.5
Agree	102(82.3%)	240(86.0%)	342	84.9
happy with all the services you had got				
Disagree	12(9.7%)	18(6.5%)	30	7.4
Neutral	16(12.9%)	12(4.3%)	28	6.9
Agree	96(77.4%)	249(89.2%)	345	85.6
You advise others to receive ANC where you				
attended	12(9.7%)	26(9.4%)	38	9.4
Disagree	11(8.9%)	14(5.0%)	25	6.2
Neutral	101(81.5%)	238(85.6%)	339	84.1
Agree				

6.1.6 Co-morbidities during pregnancy

In this study, 12.1% of cases and 4.3% of controls had reported history of hypertension during current pregnancy (17 from client card and 10 from self report). Nearly sixteen percent (16.1%) of cases and 13.7% of controls had history of anemia during pregnancy (38 from client card and 20 self reports). Less than five percent (4.8%) of cases and 7.9% of controls had history of urinary tract infection (16 from client card and 12 from self report). Six point six percent of mothers with low birth weight babies and nearly five percent (4.7%) of mothers with normal birth babies reported malaria attack during current pregnancy (11 from client card and 10 from self report). Looking at, HIV/ADIS status of women during pregnancy, nearly five percent (4.8%) of cases and 1.8% of controls were sero- positive (all from client card).

Table 5: co-morbidities during pregnancy among selected health facilities in Bahirdar, North West Ethiopia, 2015

Variable	Birth weight status		Total	
Variables	Low	Normal	frequency	Percent
HPN*				
Yes	15(12.1%)	12(4.3%)	27	6.7
No	109(87.9%)	266(95.7%)	375	93.1
Missed values	0(0.0%)	1(0.4%)	1	0.2
UTI **				
Yes	6(4.8%)	22(7.9%)	28	6.9
No	118(95.2%)	256(92.1%)	374	92.8
Missed values	0(0.0%)	1(0.4%)	1	0.2
Anemia				
Yes	20(16.1%)	38(13.7%)	58	14.4
No	104(83.9%)	239(86.3%)	343	85.1
Missed values	0(0.0%)	2(0.7%)	2	0.5
Malaria				
Yes	8(6.6%)	13(4.7%)	21	5.2
No	114(93.4%)	261(95.3%)	375	93.1
Missed values	2(1.6%)	5(1.8%)	7	1.7
HIV***				
Yes	6(4.8%)	5(1.8%)	11	2.7
No	118(95.2%)	268(98.2%)	386	95.8
Missed values	0(0.0%)	6(2.2%)	6	1.5%
***=hypertension **=urinary tract infection ***=human immunodeficiency virus				

6.1.7 Exposure to alcohol drinking and cigarette smoking during pregnancy

More than half of the cases (58.1%) and controls (63.7%) reported that they drank some form of alcohol during their current pregnancy. Only 1 .6 % of cases and 2.6% of controls reported that there were smokers in their families. However, none of the cases and controlees reported self cigarette smoking.

Table 6: exposure to alcohol drinking and cigarette smoking during pregnancy among selected health facilities in Bahirdar, North West Ethiopia, 2015

Variable	Birth weight status		Total	
Variables	Low	Normal	frequency	Percent
Alcohol drinking				
Yes	72(58.1%)	177(63.7%)	249	61.8
No	52(41.9%)	101(36.3%)	153	38.0
Missed values	0(0.0%)	1(0.4%)	1	0.2
Family cigarette smoking				
Yes	2(1.6%)	7(2.6%)	9	2.2
No	122(98.4%)	266(97.4%)	388	96.3
Missed values	0(0.0%)	6(2.2%)	6	1.5
Maternal cigarette smoking				
Yes	0(0.0%)	0(0.0%)	0	0
No	123(99.19%)	274(98.2%)	397	98.5
Missed values	1(0.8%)	5(1.8%)	6	1.5

6.1.8 Frequency distribution of maternal anthropometric characteristics

The Mid-upper arm circumference of more than half of the mothers with LBW babies (58.7%) were less than 23cm whereas the MUAC of mothers with NBW (18.8%) were ≥23cm. Looking at the stature of mothers, nearly ten percent of cases (9.8%) and 5.4% of controls maternal height was under 150cm.

Table-7: frequency distribution of maternal anthropometric characteristics among selected health facilities in Bahirdar, North West Ethiopia, 2015

Variable	Birth weight status		Total	
Variables	Low	Normal	Frequency	Percent
Maternal MUAC*				
<23cm	71(58.7%)	52(18.8%)	123	30.5
≥23cm	50(41.3%)	225(81.2%)	275	68.2
Missed values	3(2.4%)	2(0.7%)	5	1.2
Maternal Height				
<150 cm	12(9.8%)	15(5.4%)	27	6.7
≥150cm	110(90.2%)	263(94.6%)	373	92.6
Missed values	2(1.6%)	1(0.4%)	3	0.7
*=mid-upper arm circumference				

6.2 Results from bivariate analysis

6.2.1 Socio-demographic and economic characteristics with birth weight

Without adjusting potential confounders, it was found that low birth weight was associated with many of socio-demographic factors such as residence, educational status, occupational status, household food insecurity and wealth status. However, socio-demographic variables like maternal age and current marital status were not associated with LBW. It was also shown that sources of water and hygiene (washed at four critical times) were not found statistically associated with birth weight at bivariate level. The sex of new born (being female) was another finding significantly associated with low birth weight at bivariate level.

Table-8: binomial logistic regression output of Socio-demographic and economic covariates of low birth weight at term in selected health facilities of Bahir Dar, North west Ethiopia, 2015

	Birth weight status			
Variables	Low	Normal	COR WITH 95% CL	P value
Age				
<19	12	12	2.09(0.85-5.13)	0.186
20-24	37	95	0.813(0.47-1.42)	
25-29	39	97	0.840(0.48-1.46)	
≥30©	34	71	1	
Residence				
Rural	53	73	2.15(1.36-3.31)*	0.001
Urban©	70	204	1	
Level of l education				
No formal education	53	78	2.51(1.30-4.82)*	0.006
Primary	31	67	1.71(0.85-3.43)	
secondary	20	73	1.01(0.48-2.12)	
higher education©	16	59	1	
Occupational status				
Government worker©	11	50	1	0.0013
Merchant	11	31	1.61(0.63-4.16)	
Housewife	35	115	1.38(0.65-2.94)	
Farmer	47	58	3.68(1.73-7.86)*	
Others	18	24	3.41(1.39-8.34)*	
Current marital status				
Single	21	38	1.27(0.71-2.27)	0.418
married©	103	237	1	
Sex of infant				
Female	79	139	1.77(1.15-2.73)*	0.010
Male©	45	140	1	
Wealth				
Lowest	32	48	0.86(0.46-1.62)	0.001
Second	23	48	0.62(0.32-1.21)	
Middle	16	81	0.26(0.13-0.51)*	
Fourth	16	55	0.38(0.18-0.77)*	
Highest©	34	44	1	
food insecurity				<0.001
yes	32	20	4.50(2.45-8.27)*	
no©	92	259	1	
Water sources				0.154
Non-improved	42	75	1.39(0.88-2.21)	
Improved©	79	197	1	
Washed at critical time				0.298
No	42	79	1.27(0.81-2.01)	
Yes©	81	194	1	
©=reference category *= significant at bivariate level(p<0.05) COR=crude odd ratio				

6.2.2 Obstetric related variables with low birth weight

Without any adjustment, age at the first birth less than 18 years, unwanted pregnancy, late initiation of ANC, reason of first ANC visit and ANC follow up less than four were found to be associated with low birth weight. On the other hand, parity, birth interval, and previous history of low birth weight were not found to be significantly associated with low birth weight.

Table-9: binomial logistic regression output of Obstetric related covariates of low birth weight at term in selected health facilities of Bahir Dar, North west Ethiopia, 2015

Variable	Birth weight status			
Variables	Low	Normal	COR with 95%CI	P value
Parity				
1©	63	141	1	
2-4	44	119	0.83(0.53-1.31)	0.065
>4	17	19	2.00(0.98-4.11)	
Small/very small baby of pervious birth				
Yes	17	23	1.971(0.96-4.05)	0.065
No©	42	112	1	
Birth spacing in a year				
<3	19	28	1.88(0.94-3.74)	0.072
≥3©	39	108	1	
Age at first birth				
<18	30	39	1.92(1.13-3.28)*	0.016
≥18©	92	230	1	
Pregnancy type				
Unwanted	25	17	3.82(1.98-7.37)*	<0.001
Wanted©	99	257	1	
No of ANC				
<4	70	88	2.89(1.86-4.48)*	<0.001
≥4©	52	189	1	
Time of first ANC visit				
Third trimester(≥28weeks)	13	11	3.81(1.58-9.17)*	0.008
Second trimester (16-27 Weekes)	57	122	1.51(0.94-2.42)	
First trimester (<16 Weekes) ©	40	129	1	
Reason of first ANC visit				
For other	26	29	2.29(1.29-4.09)*	0.005
For ANC©	97	248	1	
©=reference category *= significant at bivariate level(p<0.05) COR=crude odd ratio				

6.1.4 Contents of antenatal care with low birth weight

Without controlling possible confounders most of the contents of ANC (iron intake, TT immunization, de-worming and dietary advice) were found significantly associated with low birth weight. Whereas, advice on alcohol cessation was not found to be associated with low birth weight

Table-10 binomial logistic regression output of ANC content related covariates of low birth weight at term in selected health facilities of Bahir Dar, North west Ethiopia, 2015

Variable	Birth weight status			
	Low	Normal	COR with 95%CI	P value
Number of days of iron taken				
<30 days	67	35	7.99(4.84-13.22)*	<0.001
≥30 days©	56	234	1	
TT given				
No	31	36	2.27(1.33-3.89)*	0.003
Yes©	92	243	1	
No of TT				
<2	44	69	1.67(1.06-2.64)*	0.028
≥2©	79	207	1	
De-worming				
No	100	189	2.04(1.21-3.47)*	0.008
Yes©	22	85	1	
Dietary advice				
No	49	56	2.60(1.64-4.14)*	<0.001
Yes©	75	223	1	
Advised on alcohol cessation				
No	48	84	1.45(0.93-2.26)	0.099
Yes©	76	193	1	
©=reference category *= significant at bivariate level(p<0.05) COR=crude odd ratio				

6.2.4 **Level of satisfaction with birth weight**

Though women who were not satisfied with ANC service were 1.434 times higher to give low birth weight babies, the overall level of satisfaction was not found significantly associated with LBW at bivariate level. A bivariate analysis of each items of ANC satisfaction on the other hand showed some of the items were associated with LBW.

Table-11 Bivariate analysis result of ANC satisfaction with LBW among selected health facilities in Bahir Dar, North West Ethiopia, 2015

Variable	Birth weight			
	Low	Normal	COR with 95%CI	P value
Provider's greeting was good				
Disagree	16	27	1.38(0.71-2.66)	0.614
Neutral	5	13	0.89(0.31-2.57)	
Agree©	103	239	1	
provider was easy to understand				
Disagree	22	24	2.29(1.25-4.27)*	0.033
Neutral	3	8	0.94(0.24-3.59)	
Agree©	99	247		
Waiting time was fair				
Disagree	36	24	4.26(2.41-7.54)*	<0.001
Neutral	1	8	0.36(0.04-2.88)	
Agree©	87	247		
Waiting area was adequate & with seats				
Disagree	38	50	1.99(1.22-3.26)*	0.017
Neutral	3	11	0.72(0.19-2.63)	
Agree©	83	218		
The ANC clinic had clean latrine and adequate water				
Disagree	33	41	2.16(1.28-3.65)*	0.015
Neutral	9	18	1.34(0.58-3.11)	
Agree©	82	220	1	
The procedure was performed with cleanliness & sanitation				
Disagree	21	17	3.13(1.58-6.17)*	0.004
Neutral	3	9	0.84(0.22-3.18)	
Agree©	99	253		
expense incurred during ANC was fair				
Disagree	17	57	0.68(0.37-1.22)	0.009
Neutral	13	9	3.27(1.35-7.92)*	
Agree©	94	213	1	
received full information about ANC				
Disagree	17	22	1.82(0.93-3.57)	0.155
Neutral	5	17	0.69(0.25-1.93)	
Agree©	102	240	1	
happy with all the services you had got				
Disagree	12	18	1.73(0.80-3.73)	0.004
Neutral	16	12	3.46(1.58-7.58)*	
Agree©	96	249	1	
You advise others to receive ANC where you attended				
Disagree	12	26	1.09(0.53-2.24)	0.340
Neutral	11	14	1.85(0.81-4.22)	
Agree©	101	238	1	
Overall Satisfaction of ANC				
Not satisfied	47	83	1.43(0.92-2.24)	0.112
Satisfied ©	77	195	1	

©=reference category *= significant at bivariate level(p<0.05) COR=crude odd ratio

6.2.5 **Co-morbidities during pregnancy with LBW**

Without adjusting potential confounders, only gestational hypertension was found to be associated with low birth weight. However, history of urinary tract infection, anemia, malaria attack and HIV/AIDS were not found to be associated with low birth weight.

Table-12 binomial logistic regression output of co-morbidity related covariates of low birth weight at term in selected health facilities of Bahir Dar, North west Ethiopia, 2015

Variable	Birth weight status			
Variables	Low	Normal	COR with 95%CI	P value
HPN				
Yes	15	12	3.05(1.38-6.73)*	0.006
No©	109	266	1	
UTI				
Yes	6	22	0.59(0.23-1.49)	0.268
No©	118	256	1	
Anemia				
Yes	20	38	1.21(0.67-2.18)	0.526
No©	104	239	1	
Malaria				
Yes	8	13	1.41(0.57-3.49)	0.459
No©	114	261	1	
HIV				
Yes	6	5	2.73(0.82-9.11)	0.103
No©	118	268	1	
©=reference category *= significant at bivariate level($p<0.05$) COR=crude odd ratio				

6.2.6 Exposure to alcohol drinking and cigarette smoking during pregnancy with LBW

Maternal report of alcohol drinking during pregnancy was not significantly associated with low birth weight. Passive cigarette smoking during pregnancy was also not significantly associated with LBW. Since, there was no report of maternal cigarette smoking bivariate analysis was not done.

Table-13 binomial logistic regression output of alcohol drinking and passive cigarette smoking during pregnancy with LBW at term in selected health facilities of Bahir Dar, North west Ethiopia, 2015

Variable	Birth weight status			
Variables	Low	Normal	COR with 95%CI	P value
Alcohol drinking				
Yes	72	177	0.79(0.51-1.22)	0.286
No©	52	101	1	
Family member cigarette smoking				
Yes	2	7	0.62(0.13-3.04)	0.559
No©	122	266	1	
Maternal cigarette smoking				
Yes	0	0		
No	123	274		
©=reference category COR=crude odd ratio				

6.2.7 Maternal anthropometric characteristics with low birth weight

Without controlling possible confounders, nutritional status of mothers (MUAC<23cm) were significantly associated with low birth weight. On the other hand, maternal height less than 150 cm was not significantly associated with LBW.

Table-14 logistic regression output of maternal anthropometric characteristics with low birth weight at term in selected health facilities of Bahir Dar, North west Ethiopia, 2015

Variable	Birth weight status			
Variables	Low	Normal	COR with 95%CI	P value
Maternal MUAC				
<23	71	52	6.14(3.84-9.84)*	<0.001
≥23©	50	225	1	
Height				
<150	12	15	1.91(0.87-4.22)	0.108
≥150©	110	263	1	
©=reference category *= significant at bivariate level(p<0.05) COR=crude odd ratio				

6.3 Results from multivariate analysis

6.3.1 Basic characteristics of study participants associated with low birth weight

After adjusting potential confounders (ANC, maternal nutrtion status, comorbidities during pregnancy, age at first birth and unwanted pregnancy) most socio-demographic and economic variables didn't show significant association with birth weight at term except wealth status and household food insecurity. Compared to food secured households, mothers from food in secured households had more risks of LBW at term [AOR 4.96(95% CI 2.08-11.86)]. Mothers in the middle and fourth wealth quintiles were also less likely to give LBW infants at birth.

Some obstetric related variables which were found significantly associated with birth weight at term in the bivariate analysis was no longer found to be significantly associated with LBW after adjusting possible confounders (wealth ,food insecurity,poor nutrional status) except the number of ANC. Mothers who had less than four ANC had higher risk of LBW at term [AOR 3.22 (95% CI 1.50-6.89)].

Poor maternal nutritional status was also found to be significantly associated with low birth weight at term in the multivariate analysis after controlling wealth, food insecurity, ANC and comorbidities during pregnancy. Mothers who had MUAC less than 23 cm were more likely to give low birth infants at term [AOR 4.57(95% CI 2.14-9.78)]. The sex of the new born (being female) and gestational hypertension which were significantly associated with LBW at bivariate level was not significantly associated with LBW at multivariate level of analysis.

Fig-15 multinomial logistic regression output of basic characteristics of study participants with low birth weight at term in selected health facilities of Bahir Dar, North west Ethiopia, 2015

	Birth weight status			
Variables	Low (<2.5)	Normal(≥2.5)	AOR WITH 95%CI	P value
Residence				
Rural	53	73	0.75(0.20-2.75)	0.658
Urban©	70	204	1	
Level of Education				
No formal education	53	78	1.18(0.31-4.49)	0.256
Primary education	31	67	1.96(0.62-6.21)	
Secondary education	20	73	0.68(0.19-2.48)	
Higher education *	16	59	1	
Occupational status				
Government worker©	11	50	1	0.905
Merchant	11	31	1.63(0.37-7.29)	
Housewife	35	115	1.05(0.28-3.92)	
Farmer	47	58	1.60(0.29-8.64)	
Others	18	24	1.02(0.21-4.91)	
Wealth				
Lowest	32	48	0.31(0.07-1.42)	
Second	23	48	0.31(0.09-1.067)	
Middle	16	81	0.26(0.09-0.77)**	0.015
Fourth	16	55	0.27(0.09-0.83)**	
Highest©	34	44	1	
food insecurity				
yes	32	20	4.96(2.08-11.86)**	<0.001
no©	92	259	1	
Sex of infant				
Female	79	139	1.83(0.91-3.71)	0.092
Male*	45	140		
Age at first birth				
<18	30	39	0.98(0.36-2.67)	0.968
≥18©	92	230	1	
Pregnancy type				
Unwanted	25	17	1.35(0.39-4.63)	0.637
Wanted©	99	257	1	
No of ANC	70	88	3.22(1.50-6.89)**	0.003
<4	52	189	1	
≥4©				
Time of first ANC initiated				
Third trimester	13	11	2.59(0.57-11.84)	0.378
Second	57	122	0.88(0.43-1.83)	
First trimester©	40	129	1	
Reason of first ANC				0.187
For other	26	29	1.95(0.72-5.26)	
For ANC©	97	248	1	
Maternal MUAC			4.57(2.14-9.78)**	<0.001
<23	71	52	1	
≥23*	50	225		
Hypertension				0.416
Yes	15	12	1.03(0.21-4.99)	
No*	109	266	1	
©=reference category **= significant at multivariate level				

6.3.2 Major explanatory variables associated with LBW

The major explanatory variables of this study were the contents and perceived quality of ANC (assessed in terms of satisfaction) .In the multivariate analysis some of the contents of ANC were found significantly associated with low birth weight.

6.3.2.1 Contents of ANC with low birth weight

After adjusting potential confounders (wealth, food insecurity, number of ANC, times of ANC, comorbidities during pregnancy and maternal MUAC); the number of days of iron intake and dietary advice during ANC were found significantly associated with birth weight at term. However, other contents of ANC which were significantly associated with birth weight at bivariate level were no longer found to be associated with low birth weight. Women who reported iron intake of <30 days and did not get ANC dietary advice had more risk of LBW at term [AOR 2.93(95%CI 1.34-6.42)] and [AOR 2.29 (95%CI 1.03-5.11)] respectively.

Table-16 multinomial logistic regression output of ANC content related covariates of low birth weight at term in selected health facilities of Bahir Dar, North west Ethiopia, 2015

Variable	Birth weight status			
	Low	Normal	AOR WITH 95%CI	P value
Number of days of iron taken				
<30 days	67	35	2.93(1.34-6.42)**	0.007
≥30 days©	56	234	1	
TT given				
No	31	36	2.01(0.62-6.47)	0.244
Yes©	92	243		
Number of TT given				
<2	44	69	0.64(0.23-1.79)	0.390
≥2©	79	207	1	
De-worming				
No	100	189	1.65(0.68-3.97)	0.266
Yes©	22	85	1	
Dietary advice				
No	49	56	2.29(1.03-5.11)**	0.042
Yes©	75	223	1	
©=reference category **= significant at multivariate level				

6.3.4 ANC satisfaction with LBW

6.3.2.2 ANC satisfaction with LBW

After adjusting socio- demographic, co-morbidities and obstetric factors including the number and times of initiation of ANC, Some items used to measure satisfaction which were significantly associated with LBW at bivariate level were found no longer to be associated with low birth weight at term in multivariate analysis.

Table-17 multinomial logistic regression output of ANC satisfaction with LBW among selected health facilities in Bahir Dar, North West Ethiopia, 2015

Variable *	Birth weight			
	Low	Normal	AOR WITH 95%CI	P value
The ANC clinic had clean latrine and adequate water				
Disagree	33	41	1.72(0.72-4.13)	0.447
Neutral	9	18	0.84(0.19-3.74)	
Agree©	82	220	1	
expense incurred during ANC was fair				
Disagree	17	57	0.52(0.18-1.56)	0.371
Neutral	13	9	1.68(0.35-8.11)	
Agree©	94	213	1	
happy with all the services you had got				
Disagree	12	18	0.56(0.13-2.54)	0.745
Neutral	16	12	1.03(0.21-4.99)	
Agree©	96	249	1	
Overall Satisfaction of ANC				
Not satisfied	47	83		
Satisfied ©	77	195		

*=Some variables(items of satisfaction) that was significant at bivariate level were not included in the multivariate model as suspecting mullti-collinarity (inflation of standard error of beta Coefficients i.e. >2.0)

7. Discussion

This study is mainly aimed to assess the relationship between contents of antenatal care and perceived quality of ANC with low birth weight at term. Based on the main objective of this study, ANC dietary counseling and an iron intake of ≥30 days were found significantly associated with low birth weight at term. Other factors such as economic status of mothers, household food insecurity, number of ANC and poor nutritional status of mothers were also identified as potential determinants of low birth weight at term.

Though, there were paradoxical study findings on the association between the number of ANC and low birth weight, in this study, number of ANC was found significantly associated with birth weight at term even after adjusting socio-economic, contents of ANC, medical factors and reason of first ANC visiting. Births from women who had less than four ANC visiting were 3.22 times more likely to be low birth Weight than births from mothers who had four or more than four ANC visiting with corresponding 95% CI of (1.50-6.89). Some reports in Ethiopia support this finding (9, 28) and some are inconsistent with this study finding (13, 27). This discrepancy may be due to time, study population and contextual differences. The significant association of number of ANC with low birth weight may be attributed to the beneficial impact of intensified and an array of available medical, nutritional and educational interventions which may intend to reduce low birth weight. As the number of ANC (contact time with care provider increases), women will have an opportunity of gaining more and intensified medical, nutritional and educational interventions which could have a potential benefit for favorable weight gain which may in turn increase weight at birth. Though there were no statistical significant association between the time of ANC initiated and low birth weight, women who started their ANC after 28 weeks were 2.59 times more likely to give low birth weight babies at term with Corresponding confidence interval of (0.57-11.84) . This is supported by facility based study finding in wollo, Ethiopia (11). Lack of statistical Significant association between low birth weight and late initiation of ANC in this study may be due to small number of mothers started their ANC after 28 weeks (i.e. 6%) as observed in the result section(table-3).

Coming to the contents of ANC, iron intake during pregnancy and dietary advice were found to be significantly associated with birth weight at term in both bivariate and multivariate analysis. It was found that iron consumption during pregnancy was protective against low birth weight at term.

The odd of giving low birth weight at term was 2.93 times higher among women who didn't take iron for more than 30 days with corresponding 95% CI of (1.34-6.42). This finding is consistent with study findings in Nepal (44, 47) and India (46, 49). A similar finding was also reported among a cohort of women in Britain (45). However, this study finding is inconsistent with a comparative cross-sectional study finding in Northern Ethiopia (28). This difference could be explained as variation in study subjects and study design. For instance, the report from Northern Ethiopia includes both term and preterm neonates and mothers irrespective of their ANC status. On the contrary, this study includes exclusively term newborns and mothers who had at least one ANC visiting. Studying the effect of iron consumption during pregnancy against low birth weight in both term and preterm babies at the same time may under estimate the significant effect of iron. As reported by another study, iron consumption was not significantly associated with preterm births (44).The possible justification for significant association between iron intake and birth weight may be due to iron prevents anemia during pregnancy which results oxidative stress to the fetal growth. Other possible explanation may be iron intake during pregnancy improves appetite leading to improvements of nutritional status of the mother and improved nutritional status of the mother in turn increases birth weight. From this study, it is difficult to explain whether the respondents took iron or iron folic acid combination. In most public health institutions the available form is iron folic acid combination. Where ever the mother obtained, in other studies it was found that it is iron not folic acid which was associated with low birth weight (44, 48)

Nutritional advice during ANC was the second important finding among the contents of ANC in this study and it was found significantly associated with LBW at bivariate and multivariate level of analysis. The odds of LBW among women who hadn't got dietary counseling was 2.29 times higher than who had got during the current pregnancy with 95% CI of (1.03-5.11). This finding is also supported by study findings in low and middle income countries (40). It is also in line with interventional studies in New Delhi and Bangladesh (41, 42). Possible explanation for this significant association may be nutritional advice during pregnancy improves birth weight via improving weight gain and by reducing iron deficiency anemia.

The significant association between ANC dietary advice and LBW could be also explained as majority of study participants in this study were food secured and relatively small number of mothers were in the lowest wealth quintiles (table-2) and the effect of dietary counseling on birth weight improvement is more significant among food secured as reported in other study (40).

When we look at the association between client level of satisfaction and birth weight at term, the level of satisfaction were not significantly associated with LBW at term at bivariate level though women who score below the mean satisfaction score were 1.43 times higher to give LBW as compared with who score above the mean score of satisfaction. It was further tried to look at the association between each items of satisfaction with low birth weight and some of the items of satisfaction were found significantly associated with LBW at bivariate level. However, none of the items were found significantly associated with birth weight after adjusting socio-economic variables, number of ANC, time ANC was initiated and contents of ANC. The lack of significant association between ANC level of satisfaction and low birth may be due to a courtesy biased introduced when women were asked about services satisfaction at health institutions. Women may tend to respond to answer positively because of reluctant to criticize the care provider. Hence, information bias secondary to half hearted information may be introduced which in turn under estimate the association between level of satisfaction and low birth weight.

In addition to the main study variables; Economic status, household food insecurity and maternal nutrition status were found to be significantly associated with low birth weight at term. Women in the middle AOR 0.26 (95% CI 0.09-0.77) and fourth AOR 0.27 (95% CI 0.07-0.83) wealth quintiles were less likely to give low birth weight babies. This finding is in agreement with study findings from the least developed countries including sub-Saharan Africa (56-58). Similar finding was reported in eastern and southern Ethiopia (53, 54). There are different arguments for the significant association between economic status and low birth weight. One justification is women in the highest socioeconomic status would have a sort of prenatal and nutritional care which in turn would have improved birth weight. The second justification may be women with poor socioeconomic status would have poor feeding pattern and failure to achieve the recommended weight gain eventually affecting birth weight of infants.

The significant association between food insecurity and low birth weight at term was found both at baivarite and multivariate analysis. The odd of LBW was 4.96 times higher among mothers from food in secured households as compared to secured households with corresponding 95% CI of 2.08-11.86. This finding is in line with a case control study finding in Tehran (60). Possible explanation for the significant association between food insecurity and low birth weight may be food insecurity reduces the quality and quantity of food available to mothers, reducing weight gain and impair the nutritional status of the mother which subsequently reduces weight at birth. Food in secured mothers may often restrict their food and scarify their own nutrition in order to protect their children from hunger which in turn impairs the nutritional status of the mother and consequently reduces weight at birth. Other possible explanation may be women from food in secured households may be at risk of depression and stress which are potential determinants of LBW as documented in some studies (54, 60). The nutritional status of women as proxy by MUAC was also strongly associated with LBW at term. The odd of developing LBW was 4.57 times higher among mothers who had MUAC of <23cm as compared to mothers who had ≥23 cm with corresponding CI of (2.14-9.78). Other studies also reported a similar finding [53 and 54]. MUAC was found to be a good anthropometric indicator to identify acutely malnourished pregnant women and to predict adverse birth outcomes [64] .women that possesses a good nutrition status during pregnancy may be better able to meet the demands imposed by the pregnancy and may have more successful birth outcomes.

In this study, other socio-economic factors (residence, religion, educational status, occupation and marital status) were not significantly associated with low birth weight at term. This finding is in concurrence with other study findings [9, 13, 27, and 28]. The lack of significant association may be due to the similar nature of mothers included in this study with majority were housewife, Christian religion followers, married, residing in urban area and attending more than primary and secondary education (table-2).The age of the mother was also not significantly associated with low birth weight at both bivariate and multivariate analysis. This may be attributed to difficulty of ascertaining the accurate age of the mother which can possibly cause non differential exposure misclassification which in turn may nullifies the actual effect. This explanation may also works for insignificant association between age at the first birth and low birth weight.

Among medical factors during pregnancy, only pregnancy induced hypertension was statistically associated with birth weight at bivariate level of analysis. However, the significant association in the bavariate analysis was insignificant after adjustment of possible confounders (wealth, food insecurity, ANC, residence and educational status). Other medical factors (HIV, anemia, and UTI) were not significantly associated with LBW in both biavriate and the multivariate analysis. This may be owing to the fewer number of cases and controles exposed as observed in the result section. This sample may be insufficient to detect the existing exposure difference between cases and controls which in turn result insignificant association between medical factors with LBW (table -5).

Obstetric factors such as birth interval and previous small / very small babies were not significantly associated with LBW at both bivariate and multivariate levels. This may be ascribed to large missing value as observed in the result section (table-3). This missing values were resulted because of 50.6 % respondents were their first birth so that information with regard to birth interval and previous history of low birth weight was not obtained. This large missing value hinders to detect the existing difference and under estimate the significant association between these variables with LBW. In addition information with previous history of small/very small births was obtained from maternal subjective assessment of her baby size at birth which may not reflect the actual size.

In this study, the significant association between exposure to alcohol drinking during pregnancy and low birth weight was not observed. Though, 61.8% women drank some form of alcohol during pregnancy, no significant association with LBW at term was found both at bivariate and multivariate analysis. Other studies also support this finding (67, 68). The possible justification for lack of association between alcohol drinking and low birth weight in this study may be due to women consumed small amount of alcohol during pregnancy and in other studies it was documented that small and moderate alcohol consumption had no significant effect on birth weight (68).

8. Strengths and limitations of the study

This study had some strength. Since, the finding of this study was based on case control study, it could give more strong evidence on causation compared to cross-sectional and other descriptive studies. As incidence cases were included, it gives additional strength as compared to retrospective case control study. This study also tried to control the confounding effect of gestational age by restricting the study populations at design stage (only term births were included). It was tried to control the effect of adverse selection of pregnant mothers to ANC by asking their reasons at the time of ANC enrolment. It was also tried to make the data collectors and respondents to blind up on the main hypotheses of this study.

However, this study is not free from limitations. The first limitation of this study arises from the nature of the study design. Since, it was a case control study it is difficult to establish temporal relationships. The second limitation of this study is possibility of introduction of social desirability bias when women were asked about questions related to ANC service satisfaction at health institutions. This may also causes reporting bias which eventually leads to exposure misclassification. Though the data collectors were blinded up on the main hypotheses, their prior knowledge may introduce differential exposure misclassification bias by retrieving more information among cases than controls. Another limitation of this study is possibility of recall bias while determining gestational age. Though training on measurements (about calibration and recording) and standard procedures were given, we couldn't be 100% perfect on measurement of maternal height, MUAC and newborn weight. Therefore, there might be an introduction of misclassification bias secondary to measurement bias. Due to poor recording and recall bias weight gain during pregnancy was not included. Therefore, the potential effect of weight gain during pregnancy was not included in this study. This study didn't consider some potential risk factors for LBW such as intrauterine infection, placental factors, antenatal depression and social support during pregnancy. Finally, as the finding of this study was based on institutional based study, it may not be appropriate to infer to external populations.

9. Conclusion and recommendations

The primary purpose of this study is not to abandon the current existing care during pregnancy, rather to assess and determine its relationship with birth outcomes (low birth weight). In general, the risk of low birth weight was associated with modifiable risk factors. Particularly, Low birth weight at term was associated with contents of ANC that are likely to improve birth outcome such as iron intake of ≥30 days and dietary counseling. Therefore, the key elements of antenatal care such as dietary advice and iron intake which are likely to improve low birth weight need to be addressed in this study setup. It was also found that low birth weight at term was strongly associated with food insecurity, wealth and nutritional status of mothers. Therefore improving nutritional status of women by giving special emphasis for poor and food in secured women during ANC is recommended to reduce LBW at term in this study setup.

Specific Recommendations

For health facilities

- Identification of women at risk of malnutrition (such as poor and food in secured women) and provision of nutritional support *(in the form of food supplements, micronutrient supplements)* during pregnancy.
- Empowering and training frontline health workers to provide effective nutritional counseling during pregnancy.
- Provision of daily iron preferably for ≥30 days and reinforcing women not to withdraw the recommended iron intake.
- Ensuring appropriate recording and follow up of maternal weight gain during pregnancy

For government officials and policy makers

- Design strategies to increase the nutritional status of poor and food in secured pregnant women and subsequent pregnancy weight gain during pregnancy.

For researchers

- Additional research such as large scale (community based with large sample size), strong designed study (prospective cohort or experimental study) need to be conducted.

12. References

1. Healthy People 2020. Maternal, infant, and child health.2013.Also available at: https://www.healthypeople.gov/2020/.../maternal-infant-and-child-health. accessed june,2015
2. United Nations Children's Fund and World Health Organization. Low Birth Weight Country, regional and global estimates. UNICEF 2004. Also available at: www.who.int/nutrition/topics/fetal_dev_report_EN.pdf .accessed julay,2015
3. World Health Organization. Promoting optimal fetal development report of a technical consultation. World health organization 2006. Also available at: www.who.int/nutrition/topics/fetal_dev_report_EN.pdf. accessed julay,2015
4. Risnes KR *etal*, Birth weight and mortality in adulthood. Int J Epidemiology 2011; 40:647-61.
5. Goldenberg RL, Culhane JF, Iams JD, Romero R. Epidemiology and causes of preterm birth. Lancet 2008; 371(9606):75–84.
6. Villar J, Abalos E, Carroli G, Giordano D, Wojdyla D, Piaggio G *et al*. Heterogeneity of perinatal outcomes in the preterm delivery syndrome. Obstet Gynecol 2004; 104(1):78–87
7. Goldenberg RL, Gravett MG, Iams J, Papageorghiou AT, Waller SA, Kramer M *et al*. The preterm birth syndrome: issues to consider in creating a classification system. Am J Obstet Gynecol. 2012; 206(2):113–18.
8. Villar J, Papageorghiou AT, Knight HE, Gravett MG, Iams J, Waller SA *et al.* The preterm birth syndrome: a prototype phenotypic classification. Am J Obstet Gynecol. 2011; 206(2):119–23.
9. Megabiaw B, Zelalem M, Mohammed N. Incidence and correlates of low birth weight at a referral hospital in Northwest Ethiopia. Pan African Medical Journal 2012;12:4
10. Central Statistical Agency. Ethiopian Demographic and Health Survey.CSA 2012.
11. Eshete A, Birhanu D, Wassie B. Birth outcomes among laboring mothers in selected health facilities of North Wollo Zone, Northeast Ethiopia. open access 2013; 5:7
12. Gebremariam A. Factors predisposing to low birth weight in Jimma Hospital South Western Ethiopia. East African Medical Journal 2005; 82: 554-8.

13. Adane AA, Ayele TA, Ararsa LG, Bitew BD and Zeleke BM .Adverse birth outcomes among deliveries at Gondar University Hospital, Northwest Ethiopia. BMC Pregnancy and Childbirth 2014, 14:90
14. Nekatibeb G, G/Mariam A. Analysis of birth weight in Metu Karl hospital South West Ethiopia. Ethiopian Medical Journal 2007, 45: 195-202
15. Resolution WHA 65.6. Comprehensive implementation plan on maternal, infant and young child nutrition. World Health Organization 2012;12-13
16. FMOH/MCH Directorate, National Newborn and Child Survival Strategy Document Brief Summary 2015/16-2019/20. June 2015.
17. Alexander G.R, Kotelchuck, M. Assessing the role and effectiveness of prenatal care: History, challenges and directions for future research. Public Health Reports 2001 ; 116 :306-16
18. Untied nation children's fund .The status of world children. UNICEFE 2014: also available at www.unicef.org/gambia/sow-report-2014.pdf. accessed august, 2015
19. Matthews TJ, MacDorman MF. Infant mortality statistics from the 2006 period linked birth/infant death data set. National vital statistics reports 2010; 58:17.
20. Bahirdar city administration annual health report. HMIS (unpublished report) 2014.
21. Ejigu T, Woldie M and Kifle Y. Quality of antenatal care services at public health facilities of Bahir-Dar special zone, Northwest Ethiopia. BMC Health Services Research 2013; 13:443
22. UNICEF. Committing to Child Survival: A Promise Renewed Progress Report 2013. UNICEF2013.www.unicef.org/.../Committing_to_Child_Survival_APR_9_Sept_2013. *Accessed September 2015*
23. Christian P. prenatal origins of under nutrition. Nestle Nutr Workshop Ser Pediatr Program 2009 , 63:59-73
24. Shrimpton R, Victora C, De Onis M, Lima R, Blossner M ,Clugston, G. Worldwide timing of growth faltering: implications for nutritional interventions. Pediatrics 2001; 107:1-7.
25. FMOH. National Nutrition Programme from June 2013 – June 2015. 2013

26. Fonseca CRB, Strufaldi MWL, Carvalho LR, Puccini RF. Adequacy of antenatal care and its relationship with low birth weight in Botucatu, São Paulo, Brazil. BMC Pregnancy and Childbirth 2014; 14:255
27. Zenebe K, Awoke T, Birhan N. Low Birth Weight & Associated Factors Among Newborns in Gondar Town, North West Ethiopia. Indo Global Journal of Pharmaceutical Sciences 2014; 4(2): 74-80
28. Teklehaimanot N, Hailu T, Assefa H. Prevalence and Factors Associated with Low Birth Weight in Axum and Laelay Maichew Districts, North Ethiopia. International Journal of Nutrition and Food Sciences 2014; 3(6): 560-66
29. Merry KM. Prenatal care Limitations and opportunities. JOGNN 2006; 35: 278-86
30. Carroli G, Rooney C, Villar J. How effective is antenatal care in preventing maternal mortality and serious morbidity? An overview of the evidence. Paediatr. Perinat. Epidemiol 2001; 1-42.
31. Di Mario S, Basevi V, and Gori G, Spettoli D. What is the effectiveness of antenatal care? WHO Regional Office for Europe; 2005. Also available at: www.euro.who.int/__data/.../E87997.pdf . accessed augest,2015
32. Strong T. What expectant parents should know about prenatal care in America? New York : University Press 2000; 5:2
33. Nwaru BI, Wu Z, Hemminki E. Determinants of the use of prenatal care in rural China the role of care contents. Maternal and child health journal 2012; 16(1): 235–41.
34. Gebremariam A. Factors predisposing to low birth weight in Jimma Hospital South Western Ethiopia. East African Medical Journal 2005; 82:11
35. Ezugwu E, *et al*. Singleton Low Birth Weight Babies at a Tertiary Hospital in Enugu, South East Nigeria. Journal of Gynecology and Obstetrics 2010; 14 :1
36. Jammeh A, Sundby J, and Vangen S. Maternal and obstetric risk factors for low birth weight and preterm birth in rural Gambia: a hospital-based study of 1579 deliveries. Open Journal of Obstetrics and Gynecology 2010; 1:94-103
37. World health organization. Standards for maternal and neonatal care: provision of effective antenatal care, WHO 2007.

38. Ghosh-Jerath S *et al*. Antenatal care utilization, dietary practices and nutritional outcomes in pregnant and recently delivered women in urban slums of Delhi, India. Reproductive Health journal 2015; 12:20.
39. Darnton-Hill I. Nutrition counseling during pregnancy: Biological, behavioral and contextual rationale. E-Library of Evidence for Nutrition Actions. 2013 available at: www.who.int/elena/.../nutrition_counselling_... *Accessed November,2015*
40. Girard AW, Olude O. Nutrition education and counseling provided during pregnancy: effects on maternal, neonatal and child health outcomes. Paediatric and Perinatal Epidemiology. 2012, 26:191-204.
41. Aashima Garg and Sushma Kashyap. Effect of Counseling on Nutritional Status during Pregnancy. Indian J Pediatr 2006; 73 (8) : 687-92
42. Akter SM,Roy SK,Thakur SK, Sultana M, Khatun W, Rahman R, Saliheen SS, Alam N. Effects of third trimester counseling on pregnancy weight gain, birth weight, and breastfeeding among urban poor women in Bangladesh Food and Nutrition Bulletin 2012;33: 3
43. Aranda N, Ribot B, Garcia E, Viteri FE, Arija V: Pre-pregnancy iron reserves, iron supplementation during pregnancy and birth weight. Early Hum Dev 2011, 87:791–97
44. Christian *etal*. Effects of alternative maternal micronutrient supplements on low birth weight in rural Nepal: double blind randomized community trial. BMJ 2003;326:571
45. Alwan NA, Greenwood DC, Simpson NAB, McArdle HJ, Godfrey KM, Cade JE: Dietary iron intake during early pregnancy and birth outcomes in a cohort of British women. Hum Reprod 2011; 26:911-19
46. Balarajan Y, Subramanian S, Fawzi WW. Maternal iron and folic acid supplementation is associated with lower risk of low birth weight in India. J Nutr 2013 :143 :1309-1315
47. Khanal V, Zhao Y and Sauer K. Role of antenatal care and iron supplementation during pregnancy in preventing low birth weight in Nepal: comparison of national surveys 2006 and 2011. BioMed Central Ltd 2014; 72:4
48. Palma S, Perez-Inglesias R, Prieto D, Pardo R, Llorca J, Delgado-Rodriguez M. Iron but not folic acid supplementation reduces the risk of low birth weight in pregnant women without anemia. Journal of Epidemiology and Community Health. 2008; 62:120-24.

49. Cogswell ME, Parvanta I, Ickes L, Yip R, Brittenham GM. Iron supplementation during pregnancy, anemia, and birth weight: a randomized controlled trial. Am J Clin Nutr 2003; 78:773–781
50. Promising Practices Network. Promising Practices for Preventing Low Birth Weight.2010.availableat: http://www.promisingpractices.net/briefs/briefs_lowbirthweight.asp. accessed September 2015
51. Ota E, Ganchimeg T, Morisaki N, Vogel JP, Pileggi C, *et al*. Risk Factors and Adverse Perinatal Outcomes among Term and Preterm Infants Born Small-for-Gestational-Age: Secondary Analyses of the WHO Multi-Country Survey on Maternal and Newborn Health. PLoS ONE 2014; 9(8)
52. Sebayang SK, Dibley MJ, Kelly PJ, Shankar AV, Shankar AH. Determinants of low birth weight, small for gestational age and preterm birth in Lombok, Indonesia: analyses of the birth weight cohort of the SUMMIT trial. Trop Med Int Health 2012:17: 938–50
53. Assefa N, Berhane Y, Worku A. Wealth Status, Mid Upper Arm Circumference and Antenatal Care (ANC) Are Determinants for Low Birth Weight in Kersa, Ethiopia. PLoS ONE ; 2012:7(6)
54. Wado YD, Afework MF, Hindin MJ. Effects of Maternal Pregnancy Intention, Depressive Symptoms and Social Support on Risk of Low Birth Weight: A Prospective Study from Southwestern Ethiopia. PLoS ONE 2014; 9(5)
55. Hillemeier M, Weisman CS, Chase GA, Dyer AM .Individual and community predictors of preterm birth and low birth weight along the rural urban continuum in central Pennsylvania. J Rural Health 2007; 23: 42-48
56. Badshah S, Mason L, Mckelvie K, Payne R, Lisboa PJ. Risk Factors for low birth weight in the public-hospitals at Peshawar, NWFP-Pakistan. BMC 2008; 8:197
57. Vahdaninia M, Tavafian SS, Montazeri A. Correlates of low birth weight in term pregnancies: a retrospective study from Iran. Tehran, Iran. BioMed central. BMC pregnancy and childbirth 2008; **8**:12
58. Feresu SA, Harlow SD, Welch K, Gillespie BW. Incidence of and socio-demographic risk factors for stillbirth, preterm birth and low birth weight among Zimbabwean women. Harare, Zimbabwe. Blackwell Publishing LTD Pediatric and prenatal Epidemiology 2004; 18: 154-163.

59. Barbara A. Laraia, Anna Maria Siega-Riz and Craig Gundersen. Household food insecurity is associated with self-reported pregravid weight status, gestational weight gain and pregnancy complications. J Am Diet Assoc 2010; 110(5): 692–701.
60. Mozayeni M, Motlagh A, Eshraghian M, Davaei M .relationship between food security and stress in pregnant mothers and low birth weight infant in childbirth in Tehran akbar abadi hospital. international journal of current life sciences 2014;4:2915-21
61. Jammeh A, Sundby J, Vangen S. Maternal and obstetric risk factors for low birth weight and preterm birth in rural Gambia: a hospital-based study of 1579 deliveries. Open Journal of Obstetrics and Gynecology 2011; 1: 94-103
62. Khoshwood, B. Risk of low birth weight associated with advanced maternal age among four ethnic groups in United States. Maternal and Child Health Journal 2005;9(1): 3-9
63. Siza, J. Risk factors associated with low birth weight of neonates among pregnant women attending a referral hospital in Northern Tanzania. Tanzania Journal of Health Research 2008; 1-8
64. Mohsen M.A, Wafay H.A. Influence of maternal anthropometric measurements and serum biochemical nutritional indicators on fetal growth. J. Med.Sci 2007; 7: 1330-34.
65. Chang M, Chun H, and Kuei-Feng C. the effects of pre-pregnancy body mass index and gestational weight gain on neonatal birth weight in Taiwan. International Journal of Nursing and Midwifery 2010 ; 2: 28-34
66. Centers for Disease Control and Prevention. Alcohol use and binge drinking among women of childbearing age in United States, 2006–2010. MMWR Morb Mortal Wkly Rep 2012; 61:534–8.
67. Fergus P *etal*. Association between Maternal Alcohol Consumption in Early Pregnancy and Pregnancy Outcomes. Obstet Gynecol 2013; 122:830–37
68. Patra *etal*. Dose-response relationship between alcohol consumption before and during pregnancy and the risks of low birth weight, preterm birth and small size for gestational age: A systematic review and meta-analyses. BJOG. 2011 ; 118(12): 1411–21
69. Bolajoko O etal. Predictors of Preterm Births and Low Birth weight in an Inner-City Hospital in Sub-Saharan Africa. Maternal Child Health J 2010; 14:978–86
70. Uche C, Isiugo-Abanihe. Maternal and environmental factors influencing infant birth weight in Ibadan, Nigeria. African Population Studies 2011; 25:2

71. Onesmus Maina O, Echoka E, Makokha A. Factors associated with low birth weight among neonates born at Olkalou District Hospital, Central Region, Kenya. Pan African Medical Journal. 2015; 20:108
72. Zafar A, Shariq K, S. Suha T. Antenatal care and the occurrence of Low Birth Weight delivery among women in remote mountainous region of Chitral, Pakistan, Pak J Med Sci 2012 ;28
73. Coates J, Swindale A and Bilinsky P. Household Food Insecurity Access Scale (HFIAS) for measurement of food access. FANTA, 2007.Avaliable at www.fantaproject.org

13. Annexes

I. Participant Information Sheet

Code number of the participant ______________________

My Name is _____________________I am working as a data collector for the study being conducted in this health institution on the link between antenatal contents and perceived quality with low birth weight , by Kindie Mitiku, who is studying his master's degree at Addis Ababa University, College of Medical and Health Sciences. I kindly request you to lend me your attention to explain you about the study and being selected as a study participant.

The study title: The link between antenatal care contents and perceived quality with low birth weight among term neonates in Bahirdar special zone, North West Ethiopia

Purpose of the study: The findings of this study can be of a paramount importance for Bahirdar special zone Health bureau to plan intervention programs on ANC and low birth weight based on the identified determinants in your community and others; thereby improve neonatal and maternal health in general. Moreover, the aim of this study is to write a thesis as a partial requirement for the fulfillment of a Master's Program in Public Health for the principal investigator.

Procedure and duration: I will interview you using a questionnaire to provide me with pertinent data that is helpful to the study. There are questions to answer where I will fill the questionnaire by interviewing you. The interview will take 40 minutes, so I kindly request you to spare me this time for the interview. In addition to interview measurement of your height and mid upper arm as well as weight of your baby will be taken.

Risks and benefits: The risk of participating in this study is very minimal, but only taking 40 minutes from your time. There would not be any direct payment for participating in this study. But the findings from this research may reveal important information for the district health office and local health partners.

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

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

Contact address: If there are any questions or enquires any time about the study or procedures, please contact: Principal investigator: Kindie Mitiku, **Mobile: 0917-742-402, and email: kindiemitiku@gmail.com**

Participants Informed Consent

I have read (she/he have read) the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, the right of participation and the contact address for any queries. I have been given the opportunity to ask any questions for things that may have been unclear. I was informed that I have the right to withdraw from the study at any time or not to answer any question that I do not want. Therefore, I declare my voluntary consent to participate in this study.

N.B: please! Read or make them to read the above oral informed consent before you proceed to go the data collection process.

II. English version Questionnaire

Questionnaire on the link between antenatal care contents and perceived quality with low birth weight to be filled by data collectors

Interviewer's name____________________________ Signature__________ ________

Code number of the respondent ___________________

Region______________ Zone________ health institution_______________________

Date/Month/Year of interview: _____ /_____ / _______E.C.

The questionnaire checked by supervisor or investigator: Name____________________

signature_________________

Strict rules that should be followed by each data collector:

Dear! Data collectors, before you start the data collection please strictly follow the following solid rules.

- First the weight of the neonate should be measured
- The following participants should be included in this study
  - ✓ Mothers who have at least one antenatal care visiting
  - ✓ neonates who have gestational age ≥37 completed weeks
- The following participants should be excluded
  - ✓ Still births
  - ✓ Neonates bore from multiple pregnancy
  - ✓ Neonates with congenital anomalies

English version Data extraction format

1. Anthropometric measurement record form for both the mother and neonate

	To be measured	Record
For the mothers	MAC(mid upper arm circumference)	____________cm
	Height	____________cm
For neonates	Weight	____________gm

2-Medical conditions of the mother to be retrieved from patient card

Medical conditions	Yes	No
Hypertension		
UTI		
Anemia		
HIV		

3. Others to be checked from patient card

What to be checked	Source	Record here
Date of Last menstrual period	Clients cared/mother	
date of delivery	Clients cared/mother	
Total weight gain during her pregnancy	Clients cared	

English version questionnaire

No	**Questions**	Response	Code	Skip
	1. Scio-economic and demographic related questions			
101	How old were you at your last birthday?	_________completed years		
102	What is your religion?	Orthodox Catholic Protestant Muslim Other(Specify)__________	1 2 3 4 5	
103	Where do you stay? (Type of residential settlement)	Rural Urban	1 2	
104	What is your occupational status?	House wife Farmer Merchant Government worker Student Other (Specify) _________	1 2 3 4 5 6	
105	Have ever attended formal school?	Yes No	1 2	If no To 107
106	What is highest level of school you attended?	Primary (1-8) Secondary(9-12) Technical /vocational Higher Education (12+)	1 2 3 4	
107	What is your current marital status?	Single Married Divorced Widowed	1 2 3 4	
108	**Household wealth :Does your household has:-**			
	1. Electricity?	1. Yes 2. No		if no To 5
	2. An electric mitad?	1. Yes 2. No		
	3. A refrigerator	1. Yes 2. No		
	4. A television?	1. Yes 2. No		
	5. A radio?	1. Yes 2. No		
	6. A bicycle?	1. Yes 2. No		
	7. Bajaj?	1. Yes 2. No		
	8. A motorcycle?	1. Yes 2. No		
	9. Animal drone cart?	1. Yes 2. No		

	10. a car?	1. Yes 2. No		
	11. Milk cows, oxen or bulls?	1. Yes 2. No		
	12. Horses, donkeys, or mules?	1. Yes 2. No		
	13. Goats?	1. Yes 2. No		
	14. Sheep?	1. Yes 2. No		
	15. Poultry?	1. Yes 2. No		
	16. Your own land?	1. Yes 2. No		
	2. Questions on obstetric characteristics			
109	Was this child pregnancy your first, second, third or fourth pregnancy?	First Second Third Fourth Above four	1 2 3 4 5	If 1 to 116
110	Have you had any other live births since the birth of this child?	Yes No	1 2	To 112if no
111	How money live births Have you had including this birth?	______number of live births		
112	Since the birth of this child, have you had any other pregnancies that did not result in a live birth?	Yes No	1 2	To 114 if no
113	How many of pregnancies did not result in a live birth?	______numbers of still birth		
114	When the previous child was born, was he/she large, average, and small?	Very large large average small very small	1 2 3 4 5	
115	After how many months stay from the previous child did you give this baby?	________completed months		
116	How old were when you gave your first birth?	___________completed years		
117	At the time you became pregnant did you want to become pregnant?	Yes No	1 2	
118	At the time you became pregnant did you want to wait until later?	Yes No	1 2	
119	What is the sex of this baby?	Male Female	1 2	
	3.ANC service utilization related questions			
120	Did you see any one while you were pregnant with this child?	Yes No	1 2	
121	How many times did you receive antenatal care for this child pregnancy?	_________number of times		

122	How many months pregnant were you when you first received antenatal care for this pregnancy? **probe by relating with celebrity day**	_________completed months		
123	What was your reason when you received our first ANC	For ANC For other reason (medical, HIV follow up)	1 2	
	4. Questions on the contents of ANC			
124	During this pregnancy, were you given or did you buy any iron tablets **Probe by telling the color of iron or by showing iron tablet**	Yes No	1 2	To 126 if 2
125	For how many weeks/months did you take iron tablet?	____________days if less than week ______________weeks if less than a month ________________months if ≥ a month		
126	During this child pregnancy, were you given an injection in the arm to prevent the baby from getting tetanus, that is, convulsions after birth?	Yes No	1 2	To 128 if 2
127	How many injections were given to you?	_________________numbers of injection		
128	During this pregnancy, were you given any drug for intestinal worms? **Probe by telling the color of tablet or by showing the tablet**	Yes No	1 2	
129	As the part of antenatal care, did the doctor or nurse advise you about reducing or eliminating alcohol use and smoking?	Yes No	1 2 3	
130	As the part of antenatal care, did the doctor or nurse advise you about eating balanced and additional foods during pregnancy? **Balanced diet to mean combination of vitamins, proteins and carbohydrates**	Yes No	1 2	
	5. questions on toxic exposure during her pregnancy			
131	During this child pregnancy, did you take a drink that contains alcohol (tella/tegi/areke/beer/wine, etc...)?	Yes No	1 2	
132	Is there any one in your household who ever smoke cigarettes?	Yes No	1 2	
133	During this child pregnancy Have ever smoke cigarettes?	Yes No	1 2	
	6 .Co-morbidity related questions			
134	Did you encounter hypertension during this child pregnancy?	Yes No	1 2	
135	Did you encounter urinary tract infection during this child pregnancy?	Yes No	1 2	
136	Did you encounter anemia during this child pregnancy?	Yes No	1 2	

137	Did you encounter malaria during this child pregnancy?	Yes No	1 2	
	7.Questions related to antenatal care satisfaction			
	Do you disagree, neutral, agree about the ANC received during pregnancy?			
138	Provider's greeting was good and in a friendly way (polite)	Disagree neutral Agree	1 2 3	
139	The provider was easy to understand	Disagree neutral Agree	1 2 3	
140	Waiting time was fair	Disagree neutral Agree	1 2 3	
141	Waiting area was adequate & with seats	Disagree neutral Agree	1 2 3	
142	The ANC clinic has clean latrine and adequate water	Disagree neutral Agree	1 2 3	
143	Provider performed the procedure with cleanliness and sanitation	Disagree neutral Agree	1 2 3	
144	The expense incurred during ANC was fair	Disagree neutral Agree	1 2 3	
145	You feel that during antenatal care you received full information about ANC.	Disagree neutral Agree	1 2 3	
146	Generally you were happy with all the services you had got	Disagree neutral Agree	1 2 3	
147	You advise your families, friends and others to receive ANC where you attended	Disagree neutral Agree	1 2 3	
	8-Water, Sanitation and hygiene related questions			
148	In your home, What is the main source of water used for cooking, drinking and hand washing? **Note:** More than one answer is possible	pipe rain river protected spring protected well unprotected well un protected spring other (specify)________	1 2 3 4 5 6 7 8	
149	When do you wash your hand? **Note:** More than one answer is possible	before meal after meal after toilet after bathing of the child other specify ________	1 2 3 4 5	
150	What type of toilet do you mainly use? **Note:** More than one answer is possible	A toilet connected to a public sewer or septic tank system hygienic pit toilet with cover open pit toilet Public or shared toilet open defecation/defecation in bush other specify__________	1 2 3 4 5 6	

9. Food security Condition (HAFIS)

1	In the past four weeks, did you worry that your **household** would not have enough food? **Probe:** By "household" we mean those of you that sleep under the same roof and take meals together at least four days a week.	1 No 2 Yes	If 1, to Q2
1a	How often did this happen?	1 Rarely (Once or twice in the past four weeks) 2 Sometimes (3 to 10 times in the past four weeks) 3 Often (more than 10 times in the past four weeks)	
2	In the past four weeks, were you or any household member not able to eat the **kinds of foods you/he/she preferred** because of a **lack of resources**? **Probe:** By "**kinds of foods you preferred**" we mean foods that food secure people eat that food insecure people cannot afford to eat. E.g. Eggs, meat, fish, "Doro wot", etc By "**lack of resources**" we mean not having money or the ability to grow or trade for the food.	1 No 2 Yes	If 1, to Q3
2a	How often did this happen?	1 Rarely (Once or twice in the past four weeks) 2 Sometimes (3 to 10 times in the past four weeks) 3 Often (more than 10 times in the past four weeks)	
3	In the past four weeks, did you or any household member have to eat a **limited variety of foods** due to a lack of resources? **Probe:** When we say "**limited variety of foods**", we want to mean an undesired monotonous diet for an extended period of days.	1 No 2 Yes	If 1, to Q4
3a	How often did this happen?	1 Rarely (Once or twice in the past four weeks) 2 Sometimes (3 to 10 times in the past four weeks) 3 Often (more than 10 times in the past four weeks)	
4	In the past four weeks, did you or any household member have to eat some **foods that you really did not want to eat** because of a lack of resources to obtain other types of food? **Probe: Foods that you really did not want to eat** is Food that is considered to be undesirable or socially unacceptable.	1 No 2 Yes	If 1, to Q5

4a	How often did this happen?	1 Rarely (Once or twice in the past four weeks) 2 Sometimes (3 to 10 times in the past four weeks) 3 Often (more than 10 times in the past four weeks)	
5	In the past four weeks, did you or any household member have to eat a smaller **meal** than you felt you needed because there was not enough food? **Probe:**By "**meal**" we mean the major eating occasions (not including snacks).	1 No 2 Yes	If 1, to Q5
5a	How often did this happen?	1 Rarely (Once or twice in the past four weeks) 2 Sometimes (3 to 10 times in the past four weeks) 3 Often (more than 10 times in the past four weeks)	
6	In the past four weeks, did you or any other household member have to eat **fewer meals in a day** because there was not enough food? Probe: "**fewer meals in a day**" than the social norm, eat fewer than three meals in a day.	1 No 2 Yes	If 1, to Q5
6a	How often did this happen?	1 Rarely (Once or twice in the past four weeks) 2 Sometimes (3 to 10 times in the past four weeks) 3 Often (more than 10 times in the past four weeks)	
7	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	1 No 2 Yes	If 1, to Q5
7a	How often did this happen?	1 Rarely (Once or twice in the past four weeks) 2 Sometimes (3 to 10 times in the past four weeks) 3 Often (more than 10 times in the past four weeks)	
8	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	1 No 2 Yes	If 1, to Q9
8a	How often did this happen?	1 Rarely (Once or twice in the past four weeks) 2 Sometimes (3 to 10 times in the past four weeks) 3 Often (more than 10 times in the past four weeks)	
9	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	1 No 2 Yes	
9a	How often did this happen?	1 Rarely (Once or twice in the past four weeks) 2 Sometimes (3 to 10 times in the past four weeks) 3 Often (more than 10 times in the past four weeks)	

የተሣታፊዎች መረጃ እና ስምምነት ማረጋገጫ ቅጽ በአማርኛ

የተሣታፊዎች መረጃ ቅፅ

የተሣታፊዉ መለያ ቁጥር___________________________________

እኔ________________________________እባላሁ፡፡አዲስ አበባ ዩኒቨርሲቲ ህክምና › እና ጤና ሳይንስ ኮሌጅ የድህረ ምረቃ ትምህርቱን በመከታተል ላይ የሚገኘዉ ክንዴ ምትኩ በሚሰራዉ ጥናት መረጃ ሰብሳቢ ነኝ፡፡ እርስዎ ለቃለ መጠይቅ ለምን እንደተመረጡ እንድገልፅለዎት ሀሣብዎን ሠብሠብ አድርገዉ እንዲከታተሉኝ በትህትና እጠይቀዎታለሁ፡፡

የጥናቱ ርዕስ፡ በቅድመ ወሊድ ክትትል እና ክብደት ቀንሶ በሚዎለዱ ህጻናት መካከል ያለዉን ዝምድና ለማጥናት ነዉ

የጥናቱ ዓላማ፡:በጥናቱ የሚገኘዉ ዉጤት ለብሀርዳር ልዩ ዞን ጤና መምሪያ እና በእናቶች እና ህፃናት ዙሪ ለሚስሩ ድርጅቶች እቅድ ለማዉጣት፣ ለማሰፈጸም እና ለማሻሻል ይጠቅማል፡፡ ከዚህ በተጨማሪ ይህ ጥናት ለተመራማሪዉ በህብረተሠብ ጤና ሳይንስ የሁለተኛ ዲግሪዉን ለማግኘት ይጠቅመዋል፡፡

አካሔድ እና የሚወስደዉ ጊዜ፡ እኔ በመጠይቅ በመታገዝ ስጠይቀዎ ትክከለኛ መረጃ ቢሰጡኝ ለጥናቱ ጠቃሚ ነዉ፡፡ በአጠቃላይ ቃለምልልሡ 40 ደቂቃ ይወስዳል፣ ስለዚህ ይህን ጊዜዎን ለቃለምልልሡ መስዋዕት እንዲያደርጉልኝ በትህትና እጠይቀዎታለሁ፡፡ ከቃለ መጠይቁ በተጨማሪ የእርሰዎ ቁመት፤ የክንድ ጡነቻ መጠን እና የልጀዎ ክብደት ይለካል

ጉዳት እና ጥቅም፡ በዚህ ጥናት መሳተፍ 40 ደቂቃ ከጊዜዎ ከመዉሰደ ዉጭ ጉዳት የለዉም፡ :በጥናቱ ሲሳተፉ ምንም አይነት ክፍያ ባይኖረዉም ጥናቱ ለዞኑ ጤና ቢሮ እና በአካባቢዉ ለሚገኙ የጤና አጋር ድርጅቶች ጠቃሚ መረጃ ሊያስገኝ ይችላል፡፡

ሚስጥራዊነት፡ እርስዎ የሚሠጡን መረጃ በሚስጥር የሚያዝ ነዉ፡፡ የዚህ ጥናት ዉጤት እርስዎን ወይም ልጆዎን የሚያመለክት ምንም አይነት መረጃ አይኖርም፡፡ መጠይቆቹ የመለያ ቁጥር ስለሚሠጣቸዉ ስምዎን አያሳዩም፡፡እርስዎን እና ጥናቱን የሚያገናኝ የቃል ወይም የፅሁፍ መረጃ አይወሰድም፡፡

መብት፡ በዚህ ጥናት መሣተፍ በፍላጎት ላይ የተመሠረተ ነዉ፡፡እርስዎም የማይፈልጉትን ጥያቄ ያለመመለስ እና በፈለጉት ጊዜ የማቋረጥ መብት አለዎት፡፡

የአቤቱታ አደራሻዎች፡ ስለጥናቱ ወይም ስለአካሔድ ማንኛዉንም ጥያቄ ካለዎት በሚከተለዉ አድራሻ ያድርሡን

የዋናተመራማሪ፡-ክንዴ ምትኩ የሞባይል ቁጥር፡ 0917-742-420 እና ኢሜል፡ kindiemitiku@gmail.com

የተቋሙ የምርምር ስነምግባር አፅዲቂ ኮሚቴ፡-የቢሮ ስልክ ቁጥር------------------፤መ.ሣ.ቁ--------

<u>በፍቃደኝነት የተመሰረተ የስምምነት ማረጋገጫ ቅጽ</u>

የተሣታፊዎች የመረጃ ቅፅ ተነቦልኛል(አንብቤዋለሁ)፡፡ የጥናቱ ዓላማ፣ አካሔድ እና የሚወስደዉን ጊዜ፣ ጉዳት እና ጥቅም፣ ሚስጥራዊነት፣ ያለኝን መብት እንዲሁም የአቤቱታ አድራሻዎችን በግልፅ ተረድቸዋለሁ፡፡ ግልፅ ያልሆኑ ነገሮችን እንድጠይቅ እድል ተሠጥቶኛል፡፡ የማልፈልገዉን ጥያቄ ያለመመለስ እና በፈለኩት ጊዜ የማቋረጥ መብት እንዳለኝ ተነግሮኛል፡፡ ስለዚህ ለመሣተፍ በፍቃደኝነት መስማማቴን አረጋግጣለሁ፡፡

ማሳሰቢያ

እባከዎ! ቀጥታ ወደ መረጃ ስብሰባ ከማምራተዎ በፊት በፍቃደኝነት የተመሰረተ የስምምነት ማረጋገጫ ቅጽን ያንብቡላቸዉ / እንዲያነቡ ያድርጉ፡፡

III. Amharic version questionnaire

የአማርኛ መጠቅ

የጠያቂዉ/ዋስም_______________________ ፊርማ__________________

የተሣታፊዉ መለያ ቁጥር_____

መጠይቁን ያረጋገጠዉ የሱፐርቫይዘሩ/የተመራማሪዉ፡ስም_______________

ፊርማ______________

<u>የመረጃ ሰብሳቢው/ዋ ሊከተላቸው የሚገቡ መመሪያዎች</u>

ዉድ! የዚህ ጥናት መረጃ ሰብሳቢዎች ቃለመጠይቅ ከማረጋቹህ በፊት የሚከተሉትን መመሪያዎ አንድትተገበሩ አሳስባለሁ፡፡

1. የህፃኑ/ዋ ክብደት በመጀመሪያ ተለክቶ መረጃ በሚሰበሰብበት ቦታ መቀመጥ አለበት
2. በዚህ ጥናት ሊሳተፉ የሚችሉ እና የማይችሉ ተለይተው መታወቅ አለባቸው

<u>በዚህ ጥናት መሳተፍ የሚችሉት</u>

- ✓ ቢያንስ አንድ ጊዜ የቅድመ ወሊድ ክትትል ያላቸው
- ✓ የተወለደው/ችው ጨቅላ ህፃን 37 ሳምንት እና ከዚያ በላይ የእርግዝና እድሜ ያለው/ላት

<u>በዚህ ጥናት መሳተፍ የማይችሉት</u>

- ✓ ሞተው የተወለዱ፣መንታና ከዚያ በላይ ሁነዉ የተወለዱ ፣በአፈጣጠር ልዩ ሆነው የተወለዱ(የአፈጣጠር ችግር ያለባቸው) ጨቅላ ህጻናት ናቸዉ፡፡

በአማርኛ ዳታ ለመመዝገብ የሚያገለግሉ ቅፆች

1. የጨቅላ ህፃኑ/ኗ እና የእናቷ የሰውነት ልኬት የሚሟላበት ቅጽ

	የሚለካው	መጠን
የእናቷ	ቁመት	____________________ሳ.ሜ
	የእናቷ ክንድ ጠቅቻ ማጠን	____________________ሳ.ሜ
የጨቅላህፃኑ/ኗ	ክብደት	____________________ግ.ም

2. በእርግዝና ወቅት ሚከሰቱ በሽታዎችን በተማለከተ

የበሽታው ስም	አለ	የለም
የደም ግፊት		
የሽንት ቱቦ ህመም		
የደም ማነስ		
ኤች-አይቪ		

3. **ከእናቷ ካርድ በማየት የሚሟሉ ተጨማሪ ነገሮች**

	የሚታይበት	የሚመዘገብበት
የመጨረሻ የወር አበባ የታየበት ቀን	ከካርዱ/እናቷን በመጠየቅ	
የወለደችበት ቀን	ከካርዱ/እናቷን በመጠየቅ	
በርግዝና ጊዜ ያገኘችዉ አጠቃላይ ክብደት	ከካርዱ	

ተ.ቁ	ጥያቄ	አማራጭ መልሶች	ኮድ	ይለፉ
	1. ከማህበራዊ፤ ኢኮኖሚያዊ እና ዲሞግራፊያዊ ጋር የተያያዙ ጥያቄዎች			
101	እድሜዎ ስንት ነው?	________________ዓመት		

102	የምን ሀይማኖት ተካይ ነዎት?	ኦርቶዶስ ካቶሊክ ፕሮቴስታንት ሙስሊም ሌላ (ይገለፅ) ___________	1 2 3 4 5	
103	የት ነው የሚኖሩት ?	ገጠር ከተማ	1 2	
104	የእርስዎ ስራ ምንድነው?	የቤትእመቤት አርሶአደር ነጋዴ የመንግስት ሠራተኛ ተማሪ ሌላ (ይገለፅ) ___________	1 2 3 4 5 6	
105	የመደበኛ ትምህርት ተከታትለዉ ያወቃሉ?	አዎ አልተከታተልኩም	1 2	2 ከሆነ ወደ 107
106	እስከ ስንት የትምህርት ደረጃ ተምሯዋል?	የመጀመሪያ ደረጃ (1-8) የሁለተኛ ደረጃ እና መሰናዶ (9-12) የሙያና ቴክኒክ የከፍተኛ ትምህርት(12^{+})	1 2 3 4	
107	በአሁኑ ወቅት የእርሶዎ የጋብቻ ሁኔታ ምንድ ነው?	ያላገባች ባለትዳር የፈታች ባሏ የሞተባት	1 2 3 4	
108	**3.የቤት ወስጥ ንብረት በተማለከተ የተዘጋጀ ማጠይቅ እቤቶ ወስጥ፡ -**			
	1.መብራት አሎት?	አዎን የለም	1 2	2 ከሆነ ወደ 5
	2.ኤሌልክትሪክ ምጣድ አሎት?	አዎን የለም	1 2	
	3.ፍሪጅ አሎት?	አዎን የለም	1 2	
	4.ቴሌቭዥን አሎት?	አዎን የለም	1 2	
	5.ሬድዮ አሎት?	አዎን የለም	1 2	
	6.ሳይክል አሎት?	አዎን የለም	1 2	
	7.ባጃጅ አሎት?	አዎን የለም	1 2	
	8.ሞተር ሳይክል አሎት?	አዎን የለም	1 2	
	9.ጋሪ አሎት?	አዎን የለም	1 2	
	10.መኪና አሎት?	አዎን የለም	1 2	
	11.የወተት ከብት፤ በሬ፤ ወይፈን አሉት?	አዎን የለም	1 2	
	12.ፈረስ፤አህያ፤በቅሎ የመሳሰሉት የጋማ ከብቶች አሎት?	አዎን የለም	1 2	
	13.ፍየል አሎት?	አዎን የለም	1 2	
	14.በግ አሎት?	አዎን የለም	1 2	
	15.ዶሮ አሎት?	አዎን የለም	1 2	

	16.የራሶ የሆነ ሜሬት አሎት?	አዎን የለም	1 2	
	4. ከእናቶች ሶሻ-ተዋልዶ ጋር የተያያዙ ጥያቄዎች			
109	ይህንን ጨቅላ ህፃን ስታረግዢ እርግዝናዉ ስንተኛሽ ነበር?	የመጀመሪያ ሀለተኛ ሶስተኛ አራተኛ ከአራት በላይ	1 2 3 4 5	1 ከሆነ ወደ 116
110	ከዚህ ጨቅላ ህፃን ውጭ በህይወት የተወለዱ ልጆች አሉሽ?	አዎ የሉኝም	1 2	2 ከሆነ ወደ 112
111	ይህን ጨቅላ ህፃን ጨምሮ ምን ያክል በህይወት የተወለዱ ልጆች አሉሽ?	________________ያክል	1 2	
112	በህይወት ያልተወለዱ (ሞተው) የተወለዱ ነበሩሽ?	አዎ የሉኝም	1 2	2 ከሆነ ወደ 114
113	በህይወት ያልተወለዱ (ሞተው) የተወለዱ ስንት ነበሩሽ?	________________ያክል		
114	ከዚህ ልጅ በፊት የተዎለደዉ/ቺዉ ልጅ ትልቅ፣መካከለኛ፣ትንሽ ነበር/ች?	በጣም ትልቅ ትልቅ መካከለኛ ትንሽ በጣም ትንሽ	1 2 3 4 5	
115	በዚህ ጨቅላ ህፃን እና ከዚህ በፊት ባለው ልጅ መካከል ምን ያክል የወር ልዩነት ነበር?	________________ወር		
116	የመጀመሪያ ልጅሽን ስትወልጅ ስንት ዓመትሽ ነበር?	________________ዓመት		
117	ይህንን ጨቅላ ህፃን በረገዝሽበት ግዜ እርግዝናዉን ፈልገሽው ነበር?	አዎ አልፈለኩም	1 2	
118	ይህንን ጨቅላ ህፃን ስታረግዢ እርግዝናው የተዎሰነ ጊዜ እንዲራዘም ፈልገሽ ነበር?	አዎ አልፈለኩም	1 2	
119	የዚህ/የዚች ጨቅላ ህፃን ፆታ ምንድ ነው?	ወንድ ሴት	1 2	
	5. ከወሊድ በፊት(ቅድመ ወሊድ) ክትትል ጋር የተያያዙ ጥያቄዎች			
120	ለዚህ ጨቅላ ህፃን የቅድመ ወሊድ ክትትል አድርገው ያውቃሉ?	አዎ አላዳረኩም	1 2	
121	ለዚህ/ች ጨቅላ ህፃን ስንት የቅድመ ወሊድ ክትትል አድርገዋል?	______________የክትትል ብዛት በቁጥር	1 2	
122	የመጀመሪያ የቅድመ ወሊድ ክትትል ሲያደርጉ እርግዝናው የስንት ወር ነበር?	______________ወር አላስታወስም	1 2	
123	የመጀመሪያ ቅድመ ወሊድ ክትትል ስታረጊ ምክንያትሽ ምን ንበር?	1. ስላመመኝ እና ለህመሜ መፍትሄ ለማግኘት 2. አላመመኝ ነገር ግን ለወሊድ ክትትል ብቻ ነበር 3. ሌላ ምክኒያት	1 2 3	
	6. ከወሊድ በፊት ክትትል ግዜ የተደረጉላትን ነገሮች በተመለከተ የሚጠይቁ ጥያቄዎች			
124	በቅድመ ወሊድ ክትትል ወቅት የደም ማስ መድኃኒት ተሠጥቶዎት ነበር? **የመዳኒቱን ቀለም በመናገር /መድሃኒቱን በማሳየት እንዲያስታዉሱ ያድርጉ**	አዎ አልተሠጠኝም	1 2	2 ከሆነ ወደ 126
125	በቅድመ ወሊድ ክትትል ወቅት የደም ማስ መድኃኒት ለስንት ሳምንት /ወር ወስደሻል	________________ቀን (ከሳምንትካነሰ ብቻ) ________________ሳምንት ከወር ካነሰ ብቻ) ________________(ወር ወር እና ከዚያ በላይ ከሆነ)		
126	በቅድመ ወሊድ ክትትል ወቅት የመንጋጋ ቆልፍ ክትባት ተሰጥቶዎት ነበር ? **(ከቀኝ የላይኛው ክንድ ጠፆቻ መርፌ ተሰጥቶዎት ነበር በማለት እንዲያሰታዉሱ ያድርጉ)**	አዎ አልተሠጠኝም	1 2	2 ከሆነ ወደ 128

127	በቅድመ ወሊድ ክትትል ወቅት ስንት የመንጋጋ ቆልፍ ክትባት ወስደሻል	______የመንጋጋ ቆልፍ ክትባት ብዛት		
128	በቅደመ ወሊድ ክትትል ወቅት የአንጀት/የሆድ ትላትል መድሃኒት ተሰጥቶዎት ነበር? **የመዳኒቱን ቀለም በመናገር /መድሃኒቱን በማሳየት እንዲያስታዉሱ ያድርጉ**	አዎ አልተሠጠኝም	1 2	
	7.በቅድመ ወሊድ ጊዜ የተሰጡ የምክር አገልግሎቶችን በተመለከተ የሚጠየቁ			
129	በቅድመ ወሊድ ክትትል ወቅት ሀኪምዎ/ነርሶዎ አልኮል እና ሲጋራ እንዲቀንሱ ወይም እንዲያቆሙ የምክር አገልግሎት ሰጥዎት ነበር?	አዎ አልተሠጠኝም	1 2	
130	በቅደ መወሊድ ክትትል ወቅት ሀኪምዎ/ነርሶዎ ተጨማሪ ወይም የተመጣጠነ ምግብ እንዲመገቡ የምክር አገልግሎት ሰጥዎት ነበር? **የተመጣጠነ ምግብ ማለት ገንቢ፣ በሽታ ተከላካይ እና ሀይልና ሙቀት ሰጭ ለማለት ነዉ**	አዎ አልተሠጠኝም	1 2	
	8.በእርግዝና ወቅት አጠቃላይ የእናቶችን ባህሪ በተመለከተ የሚጠየቁ			
131	በእርግዝና ወቅት አልኮልነት ያላቸው ማጠጦችን እንደጠላ/ጠጅ/አረቂ/ቢራ/ወይን እና የመሳሰሉትን ማጠጦች ጠጥተሸ ታዉቂ ነበር?	አዎ አልጠጣም	1 2	
132	ከቤተሰብ መካከል ሲጋራ የሚያጨስ አለ?	አዎ የለም	1 2	
133	በእርግዝና ወቅት እርሰዎ ሲጋራ ያጨሱ ነበር ?	አዎ አላጨስም	1 2	
	9. በእርግዝና ወቅት ከሚከሰቱ በሽታዎች ጋር የተያያዙ ጥያቄዎች			
134	በዚህ ጨቅላ ህፃን እርግዝና ዎቅት የደም ግፊት ኀህመም ይዞሽ ነበር ?	አወ አላዘኝም	1 2	
135	በዚህ ጨቅላ ህፃን እርግዝና ዎቅት የሽንት ቱቦ ኀህመም ይዞሽ ነበር?	አወ አላዘኝም	1 2	
136	በዚህ ጨቅላ ህፃን እርግዝና ወቅት የደም ማነስ በሽታ ይዞሽ ነበር?	አዎ አላዘኝም	1 2	
137	በዚህ ጨቅላ ህፃን እርግዝና ወቅት የወባ በሽታ ይዞሽ ነበር?	አዎ አላዘኝም	1 2	
	10. በቅድመ ወሊድ ጊዜ የእናቶችን የአገልግሎት እርካታ በተመለከ የሚጠየቁ ➤ አልስማማም፣ በዚህ ዙሪያ ሀሳብ የለኝም፣ እስማማለሁ፣ በማለት እንዲመልሱ ያድርጉ			
138	የቅድመ ወሊድ ክትትል የሰጠኝ / የሰጡችኝ ጥሩ እና ተግባቢ ነበረች	አልስማማም በዚህ ዙሪያ ሀሳብ የለኝም እስማማለሁ	1 2 3	
139	የቅድመ ወሊድ ክትትል የምትሰጠው /የሚሰጠው በቀላሉ ልረዳት /ልረዳው የምችል ነበረ/ነበረች	አልስማማም በዚህ ዙሪያ ሀሳብ የለኝም እስማማለሁ	1 2 3	
140	የቅድመ ወሊድ ክትትል እስካገኝ ድረስ የምጠብቀው ሰዓት አግባብ ያለው /ብዙ ሰዓት የሚቆይ ነበረ	አልስማማም በዚህ ዙሪያ ሀሳብ የለኝም እስማማለሁ	1 2 3	
141	የቅድመ ወሊድ ክትትል እስካገኝ ድረስ የቆየሁበት ቦታ በቂ እና መቀመጫ ያለው ነበር	አልስማማም በዚህ ዙሪያ ሀሳብ የለኝም እስማማለሁ	1 2 3	
142	የቅድመ ወሊድ የሚሰጥበት የጤና ተቋም ንፅህ ሽንት ቤት እና በቂ ዉሃ ያለዉ ነበር	አልስማማም በዚህ ዙሪያ ሀሳብ የለኝም እስማማለሁ	1 2 3	
143	የቅድመ ወሊድ ክትትል ሲሰጠኝ የተደረገልኝ ሁሉ ንፅህናዉን በጠበቀ ሁኔታ ነበር	አልስማማም በዚህ ዙሪያ ሀሳብ የለኝም እስማማለሁ	1 2 3	
144	ለቅድመ ወሊድ ክትትል ያወጣዉት ወጭ/ገንዘብ በቂ እና ተመጣኝ ነበር	አልስማማም በዚህ ዙሪያ ሀሳብ የለኝም እስማማለሁ	1 2 3	
145	የቅድመ ወሊድ ክትትል ጊዜ ስለ ቅድመ ወሊድ በቂ ኢንፎርሜሽን ተሰጥቶኝ ነበር	አልስማማም በዚህ ዙሪያ ሀሳብ የለኝም እስማማለሁ	1 2 3	

146	በአጠቃላይ በቅድመ ወሊድ ጊዜ በተሰጠኝ አገልግሎት ደስተኛ ነበርኩኝ	አልስማማም በዚህ ዙሪያ ሀሳብ የለኝም እስማማለሁ	1 2 3	
147	እርሰዎ የቅድመ ወሊድ ክትትል ባደረጉበት የጤና ተቋም የእርሰዎ ዘመዶች/ሌሎች እንዲከታተሉ ያደርጋሉ	አልስማማም በዚህ ዙሪያ ሀሳብ የለኝም እስማማለሁ	1 2 3	
	11. ከሽንት ቤት አጠቃቀም፣ ንጹህዉሃ አቅረቦት አና ንፅህና አጠባበቅ ጋር የተያዙ ጥየቄዎች			
148	በ አብዛኛው ግዜ ለመጠጥ ፣ለእጅ ማታጠቢያ ፣ ወይም ለምግብ ዝግጅት የሚጠቅሙትን ወሀ ከየት ነው የሚያገኙት? ከአንድ በላይ ሚለስ መመለስ ይቻላል	ቧንቧ ዝናብ ወንዝ የተከለለ የምንጭ ወሀ የተከደነ የጉድጓድ ወሀ ያልተከደነ የጉድጓድ ወሀ ያልተከለለ የምንጭ ወሀ ሌላ (ይጠቀስ)	1 2 3 4 5 6 7 8	
149	መቼ ነው እጅሽ የምትታጠቢው? ከአንድ በላይ ሚለስ መመለስ ይቻላል	ከምግብ በፊት ከምግብ በኋላ ሽንት ቤት ከተጠቀምኩ በኋላ ልጅን ከፀዳዳዉ በኃላ ሌላ (ይጠቀስ)____________	1 2 3 4 5	
150	በ አብዛኛው ጊዜ የሚጠቀሙበት መጸዳጃ ቤት ምን አይነት ነው? ከአንድ በላይ ሚለስ መመለስ ይቻላል	ከፈሳሽ ማስዎገጃ ጋር የተገናኘ ሽንት ቤት ቆሻሻ መጣያ እና መከደኛ ያለው የጉድጓድ ሽንት ቤት መከደኛ የሌለዉ የጉድጓድ ሽንት ቤት የጋራ / የህዝብ ሽንት ቤት ሜዳ ላይ/ ቁጥቋጦ ስር ሌላይጠቀስ_____________	1 2 3 4 5 6	

12. የምግብ ዋስትና ሁኔታ በተመለከተ የሚጠየቁ ጥያቄዎች

1	ባለፉት አራት ሳምንታት ጊዜ ዉስጥ ቤተሰቤ በቂ ምግብ የለዉም የሚል ስጋት ገብቷችሁ ነበር? **ቤተሰብማለት** ቢያንስ በሳምንት ለአራት ቀን ያህል በአንድ ጣርያ ስር አብራችሁ የምታድሩና የምትመገቡ ለማለት ነዉ::	1. አይ 2. አዎ	1 2	1(አይ) ከሆ ነ ወደ 2 ሂድ
1ሀ	ለምን ያህል ጊዜ ትሰጉ ነበር?	1. በጣም አልፎ አልፎ (ባለፉት አራት ሳምንታት አንዴ ወይም ሁለቴ) 2. አንድ አንድ ጊዜ (ባለፉት አራት ሳምንታት ከ 3 እስከ 10 ጊዜ) 3. ብዙ ጊዜ (ባለፉት አራት ሳምንታት ከ 10 ጊዜ በላይ ነበር)	1 2 3	
2	ባለፉት አራት ሳምንታት ጊዜ ዉስጥ አንተ/ቺ ወይም ሌላ የቤተሰቡ አባል የፈለገዉን ወይም የሚጠዉን የምግብ አይነት ለመበላት የአቅም ማነስ ችግር ገጥሟችሁ ነበር? **የሚጠዉን የምግብዐይነት ማለት** ማንኛዉም በምግብ እራሱን የቻለ ቤተሰብ የሚመገበዉ ዐይነት ማለት ነዉ:: ለምሳሌ እንቁላል; ሥጋ; አሣ; ዶሮ ወጥና የመሳሰሉት ማለት ነዉ:: **የአቅም ማነስ ችግር ማለት** ለመግዛትየሚሆን ገንዘብ ማጣት ወይም ማምረት አለመቻል ማለት ነዉ::	1. አይ 2. አዎ	1 2	1.(አይ) ከሆነ 3 ሂድ
2ሀ	ለምን ያህል ጊዜ ነበር የተከሰተዉ?	1. በጣም አልፎ አልፎ (ባለፉት አራት ሳምንታት አንዴ ወይም ሁለቴ) 2. አንድ አንድ ጊዜ (ባለፉት አራት ሳምንታት ከ 3 እስከ 10 ጊዜ) 3. ብዙ ጊዜ (ባለፉት አራት ሳምንታት ከ 10 ጊዜ በላይ ነበር)	1 2 3	
3	ባለፉት አራት ሳምንታት ጊዜ ዉስጥ አንተ/ቺ ወይም ሌላ የቤተሰቡ አባል የሚያስፈልገዉን አቅም ከማጣት የተነሳ ዉስን የሆኑ የምግብ ዐይነቶችን ለመመገብ ተገዳችሁ ነበር? **ዉስን የሆኑ ሲባል** ተመጋቢዉ መመገብ የሚፈልገዉ አንድ ዐይነት ምግብ ለብዙ ጊዜያት ለማለት ነዉ::	1. አይ 2. አዎ	1 2	1(አይ) ከሆነ ወደ 4 ሂድ
3ሀ	ለምን ያህል ጊዜ ነበር የተከሰተዉ?	1. በጣም አልፎ አልፎ (ባለፉት አራት ሳምንታት አንዴ ወይም ሁለቴ) 2. አንድ አንድ ጊዜ (ባለፉት አራት ሳምንታት ከ	1 2	

		3 እስከ 10 ጊዜ) 3. ብዙ ጊዜ (ባለፉት አራት ሳምንታት ከ 10 ጊዜ በላይ ነበር)	3	
4	ባለፉት አራት ሳምንታት ጊዜ ዉስጥ አንተ/ቺ ወይም ሌላ የቤተሰቡ አባል አቅም ስለሚፈቅድና ሌላ ምግብ መማብ ስላልቻላችሁ ፈጽሞ ልትመገቡ የማትፈልጉትን ምግብ ለመማብ ተገዳችሁ ነበር? **ፈጽሞ ልትመገቡ የማትፈልጉት** ምግብ ማለት በህብረተሰቡ ዘንድ የሚወደድና ተቀባይነት የሌለዉ ለማለት ነዉ::	1.አይ 2.አዎ	1 2	1(አይ) ከሆነ ወደ 5 ሂድ
4ሀ	ለምን ያህል ጊዜ ነበር የተገደዳችሁት?	1. በጣም አልፎ አልፎ (ባለፉት አራት ሳምንታት አንዴ ወይም ሁለቴ) 2. አንድ አንድ ጊዜ (ባለፉት አራት ሳምንታት ከ 3 እስከ 10 ጊዜ) 3. ብዙ ጊዜ (ባለፉት አራት ሳምንታት ከ 10 ጊዜ በላይ ነበር)	1 2 3	
5	ባለፉት አራት ሳምንታት ጊዜ ዉስጥ አንተ/ቺ ወይም ሌላ የቤተሰቡ አባል በቂ ምግብ ስለሌላችሁ በቀን ከምትመገቡት 3 ዋና ዋና ምግቦች ከምትፈልጉት በመጠን ያነሰ የሚሻላችሁን ምግብ ለመማብ ተገዳችሁ ነበር?	1. አይ 2. አዎ	1 2	1(አይ) ከሆነ ወደ 6 ሂድ
5ሀ	ለምን ያህል ጊዜ ነበር የተገደዳችሁት?	1. በጣም አልፎ አልፎ (ባለፉት አራት ሳምንታት አንዴ ወይም ሁለቴ) 2. አንድ አንድ ጊዜ (ባለፉት አራት ሳምንታት ከ 3 እስከ 10 ጊዜ) 3. ብዙ ጊዜ (ባለፉት አራት ሳምንታት ከ 10 ጊዜ በላይ ነበር)	1 2 3	
6	ባለፉት አራት ሳምንታት ጊዜ ዉስጥ አንተ/ቺ ወይም ሌላ የቤተሰቡ አባል በቂ ምግብ ስለሌላችሁ በቀን መማብ ከነበረባችሁ 3 ዋና ዋና ምግቦች በታች ለመማብ ተገዳችሁ ነበር? **ምሳሌ:** ከሶስቱ አንዱን ወይም ከዛ በላይ መተዉ ማለት ነዉ::	1.አይ 2.አዎ	1 2	1(አይ) ከሆነ ወደ 7 ሂድ
6ሀ	ለምን ያህል ጊዜ ነበር የተገደዳችሁት?	1. በጣም አልፎ አልፎ (ባለፉት አራት ሳምንታት አንዴ ወይም ሁለቴ) 2. አንድ አንድ ጊዜ (ባለፉት አራት ሳምንታት ከ 3 እስከ 10 ጊዜ) 3. ብዙ ጊዜ (ባለፉት አራት ሳምንታት ከ 10 ጊዜ በላይ ነበር)	1 2 3	
7	ባለፉት አራት ሳምንታት ጊዜ ዉስጥ ምግብ ለማግኘት የሚያስፈልጋችሁ አቅም ስላልነበራችሁ ምንም ዐይነት ምግብና ለምግብ የሚሆን ነገር ከቤታችሁ ጠፍቶ ነበር?	1.አይ 2.አዎ	1 2	1(አይ) ከሆነ ወደ 8 ሂድ
7ሀ	ለምን ያህል ጊዜ ነበር ይሄ ችግር የገጠማችሁ?	1. በጣም አልፎ አልፎ (ባለፉት አራት ሳምንታት አንዴ ወይም ሁለቴ) 2. አንድ አንድ ጊዜ (ባለፉት አራት ሳምንታት ከ 3 እስከ 10 ጊዜ) 3. ብዙ ጊዜ (ባለፉት አራት ሳምንታት ከ 10 ጊዜ በላይ ነበር)	1 2 3	
8	ባለፉት አራት ሳምንታት ጊዜ ዉስጥ በቂ ምግብ ስላልነበረ አንተ/ቺ ወይም ሌላ የቤተሰቡ አባል ሳይመገብ ወደ መኝታ የሄደበት ጊዜ ነበረ?	1. አይ 2. አዎ	1 2	1(አይ) ከሆነ ወደ 9 ሂድ
8ሀ	ለምን ያህል ጊዜ ነበር የተከሰተዉ?	1. በጣም አልፎ አልፎ (ባለፉት አራት ሳምንታት አንዴ ወይም ሁለቴ) 2. አንድ አንድ ጊዜ (ባለፉት አራት ሳምንታት ከ 3 እስከ 10 ጊዜ) 3. ብዙ ጊዜ (ባለፉት አራት ሳምንታት ከ 10 ጊዜ በላይ ነበር)	1 2 3	

9	ባለፉት አራት ሳምንታት ጊዜ ወስጥ በቂ ምግብ ስላልነበረ አንተ/ቺ ወይም ሌላ የቤተሰቡ አባል ምንም ዐይነት ምግብ ሳይመገብ ቀኑን ሙሉ ዉሎ ለሊትም ያደረ አለ?	1.አይ 2.አዎ	1 2	
9ሀ	ለምን ያህል ጊዜ ነበር የተከሰተዉ?	1 በጣም አልፎ አልፎ (ባለፉት አራት ሳምንታት አንዴ ወይም ሁለቴ) 2 አንድ አንድ ጊዜ (ባለፉት አራት ሳምንታት ከ 3 እስከ 10 ጊዜ) 3 ብዙ ጊዜ (ባለፉት አራት ሳምንታት ከ 10 ጊዜ በላይ ነበር)	1 2 3	

IV. Training manual

Main themes of training	Training provider	Target group	Material needed	Time allocated
1. Training on Objective and methods of project	PI	Data collectors	Paper, pen projector	30 minutes
2. Training on tools				
2.1. About questionnaire	PI	Data collectors	Questionnaire, pen/pencil	1 hlr
2.2. About instrument and measurement	PI**, nurses*	Data collectors	Shkir strip tape , beam balance, studio meter	1 h/r
3. Training on keeping confidentiality	PI	Data collectors	-	30 min
PI= principal investigator		*= practical part	** = theoretical part	

Reports of the activities of training

The training was started by introducing each other including the principal investigator. After introducing each other, a detail explanation about the objectives and methods of the project was given for five data collectors. The explanation had taken around 30 minutes. Unclear pointes and questions were raised by data collectors and response was given by principal investigator. Once the aim and methods of the project was explained, training on questionnaire was given by principal investigator. Data collectors were made to ask unclear items of questions. It was also trained to train each other before a head of the pretests. They were also trained:

- ✓ To gather exposure information in similar ways among the cases and controls
- ✓ To use memory aiding such as celebrity days and color of drugs when ascertaining information in certain items of questions

Training about weight, height and MUAC measurements was also given by both principal investigator and senior diploma nurse who had an experience of weighing, height, weight and MUAC. The theoretical part of measuring weight, height, and MUAC was given by principal investigator on the other hand the practical part was given by experienced diploma nurse who was working in one of the health center. During training more emphasis was given for calibration and recording of measurements. Finally, training on keeping confidentiality was given for data collectors. They were also trained to inform their respondents about the purpose, procedure, risk and benefit of the project.

Curriculum Vitae

Personal Profile

Name: Kindie Mitiku kebede

Sex: Male

Current Adders: Addis Ababa

Date of Birth: January 29, 1987

Nationality: Ethiopian

Marital status: Single

Contact Address

Addis Ababa University College of Health Science

School of public health

Mobile +251917742402

Qualification: Bachelor of Science degree in Public health (PH)) from Wollega University.

Training Participation

	Title of the training	Arrange by	Duration of training
1	Instructional Skill Training	Mizan Tapi University	Jun 2-14, 2013
2	Training on SPSS	Mizan Tapi University	August 2-6, 2013
3	Training on Computer basics	Mizan Tapi University	February 12 to march 18, 2013 E.C

Work Experience

- Work in Mizan Tapi University (for 3 years starting January 31, 2010) till now.
  - As **graduate assistant** since January 31 , 2010 and **assistant lecturer** since January , 2013 till now in public health department

Skills and Hobbies

- Language skill
  - Amharic;- listen, speak, write and read
  - English :- listen, speak, write and read

- Computer skill :SPSS, Epi info, Internet basic ,MS word, excel, power point, access)
- Hobbies : Reading books and writing poem

Reference

- Tefera Chane–MPH (lecturer) in Wolayta Sodo university
    - Phone-1928794089
- Eskziaw Agedew- MPH (lecturer) in Arbamich university
    - Phone-0920413878
- Adissu Melak-MSC(lecturer) in Mizan-Tepi university
    - Phone-0913942654