



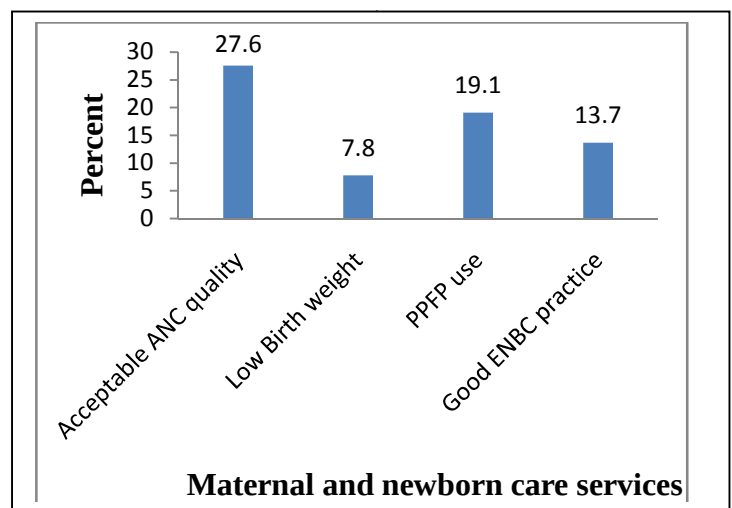
ADDIS ABABA UNIVERSITY, SCHOOL OF GRADUATE STUDIES

EFFECT OF QUALITY ANTENATAL CARE SERVICE ON THE
CONTINUUM OF MATERNAL AND NEWBORN HEALTH CARE
SERVICES; A FOLLOW UP STUDY AT PUBLIC HEALTH
FACILITIES OF BAHIR-DAR CITY ADMINISTRATION; NORTH
WEST ETHIOPIA

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Bahir Dar City Administration



Dissertation for the Degree of Doctor of Philosophy (PhD) in Public Health
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May, 2018



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A Dissertation Submitted to the School of Graduate Studies of Addis Ababa University for the Partial Fulfillment of the Requirements of the Degree of Doctor of Philosophy (PhD) in Public Health.

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May, 2018

DISSERTATION APPROVAL
ADDIS ABABA UNIVERSITY
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Dissertation Title: Effect of quality Antenatal Care Service on the Continuum of Maternal and Newborn health care services; a follow up study at public health facilities of Bahir-Dar city administration; North West Ethiopia

BY: _____

SCHOOL OF PUBLIC HEALTH, ADDIS ABABA UNIVERSITY

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Declaration

I, the undersigned, declare that this is my original work, has never been presented in this or any other University, and that all the resources and materials used for the dissertation, have been fully acknowledged.

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Dedication

This dissertation is dedicated to all Ethiopian women and newborns that lost their life and are currently suffering from the sequel due to pregnancy related complications because of lack of access to quality maternal and newborn health care services.

List of original papers

This dissertation work is based on the following four original papers, which are listed here under.

- I. Antenatal Care Service Quality Increases the odds of Utilizing Institutional Delivery in Bahir Dar City Administration, North Western Ethiopia: A prospective follow up study
Published in PLOS one journal: Plos ONE 13(2): e0192428.
<https://doi.org/10.1371/journal.pone.0192428>
- II. Providers adherence to essential contents of antenatal care services increases birth weight in Bahir Dar City Administration, North West Ethiopia: a Prospective Follow up Study
Under review in PLOS one journal; manuscript number, PONE-D-18-05284
- III. Counseling on family planning during ANC service increases the likelihood of postpartum family planning use in Bahir Dar City Administration, Northwest Ethiopia: A prospective follow up Study. *Under review in Contraception and reproductive medicine BMC Springer nature journal; manuscript number, CARM-D-18-00021*
- IV. Does antenatal care quality influence on essential newborn care practices? A follow up study: *under review in Italian journal of pediatrics; manuscript number, ITJP-D-18-00071*

Acronyms and abbreviations

ANC	Antenatal Care
AOR	Adjusted Odds Ratio
BPCRP	Birth Preparedness and Complication Readiness Plan
BSc	Bachelor of Science
CI	Confidence Interval
DHS	Demographic and Health Surveillance
FANC	Focused Antenatal Care
FP	Family planning
GEE	Generalized Estimating Equation
HC	Health Center
HCT	Hematocrit
HF	Health Facility
HIV	Human Immune Deficiency Virus
JHPIEGO	John Hopkins International Education in Gynecology and Obstetrics
IFA	Iron Folic Acid
ITN	Insecticide Treated Net
IUD	Intra Uterine Device
LBW	Low Birth Weight
MMR	Maternal Mortality Ratio
MNCH	Maternal, Newborn and Child Health
NMR	Neonatal Mortality Rate
NNP	National Nutrition program
PMTCT	Prevention of Mother to Child Transmission
PNC	Post natal Care
PPFP	Post Partum Family Planning
SDG	Sustainable development Goal
SMI	Safe Mother hood Initiative
SPSS	Statistical Packages for Social Sciences
SSA	Sub-Saharan Africa

TT	Tetanus toxoid
UHC	Universal Health service Coverage
UK	United Kingdom
UNICEF	United Nations International Children Emergency Fund
USA	United States of America
VDRL	Venereal Disease Research Laboratory
VIF	Variance Inflation Factor
WHO	World Health Organization

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Executive Summary

Background: In Ethiopia, more than 62 % of pregnant women attend antenatal care (ANC) at least once and it is an opportunity for reaching pregnant women with a number of interventions that may be vital to their health and the well-being of their infants. However data on the extent to which providers utilize these opportunities remain limited especially in developing countries. Ethiopia is one of the countries that experiences relatively high ANC coverage and high maternal and neonatal mortality. This paradox urges the need to investigate the linkage between ANC service quality and continuum of maternal and newborn health care services.

Objective: To assess the effect of antenatal care service quality on the continuum of maternal and newborn health care services at public health facilities of Bahir Dar City Administration.

Method: A facility based prospective follow up study was conducted among 970 first ANC visit pregnant women with gestational age ≤ 16 weeks selected by systematic sampling technique ($k=3$). Women were followed from their first ANC visit till six weeks after delivery. Longitudinal data on the quality of ANC service was collected through structured observation checklist during consultation with ANC providers during each of the four ANC visits. ANC service was considered as acceptable quality if women received $\geq 75^{\text{th}}$ percentile of the essential ANC services. Exit interview just after their fourth ANC visit was carried out to assess the satisfaction of pregnant women on ANC services they received and another exit interview was also conducted at 6 weeks after birth when women come to immunize their child to assess the essential newborn care practices that their babies received from a provider and/or woman; and whether or not they started to use postpartum modern family planning. If a woman does not come to the health facility for immunization, the data collectors traced her based on the address registered during her first ANC visit.

For the assessment of health facility delivery, postpartum modern family planning use and essential newborn care practices, completed data were obtained from 823 women where as for the assessment of birth weight, it was obtained from 718 women since those women who gave birth at home and those who deliver a premature or still birth baby were excluded due to the fact that data on birth weight could not be obtained and as it might be affected by the underlying conditions respectively.

Generalized Estimating Equation (GEE) was carried out to control cluster effect among women who received ANC in the same facility. The model fitness was checked by observing the difference of the -2 log likelihood ratio between the null model and the model with independent variables; linear regression assumptions were also checked by graphical and/or statistical methods accordingly. In addition, Multi co linearity diagnosis was also carried out using variance inflation factor (VIF).

Based on Hosmer and Lemeshow applied logistic regression guide a p-value <0.2 was considered to select eligible variables for multivariable regression analyses and p-value <0.05 was considered to identify statistically significant predictor variables for the outcome of interest.

Results: Among 823 pregnant women who completed follow up, only about one-fourth (27.6%) (95% CI =24.5%, 30.5%) received acceptable quality ANC services. The odds of giving birth at health facility among pregnant women who received acceptable ANC service quality was about 3.38 times higher than pregnant women who received un acceptable quality ANC service (AOR=3.38, 95% CI: 1.67, 6.83). Being urban dweller (AOR = 9.91, 95% CI: 2.52, 38.91), being younger age (AOR = 3.69, 95% CI: 1.44, 9.49); Secondary school and above educational status of pregnant women (AOR = 6.83, 95% CI; 3.33, 13.97) were also positively associated with Health facility delivery.

However, primary school educational status of women has no significant difference in the use of institutional delivery compared to those women who cannot read and write.

The magnitude of low birth weight (<2500grams) among 718 babies delivered at the health facility was 7.8% (95%CI= 6.0%, 9.7%) with 1.4% versus 10.5% among those who received acceptable and not acceptable ANC services quality respectively (P-value<0.001); frequency of maternal nutritional advice (β = 0.147, 95%CI= 0.11, 0.19), iron-folic acid supplementation (β = -0.358, 95%CI= -0.476,-0.240), tetanus toxoid vaccination (β = 0.609, 95%CI= 0.316, 0.903), maternal educational status (β = 0.079, 95%CI= 0.06, 0.10) and parity (β = -0.174, 95%CI= 0.24, 0.11) were determinants for birth weight.

About 22.7% of pregnant women were counseled about postpartum family planning at least once during their four ANC visits. The magnitude of postpartum modern family planning use within 6 weeks after delivery among the study women was 157 (19.1%) with 95%CI (16.4%, 21.9%). The odds of postpartum modern family planning use within 6 weeks after birth among women who

were counseled about postpartum family planning at their third or fourth visit was 3.5 times higher compared to those who were not counselled at any of their visits (AOR=3.5; 95% CI:2.19,5.49). Being satisfied with ANC services received (AOR= 4.12; 95% CI: 2.55, 6.66), counseling on birth preparedness and complication readiness plan (AOR= 2.2; 95% CI: 1.32, 3.55), Being counselled on breast feeding (AOR= 1.8; 95% CI: 1.15, 2.82) and post natal care use (AOR= 13.5; 95% CI: 8.24, 22.07) had also significant positive effect on postpartum modern family planning use.

The composite index for good essential newborn care practice was only 13.7%, with 95% CI (11.3%, 16.2%). About 24.7% versus 9.6% women who received acceptable and un acceptable ANC service quality had good essential newborn care practices ($X^2=31.668$, $p<0.000$). ANC service quality (AOR= 2.31, 95% CI=1.47, 3.65), PNC use (AOR= 1.69, 95% CI=1.03, 2.79), parity (AOR= 0.43 95% CI=0.27, 0.69) and age (AOR=3.94 95% CI=1.12, 13.91) of the women were predictors for essential newborn care practice (ENBC) practice

Conclusion and recommendation:

The quality of ANC service was low and adherence to essential contents of ANC services was also heterogeneous.

ANC service quality ensures normal birth weight outcome

Majority of the post partum women were at risk for closely spaced pregnancy; the risk increases among those who were not counselled on FP

Good ENBC practice was significantly low; mainly due to problem related to clean cord care

Quality of ANC service matters continuum of maternal and newborn health care services more than frequency of visit.

Therefore Maternal and newborn health programme managers and health providers need to ensure continuity of care through maintaining the quality of ANC service by integrating maternal and newborn health care services and through strengthening referral linkages between community health workers (like health extension workers and health development armies) and primary level of care for maternal and newborn care services.

In addition, the local authorities at each level of health sector or the nongovernmental organizations working to improve maternal and newborn health need to provide training for ANC providers and equip the necessary supplies for the provision of quality ANC service.

1. Introduction

1.1 Background

Antenatal care (ANC) is the care given during pregnancy and it is important for the health of the mother and the development of the unborn baby by promoting healthy behaviors and parenting skills. Its interventions, including diagnostic tests, advice and counselling, iron–folic acid (IFA) supplementation and tetanus toxoid (TT) injections have been recommended for a long time and have been accepted by most of the countries in the world [1].

Poor quality of care is a major impediment to efforts aimed at improving the health of populations in developing countries, particularly with respect to Maternal, Neonatal and Child Health (MNCH) [2, 3].

The Sustainable Development Goal (SDG) has set ambitious health-related targets for mothers, newborns and children under the umbrella of Universal Health Coverage (UHC) by 2030. Addressing quality of care will be fundamental in reducing maternal and newborn mortality and achieving the health-related SDG targets[4].

The three core strategies identified as critical for reducing maternal and early neonatal deaths include comprehensive reproductive health care; timely ANC care (first visit during the first three months of pregnancy) for all pregnant women, sufficient (at least four antenatal visits) and adequate (with appropriate content), delivery care and emergency obstetric care for all women and infants with life threatening complications. However, these conditions have been rarely studied together in the context of low- and middle-income countries[5, 6].

Quality ANC is a care that links the woman and her family with the formal health system, thereby increasing the chances of using a skilled birth attendant, post partum family planning and providing essential newborn care practices. Inadequate care during this time breaks a critical link in the continuum of care, and affects both women and babies [7-10].

To reduce various health risks for both the mother and the baby it is also recommended having at least two years between pregnancies. Counseling for postpartum contraception can be given during prenatal care visits, after birth or both. Postpartum contraceptive counseling has been studied by several groups, but the prenatal period is usually neglected. Contraceptive counseling,

given according to the needs of couples during routine prenatal care visits, especially in the third trimester might increase the use of postpartum contraception[11].

In spite of the fact that percentage of women attending ANC for at least once tends to be satisfactory even in low-income countries, maternal and neonatal mortality remain high. In Ethiopia a relatively high ANC coverage coexists with low institutional delivery and post partum family planning use. About 62% of mothers have at least one ANC visit with 32% having four visits. Yet, three-fourth of the Ethiopian mothers are giving birth at home, similarly the maternal mortality ratio (MMR) and neonatal mortality rate (NMR) are un acceptably high with 412/100,000 and 29/1000 live births respectively; that is 4 maternal deaths for every 1,000 live births[12, 13]

Majority of studies have measured coverage independently without looking at the quality (contents) of services given in each of the antenatal care visits thus reporting high average levels but has failed to reflect the individual dimension of ANC services women received and its effect on the continuum of maternal and newborn health care service utilization[14-16].

The quality of antenatal care is measured by what extent comprehensive history is taken by the provider, type of clinical examinations done and treatments given, the type of information provided to women during their visits, effective communication between client and service provider, and client satisfaction regarding their interaction with the health care provider. Although quality of care is multifaceted, compliance with the standard guideline (process quality) and satisfaction of clients (outcome quality) need to be met. However, if ANC services are poor in quality, clients may avoid them altogether and resort to home remedies rather than having a confidence on the health system and comply with the continuum of maternal and newborn health care services [17, 18].

1.2 Statement of the problem

In 2016, at the start of SDGs, pregnancy-related preventable morbidity and mortality remains unacceptably high. WHO envisions “every pregnant woman and newborn to receive quality care throughout the pregnancy, childbirth and postnatal periods. However, approximately 303 000 women died as a result of pregnancy and child birth-related complications in 2015; 99% in low-resource settings, with Sub-Saharan Africa (SSA) countries alone accounting for roughly 66% and most are preventable. This showed the presence of greater disparities in access and quality of maternal health care globally [19-21].

Newborn survival (up to 28 days after childbirth) has improved more slowly in all regions of the world, and globally in 2012, 44% of all under-five deaths occurred during the neonatal period which is higher than 37% in 1990[22].

In developing countries, most child births occur at home and are not assisted by skilled birth attendants. The situation increases the risk of death for both mother and child. Of approximately four million global neonatal deaths that occur annually, 98% occur in developing countries, where most newborns die at home while they are cared by mothers, relatives, and traditional birth attendants. Despite proven cost-effective solutions to reduce neonatal mortality, such as skilled attendance during delivery, clean cord care, immediate and exclusive breast-feeding, and promoting tetanus toxoid immunization, there has been relatively little change in neonatal mortality[23, 24].

Pregnancy and childbirth are important stages in life because they are associated with social problems, mortality and morbidity of mother and the child especially in low income countries. Inter-pregnancy interval under one year is a risk factor for both the mother and the newborn [25, 26]

Several studies showed that women who attend ANC are more likely to seek skilled delivery care. However, at least 20% of all women who attend ANC four times or more in Sub-Saharan African and Southern Asia countries do not seek skilled delivery attendance. Similarly in Ethiopia about 62% and 32% of pregnant women had at least one and four ANC visits respectively but only 26% of women are giving birth at health facilities [12, 27-29]

ANC services provide opportunities to reach women who would be the main target for the promotion of healthy behavior practices during pregnancy, delivery and post partum period. This has been the rationale behind standard strategies using ANC as an entry point for the delivery of core reproductive health services, including health facility delivery, post partum family planning and essential newborn care practices; however studies have shown that there is a preference among health workers for promoting health facility delivery while other maternal and newborn health care services like family planning advice and essential newborn care practices are very limited [30, 31].

It is suspected that while coverage of health services for populations in developing countries has increased, the quality of care provided is substandard. Development of suitable measurement tools is necessary to support the improvements in quality of care and improve population health outcomes. One of the greatest obstacles facing such efforts however is lack of data relating to quality of health care, especially in low and middle income countries (LMICs) [32, 33]

Efforts to understand the complex factors underlying this discrepant pattern between high utilization of antenatal care and low use of skilled birth attendance, post partum modern family planning and low coverage of essential newborn care practices in Sub-Saharan Africa and Asian regions where over 85% of all maternal and neonatal deaths occur must be undertaken [34, 35].

1.3 Rationale of the study

Several studies in sub-Saharan Africa investigated a dose response relationship between access to antenatal care and maternal and newborn health care service utilization like the use of health facility delivery, postpartum family planning use and essential newborn care practices in which an increase the number of ANC results in their utilization[36-41]. But, these findings had several limitations. In these studies, the contents of ANC women received and the time of enrolment were missed from the dose response relationship. In addition, term low birth weight and preterm low birth weight were studied together despite they have different risk factors, sequellae and intervention [42-44]

Authors 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 the use of subsequent maternal and newborn health care services and reduction of adverse birth outcomes such as low birth weight [45].

In addition there is also information gap why women who have frequent antenatal visits still prefer to deliver at home, applying different non essential newborn care practices in different societies and do not use post partum family planning within six weeks after delivery.

Therefore this study was intended to investigate effect of quality antenatal care services on the continuum of maternal and newborn health care services; this information is useful for policy makers and program implementers to improve the quality of maternal and newborn health care services such as increasing the use of health facility delivery, spacing pregnancies and implementing intervention packages of newborn care practices to reduce maternal and neonatal mortality.

2. Literature review

Antenatal care is believed to detect and manage conditions during pregnancy that have the potential to lead to adverse maternal and neonatal outcomes. However, the efficacy of ANC in the prevention of adverse birth outcomes, infant and maternal mortality has been questioned and resulted in several flaws. It was found that prenatal care alone was not an effective prematurity prevention strategy and should not be given whole hearted endorsements.[25, 26, 46, 47]

2.1. Quality of Antenatal Care and health facility delivery

A study done in rural Mexico based on retrospective maternal reports on the contents of antenatal care received revealed more than two-third of pregnant women received less than the 75th percentile of procedures, while 28.4% received $\geq 75^{\text{th}}$ percentile of the procedures[48].

Different studies in India, Kenya and Nigeria also reported a significant relationship between skilled institutional delivery and the contents of care received during ANC, whereby higher proportions of women who had skilled institutional delivery were also more likely to receive most of the prenatal care. These studies also showed the contents of antenatal care service provision was heterogeneous; tetanus vaccination and weight measurement were high (84% to 90%) but low provision of other services ; history of current pregnancy taken (25.1%). blood group determined (41.1%), malaria prevention (6.4% to 21%), 100 iron tablets and folate supplementation (35.7% to 53%), syphilis testing (19.4%) diet-related advice (58%), family planning related advice (40.6%) and breastfeeding-related advice (39.1%)[9, 49, 50].

Studies in Uttar Pradesh, India and Pakistan also revealed that after controlling other variables level of antenatal care use does make a difference to the chances of delivering in a health institution; the likelihood of women who had one to two antenatal care visits were two to three times and women who had three or more antenatal visits were three to six times more likely to deliver in health institutions compared to those who had no any antenatal care visits[46, 47, 51].

Other studies conducted in rural Andhra Pradesh, rural Cambodia, Memot district, Chandigarh and Ghana also showed receiving antenatal care early (in their first trimester) and the number of antenatal visits increased the likely to deliver at health facilities; pregnant women who had

minimum of three prenatal care visits were more likely to undergo skilled institutional delivery compared with those antenatal care[29, 52-55]

A cross- country analysis conducted in nineteen African countries and studies in Burkina Faso and Kenya among antenatal users revealed that the number of antenatal care visits and receiving advice and information on pregnancy complications (i.e. fever, severe headache, blurred vision, loss of consciousness, convulsions, swelling of the face, excessive fatigue, anemia, vaginal bleeding, reduction or absence of fetal movements and smelly vaginal discharge) increases the likelihood of institutional delivery even though there was variation between countries (29% in Ethiopia to 92% in *Congo Brazzaville*) [26, 32, 50].

However a study conducted in Kenya concluded that only 7.4% of pregnant women attended antenatal care gave birth at health institutions and use of antenatal care was not a predictor for the use of institutional delivery[56].

2.2. Quality of Antenatal care and Birth weight

The effect of nutritional advice during pregnancy is controversial. A systematic review and Meta analysis of 34 studies with 11 of them in low and middle income countries found that nutritional education and counseling increased birth weight by 105 gm. Another study among poor urban inhabitants of Bangladesh also revealed that nutritional education provided during the third trimester improved weight gain during pregnancy and reduced low birth weight by 78%. However, the metaanalysis study also reported 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 [57, 58].

Studies in Nepal, India and Britain reported that nutritional education and counseling increases birth weight and reduced low birth weight by 16% to 23%. This is also supported by another study in Nepal where mothers not consuming iron supplementation during their pregnancy were more likely to have LBW infants[59-63].

While, there were contradictory findings, antenatal dietary counseling, daily supplementation of iron, de-worming in hookworm endemic areas were found to be associated with weight at birth [62, 64, 65]

Though the contents of ANC provided during ANC follow-up has significance influence on birth weight, many women missed these opportunities during their ANC follow up. For instance a study conducted in Bahir- Dar, North West Ethiopia found that nearly 64% and 41.1% of pregnant mothers didn't get iron supplementation and dietary advice during ANC visiting respectively[66]

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; one of the strategic objective of the Ethiopian national nutrition program (NNP) is to improve the nutritional status of pregnant and adolescent women by providing ANC and necessary micronutrient supplementations during pregnancy[67-69].

2.3. FP counselling during ANC and Post partum contraceptive use

Contraceptive use in low resource settings remains low for various reasons. A study conducted among prenatal women at the national referral hospital Mulago, Uganda showed that women shared the incorrect notion that contraceptives can cause cancers and infertility. The authors in this study suggest effective educational interventions to dispel the pervasive myths among poor communities. Deliberate promotion of postpartum family planning has shown promising results. Most of the evidence is limited to middle- and high-income countries[33, 70].

A published systematic review also showed that prenatal care and educational interventions were associated with improved family planning outcomes. Therefore programs promoting contraception counselling during pre- and postnatal care are important in improving family planning outcomes and preventing induced abortions [71-73]

Different studies conducted in Nigeria, Kenya, Nicaragua and Mexico among women who had live births one to five years prior to the surveys using DHs data reported that family planning counselling during antenatal care had positive influence on the use of post partum family

planning within a year after delivery. These studies also noted as the number of antenatal care visits increases, the percentage of using modern methods of contraception also increases[74-77].

Studies done in Adigrat, Northern Ethiopia, Uttar Pradesh and a systematic review published in 2014 also supported the integration of family planning into antenatal care services which showed increased modern family planning use where the demand is high [36, 72, 78, 79]. Similarly, the findings of a qualitative study at medical center in Chicago to examine women's perspectives toward the optimal provision of comprehensive contraceptive counseling suggest that focused antenatal contraceptive counseling increased the possibility of post partum family planning use [80].

Clients' satisfaction during ANC is very important for the link to postpartum family planning use because satisfied clients often are more likely to comply with the ANC services such as Family planning advice and which in turn increase the likelihood of post partum family planning use. Unfortunate to this, a study done in Bahir Dar, North West Ethiopia documented that almost half (47.7%) of the study participants were not satisfied with service provided during ANC [66]

2.4. Quality of Antenatal Care and Essential newborn care practices

WHO recommends improving care practices at birth in order to reduce neonatal morbidity and mortality. These have been described as essential newborn care (ENBC) practices and include clean cord care, thermal care and initiating breast feeding immediately or within the first hour after birth. To be effective, such evidence-based interventions need to be implemented within the continuum of care for maternal, newborn and child (MNC) care [8, 81-83].

There are debates on the association between ANC and essential newborn care practices. A study done in India and Bangladesh reported that women who completed three or more ANC visits in Bangladesh were more likely to report having practiced recommended newborn care like clean cord care and early breastfeeding, but not with thermal care. In support of this a national survey in India also revealed thermal care did not seem to have an association with the number of ANC visits irrespective of the place of child birth. This study also noted four antenatal visits may not impact the outcome of pregnancy till the coverage is 60% [84-86].

A maternal and newborn care guide for skilled providers prepared by JHPIEGO also noted if a woman and her family are well prepared for normal child birth as well as any possible maternal and newborn complications, the woman or baby is more likely to receive skilled and timely care needed to preserve their health and ensure survival [87].

In contrary to this, a study in India showed number of antenatal care was found to be independently associated with correct breast-feeding practices and thermal care but not with clean cord care. Other studies in Uganda and Kenya also noted even when some women made adequate contact with the health care system during pregnancy they remained inadequately prepared for newborn care as ANC providers are more inclined to offer clinical oriented services at the expense of less technical services like health education on newborn care practices[50, 88-90].

Synthesis of the literatures reviewed

Most of the studied literatures reviewed were cross sectional in design that focus on assessing the association between access to and frequency (uptake) of antenatal visit rather than adherence of providers to essential contents of antenatal care services (including the time of ANC enrolment) and the continuum of maternal and newborn health care services. In addition most of the studies were conducted outside Ethiopia and some were even in developed countries where results from a research conducted in these countries are not necessarily applicable to less developed nations like Ethiopia. Therefore this study was supposed to fill all these gaps.

2.5. Conceptual frame work

The socio demographic factors like maternal age, educational status and occupation of a woman could influence the parity, time of ANC enrollment, and frequency of exposure to health promotion services (dietary advice, advice on BPCR, use of institutional delivery, danger signs of pregnancy, breast feeding, post partum family planning, immunization) and prevention services (TT vaccination, iron supplementation and deworming) which in turn influence the use of institutional delivery and birth weight of the baby.

Health facility delivery might also have its own effect on the use of post partum family planning, the use of post natal care services as well as essential new born care practices provided to the baby by the provider and/ or the woman.

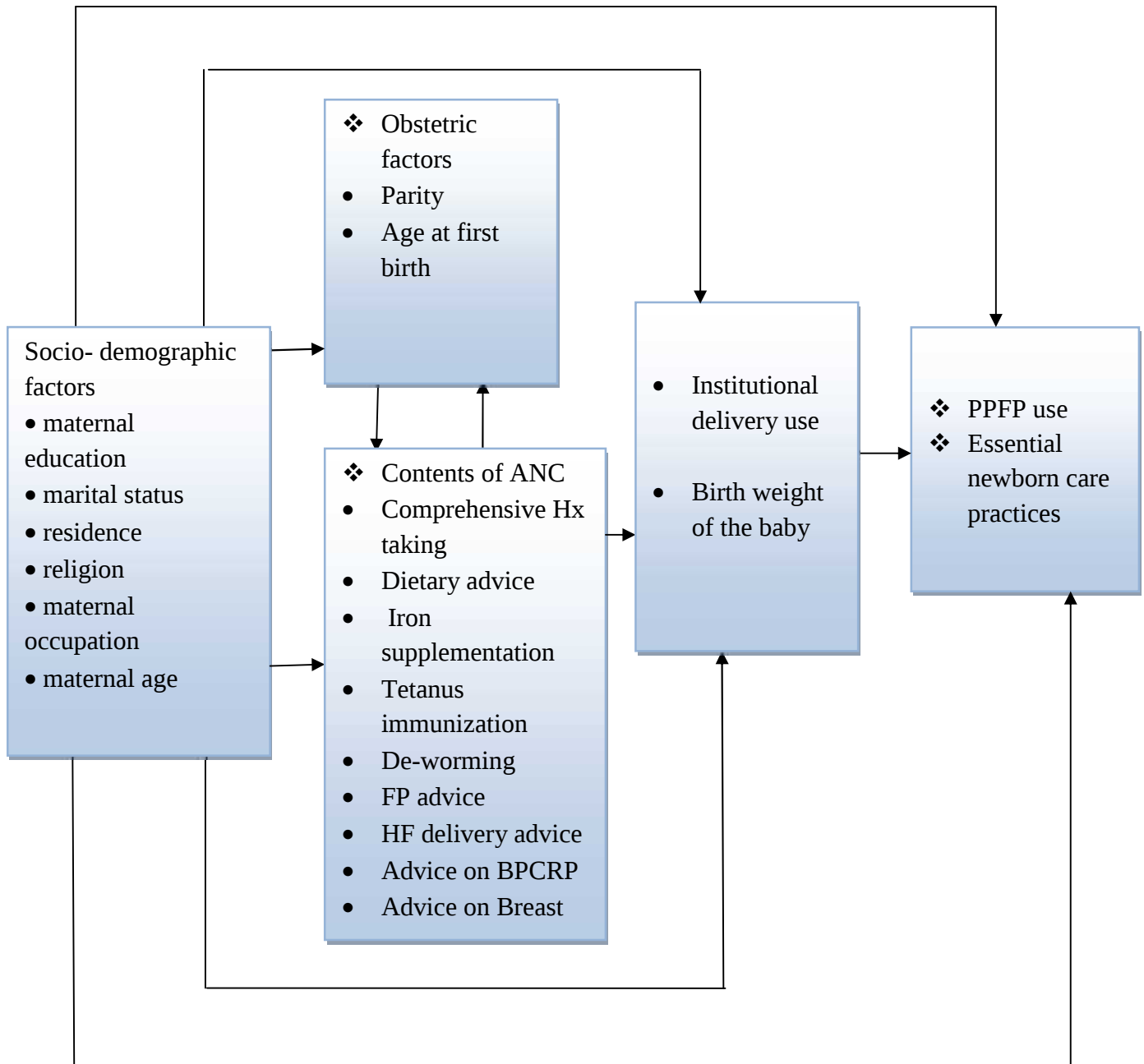


Figure 1: Conceptual framework for a study to examine effect of ANC service quality on the continuum of maternal and newborn health care services in public health facilities of Bahir Dar City Administration, North West Ethiopia.2015/2016

3. Objectives of the study

3.1. General objectives of the study

The aim of this study was to assess the effect of quality ANC services on the continuum of maternal and newborn health care services and their associated factors among pregnant women following their ANC visit at public health facilities of Bahir- Dar City administration, North West Ethiopia, in 2015/2016.

3.2. Specific Objectives

- I. To assess the quality of ANC service and its effect on the use of institutional delivery.
- II. To determine the effect of quality ANC service on birth weight.
- III. To assess the effect of FP counseling during ANC on post partum modern family planning use within 6weeks after delivery.
- IV. To examine the effect of quality ANC service on essential newborn care practices (clean cord care, optimal thermal care and good neonatal feeding practices).

4. Methods and materials

4.1 Study Area & period

Bahir Dar City Administration is one of the eleven zones in the Amhara Regional State, which is found in the North Western part of Ethiopia. Bahir-Dar City is the capital city of the Amhara Regional State located 565kms from Addis Ababa and recently recognized as one of the tourist attraction area in the country .With the new administrative organization Bahir Dar city administration includes 17 urban kebeles, four other small towns, and five surrounding rural kebeles.

According to the Amhara National Regional State Finance and Economic Development Bureau population projection report by 2014, the total population of Bahir-Dar city administration is 297,775 of these 239,790 (80.5%) and 57, 985 (19.5%) people are urban and rural dwellers respectively [91]. Among the total population, those who are expected for pregnancy account 3.37% [92] which finally gave 10, 035 eligible pregnant woman in the year 2015/2016.

In the same year according to the Bahir Dar city administration health office report the antenatal care (at least one visit) and institutional delivery coverage in the study area was 96% and 42 % respectively [93]. At the start of the data collection period (October, 2015), there were twelve governmental health facilities (two public hospitals and ten health centers) providing antenatal care in the study area. However this study is conducted on seven of the public health facilities, due to the reason that one of the hospitals and four of the health centers were new and had very small number of ANC service users. Longitudinal data was collected from October 2015 to August 2016.

4.2. Study design

A prospective follow up study was conducted to assess the effect of quality ANC service on the continuum of maternal and newborn health care services among pregnant women following their ANC visit at public health facilities of Bahir- Dar City administration, North West Ethiopia, from October 2015 to August 2016.

4.3. Source population:

All mothers who were attending their ANC visits at public health facilities of Bahir- Dar city administration were the source population.

4.4. Study population and sample

All first visit pregnant women with gestational age ≤ 16 weeks who received ANC service in public health facilities of Bahir- Dar city administration during the data collection period and those pregnant women who were selected by systematic random sampling were the study population and samples for this study respectively.

For the second objective (about birth weight) women who gave birth at home were excluded in the analysis due to the fact that data on birth weight could not be obtained within one hour after birth.

4.5. Sample size determination

The sample size for each outcome variables was computed using Stat Cal application of Epi-Info version 7 software using two population proportion formula. Sample size was calculated for each of the objectives to obtain and consider the maximum sample for the study.

For objective (I): the proportion of women who gave birth at health facilities among those who received unacceptable antenatal care quality was 16.5% [94] and assuming there might be a 10% increase in the use of institutional delivery among those women who got acceptable ANC service quality.

For objective (II): prevalence of LBW babies among mothers completing four ANC visits

6% [95] and assuming 10% increase in prevalence of LBW among mothers with < 4 ANC visits

For objective (III): 2.8% [96] postpartum modern family planning use at six weeks after birth among women who had no ANC (considering these women as they were not counseled on postpartum family planning during ANC) and assuming 5 % increase in post partum modern family planning use among women who were counseled.

For objective (IV): the prevalence of clean cord care (24.0%) [97] among women with ≥ 4 ANC visits considering these women as if they received acceptable quality ANC service and there

could be a 10% reduction in optimal cord care among mothers who received <4 ANC visits due to the absence of previous literature that reported the association between ANC service quality and other essential newborn care practices.

The assumptions of 95 % confidence level, 5% type I error, 80% power and 2:1 ratio of unexposed to exposed population and non response rate of 15% were considered in all sample size determinations.

The total sample size required to address all of the objectives is the one computed for that gave 970 samples which was the maximum sample size among all others and this was considered as the final sample size to address all objectives of this study.

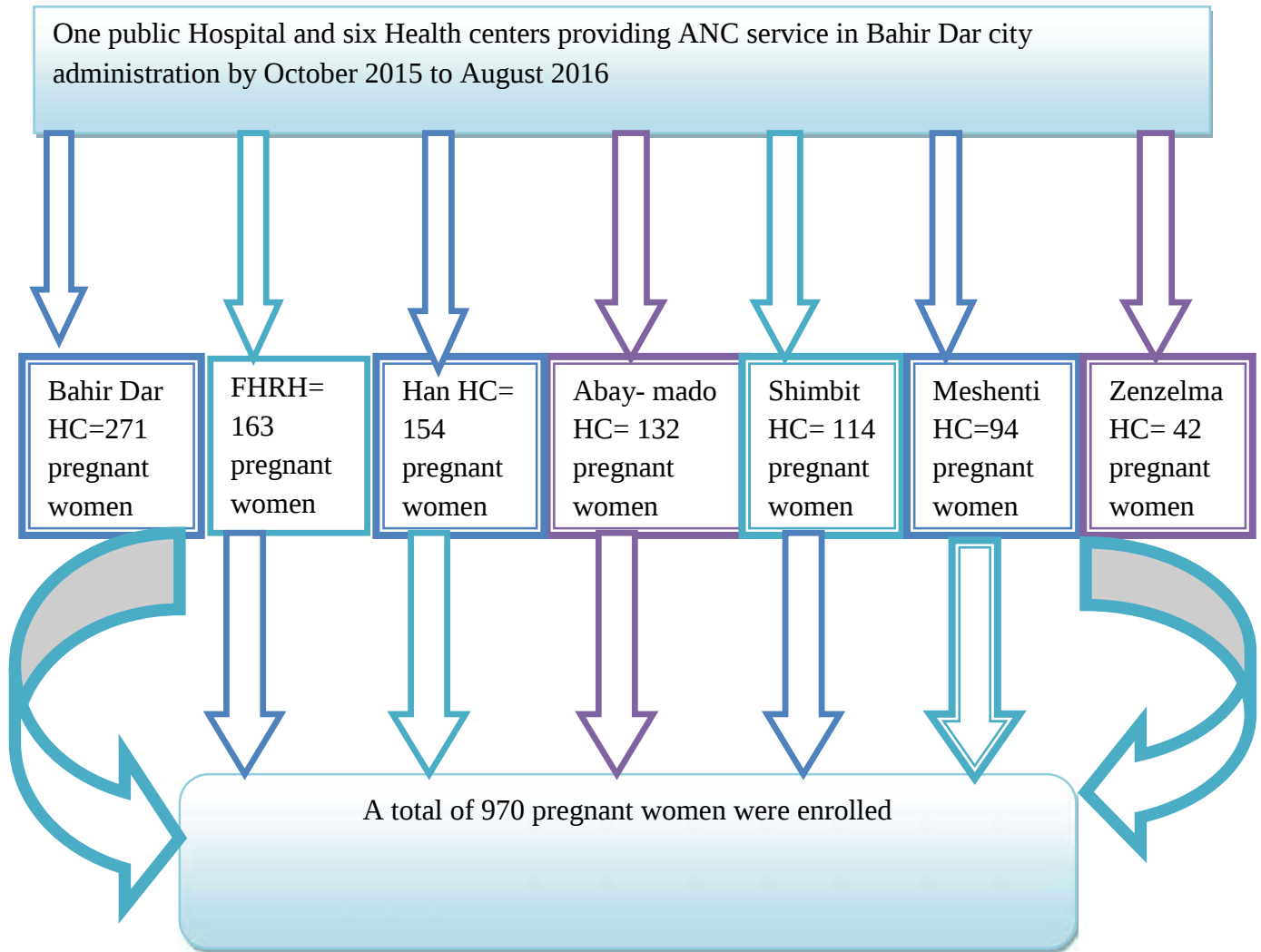
Table 1: Sample size determination for each objective

Objective	Exposure variable	Outcome among exposed	Outcome among non-exposed	Calculated sample size
To measure the quality of ANC service and its effect on the use of institutional delivery	Quality of ANC service (acceptable Vs not acceptable quality)	26.5%	16.5%	970
To investigate the effect of ANC quality on birth weight of the newborn baby		6.0%	16.0%	464
To investigate the effect of FP counseling during ANC on post partum modern family planning use within 6weeks after delivery.	FP planning counselling during ANC (Counselled Vs not counselled)	7.8%	2.8%	777
To examine the effect of ANC service quality on essential newborn care	Frequency of ANC service (≥4 visits Vs <4	24.0%	14.0%	656

4.6. Sampling technique

First ANC visit pregnant women who came to the study public health facilities in the study area before or at 16 weeks of gestation were included in the study. Pregnant women were selected by systematic sampling technique using “ $K=3$ ” which was obtained by dividing N (the source population that was assumed all first ANC visit pregnant women following ANC at the study health facilities a year preceding the study) to n (the final sample size). The sampling interval was used in all facilities to select study participants. The first client was selected by simple random sampling technique using lottery method among the first three ANC service users.

Proportional to size allocation was made to achieve the desired sample size of pregnant women from each selected public health facility based on the number of ANC users at each health facility in the last one year prior to the study (271 from Bahir Dar H/C, 163 from Felege-Hiwot referral Hospital, 154 from Han HC, 132 from Abay-mado HC, 114 from Shimbit HC, 94 from Meshenti HC and 42 from Zenzelma HC)



NB: FHRH=Felege Hiwot referral Hospital; HC= Health center

Figure 2: Schematic diagram for how the pregnant women were selected for a study to assess effect of ANC service quality on the continuum of maternal and newborn health care services in public health facilities of Bahir Dar City Administration, North West Ethiopia.2015/2016.

4.7. Data collection instruments and techniques

Pregnant women were followed from their first visit till six weeks after birth (Figure 3).

An interviewer administered questionnaire was used to obtain the socio-demographic data at the first ANC visit and a structured pre-tested observation check list of 88 items was used to observe the routine ANC practice against the standard for each ANC visits that was developed based on the Ethiopian Federal Ministry of Health management protocol on selected obstetric topics[98]. The components of ANC services assessed were categorized into three groups: (i) Comprehensive history taking (36 items) (ii); Measurements, tests and treatments (29 items) and (iii) Counseling/ provision of information (23 items).

For **first visit (at ≤16 weeks)**: detailed history taking about past and current pregnancy, clinical examination, laboratory testing, provision of information (maternal nutritional advice, ITN use); distribution of drugs (TT and iron) and schedule of return visit were assessed.

For **second visit (at 28 weeks)**: history of complaints in current pregnancy; assessment for fetal heart beat in addition to the clinical examination, information provision (maternal nutritional advice, ITN use) & drug distribution (TT and iron) and schedule of return visit were assessed.

For **third visit (at 32 weeks)**: in addition to the procedures done in the second visit; updating hemoglobin test and prescribing mebendazol for deworming; information provision on breast feeding, immunization, health facility delivery, Birth preparedness and complication Readiness Plan (BPCRP), Post Partum Family Planning (PPFP) and Post Natal Care (PNC) and second visit information were assessed.

For **fourth visit (at 36 weeks)**: history of complaints in current pregnancy; clinical examination and information provision similar to visit three was assessed (Figure 3).

To measure the satisfaction of pregnant women on ANC services they received during their pregnancy period, an exit interview was conducted just after their fourth ANC visit using eight items. Each item has five point likert scales from strongly disagree (1) to strongly agree (5).

In addition, there was also another exit interview with women at 6 weeks after birth when they came to the health facility to immunize their child to assess whether or not they were using any

modern post partum family planning method and to identify the essential newborn care practices like clean cord care, optimal thermal care & good neonatal feeding practices provided to the baby by the provider and/ or the woman.

If a woman doesn't come to the health facility for immunization, the data collectors were tracing her based on her address registered during the first visit.

Seven female diploma midwives were data collectors that observe about the contents of the ANC services given and the information provided by the ANC provider using the observation check list while the pregnant women received the ANC services and to carry out the exit interview just after the fourth ANC visit and six weeks after delivery. In addition there were also two female BSc Midwives who were recruited as supervisors.

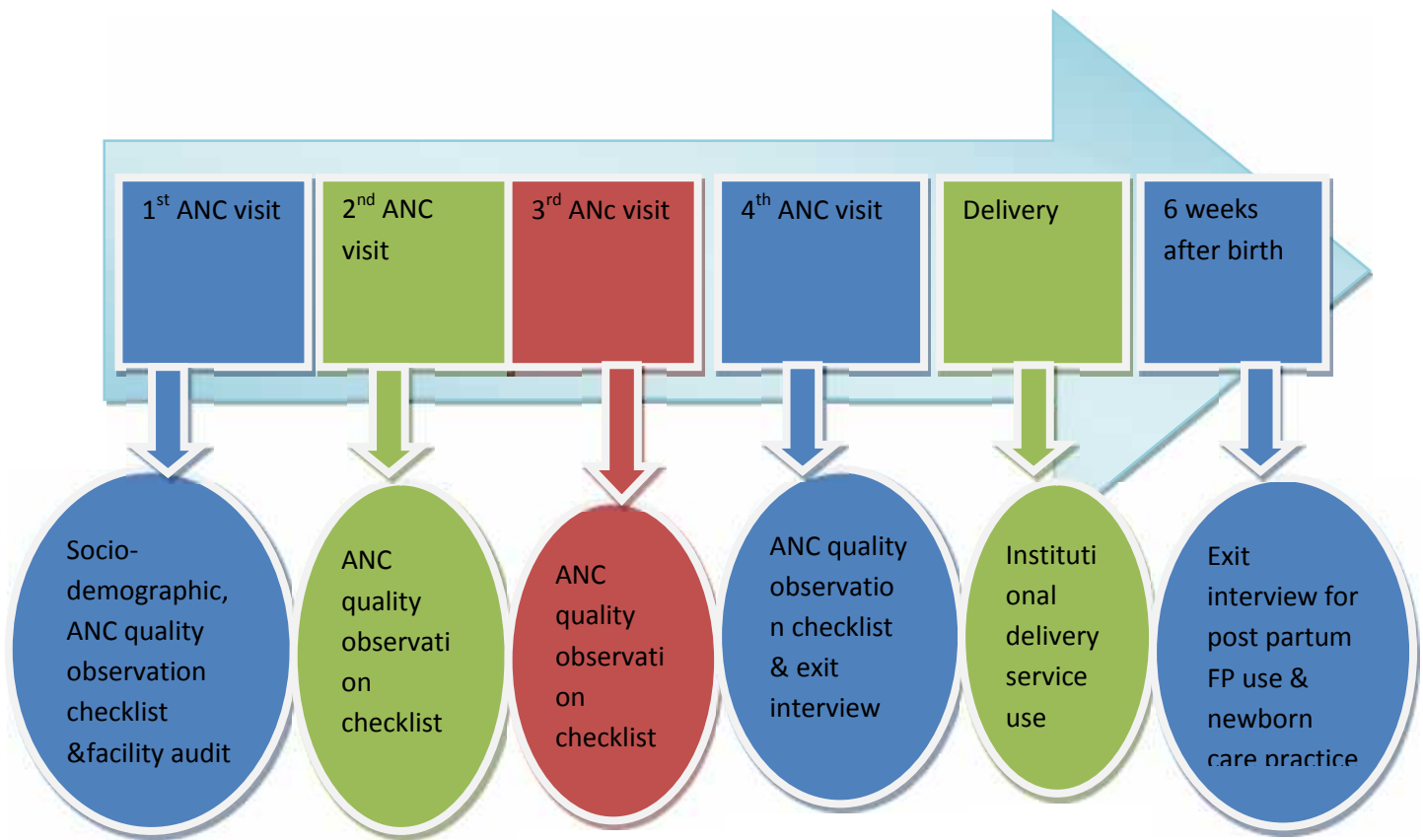


Figure 3 : The follow up time to investigate effect of quality of ANC service on the continuum of maternal and newborn health care services in public health facilities of Bahir Dar City Administration, North West Ethiopia.2015/2016

4.8. Study variables

4.8.1. Dependent variables

Based on the objectives of the study the following are the dependent variables

- Institutional delivery measured as Yes/No
- Birth weight of the newborn baby measured in kilograms to the nearest 10 kilogram within one hour after birth
- Post partum modern family planning use measured as Yes/No
- Essential newborn care practice measured as good/poor practice

4.8.2. Independent variables

- Quality of ANC was the main exposure variable for the use of institutional delivery, birth weight and essential newborn care practice where as FP counselling during ANC was the main exposure variable for post partum family planning use outcome of interest.

Definition of quality was adapted based on the frameworks of Donabedian model. Since “structure” is mainly considered as the conduit through which care takes place and “satisfaction” is a consequence of care rather than true components of quality of care, the focus of this study was therefore on process attributes of quality[99, 100].

The process dimension of ANC service quality was measured by the extent to which the pregnant women received the essential ANC services during four visits using 88 items such as to what extent the provider took a comprehensive antenatal history, type of clinical and laboratory tests done (urine, blood and stool tests), treatments given (iron folic acid, TT vaccination, deworming), type of information provided during ANC (advice on nutrition, breast feeding, malaria prevention, counselling on health facility delivery, birth preparedness and complication readiness plan (BPCR), post natal care and post partum family planning), client-provider interactions, privacy, trainings given for providers and presence of ANC guideline.

If the essential ANC service was given it was coded as 1 otherwise 0 and a composite index for the overall ANC service quality considering the four ANC visits was calculated for each woman with a minimum of 0 and maximum of 88 scores since. Percentile was computed to categorize

the quality of the services a woman received. If she received $\geq 75^{\text{th}}$ percentile of essential ANC services, ANC service was considered acceptable quality otherwise not [48].

The satisfaction score of pregnant women on the ANC services they received was computed from the eight items which had internal reliability (Cronbach's α of 0.74). A respondent had a minimum of 8 and a maximum of 40 points on ANC satisfaction score. The satisfaction score was converted to percentage satisfaction score (PSS) to make it standardized using the formula,

$$\text{PSS} = \frac{\text{Actual Score} - \text{Potential minimum score}}{\text{Potential maximum score} - \text{potential minimum score}} \times 100 \quad [101].$$

Potential maximum score - potential minimum score

The percentage mean satisfaction score for client satisfaction on the ANC services received was calculated as the data was normally distributed and it was 73.2. Clients were categorized as satisfied (if they score above the percentage mean satisfaction score) otherwise not satisfied.

4.9. Operational definitions

- *Acceptable ANC service quality*: if women received $\geq 75^{\text{th}}$ percentile, of essential ANC services [40]
- *Clean cord care*: cutting the umbilical cord with a sterilized instrument plus tying it with a sterilized thread and no substance applied to the cord
- *Optimal thermal care*: baby dried and wrapped at birth plus first bath after 24 hours
- *Good neonatal feeding*: initiating breastfeeding within the first one hour after birth plus feeding colostrum and baby given no supplements at all in the first month of life
- “Good” newborn care practice if all the three of them are full filled and was coded as “1” otherwise “0” that indicates “poor” practice [102]

Table 2: Description and measurement of variables to study effect of quality of ANC on the continuum of maternal and newborn health care services in North West Ethiopia, 2015/2016

Variables	Descriptions	Measurements	Remark
Dependent variables			
Institutional delivery	Women who gave birth at health institutions	‘Yes’ responses are coded as ‘1’ otherwise as ‘0’	
Birth weight	Weight of a baby was measured within an hour after birth	Normal birth weight if ≥ 2500 gms or low birth weight if it was < 2500 gms	
Post partum family planning use	women who start FP with in 6weeks after birth	‘Yes’ responses are coded as ‘1’ otherwise as ‘0’	
Essential newborn care practice	If clean cord care and optimal thermal care and good neonatal feeding were composite indices (each of them are operationally defined)	Over all essential newborn care practice composite index was developed and dichotomized as “good” which was labeled as 1 if all the three indices are full filled otherwise “poor” and labeled as 0.	
Independent variables			
Quality of antenatal care;	The contents of ANC services during each visit were observed using observation checklist and if the service was given it was coded as 1 other wise 0. Finally a composite index for	Women who received $\geq 75^{\text{th}}$ percentile of essential ANC services are categorized as those who received acceptable quality ANC and coded as “1” where as those women who received $< 75^{\text{th}}$ percentile of	

	the overall ANC quality was developed.	essential ANC services (un acceptable ANC quality) and was coded as “0”	
Weight and Blood pressure measurement, checking for pallor and head to toe examination, testing for Hgb, blood group & Rh factor, urine for infection and protein and VDRL, HIV and stool exam	Doing each of the procedures	‘Yes’ responses were coded as ‘1’ otherwise as ‘0	
Provision of information on danger signs in pregnancy, Immunization, Nutrition, PMTCT, Breast feeding, Birth preparedness and Complication readiness, schedule of return visit ;	Doing each of the procedures	‘Yes’ responses were coded as ‘1’ otherwise as ‘0’	

Importance of postpartum visit , provision of tetanus toxoid vaccine and iron/ folate,			
Assessment of fetal heart sound, breast examination	Doing each of the procedures	‘Yes’ responses were coded as ‘1’ otherwise as ‘0’	
Client satisfaction on ANC service just after the fourth visit	Items with Likert scale were used to assess satisfaction. Strongly agree 5), Agree (4), Uncertain(3), Disagree(2), Strongly disagree (1)	The overall satisfaction score was calculated for the four ANC visits of a woman and woman with satisfaction score $\geq$ the mean percentage satisfaction score (PSS) was categorized as satisfied otherwise not satisfied	
Overall infrastructure	Infrastructures of the health facility (ANC, lab. and pharmacy rooms), Private ANC room, water soap, generator, toilet facilities	Based on records of observation, the infrastructure of the health facility is categorized as not available (0), available but not satisfactory (1) and available and satisfactory (2).	
Basic equipments, drugs & lab reagents	Exam. couch, Screen, weight scale, Sphygmomanometer, thermometer, fetal scope , drugs, mebendazole, magnesium sulfate& laboratory reagents	Not available (0), available but not satisfactory (1) and available and satisfactory (2).	

4.10. Data management

4.10.1. Data entry and analysis

Data were coded and entered into EPI data version 3.1 and exported to SPSS version 20 for analysis. Data cleaning for missing values and inconsistencies was carried out before commencement of analysis. Descriptive summaries such as frequencies, proportions, percentages, mean, and standard deviations of different variables were determined and presented in tables.

To examine the association between ANC service quality with institutional delivery (objective I), post partum modern family planning use (objective III) and essential newborn care practice (Objective IV), Generalized Estimating Equation (GEE) analysis with binary response and to identify the association between ANC service quality and birth weight (Objective II), GEE linear regression analysis using robust estimator and exchangeable working correlation matrix was carried out to control the cluster effect of the data among women who received ANC services within the same facility.

Model fitness was checked by observing the difference of the -2 log likelihood ratio between the null model and the model with independent variables (P value=0.81); linear regression assumptions were also checked by graphical and/or statistical methods accordingly. In addition, Multi co linearity diagnosis was also carried out using variance inflation factor (VIF).

A p -value <0.2 was considered statistically significant during the binary GEE regression analysis to select eligible variables for the multivariable GEE regression and P -value <0.05 was considered statistically significant to identify predictors for each of the outcome variables.

4.10.2. Data quality assurance

To ensure the quality of data, a standardized questionnaire was adapted from previous literatures and translated to the local language (Amharic). Seven female diploma midwife data collectors and two Bachelor of Science in Midwifery supervisors experienced in data collection were involved in the data collection and supervision respectively. Both the data collectors and supervisors were not working in the study health facilities. Two days training about the data

collection instrument going through question by question and on how to observe the ANC service provision supported with practical exercises (role plays) was given for both data collectors and supervisors. Pretest of the instrument was done to ensure clarity, wording and sequence of the questionnaire. The data collectors were wearing a gown during observation and they were not giving any opinion or advice about the service provision. The weight of naked neonates was measured in kilograms to the nearest 10 kilogram by using standard beam balance in the delivery room immediately/within one hour after birth. Close supervision, checkup of the filled questionnaire for completeness and inconsistencies, daily debriefing and provision of feedback were also done to maintain the data quality.

4.11. Ethical consideration

The study protocol was approved by the Institutional Review Board (IRB) of the College of Health Sciences, Addis Ababa University with meeting number 004/2015. Letter of permission was obtained from Amhara Regional Health Bureau and Bahir-Dar City administration Health Office and letter of cooperation was also written to the study health facilities. Both ANC clients and providers were informed about the purpose of the study and verbal informed consent was obtained before data collection. Study participants had the right to refuse participation or terminate their involvement at any point during observation. The information collected is kept confidential. Furthermore, absolute confidentiality was maintained throughout the study.

Table 3: Summary table of study objectives and methods

Objectives (Papers)	Design	Study participants	Data collection method	Analysis
I: Effect of quality ANC service on Institutional delivery	Prospective follow up study	Pregnant women were followed from 1 st ANC visit to delivery	Observation while a woman received ANC service	GEE with logistic regression
II: Effect of quality ANC service on birth weight	Prospective follow up study	Pregnant women were followed from 1 st ANC visit to delivery and only those who gave birth at the health facility were included in the analysis.	Observation of ANC service and measuring birth weight within one hour after birth	GEE with linear regression
III: Effect of FP counseling during ANC on PPFP use	Prospective follow up study	Pregnant women were followed from 1 st ANC visit to six weeks after birth	Observation of ANC service and exit interview for PPFP use	GEE with logistic regression
III: Effect of quality ANC service on Essential Newborn Care Practices (ENBC)	Prospective follow up study	Pregnant women were followed from 1 st ANC visit to six weeks after birth	Observation of ANC service and exit interview to assess ENBC provided to the baby by the provider and/ or the woman.	GEE with logistic regression

5. Results

Nine hundred seventy first ANC visit pregnant women with gestational age ≤ 16 weeks were enrolled for this study and 823 (84.8%) completed the follow up period for the first, third and fourth objective (from first ANC visit to 6 weeks post partum) and for the second objective (quality ANC service with birth weight) data was obtained from 718 participants as the rest gave birth at home and birth weight of the neonate within one hour after birth could not be assessed.

The reasons for 15.2% loss to follow up were abortion, self referral to other health facilities run by government, private or NGOs, permanent change in work place, temporary move to their mother's home for delivery (for nuli- para) and long distance to reach the health facilities especially when gestation age increases. There was no statistically significant difference in quality of ANC services received between those who had loss to follow up and those who completed the follow up (quality of ANC service for both groups was measured only by the services received in their first visit)

5.1. Socio demographic characteristics of the study participants

The mean age of the participants ($\pm$ standard deviation) was 25.46 ± 4.37 years. Nearly ninety percent of the women (88.5%) were urban residents and more than half of the participants (51.4%) were house wives. About ninety percent, (90.9%) of the study participants were Orthodox Christian and almost all women (98.5%) were currently married. With regard to their educational status, about 16.9 % of them could not read and write while almost two-third (57.5%) of them had joined secondary school and above ($\geq$ grade9) (Table 4).

5.2. Obstetric history of ANC attendants

Among women who completed follow up, those with age ≤ 19 years (teen age pregnancy) and those with age ≥ 35 years (elderly pregnancy) were 4.9% each. Greater than two out of five of them 352 (42.8%) were nuli-para; 215(26.1%)primi para, 247(30.0%) multi para and only 9(1.1 %) of them were grand multi para (parity greater or equal to five).

Socio-demographic variables

30 Number

Percent

Age (in years)	15-19	40	4.9
	20-24	314	38.2
	25-29	307	37.3
	30-34	122	14.8
	≥ 35	40	4.9
Residence	Urban	728	88.5
	Rural	95	11.5
Religion	Orthodox	748	90.9
	Muslim	73	8.9
	Protestant	2	0.2
Marital status	Married	811	98.5
	Divorced	10	1.2
	Widowed	2	0.3
Educational status	Cannot read and write	139	16.9
	Can read and write	34	4.1
	Grade1-4	61	7.4
	Grade5-8	116	14.1
	Grade9-10	165	20.0
	Grade11-12	152	18.5
	Joined higher institution	156	19.0
Ethnicity	Amhara	788	95.7
	Tigre	25	3.0
	Agew	7	0.9
	Oromo	3	0.4
Occupation	House wife	423	51.4
	Merchant	113	13.7
	Gov't employee	98	11.9
	Farmer	89	10.8
	Private employee	69	8.4
	NGO employee	5	0.6
	Other*	26	3.2

Table 4: Socio-demographic characteristics of ANC attendants in public health facilities of Bahir Dar City administration (n=823), October 2015 to August 2016

Other*=daily laborers and waiters

5.3. Adherence to FANC protocol by the health providers

5.3.1. Comprehensive History Taking

The past obstetric history taking was heterogeneous. Among 471(57.2%) women with previous history of pregnancy observed, more than 95% of them were asked about their history of hypertension, cesarean section, heavy bleeding and anemia but only 4.2% of women were asked about their history of convulsion (Table 5).

Table 5 : Comprehensive history taking about past obstetric history among study participants observed at public health facilities of Bahir Dar City Administration (n=471), October 2015 to August 2016

Past obstetric Hx asked	Number	Percent
Hx. of hypertension	465	98.7
Hx. of heavy bleeding	462	98.1
Hx. of anemia	454	96.4
Hx. of obstructed labour	452	96.0
Hx. of C/S	452	96.0
Hx. of abortion	321	68.2
Hx. of instrumental delivery	151	32.1
Hx. of Multiple pregnancy	86	18.3
Hx. of Still birth	66	14.0
Hx. of convulsion	20	4.2

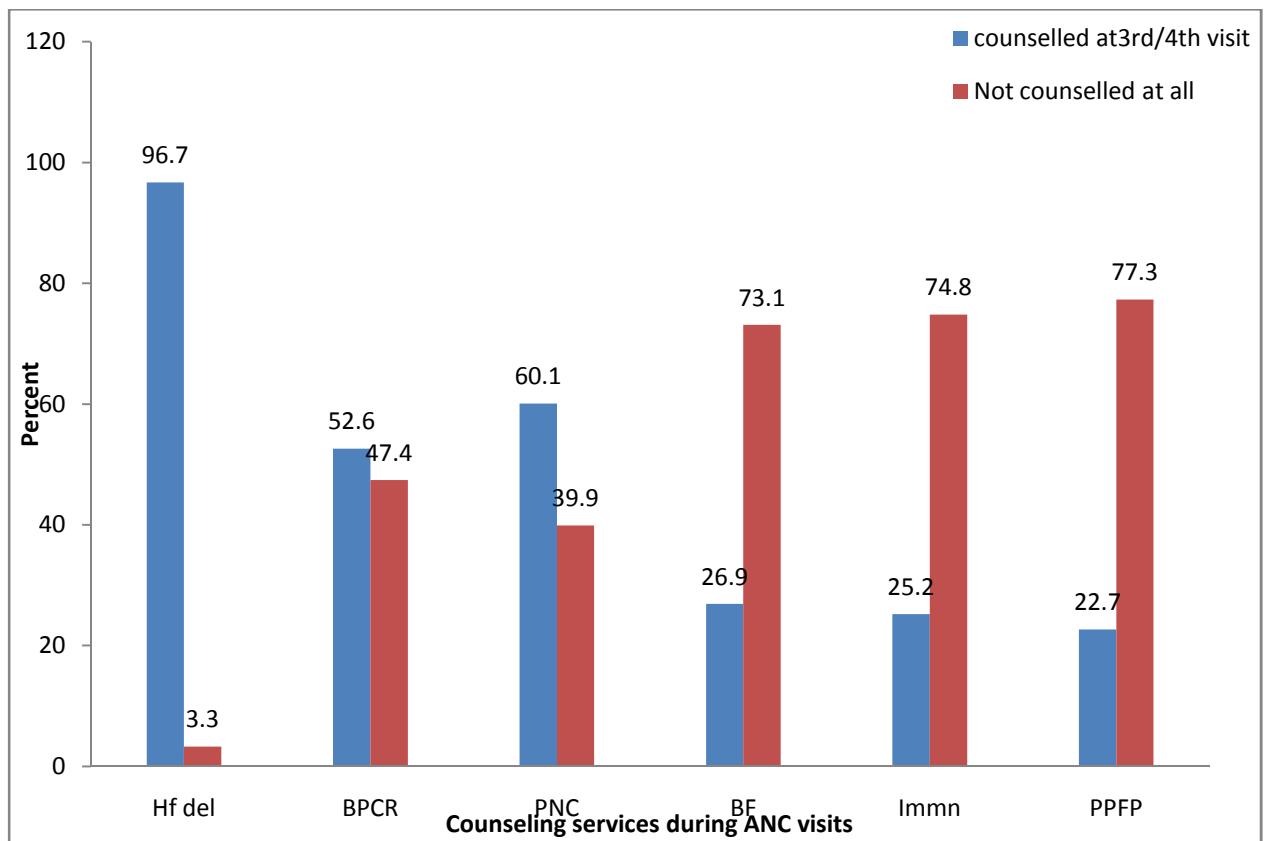
NB: Hx= history, C/S=Cesarean section

5.3.2. Information provision on danger signs of pregnancy and other ANC services

Pregnancy complications and their inadequate management threaten the survival and health of too many mothers and babies. The Safe Motherhood Initiative (SMI) advocates the provision of advice during antenatal care about potential pregnancy complications, and specifically about how to seek medical care for pregnant women and their families when the danger signs occur. However the information provision and counseling service during antenatal care in the study facilities was not implemented consistently by ANC providers (Table 6 and Figure 4).

Table 6: Advice on danger signs of current pregnancy at each ANC visit among study participants observed at public health facilities of Bahir –Dar city administration (n=823), October 2015 to August 2016

Danger signs asked	Visit one, N (%)	Visit two, N (%)	Visit three, N (%)	Visit four, N (%)
Vaginal bleeding	610(74.1)	669(81.3)	513(62.5)	554(67.3)
Severe headache	448(54.4)	441(53.6)	772(93.8)	7732(88.9)
Convulsion	27(3.3)	29(3.5)	73(8.9)	83(10.1)
Severe abdominal pain	483(58.7)	345(41.9)	408(49.6)	422(51.3)
Reduced or absent fetal heart beat	-	823(100.0)	823(100.0)	823(100.0)
Facial or hand swelling	224(27.2)	398(48.4)	790(96.0)	706(85.9)
High temperature	487(59.2)	453(55.0)	472(57.4)	434(52.7)



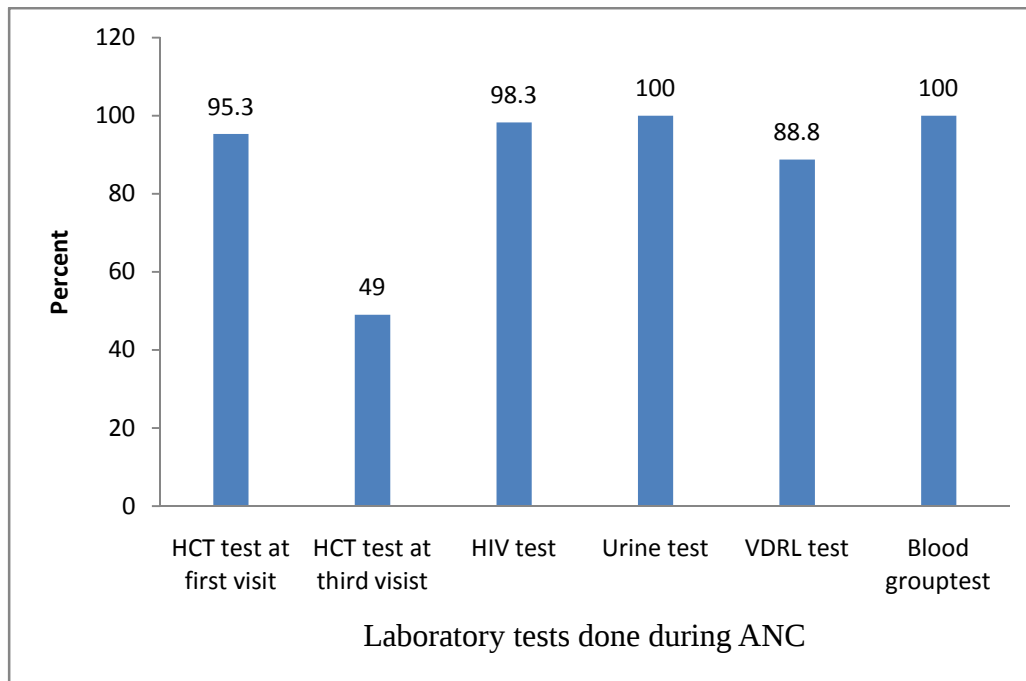
NB: HF= Health facility; BF= Breast Feeding; BPCR=Birth Preparedness and Complication Readiness Plan; PPFP=Post Partum Family Planning

Figure 4 : Counselling services provided to observed pregnant women during ANC visits at public health facilities of Bahir -Dar city administration (n=823), October 2015 to August 2016

5.3.3. Measurements and laboratory tests done during ANC visits

Weight, blood pressure, fetal heart beat measurements and routine ANC laboratory tests including HIV test were done for $\geq 95.0\%$ of pregnant women. However, HIV test was done in fragmented times (from first visit till delivery) due to inconsistent supply of the test kit. In one study facility, Venereal Disease Research Laboratory (VDRL) test was not done at all for the last two years except that pregnant women who were suspected for syphilis based on their history were referred to private health facilities to have the test. More than half of pregnant mothers have

no hematocrit update at third/ fourth ANC visit due to the reason that providers repeat the test only if they suspect the women for anemia (for diagnostic purpose) (Figure 5).



NB: VDRL=Venereal Disease research laboratory, HCT: Hematocrit; HIV=Human Immuno deficiency Virus; VDRL=Venereal Disease Research Laboratory test for syphilis.

Figure 5 : Routine laboratory tests done for pregnant women during ANC visits at public health facilities of Bahir Dar City administration (n=823) October 2015 to August 2016.

5.3.4. Facility Audit

Except two public health facilities which had permanently assigned ANC providers, the rest five health facilities assigned providers for ANC, PNC and delivery rooms to work on rotation. The total number of providers who were working in those five facilities by rotation was 12. On the average, each health facility had two providers for ANC and PNC service provision at the same room. Among 17 ANC providers, 14 (82.4%) were Midwives whereas 3(17.6%) were Nurses. Furthermore 8 (47.1%) of the ANC providers were not trained on FANC protocol while 9(52.9%) of them were trained. In all health facilities ANC and PNC services were provided in the same room.

Only one health facility had generator as an alternative power supply when there is no electricity and none of the health facilities had ANC guide line except two health facilities that posted the ANC algorithm on the wall inside the ANC room. On the other hand, water and soap in the ANC room were available only in two health facilities.

All health facilities had examination coach, BP apparatus, stethoscope, foetoscope, adult weight scale, dipsticks test strips for protein and glucose, electrical centrifuge for hematocrit, Rapid Plasma Reagin (RPR) test kit (except one health facility), blood group test reagents, HIV test kit (inconsistencies in supply was reported), HCG test strip, TT, Mebendazole, standardized ANC chart and ANC registration log book.

5.4. Association between quality antenatal care and Health facility delivery

The quality of antenatal care was measured by the level of essential antenatal care services given to pregnant women during their 1st to 4th ANC visit with respect to the FANC protocol. Among all pregnant women observed only 227 (27.6%); (95% CI =24.5%, 30.5%) received acceptable ANC service quality while the rest 596(72.4%); 95%CI= 69.5%, 75.5%) got unacceptable ANC service quality. Health facility delivery among women who received acceptable and unacceptable ANC service quality was 94.7% and 84.4% respectively (P<0.001)

After Hosmer and Lemeshow model adequacy was checked (P-value=0.81) the binary generalized estimating equation (GEE) logistic regression showed that there was a positive association between quality antenatal care and the use of health facility delivery service; age of the mother, place of residence, occupation, educational status and parity also showed an association with institutional delivery and they were eligible for the multivariable GEE logistic regression analysis.

In multivariable GEE logistic regression, quality of antenatal care, age of the mother, place of residence and educational status of the mother remained to have an association with giving birth at health facility. However, occupation and parity of pregnant women did not show statistically significant association with health facility delivery

The odds of giving birth at health facility among pregnant women who received acceptable ANC quality service was about 3.38 times higher than pregnant women who received un acceptable ANC quality service (AOR=3.38, 95% CI: 1.67, 6.83).

The odds of giving birth at health facilities among younger pregnant women (<25 years of age) was 3.69 higher than older pregnant women (age $\geq$ 35 years) (AOR= 3.69, 95% CI: 1.44, 9.49). The odds of giving birth at health facilities among pregnant women living in urban areas was 9.91 times higher than pregnant women who live in rural areas (AOR= 9.91, 95% CI: 2.52, 38.91). Educational status of pregnant women had also positive association with health facility delivery; the odds of giving birth at health facility among pregnant women with educational status of secondary school and above was 6.83 times higher compared to those women with no formal education (AOR =6.83, 95% CI; 3.33,13.97). However, the odds of giving birth at the health facilities among pregnant women who attend primary school and those who had no formal education (AOR=1.80, 95% CI; 0.97,3.35) did not show statistically significant difference in the use of health facility delivery service (Table 7).

Table 7: Multivariable Generalized Estimating Equation logistic regression to identify determinants of Health facility delivery among pregnant women attending ANC at public health facilities of Bahir- Dar city administration (n=823), October 2015 to August 2016

Variables		Health Facility Delivery, n (%)	Home Delivery, n (%)	COR(95%CI)	AOR(95% CI)
ANC quality	Acceptable	215 (94.7)	12 (5.3)	3.31(1.80, 6.25)	3.38(1.67, 6.83)*
	Not acceptable	508 (85.2)	88 (14.8)	1.00	1.00
Age	15-24 years	319(90.11)	35(9.9)	3.48 (1.59, 7.52)	3.69(1.44, 9.49)*
	25-34 years	370(86.2)	59(13.8)	2.38(1.13, 5.02)	2.14(0.91, 5.01)
	≥ 35 years	29(72.5)	11(27.5)	1.00	1.00
Resident	Urban	676 (92.9)	52 (7.1)	16.40(10.02,26.87)	9.91(2.52,38.91)*
	Rural	42 (44.32)	53(53.8)	1.00	1.00
Occupation	Employee ^a	164 (95.3)	8 (4.7)	25.11 (11.02,57.21)	0.77(0.13,4.59)
	House wife	380 (89.9)	43 (10.2)	10.83 (6.42, 18.27)	0.73(0.17,3.09)
	Others ^b	133 (97.4)	6 (4.3)	27.15(10.84,68.03)	1.33(0.23,7.72)
	farmer	40(44.9)	49 (55.1)	1.00	1.00
Education	Secondary and above (≥ grade 9)	455 (96.2)	18(3.8)	14.48(8.24,25.44)	6.83(3.33,13.97)*
	Primary school (grade1-8)	153(86.4)	24(13.6)	3.65 (2.19, 6.20)	1.80 (0.97,3.35)
	No formal education	110(63.6)	63(36.4)	1.00	1.00
Parity	Nuli para	326 (92.6)	26 (7.4)	2.43 (1.53,3.85)	0.98 (0.54, 1.75)
	Multi para	392 (83.2)	79 (16.8)	1.00	1.00

*Indicates significant difference at $p < 0.05$; ^a = Government, private and Nongovernmental organization employees; ^b= Merchants, students, daily laborers and waiters

5.5. Essential Contents of Antenatal Care and Birth weight

The mean birth weight ($\pm$ SD) of all neonates born at health facilities ($n=718$) was 3113.0 (± 474.9) grams with the minimum and maximum birth weights of 1800 and 4400 grams respectively. Of the total women who delivered at health facilities, 56 (7.8%; 95%CI= 6.0%, 9.7%) delivered low birth weight babies (<2500 grams), 648 (90.3%; 95%CI= 88.0%, 92.2%) had babies with normal birth weights (2500-4000grams) and 14 (1.9%; 95%CI= 1.0%, 3.1%) gave birth to babies that were large in size for their gestational ages (>4000 grams). The mean birth weight of neonates among women who received acceptable and unacceptable quality of ANC service was 3232 (± 0.45) and 3062 (± 0.48) grams respectively. There was a statistical significant difference in the mean birth weight of neonates born from women who received acceptable and unacceptable quality of ANC service ($P < 0.001$).

Information provision on maternal nutrition, breast feeding and immunization was heterogeneous in each visit (Table 8). Among women who gave birth at the health facilities majority, 701(97.6%) of pregnant women received two doses of tetanus toxoid vaccine but the rest 17 (2.4%) missed one dose and 304(42.3%), 327(45.5%), 77 (10.7%) and 10(1.4%) of pregnant women were supplemented with 120, 90, 60 and 30 tablets of iron- folic acid respectively. In addition, 509(70.9%) and 564 (78.6%) of pregnant women received anti-helminthics for deworming and were advised to use insecticide treated bed net for prevention of malaria respectively (Table 9). About two third (57.1%) of the pregnant women were counselled about BPCRP at least once in their four ANC visits.

Table 8: Information provided to pregnant women during ANC visits at public health facilities of Bahir Dar City Administration, Bahir Dar, Ethiopia; October 2015 to August 2016 (N=718).

ANC services given	During 1st visit, n (%)	During 2 nd visit, n (%)	During 3 rd visit, n (%)	During 4th visit, n (%)
Advised on maternal nutrition	496(69.1)	608 (84.7)	506 (70.5)	296 (41.2)
Advised on breast feeding	-	-	14(1.9)	205 (28.6)
Advised immunization	-	-	11(1.5)	196 (27.3)
Checked conjunctiva for pallor	575 (80.1)	238 (33.1)	507 (70.6)	272 (37.9)

Table 9: Birth weight status of neonates among pregnant women who received different ANC services at public health facilities of Bahir Dar City Administration, Bahir Dar, Ethiopia; October 2015 to August 2016 (N=718).

Variables		Low birth weight, n (%)	Normal birth weight, n (%)	Large size for gestational age, n (%)	Total, n
Quality of ANC received	acceptable quality	3(1.4%)	203(94.4%)	9(4.2%)	215
	Not acceptable quality	53(10.5%)	445(88.5%)	5(1.0%)	503
Maternal nutritional advice	Not advised at all	4(13.3%)	25(83.3%)	1(3.3%)	30
	Advised in one visit	7(53.8%)	6(46.1%)	0(0.0%)	13
	Advised in two visits	30(11.7%)	225(87.5%)	2(0.8%)	257
	Advised in three visits	12(4.1%)	275(93.8%)	6(2.0%)	293
	Advised in four visits	3(2.4%)	117(93.6%)	5(4.0%)	125
Iron - folic acid supplementation	Given 30 tablets	9(90.0%)	1(10.0%)	0(0.0%)	10
	Given 60 tablets	18(23.4%)	59(76.6%)	0(0.0%)	77
	Given 90 tablets	15(4.7%)	307(93.8%)	5(1.5%)	327
	Given 120 tablets	14(4.5%)	281(92.5%)	9(3.0%)	304
Deworming	Not given	16 (7.7%)	191(91.3%)	2(1.0%)	209
	Given at 3 rd /4 th visit	40 (7.9%)	457 (89.8%)	12(2.4%)	509
Tetanus toxoid vaccine	Given one dose	12(70.6%)	5(29.4%)	0(0.0%)	17
	Given two doses	44(6.3%)	643(91.7%)	14(2.0%)	701

In a bivariate Generalized Estimating Equation linear regression analysis, there was a positive association between birth weight of neonates with the maternal nutritional advice during ANC, Iron –folic acid supplementation, deworming with anti-helminths, doses of tetanus toxoid vaccination of the mother, Venereal Disease Research Laboratory (VDRL) test of the mother, hematocrit test of the mother at first ANC visit, hematocrit test update of the mother at third/ fourth ANC visit, advice on Insecticide Treated Bed Net (ITN) use and most of the socio-demographic factors such as residence, maternal age, educational status, occupation and parity. Therefore all these variables were fitted to the multivariable GEE linear regression analysis.

In multivariable Generalized Estimating Equation linear regression analysis, maternal nutritional advice during ANC, Iron supplementation, tetanus toxoid vaccination, educational status and parity remained to have statistically significant association with birth weight. In addition, deworming with anti-helminths, advice on ITN use, having VDRL test, having hemoglobin test update at third /fourth ANC visits and living in urban areas showed an increase in birth weight but the association was not statistically significant.

When the frequency of maternal nutritional advice during ANC visits was increased by one, the birth weight of a neonate was increased by 147 grams ($\beta = 0.147$, 95%CI= 0.11, 0.19). When the number of iron tablet supplementation to pregnant women during ANC visits decreased from 90 or more tablets to less than 90 tablets, the birth weight of their neonates decreased by 358 grams ($\beta = -0.358$, 95%CI= -0.476,-0.240). When the dose of tetanus toxoid vaccine given to pregnant women during ANC visits increased from one to two doses till delivery, the birth weight of their neonates increased by 609 grams ($\beta = 0.609$, 95%CI= 0.316,0.903). When the educational status of women increased by one unit, the birth weight also increased by 79 grams ($\beta = 0.079$, 95%CI= 0.06, 0.10). When the parity of women increased by one the birth weight of their neonates decreased by 174 grams ($\beta = -0.174$, 95%CI= 0.24, 0.11) (Table 10).

Table 10: Multivariable Generalized Estimating Equation linear regression to identify determinants of birth weight among pregnant women attending ANC at public health facilities of Bahir- Dar City Administration (n=718), October 2015 to August 2016

Dummy variables			Number (%)	Un-Standardized β (95%CI)	Standardized β (95%CI)	P- value
Maternal nutritional advice during ANC			718(100)	0.147(0.11,0.19)	0.138(0.10,0.17)	0.001*
Residence	Urban		676 (94.2)	0.398(0.249,0.547)	0.122(-0.02,0.26)	0.09
	Rural		42(5.8)	0 ^a	0 ^a	
Iron supplementation	Took <90 tabs		87(12.1)	-0.358(-0.476,-0.240)	-0.240(-0.34,-0.14)	0.001*
	Took $\geq$ 90 tabs		631(87.9)	0 ^a	0 ^a	
TT vaccination	Took two doses		701(97.6)	0.609(0.316,0.903)	0.286(0.03,0.54)	0.03*
	Took one dose		17(2.4)	0 ^a	0 ^a	
Deworming at 3 rd /4 th visit	Yes		509(70.9)	0.109(0.035,0.183)	0.031(-0.04,0.11)	0.41
	No		209(29.1)	0 ^a	0 ^a	
Hematocrit test at 1 st visit	Yes		684(95.3)	0.115(-0.041,0.271)	-0.002(-0.15, 0.15)	0.98
	No		34(4.7)	0 ^a	0 ^a	
Hematocrit test 3 rd /4 th visit	Yes		378(52.6)	0.121(0.052,0.190)	0.026(-0.04, 0.09)	0.46
	No		340(47.4)	0 ^a	0 ^a	
VDRL test	Yes		644(89.7)	0.120(0.008,0.231)	0.028(-0.08, 0.14)	0.61
	No		74(10.3)	0 ^a	0 ^a	
Advice about ITN use	Yes		564(78.6)	0.069(-0.011,0.149)	0.031(-0.05, 0.11)	0.42
	No		154(21.4)	0 ^a	0 ^a	
Educational status of the mother			718(100%)	0.079(0.06,0.10)	0.064(0.05,0.08)	0.001*
Maternal age			718(100%)	-0.067(-0.13,-0.01)	-0.037(-0.10, 0.03)	0.25
Parity			718(100%)	-0.174(0.24,0.11)	-0.092(-0.16,-0.03)	0.01*

*(indicates statistical significance at p-value <0.05); 0^a, indicates a reference category for the categorical predictor variables.

NB: The data about birth weight were entered in kilograms to the data set; hence the betas are converted to grams by multiplying with 1000 for the ease of interpretation.

5.6. FP counselling during ANC and post partum modern family planning use

Among 823 pregnant women, 187(22.7%) of pregnant women were counseled about postpartum family planning at least once during their four ANC visits. All pregnant women were not counseled about postpartum family planning during their first and second ANC visits; however, 60(7.3%) and 186(22.6%) of pregnant women were counseled about postpartum modern family planning during their third and fourth visits respectively.

The proportion of postpartum modern family planning use within 6 weeks after delivery among the study women was 157 (19.1%) with 95%CI (16.4, 21.9). Of those women who adopted post partum modern family planning method, Injectables, Implanon, pills and IUCD were used by 111(70.7%), 34 (21.7%), 10(6.4%) and 2(1.3%) post partum women respectively.

Among 187 pregnant women who were counseled at least once during their ANC visits, 72(38.5%) of them used postpartum modern family planning compared to 13.4% of postpartum women who were not counseled at all during their four ANC visits but used post partum family planning ($p < 0.001$).

With regard to satisfaction on the ANC service provision, among 376(45.7%) women who were satisfied with their ANC service, 265(70.5%) were using postpartum family planning. However, among 447(54.3%) who were not satisfied by the service, only 46(10.3%) were using postpartum modern family planning ($p < 0.001$) in their postpartum period within 6 weeks after delivery.

5.6.1. Factors associated with postpartum modern family planning use

In a Generalized Estimating Equation binary logistic regression analysis, there was a positive association between postpartum modern family planning use and family planning counselling during ANC, satisfaction on the ANC service, birth preparedness and complication readiness plan, place of delivery, post natal care service utilization, counselling on breast feeding, residence, educational status and occupation of the mother.

In multivariable Generalized Estimating Equation logistic regression analysis, since post natal care use and place of delivery showed co linearity effect, place of delivery was not fitted in the final model. Family planning counseling during antenatal care, birth preparedness and

complication readiness plan, counselling on breast feeding at least once during ANC visits, satisfaction on the antenatal care service while she was pregnant and post natal care visit remained to have statistically significant association with postpartum modern family planning use.

The odds of postpartum modern family planning use within 6 weeks after birth among women who were counseled about postpartum family planning at their third or fourth visit were 3.5 times higher compared to those who were not counselled at any of their visits (AOR=3.5; 95% CI:2.19,5.49). The odds of postpartum modern family planning use within 6 weeks after birth among women who were counseled about birth preparedness and complication readiness plan at their third or fourth ANC visit were 2.2 times higher compared to those who were not counseled at all (AOR= 2.2; 95% CI:1.32,3.55). The odds of postpartum modern family planning use within 6 weeks after birth among women who were counseled about breast feeding at least once during their ANC visits were 1.8 times higher compared to those women who were not counselled during their ANC visits (AOR= 1.8; 95% CI:1.15,2.82). The odds of post partum modern family planning use within 6 weeks after birth among women who had at least one post natal care visit during their postpartum period were 13.5 times higher compared to those who had no any post natal care visit ((AOR= 13.5; 95% CI:8.24,22.07). In addition, the odds of post partum modern family planning use within 6 weeks after birth among women who were satisfied by the ANC service they received for their recent pregnancy were 4.1 times higher compared to their counter parts (AOR= 4.12; 95% CI:2.55,6.66) (Table 11).

Table 11: Multivariable GEE logistic regression results to assess the association between counseling on postpartum family planning (PPFP) during ANC and PPFP use at public health facilities of Bahir- Dar City Administration (N=823), October 2015 to August 2016

Variables		Postpartum modern		COR(95%CI)	AOR(95%CI)
		family planning use			
		Yes (%)	No (%)		
PPFP counseling during ANC	Counselled at least in one visit	72(38.5)	115(61.5)	4.06(2.80,5.89)	3.47(2.19,5.49*
Residence	Not counselled at all	85(13.4)	551(86.6)	1.00	1.00
Educational status	Urban	154(21.2)	574(78.8)	8.23(2.57,26.34)	1,02(0.33,3.12)
	Rural	3(3.2)	92(96.8)	1.00	1.00
	Secondary school and above	118(24.9)	355(75.1)	3.78(2.10,6.77)	1.47(0,67,3.25)
Occupation	Primary school	25(14.1)	152(85.9)	1.87(0.936,3.73)	1.12(0.47,2.71)
	No formal education	14(8.1)	159(91.9)	1.00	1.00
	Employee ^a	84(27.0)	227(73.0)	10.61(3.27,34.46)	1.93(0.50,7.48)
Counseling on BPRCP	House wife	70(16.5)	353(83.5)	5.67(1.75,18.49)	1.47(0.41,5.32)
	Farmer	3(3.4)	86(96.6)	1.00	1.00
	Counseled at least in one visit	116(26.9)	315(73.1)	3.15(2.14,4.64)	2.16(1.32,3.55)*
Counseling on breast feeding	Not counseled at all	41(10.5)	351(89.5)	1.00	1.00
	Counseled at least in one visit	72(32.6)	149(67.4)	2.94(2.04,4.23)	1.80(1.15,2.82)*
	Not counseled at all	85(14.1)	517(85.9)	1.00	1.00
At least one PNC visit	yes	96(60.4)	63(39.6)	15.06(9.97,22.80)	13.49(8.24,22.07)*
Satisfaction on ANC service	no	61(9.2)	603(90.8)	1.00	1.00
	Satisfied	111(29.5)	265(70.5)	3.65(2.50,5.32)	4.12 (2.55,6.66)*
	Not satisfied	46(10.3)	401(89.7)	1.00	1.00

* Indicates significant difference at $p < 0.05$; ^a = Government, private and Nongovernmental organization employees.

5.7.1. Practice of essential newborn care interventions among study participants

Cord was cut mostly by the use of reused but boiled razorblade or scissor 716 (87%). To keep the babies warm, 745 (90.5%) were immediately wrapped. Early bathing was common, with 120 (14.6 %) of the babies bathed within 24 hours after birth; and about 98 (11.9%) of the babies were not breast fed within an hour after birth. Although prelacteal feeding was low, still 18 (2.2%) of babies were given butter as first feed (Table 12).

Table 12: Level of newborn care interventions during delivery and neonatal period among study participants in public health facilities of Bahir Dar City administration (N=823), October 2015 to August 2016.

Variables	Frequency	percent
Place of delivery		
Health facility	718	87.2
Home	105	12.8
Type of instrument used to cut the cord		
Reused but boiled blade or scissor	716	87.0
New blade or scissor	107	13.0
What was used to tie the cord		
Plastic band	593	72.1
Sterile thread	123	14.9
Cloth strip	107	13.0
Substance applied on the cord		
None	819	99.5
Drug	3	0.4
powder	1	0.1
How long after birth was the baby rapped		
Immediately	745	90.5
Within 5 minutes	44	5.3
6-10 minutes	30	3.6

11-20 minutes	3	0.4
21-30 minutes	1	0.1
How long after birth was the baby first bathed		
Within one hour	3	0.4
2-6 hours	19	2.3
7-12 hours	50	6.1
13-24 hours	48	5.8
>24 hours	703	85.4
How long after birth was the baby first breast fed		
Within one hour	725	88.1
2-6 hours	82	10.0
7-12 hours	15	1.8
13-24 hours	1	0.1
>24 hours	0	0.0
What was given for the baby as the first feeding		
Colostrum	805	97.8
Butter	18	2.2

5.7.2. Quality ANC and essential newborn care practices

About 87.2% of the respondents delivered in the health facility (hospital or health center) but the rest 12.8% gave birth at home. All mothers who gave birth at home practiced poor essential newborn care practice.

In general the composite index of good essential newborn care practice was 13.7%, with 95%CI (11.3%, 16.2%). Of those who received acceptable ANC service quality and unacceptable antenatal care service quality 24.7% and 9.6% of them had good essential newborn care practice respectively ($X^2=31.668$, $p<0.000$).

The indices of clean cord care; good neonatal feeding and optimal thermal care were 14.8% with 95%CI (12.4%, 17.3%), 87.8% with 95%CI (85.7%, 89.8%) and 85.2% with 95%CI (82.7%, 87.6%) respectively

5.7.3. Predictors of Essential newborn care practices

In a Generalized Estimating Equation binary logistic regression analysis, good essential newborn care practice had a positive association with antenatal care quality, use of postnatal care, being urban residence, being an employee and young age of the mother. However parity had a negative association with good essential newborn care practice. The other socio demographic backgrounds of the study women (educational status, ethnicity, marital status and religion) were not associated with essential newborn care practice.

In multivariable Generalized Estimating Equation logistic regression analysis antenatal care quality, PNC utilization, parity and age of the mother remained to have statistically significant association with essential newborn care practices.

The odds of good essential newborn care practice among women who received acceptable ANC quality during their pregnancy was 2.31 time higher compared to those who received unacceptable quality of ANC during their pregnancy (AOR= 2.31, 95% CI=1.47, 3.65). The odds of good essential newborn care practice among women who had PNC service within six weeks was 1.69 times higher compared to those women who had no PNC visit (AOR= 1.69, 95% CI=1.03, 2.79). The odds of good essential newborn care practice among prima-para women was reduced by 57% compared to those women who were multi para or grand multi para (AOR= 0.43, 95% CI= 0.27, 0.69). The odds of good essential newborn care practice among young women with age 15-24 years was 3.94 times higher compared to elderly women with age ≥ 35 years (AOR= 3.94, 95% CI=1.12, 13.91) (Table 13).

Table 13: Multivariable GEE logistic regression results to assess the association between Antenatal care quality and Essential newborn care (ENBC) practices (N=823), October 2015 to August 2016

Variables		ENBC practice		COR(95%CI)	AOR(95%CI)
		Good ENBC	Poor ENBC		
		n (%)	n (%)		
ANC quality	acceptable	56(24.7)	171(75.1)	3.01(2.06,4.65)	2.31(1.47,3.65)*
	unacceptable	57(9.6)	539(90.4)	1.00	1.00
Residence	Urban	108(14.8)	620(85.2)	3.14(1.25,7.90)	1.88(0.29,12.26)
	Rural	5(5.3)	90(94.7)	1.00	1.00
PNC use	Yes	39(23.4)	128(76.6)	2.34(1.55,3.69)	1.69(1.03,2.79)*
	No	74(11.3)	581(88.7)	1.00	1.00
Parity	Primi para	38(10.8)	314(89.2)	0.64(0.43,0.97)	0.43(0.27,0.69)*
	Multi/grand multi para	75(15.9)	396(84.1)	1.00	
Age of the mother (in years)	15-24	67(18.9)	287(81.1)	2.88(0.86,9.62)	3.94(1.12,13.91)*
	25-34	43(10.0)	386(90.0)	1.37(0.41,4.65)	1.37(0.39,4.82)
	≥35	3(7.5)	37(92.5)	1.00	1.00
Occupation	Employee	44(14.1)	267(85.9)	2.77(1.06,7.21)	1.65(0.24,11.46)
	House wife	64(15.1)	359(84.9)	3.00(1.17,7.67)	1.77(0.27,11.62)
	Farmer	5(5.6)	84(94.4)	1.00	1.00

* Indicates significant difference at $p < 0.05$

6. Discussion

6.1. Antenatal care quality and Institutional delivery

This study revealed that only about one in four observed pregnant women received acceptable quality antenatal care service. The facility audit also consolidated this finding as almost half of ANC providers were not trained on FANC protocol; one health facility did not do syphilis screening (VDRL) test for the last two years due to lack of the test kit and no health facility had the focused antenatal care guide line. This is consistent with a study done in rural Mexico that reported 28.4% received acceptable quality ANC [48]. The proportion of women who received quality antenatal care in this study and the study done in Mexico was almost the same, yet there is 12 years gap in between two studies which indicates that the quality of ANC service in the current study is far behind.

The low quality ANC service in the current study might be due to the reason that the health facilities in the study area might not be well equipped with the necessary inputs and competent professionals for quality ANC service provision; presence of few number of mid wives per health facility compared to the ANC service users which might lead to insufficient counseling on the need for all women during ANC visits due to high work load.

In addition there might be a belief among ANC providers to focus on clinical services rather than preventive services with the assumption of only women with obstetric risks need to be counseled for institutional delivery and post partum family planning use or only those suspected for anemia and intestinal parasites need to be treated with iron and mebendazole respectively, which might affect the quality of ANC service.

Though, the number of women who received quality antenatal care service in this study was low, those who received acceptable quality antenatal care services with respect to the focused antenatal care protocol had increased odds of giving birth at health facility compared to their counterparts. This is consonance with other study findings [48, 103, 104]. This implies that better quality and packages of ANC services provided to pregnant women may increase their confidence on the health system and enthusiasm for future use of the continuum of care like to give birth at health facility. In addition, quality ANC service allows early detection of obstetric

complications and gives an opportunity to influence women's decision to have a skilled attendant during delivery. Furthermore, if women received quality ANC service there is a tendency to be provided with information on the importance of giving birth at health facility and having a birth preparedness and complication readiness plan for emergency conditions like labor[10].

This implied the quality of ANC service needs to be the center of attention to promote health facility delivery especially in Ethiopia where home delivery is the norm (as three – fourth of the mothers are giving birth at home) [12]; planning in advance for delivery event is not part of traditional practice and health facilities are sought as a last resort after serious complications have developed. Hence, if pregnant women are counselled during their ANC visits to have a plan for facility delivery together with arrangement for transport and other amenities like money, blood and companions for emergency conditions, they are highly likely to give birth at health facility.

Furthermore, if women receive quality ANC they will have better knowledge and information on the benefits of accessing maternal health care services thereby increasing their state of preventive health care practice and are more likely to go to the health institutions for delivery before complications occurred.

Quality ANC service is critical to ensure the intended benefits for both the mother and the baby otherwise the whole process loses credibility. Hence achieving the sustainable development goal of reducing global maternal mortality to $<70/100,000$ live birth or the target of no country should have a maternal mortality ratio $> 140/100,000$ by 2030 cannot be achieved without quality antenatal care provision [4, 105, 106]. Other studies also reported women who had three or more visits were more likely to have skilled birth attendance as compared to those who didn't have follow up[46, 51, 107].

This might be due to the fact that; as the frequency of ANC visits increased, the packages of ANC services and the information provided to pregnant women by ANC providers might increase their knowledge on the importance of having skilled birth attendant at birth there by increasing the women's likely to give birth at the health facility.

The current study also showed that there were substantial inequalities in the use of health facility delivery service by residence and educational status of the mother. Urban women were more

likely to give birth at health facility compared to the rural women. This is consistent with other studies [12, 107, 108] which might be due to urban women tend to have better access to health facilities and can reach the health facility easily in urgent conditions like during labor as they are accessible to transportation but a rural mother who is in labor and without access to transport will be obliged to walk on foot for a long distance and may further limit their likely to give birth at the health institution. Moreover, rural women are more readily influenced by traditional practices that run contrary to modern health care and accept fate about whatever might happen when they delivered at home.

This study also revealed as the educational status of a mother increases beyond secondary school the odds of giving birth at the health facility also increases. This is consistent with other studies [12, 109-111]. However there was no significant difference on the use of health facility delivery among women with primary school educational status and those who were unable to read and write. This might be explained by women with higher educational status is more likely to have a better income and highly likely able to afford the costs associated with the health care utilization compared to uneducated women. In addition education may also increase self-confidence and enhance their level of autonomy and freedom to make health-related decisions, including the use of maternal health services [47].

In addition this study also give an insight about educating women only upto primary school might not suffice for promoting health facility delivery, therefore there is a need to scale up the national education policy of universal access to primary education to access to secondary education after this finding is confirmed by additional studies and it is also important to empower women to complete their secondary education or above to promote the use of health facility delivery.

This study also revealed that younger pregnant women (<25 years) had higher odds of giving birth at the health facility compared to older pregnant women (≥ 35 years) but when the age of women became 25 years and above it had no significant effect on the odds of giving birth at health institution. This finding is in line with a study done in Andhra Pradesh that reported older pregnant women with age ≥ 30 years were more likely to give birth at home [50] .

However this finding is contradictory to a study in India that reported age had no impact on the decision to undergo health facility delivery[53].

The possible reasons for this finding might be due to the reason that older women might have an experience of giving birth (became multi para) and those women accomplished their previous delivery safely might have a belief that subsequent pregnancies will result in successful outcome; thereby increasing their chance to give birth at home.

6.2. Quality ANC and Birth weight

LBW contributes 60% to 80% of all neonatal deaths. World Health organization set a goal to reduce the number of infants with LBW by 30% by the year 2025 and similarly the third Sustainable Development Goal (SDG) by 2030 also aimed to reduce neonatal mortality to at least as low as 12 per 1,000 live births. [4, 112]

However in this study 7.8% (95%CI= 6.0%, 9.7%) pregnant women delivered low birth weight babies. This finding is consistent with findings from an urban population in Ethiopia, 9%in urban population and 11% in the general population, in Ghana (6.1%) , in Colombia (8.7%), in Mexico (8%) but is lower than study findings in Angola and (25.9%), in India (26.8%)[113-118]. The possible reason might be due to the difference in the characteristics of study participants as all the participants in this study were those who enrolled to their first ANC visit in their first trimester and were also followed till their four antenatal visits; of those who give birth at health facility, majority (94 %) were from urban and peri- urban populations that might increase the tendency to get the essential components of antenatal care like maternal nutritional advice, Iron-folic acid supplementation and other services during subsequent ANC visits that might contribute positively for birth weight.

The difference in the study period might also have its own effect for the difference in the findings as many interventions like the community based newborn care packages to improve maternal and newborn health are being implemented by Ethiopia since 2013. In addition, except the current study and the study in Ghana that collects data on birth weight direct measurement of the baby within one hour after birth, all other studies collect information about birth weight

based on mother's recall or birth registration records that might affect accuracy of their result due to recall and/or social desirability bias.

The prevalence of LBW among women who received acceptable and not acceptable quality of ANC services was statistically different (with 1.4% Vs 10.5%) respectively ($p=0.001$). This is supported with another study finding that reported a complete prenatal care (counselling, physical examination, tests and immunizations) becomes essential to ensure a normal birth weight[119]. Even if the frequency of ANC visit may not have direct causal link to LBW, better quality of the service will lead to better nutritional status of mothers and the adoption of healthy behaviors because of the counselling and other services given to the pregnant women during ANC that can reduce LBW[120, 121].

Therefore, the quality of routine ANC services needs to be emphasized. At the community level, mothers need to be supported and encouraged to attend ANC through education and counselling and that this becomes accepted as the social norm and is perceived as benefitting the whole community by reducing LBW and its longer term negative consequences.

This study revealed that the frequency of nutritional advice given to pregnant women during their ANC visits have statistically significant effect on increasing the birth weight of their babies. In contrary to this finding a Meta analysis done from thirty-three studies evidenced nutrition education and counselling significantly improved mean birth weight but was not significantly associated with the risk of low birth weight[122].

The difference might be due to the reason that this study considers dose –response relationship of nutritional advice unlike those studies included in the meta- analysis and the authors of the meta-analysis also indicated except one study, the overall quality of studies extracted (included) were low. The other possible reason could be since most of the studies included in the meta-analysis were conducted in developed countries (USA, UK, Australia, Argentina and Greece); the participants of studies in these countries might have a better educational status and awareness on maternal nutrition during pregnancy and other essential services needed for a pregnant woman so that there might not be a significant difference between women who were counseled about maternal nutrition during ANC and those who were not counseled.

The current study showed more than one in ten pregnant women were supplemented with less than 90 tablets while they were pregnant; it also revealed that the birth weight of babies born from pregnant women who were supplemented with <90 tablets during their ANC visits was significantly decreased compared to those who were supplemented with 90 tablets or more, which implies iron-folic acid supplementation had a dose –response relationship with birth weight.

This finding is supported by a systematic review that reported, 25% of low birth weight in low-income countries was attributable to maternal anemia during pregnancy; a Meta analysis done from ten randomized control trials indicating two percent increase in birth weight for every two-fold increase in folate intake and other studies conducted in Spain and Atlanta that revealed duration longer than four months of iron supplementation gave significant protective odds ratio for low birth weight and women with low folate intake ($\leq 240 \mu\text{g/d}$) had >3 times greater risk for low birth weight infant than women with folate intake $>240 \mu\text{g/d}$ respectively[63, 65, 123-125].

The physiological mechanism of iron supplementation on birth weight is not clearly understood, however, there are two hypotheses about improvements in birth weight due to iron supplements. First, iron deficiency anemia leads to changes in nor-epinephrine, cortisol and corticotrophin 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[126].

In this study majority (97.6%) of pregnant women were given two doses of tetanus toxoid vaccinations compared to the Ethiopian Demographic and Health Survey 2016 report that revealed only half of the pregnant women who gave birth five years prior to the survey took two doses (with 72% urban and 46% rural women) [12]. In addition the current study reported providing two doses of tetanus toxoid for pregnant women during their antenatal care visits significantly increased the birth weight of their babies compared to those women who were given only one dose.

The increase in birth weight of babies born to women who received two doses of tetanus toxoid might not be due to the direct effect of tetanus toxoid vaccination on birth weight rather it might be due to the fact that when women came to health facility for TT vaccinations, they are more

likely to get nutritional advices or iron- folic acid supplementations that contribute for better birth weight.

This study also found that there was an increase in birth weight as educational status of pregnant women increased from no education or primary education to secondary education and above. This is also supported by studies conducted in Bangladesh and Beirut[127, 128].

In contrary to maternal education that had positive association to birth weight, multi parity or grand multi parity of mothers and older age of the mother (≥ 35 years) had negative association with birth weight.

6.3. Counseling on family planning during ANC and postpartum modern family planning use

For women who are not breastfeeding, pregnancy can occur within 45 days of giving birth[129]. Based on the 2016 EDHS report, with only 35% modern family planning use, and high unmet need (22%)[12], investigating the effectiveness of providing family planning information through antenatal care services on postpartum family planning use, and the extent to which providers utilize these opportunities, are increasingly important.

The current study found that less than one-fourth of the women were given counseling on postpartum family planning and only one out of five postpartum women were using modern family planning at 6weeks after giving birth which implies that majority of women are at risk of closely spaced pregnancy. The finding is consistent with a study done in Adigrat Northern Ethiopia 24.6% [36] but is higher than a cross - country study done using their respective most recent (2008-2012 DHS data); Ethiopia (8%), Comoros (6.4%) and Burundi (5.8%) [79]

The possible explanations for higher postpartum family planning use in this study compared to studies done in some of the afore mentioned countries could be attributed to the time gap between the current study and DHS data collected in those countries; all participants of the current study had four ANC visits that might increase their likelihood to be aware and use postpartum family planning; the difference in background characteristics of study participants, for instance most (88.5%) of the participants of this study were urban dwellers so that they might have better awareness and access to family planning methods compared to DHS studies that

includes both rural and urban population groups. In addition, efforts by the Ethiopian government to strengthen strategies for maternal and child mortality reduction through community based health education and reproductive health services being given on house to house basis by health extension workers and health development armies hand in hand might also have an effect for the increase in postpartum modern family planning use in the current study.

This study also revealed that the odds of using post partum family planning use within six weeks after birth among women who were counseled on FP at least once during their ANC visits, was higher compared to women who were not counseled at all during their ANC visits. This finding is also supported by studies done in Mexico, Uttar Pradesh and systematic review published in 2014 that reported integration of family planning into antenatal care services showed increased modern family planning use in the post partum period when the demand is high [77, 78]. This might be due to the reason that frequent exposure of pregnant women to health professionals during antenatal care offers ample opportunity to discuss about family planning when couples are not distracted by a new baby and when they have time to consider all the options.

Among postpartum women who adopted postpartum modern family planning, Injectables and implants were the most common methods reported by the current study and this is also in line with the analysis done to assess method mix among PPFP users from DHS 2011 data [130] except that there is improvement in utilization of Implanon compared to EDHS 2011 report (21.7% Vs 10%). Similarly, studies done on the general population in Gondar and 2016EDHS report also reported that the most commonly used PPFP methods are injectables and implants[12, 96].

This implied method mix in the study area relies heavily on short-acting methods, with the majority of women using injectables and only a fraction of postpartum family planning users are using long-acting methods (implants and IUDs).

Satisfaction by the ANC services received during pregnancy was significant in predicting the likelihood of using postpartum modern family planning within 6 weeks by the current study. The study in Mexico among low-income women also supported this finding as it reported women living in communities with high quality care were more likely to use a family planning method than those with lower quality of care [77].

This might be attributed to high quality care increases the confidence of women on the health system there by to comply with the advice given by health professionals during ANC and might have a positive effect to use the continuum of care like postpartum family planning use.

The use of modern family planning is significantly associated with the use of post natal care in this study. This relationship is also evidenced by other studies findings conducted in North West Ethiopia, India and Mexico [40, 96, 131].

The present study showed women who were counseled about birth preparedness and complication readiness plan during antenatal care were more likely to use post partum modern family planning compared to their counter parts. This might be due to the reason that when health professionals discuss about birth preparedness and complication readiness plan they are more likely to discuss with the danger signs of pregnancy and their high probability of occurrence in closely spaced pregnancies; which might have a positive influence on the decision of women to use postpartum family planning. Similarly, this study also reported women who were counseled about breast feeding were more likely to use postpartum modern family planning.

6.4. Antenatal care quality and essential newborn care practices

This study revealed the quality of antenatal care given for pregnant women during pregnancy had a positive effect on essential newborn care practices. This is in line with a maternal and newborn care guide for skilled providers written by JHPIEGO/Maternal and neonatal health program that noted if a woman and her family are well prepared for normal child birth as well as any possible maternal and newborn complications, the woman or baby is more likely to receive skilled and timely care needed to preserve their health and ensure survival[87]. However this finding is in contradictory to a study done Mangwi, Uganda that reported adherence to four or more ANC visits did not show statistically significant relations with newborn care practices [97].

The difference might be due to the reason that the current study tried to look the effect of antenatal care quality (contents of antenatal care services) that the women received on essential newborn care practices but the study in Uganda investigated the association between frequencies of ANC visits with the essential newborn care practices without considering the contents of services that a woman received.

The current study also noted the composite indices of good essential newborn care practices were low; only one in seven neonates had clean cord care. Unclean cord care was mainly affected by the use of any cloth strip or plastic band which was cut by unsterile scissor. This finding is also supported by a study finding in Uttar, Pradesh India that noted the number of antenatal care was found to be independently associated with correct breast-feeding practices and thermal care but not with clean cord care implying the quality of ANC matters essential newborn care practice more than the frequency of ANC visits [88, 97].

The current study finding is lower than a study done in Eastern Uganda (46.9%)[132] in Masindi, Uganda (23.7%) [97] Eastern Uganda (38%)[102]. This difference might be explained by the difference in the supplies for clean cord care at the health facilities and commitment of health professionals as well as the knowledge of her accompanies during delivery as most of newborn care practices are beyond the control of the mother alone. For example, the person who offers delivery care will cut and tie the cord without necessarily any input from the mother. In the same way drying, wrapping and bathing of the baby remains under the control of the person assisting her in the delivery or the relatives who will attend to her soon after delivery. Yet it is important to note that clean cord care is very important in preventing early neonatal infections[8].

In this study compared to clean cord care; optimal thermal care and good neonatal feeding interventions were well practiced ($\geq 85\%$). Yet, more than 10% of neonates had poor thermal care and neonatal feeding practices. Poor thermal care was mainly due to first bath before 24 hours after birth (14.6%). Optimal thermal care and good neonatal feeding practices were better practiced in this study compared to study done in eastern Uganda that reported 11.5% optimal feeding practices and 66.3% receiving thermal protection[132].

This difference might be explained by the cultural difference as breast feeding is a norm in Ethiopia even if it might not be based on WHO recommendation which is 8-12 times per 24 hours. The other reason for the difference might be the background characteristics of the study participants as all of the pregnant women for the current study had four ANC visits which is also supported by a previous study in India that reported frequency of ANC visit is independently associated with breast feeding and thermal care[88]. In addition, most of the pregnant women were from urban (88.5%) and more than half of them (57.5%) had secondary and above

educational status for the current study compared to less than half (48.9%) of the study women had four or more ANC visits and only 33% of them had secondary and above educational status for a study done in eastern Uganda.

The low level of composite index of good essential newborn care practices in this study was mainly driven by unclean cord care (85.2%) that might be an obstacle for the achievement of Sustainable Development Goal of ending preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal and under-five mortality to at least as low as 12 and 25 per 1,000 live births by 2030 respectively [4]. Similarly it might also hinder meeting the Ethiopian health sector transformation plan of reducing neonatal mortality rates to 10 per 1,000 live births by 2020 [133].

In addition, post natal care utilization and mothers with young age (15-24years) had a positive association with essential newborn care practices. However parity of a woman had also a positive association with newborn care practices. The positive association of parity with essential newborn care practice might be due to the reason that multi para or grand multi para women have better self efficacy than primi para women in caring their child because of their previous experiences even if primi para women are very eager to care their babies with less skill.

7. Methodological discussion

7.1. Validity and generalizability

Validity is the extent to which a study measures the true value that is expected to be measured so that the study results are accurate and the conclusions made are valid (generalizable).

The extents to which the findings are accurate and the conclusions derived from these findings can be generalized depend on the data quality at all stages of the study (relevance of the study design, adequate sample size and random sampling technique, right data collection tool and procedures and appropriate data analysis techniques are critical for validity).

This can also be explained as to what extent the role of chance, bias, or confounders is accounted for the observed association between the independent variables and dependent variable there by reflecting the true relationship between explanatory variables and the outcome of interest.

7.1.1. Internal validity

Internal validity refers the extent to which the information collected accurately answers the research question. While the results of a study may reflect the true effect of an exposure on the development of the outcome of interest, it should always be considered that the findings may in fact be due to an alternative explanation such as the role of chance (random error), bias (selection, information or measurement) or confounding effect that could produce spurious results, leading to the conclusion of the existence of a valid statistical association when one does not exist, or alternatively, the absence of an association when one is truly present.

Therefore to maintain the internal validity of this research the study protocol and data collection tool validated in the Ethiopian context was used[98]. The data collection tool (observation checklist) was translated to the local language so that data collectors similarly administered the tool and pretesting of the tool was also carried out before the commencement of the data collection process to clarify any ambiguity on the check list.

Female diploma and BSc Midwives with previous exposure to data collection were involved in the data collection as data collectors and supervisors respectively to maintain the data quality as they are close in profession to maternal and newborn health services.

An intensive data collector and supervisor training supported with practical role plays going through question by question was conducted one week before the actual data collection period. There was also close field supervision, check up of filled questionnaire for completeness and consistency; daily debriefing on the problems encountered and provision of feedback at the end of each data collection day especially until they become very familiar to the data collection tool.

There was also an effort to minimize measurement bias during measuring the birth weight of the baby by weighing the baby immediately or within one hour after birth rather than recall from the mother and by calibrating the weight measuring scale to the nearest 10 kilograms to collect reliable data.

In addition to control the confounding effect different efforts were made during the design and analysis stages such as study health facilities with different level (hospital and health centers) with different number and qualification mix of ANC providers were included. A multi variable regression analysis was also carried out to control the confounding effect and to control the cluster effect among women who received ANC service in the same facility more likely by the same provider as the number of midwives in a facility in Ethiopian context is very few; Generalized Estimating Equation (GEE) with binary response regression and linear regression analysis depending on the type of the outcome variable employing a robust estimator with exchangeable correlation matrix was carried out.

During analysis, probability plot (P-P plot) was used to assess linearity assumptions. Model fitness and presence of multi co linearity, using -2 log likely hood ratio with Hosmer-Lemeshow goodness of fit test (p-value) and VIF respectively was also employed. In addition Durbin-Watson values were also checked for independence of variables.

7.1.2. External validity (generalizability)

External validity or generalizability refers to the extent to which the inferences drawn from study findings can be generalized to a broader population beyond the study population.

The role of chance need to be kept in mind in designing any study and in interpreting the data because, small sample size may lead to imprecise estimates. To increase the generalizability of the findings of this dissertation, adequate sample size was taken, randomly selected pregnant women who were receiving their ANC service at health centers and Hospitals were also participated in the study to avoid selection bias due to a difference in service quality among different level of health facilities .In addition to avoid the confounders like the cluster effect among those women who received a service in the same facility, a generalized estimating equation was carried out during analysis. Therefore, the findings of this research can be generalized to the study area and other similar settings in particular.

8. Strength and limitation of the study

As the data collection was done by direct observation while women receive antenatal care services using observation checklist, the study might not be affected by recall and social desirability bias. In addition employing a generalized estimating equation analysis controls the clustering effect among women who received ANC services within the same facility by the same ANC provider and those could be mentioned as the strength of the study.

However, this study might also have limitations as ANC providers might work with their maximum effort while the data collectors observe their service provision (Hawthorn effect) even if its effect might decrease slowly when the providers adapt their presence as the data collection period was long (one year). To minimize the hawthorn effect data collectors did not tell the ANC providers about what specific ANC services they were observing rather than telling them in a general way.

In addition, this study might also have selection bias since women who gave birth at home were excluded during analysis on birth weight due to inability to access data on it. Therefore those women who had no ANC follow up or give birth at home might have different back ground characteristics from those who had ANC follow up or give birth at health facilities.

9. Conclusions and policy implications

9.1. Conclusions

- The quality of antenatal care service in public health facilities of the study area was compromised/low.
- Provision of acceptable quality of ANC service, being urban dweller, being younger age and secondary level or more educational status of pregnant women were the predictors that increase the use of institutional delivery
- The study found that near to one in ten neonates were born with low birth weight.
- Access to quality antenatal care increases the birth weight of new born babies.
- Essential components of antenatal care (maternal nutritional advice, iron-folic acid supplementation, and tetanus toxoid vaccination) and socio- demographic variables like maternal educational status and parity were determinants for birth weight.
- A fraction of pregnant women were provided with family planning counseling during ANC.
- Family planning counseling during ANC services had a significant effect on postpartum modern family planning use within six weeks after birth.
- Counseling about postpartum family planning during ANC, satisfaction on ANC services women received while they were pregnant, counseling on birth preparedness and complication readiness plan, counseling on breast feeding and use of post natal care services were independent predictors for postpartum modern family planning use.
- The composite index of good essential newborn care practices is very low which is mainly due to a problem related to clean cord care; only one in seven neonates had clean cord care. Unclean cord care was mainly affected by the use of any cloth strip or plastic band which was cut by unsterile scissor.
- There is statistical significant improvement on essential newborn care practice among women who received acceptable quality ANC service compared to their counter parts.
- Use of Postnatal care service, young age of the mother, being multi para were the other determinants that influence essential newborn care practice positively.

9.2. Policy and program implications

This study evidenced that it is quality of ANC service matters continuum of maternal and newborn health care services and to reduce low birth weight of the baby more than frequency visits. However, the quality of ANC service provided to pregnant women in public health facilities of Bahir Dar city administration is low; with heterogeneous adherence to focused ANC guideline during provision of essential contents of the service.

It also showed that the extent to which ANC providers utilize ANC visits as opportunities to promote healthy behaviors like post partum family planning, post natal care use and maternity skills (essential newborn care practices) was low that led to majority of the babies had poor essential newborn care practice.

Recommendations

❖ For researchers

- Researchers need to conduct large scale research to investigate the quality of ANC services provided to pregnant women and its impact on the continuum of maternal and neonatal health care services as this study covers a limited area to see the reliability of this study findings and make sure the need for a change on the present ANC approach and its contents. In addition comparing quality of ANC among Public versus private health facilities is also important.
- As delivery event and post partum period are culturally attached, a qualitative research need also be carried out to explore the reasons why pregnant women even with four ANC visits prefer to give birth at home and do not want to come to the health facility for post natal care or post partum family planning within six weeks after birth.

❖ For maternal and newborn health program implementers

- Strengthening adherence of providers to essential components of antenatal care like advice on nutrition during pregnancy, post partum family planning; essential newborn care practices and iron- folic acid supplementation for every pregnant woman through need based capacity building; regular monitoring and provision of feedback is very important to improve the quality of ANC services at each visit.

- The local authorities at each level of the health sector or the nongovernmental organizations working to improve maternal and newborn health need to ensure continuity of care through further strengthening the integration of maternal and newborn health care services, providing training for community health workers (like health extension workers and health development armies); and referral linkages between community health workers and primary level of care.
- ANC providers should be committed to comply with the focused antenatal care guideline so that mothers will not miss essential contents of ANC services and they also need to request their necessary inputs before they become out of stock.
- The frequency of contact of pregnant women with ANC providers should be increased to avoid over burden of many packages of ANC service in a single visit so that missed opportunities for essential contents of ANC service can be minimized
- The Federal Ministry of Health should have not only frequency of visit but also quality measurement indicator for ANC service in its routine Health management information System
- The Federal Ministry of Education should work towards universal access for education beyond primary school as this study showed completing primary education had no significant difference on the use of maternal health care compared to those who had no formal education after confirming this finding with large scale studies.

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12. Annexes: Original papers and data Collection tools

RESEARCH ARTICLE

Antenatal care service quality increases the odds of utilizing institutional delivery in Bahir Dar city administration, North Western: A prospective follow up study

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Abstract

Background

In Ethiopia, more than 62% of pregnant women attend antenatal care at least once, yet only about one in four women give birth at health facility. This gap has fueled the need to investigate on the quality of ANC services at public health facilities and its link with the use of institutional delivery.

Objective

To assess the linkage between ANC quality and the use of institutional delivery among pregnant women attending ANC at public health facilities of BDR City Administration

Methods

A facility based prospective follow up study was conducted and nine hundred seventy pregnant women with gestational age 16 weeks who came for their first ANC visit were enrolled. Women were followed from their first ANC visit until delivery. Longitudinal data was collected during consultation with ANC providers using structured observation checklist.

ANC service was considered as acceptable quality if women received 75th percentile of the essential ANC services. Generalized Estimating Equation (GEE) was carried out to control cluster effect among women who received ANC in the same facility.

Results

Among 823 pregnant women who completed follow up, only about one third (27.6%) received acceptable quality of ANC services. In one health facility syphilis test was not done at all for the last two years. The odds of giving birth at health institution among pregnant women who received acceptable ANC quality service was about 3.38 times higher than among pregnant women who received unacceptable ANC quality service (AOR = 3.38, 95% CI: 1.67, 6.83).

Conclusion and recommendation: In this study the quality of ANC service provision in public health facilities was compromised/ low. Provision of quality ANC service had a great role in promoting institutional delivery. Therefore the local authorities at each level of health sector or the nongovernmental organizations working to improve maternal health need to provide training on focused antenatal care protocol for ANC providers.

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Introduction Care during pregnancy is important for the health of the mother and the development of the unborn baby. Antenatal care is a crucial time to promote healthy behaviors and parenting skills. World Health Organization (WHO) envisions “every pregnant woman and newborn to receive quality care throughout the pregnancy, childbirth and postnatal period. However, approximately 303 000 women died as a result of pregnancy and childbirth-related complications in 2015; 99% in low-resource settings, with Sub-Saharan Africa (SSA) countries alone accounting for roughly 66% and most can be prevented. The lifetime risk of maternal mortality is estimated at 1 in 36 in SSA, contrasting 1 in 4900 in developed countries. These showed the presence of greater disparities in maternal health care worldwide [1–4]. There is evidenced that effective interventions exist at reasonable cost for the prevention or treatment of virtually all life-threatening maternal and neonatal complications. These interventions include comprehensive reproductive health care; skilled care for all pregnant women, especially during delivery; and emergency obstetric care for all women and infants with life threatening complications. Yet, in spite of the global efforts to improve maternal health, the maternal mortality ratio (MMR) fell by approximately 44% over the past 25 years; this falls short of the MDG5 target reduction of at least 75% in MMR [5, 6]. Although the percentage of women attending Focused Antenatal Care (FANC) for at least once generally tends to be satisfactory even in low-income countries, maternal and neonatal mortality remain high. Similarly, in Ethiopia a relatively high ANC coverage coexists with low institutional delivery service coverage (about three-fourth the Ethiopian mothers are giving birth at home), high maternal mortality ratio (MMR) and neonatal mortality rate (NMR) which are 412/ 100,000 and 29/1000 live births respectively; that is 4 maternal deaths for every 1,000 live births [7, 8].

One of the four programmatic areas of the Ethiopia's innovative Health Extension Program (HEP) which is staffed with two health extension workers (HEW) at each health post is to improve family health (ANC, delivery care, postnatal care and immunization services). The HEP contributes for the quality of ANC by regular mapping of households with pregnant women; referral linkage for ANC to primary health care and through provision of individual counseling on nutrition, breastfeeding, immunization, ITN use, family planning and importance of institutional delivery [9]. However, little conceptual or empirical work exists on the measurement of ANC quality and its role on promoting the use of institutional delivery service in Ethiopia and other low income countries. Previous studies that try to assess ANC quality in the country were considering the frequency of ANC visit rather than the contents of the services and the information provided to pregnant women during their ANC visits. Therefore the aim of this study was to assess the link between antenatal care quality in terms of the contents of the ANC services and the use of institutional delivery.

Competing interests: The authors declare that they have no any financial or non-financial competing interests (political, personal, religious, ideological, academic, intellectual, commercial or any other).

Abbreviations: ANC, Antenatal Care; AOR, Adjusted Odds Ratio; BPCR, Birth Preparedness and Complication Readiness Plan; CI, Confidence Interval; COR, Crude Odds Ratio; FANC, Focused Antenatal Care; GEE, Generalized Estimating Equation; SPSS, Statistical Packages for Social Sciences; VDRL, Venereal Disease Research Laboratory.

Methods Study design, setting and population A facility based prospective follow up study was conducted from October 2015 to August 2016 in Bahir Dar City Administration, Amhara Regional State, which is located in the North West part of Ethiopia. According to the Amhara National Regional State Bureau of Finance and Economic Development report, the projected population by 2015/16 was 297,775 (80.5% urban Vs 19.5% rural), of these 156,515 (52.6%) were females & there were 3,300 eligible pregnant women.

The study was conducted on seven public health facilities, one hospital and six health centers. Currently two public hospitals and ten public health centers are providing maternal health care services but at the beginning of the data collection period of this study, one of the hospitals

and four of the health centers were new and they were not included in the studied health facilities due to less flow of ANC service users. All selected first visit pregnant women who were voluntary to participate; whose gestational age was 16 weeks and on ANC follow up during data collection period were included in the study. Those who were seriously sick or referred from other facilities were excluded.

Sample size and sampling technique: The sample size was calculated by Epi-info version 3.5. with the following assumptions: the proportion of women who gave birth at health facilities among those who received unacceptable antenatal care quality service was 16.5% from previous literature [10], 95% confidence level, 80% power, 2:1 ratio of unexposed to exposed (those who received un acceptable ANC quality service to those who received acceptable quality of ANC) and 10% non response rate. Accordingly, the minimum sample size required for the study was 970 (647 non exposed & 323 exposed participants). Proportional to size allocation was made to achieve the desired sample size of pregnant women from each selected public health facility based on the average number of ANC users in the most recent quarterly report of each health facilities (271 from Bahir Dar H/C, 161 from Felege-Hiwot referral Hospital, 154 from Han HC, 132 from Abay-mado HC, 114 from Shimbit HC, 94 from Meshenti and 42 from Zenzelma HC) Study participants at each health facility were selected using systematic random sampling technique during the data collection period until the required sample size at each health facility was obtained. The sampling interval ($k = 3$) was calculated by dividing the source population to the total sample size (970) and this interval was used in all facilities to select study participants. The first client was selected by simple random sampling technique among the first three ANC service users.

Data collection process. Pregnant women were followed from their first visit till they give birth. A structured observation check list of 88 items developed based on FANC protocol was used to see the routine ANC practice for each visit. The components of ANC services assessed were categorized into three groups: (i) Comprehensive history taking (36 items) (ii); Measurements, tests and treatments (29 items) and (iii) Counseling/ provision of information (23 items).

For first visit: detailed history taking about past and current pregnancy, clinical examination laboratory testing, provision of information; distribution of drugs (TT and iron) and schedule of return visit were assessed.

For second visit: history of complaints in current pregnancy; assessment for fetal heart beat in addition to the clinical examination, information provision & drug distribution (TT and iron) and schedule of return visit were assessed.

For third visit: in addition to the procedures done in the second visit; updating hemoglobin test and prescribing mebendazol for deworming; information provision on breast feeding, immunization, health facility delivery, Birth preparedness and complication Readiness Plan (BPCR), Post Partum Family Planning (PPFP) and Post Natal Care (PNC) and second visit information were assessed.

For fourth visit: history of complaints in current pregnancy; clinical examination and information provision similar to visit three was assessed (Fig 1)

Seven female diploma midwives were data collectors that observe about the contents of the ANC services given and the information provided by the ANC provider using the observation check list that was developed based on FANC protocol while the pregnant women received the ANC services. Two BSc female Midwives were recruited as supervisors. Both data collector and supervisors were not working in health facilities under the study. Training was given on the data collection instrument and how to approach and observe the service provision. Pretest of the instrument, close supervision and daily checkup of the filled questionnaire for completeness were also done to maintain the data quality.

Fig 1. Follow up time for study participants, Bahir Dar, Ethiopia; October 2015 to August 2016.

Dependent- Institutional delivery (Yes/No)

Independent- Quality of ANC was the main exposure variable. Definition of quality was adapted based on the frameworks of Donabedian model. Since “structure” is mainly considered as the conduit through which care takes place and “satisfaction” is a consequence of care rather than true components of quality of care [11, 12] the focus of this study was therefore on process

attributes of quality. It was measured by the extent to which the pregnant women received the essential ANC services in four visits using 88 items. If the essential ANC service was given it was coded as 1 otherwise 0 and a composite index for the overall ANC service quality was calculated for each woman with a minimum of 0 and maximum of 88 scores. Percentile was computed to categorize the quality of the services a woman received. If she scored 75th percentile, of essential ANC services, ANC service was considered acceptable quality otherwise not [13].

Data analysis; Data were coded and entered into EPI data version 3.1 and exported to SPSS version 20 for analysis. Descriptive statistics were used to describe the data. Generalized estimating equation analysis (which is an extension of the generalized linear model to allow analysis of correlated observations such as clustered data) with binary response variable using robust estimator and exchangeable working correlation matrix was carried out to control the cluster effect of the data among women who received ANC services within the same facility by the same ANC provider and to identify the predictor variables for institutional delivery. The model fitness was checked by observing the difference of the -2 log likelihood ratio between the null model and the model with independent variables (P value = 0.81). The significance of each independent variable in the equation was also assessed by Wald statistics test at a significance level of P -value < 0.05 . In addition, Multicollinearity diagnosis was also carried out using variance inflation factor (VIF), which was < 10 for all variables. Based on Hosmer and Lemeshow applied logistic regression guide a p -value < 0.2 was considered to select eligible variables for multivariable regression analyses and p -value < 0.05 was considered to identify statistically significant predictor variables for institutional delivery.

Results

Background characteristics of ANC attendants: Among 970 enrolled mothers 823 (84.8%) completed the follow up (from their first ANC visit to delivery). The reasons for 15.2% loss to follow up were abortion, self referral to other health facilities run by government, private or NGOs, permanent change in work place, temporary move to their mother's home for delivery (for nuli para) and long distance to reach the health facilities especially when gestation age increases. There was no statistically significant difference in background characteristics and quality of services received between those who had loss to follow up and those who completed the follow up (quality of the service for those loss to follow up was considered by the services received only in the first visit)

Among women who completed follow up, those with age <19 years (teen age pregnancy) and those with age ≥ 35 years (elderly pregnancy) were 4.9% each. The mean age ($\pm$ standard deviation) was 25.46 $\pm$ 4.37 years. Nearly ninety percent of the women (88.5%) were urban residents and above half of the participants (51.4%) were house wives. About ninety percent, (90.9%) of the study participants were Orthodox Christian and almost all women (98.5%) were currently married. With regard to their educational status, about 17% of them could not read and write while 57.5% of them had attended secondary school and above (Table 1).

Obstetric history of ANC attendants

Greater than two out of five of them (42.8%) were nuli para; 26.1% primi para, 30.0% multi para and only 1.1% of them were grand multi para (parity greater or equal to five).

Adherence to Focused Antenatal Care (FANC) protocol by the health providers **Comprehensive history taking.**

The past obstetric history taking was heterogeneous. Among 471 women with previous history of pregnancy observed, more than 95% of them were asked about their history of hypertension, cesarean section, heavy bleeding and anemia but only 4.2% of women were asked about their history of convulsion (Table 2).

Information provision on danger signs of pregnancy and other ANC services. Pregnancy complications and their inadequate management threaten the survival and health of too

many mothers and babies. The Safe Motherhood Initiative advocates the provision of advice during antenatal care about potential pregnancy complications, and specifically about how to seek medical care for pregnant women and their families when the danger signs occur. However the information provision and counseling service during antenatal care in the study facilities was not implemented consistently by ANC providers (Table 3 and Fig 2)

Table 1. Socio-demographic characteristics of ANC attendants in public health facilities of Bahir Dar city administration (n = 823), October 2015 to August 2016.

Socio-demographic variables	Number	Percent
Age (in years)	15-19	4.9
	20-24	38.2
	25-29	37.3
	30-34	14.8
	≥ 35	4.9
Religion	Orthodox	90.9
	Muslim	8.9
	Protestant	0.2
Marital status	Married	98.5
	Divorced	1.2
	Widowed	0.3
Educational status	Cannot read and write	16.9
	Can read and write	4.1
	Grade1-4	7.4
	Grade5-8	14.1
	Grade9-10	20.0
	Grade11-12	18.5
	Joined higher institution	19.0
	Amhara	95.7
Ethnicity	Tigre	3.0
	Agew	0.9
	Oromo	0.4
Occupation	House wife	51.4
	Merchant	13.7
	Gov't employee	11.9
	Farmer	10.8
	Private employee	8.4
	NGO employee	0.6
	Other*	3.2

Measurements and laboratory tests done during ANC visits. Weight, blood pressure, fetal heart beat measurements and routine ANC laboratory tests including HIV test were done

for 95.0% of pregnant women. However, HIV test was done in fragmented times (from first visit till delivery) due to inconsistent supply of the test kit. Venereal Disease Research Laboratory (VDRL) test was not done at all for the last two years except only for those pregnant women who were suspected to have syphilis based on history were referred to private health facilities to have the test. More than one in two pregnant mothers (51%) have no hematocrit update at the fourth visit due to the reason that providers repeat the test only if they suspect the women might have anemia (for diagnostic purpose) (Fig 3)

Facility audit. Only two public health facilities in had permanently assigned ANC providers while the rest five health facilities assigned providers for ANC, PNC and delivery rooms to work on rotation. The total number of providers who were working in those five facilities by rotation was 12. On the average, each health facility had two providers for ANC and PNC service provision at the same room. Among the 17 providers 14(82.4%) were mid wives whereas 3 (17.6%) were nurses. Furthermore 8 (47.1%) of the ANC providers were not trained on FANC protocol while 9(52.9%) of them were trained. In all health facilities ANC and PNC services were provided in the same room.

Table 2. Comprehensive history taking about past obstetric history among study participants observed at public health facilities of Bahir Dar city administration (n = 471), October 2015 to August 2016.

Past obstetric Hx asked	Number	Percent
Hx. of hypertension	465	98.7
Hx. of heavy bleeding	462	98.1
Hx. of anemia	454	96.4
Hx. of obstructed labour	452	96.0
Hx. of C/S	452	96.0
Hx. of abortion	321	68.2
Hx. of instrumental delivery	151	32.1
Hx. of Multiple pregnancy	86	18.3
Hx. of Still birth	66	14.0
Hx. of convulsion	20	4.2

NB: Hx = history; C/S = Caesarian Section

Table 3. Advice on danger signs of current pregnancy at each ANC visit among study participants observed at public health facilities of Bahir–Dar city administration (n = 823), October 2015 to August 2016.

Danger signs asked	Visit one, n (%)	Visit two, n (%)	Visit three, n (%)	Visit four, n (%)
Vaginal bleeding	610(74.1)	669(81.3)	513(62.5)	554(67.3)
Severe headache	448(54.4)	441(53.6)	772(93.8)	7732(88.9)
Convulsion	27(3.3)	29(3.5)	73(8.9)	83(10.1)
Severe abdominal pain	483(58.7)	345(41.9)	408(49.6)	422(51.3)
Reduced or absent fetal heart beat	-	823(100.0)	823(100.0)	823(100.0)
Facial or hand swelling	224(27.2)	398(48.4)	790(96.0)	706(85.9)
High temperature	487(59.2)	453(55.0)	472(57.4)	434(52.7)

Only one health facility had generator as an alternative power supply when there is no electricity and none of the health facilities had ANC guide line except two health facilities that posted the ANC algorithm on the wall inside the ANC room. On the other hand, water in the ANC room and soap were available only in two health facilities.

All health facilities had examination coach, BP apparatus, stethoscope, fetoscope, adult weight scale, dipstick test strips for protein and glucose, electrical centrifuge for hematocrit, Rapid Plasma Reagin (RPR) test kit (except one health facility), blood group test reagents, HIV test kit, HCG test strip, TT, Mebendazole, standardized ANC chart and ANC registration log book.

Linkage of antenatal care quality and institutional delivery. The quality of antenatal care was measured by the level of essential antenatal care services given to pregnant women during their 1st to 4th ANC visit with respect to the FANC protocol. Among all pregnant women observed only 227 (27.6%; 95% CI = 24.5%, 30.5%) received acceptable quality of ANC while the rest 596(72.4%; 95%CI = 69.5%, 75.5%) got unacceptable quality of ANC services. After Hosmer and Lemeshow model adequacy was checked (P-value = 0.81) the binary generalized estimating equation (GEE) logistic regression showed that there was a positive association between antenatal care quality and the use of institutional delivery service; age of the

Fig 2. Counselling services provided to observed pregnant women during ANC visits at public health facilities of Bahir -Dar city administration (n = 823), October 2015 to August 2016.

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Antenatal care service quality and institutional delivery place of residence, occupation, educational status and parity also showed an association with institutional delivery and they were eligible for the multivariable GEE logistic regression analysis.

In multivariable GEE logistic regression, quality of antenatal care, age of the mother, place of residence and educational status of the mother remained to have an association with giving birth at health facility. However, occupation and parity of pregnant women did not show statistically significant association with institutional delivery

The odds of giving birth at health institution among pregnant women who received acceptable ANC quality service was about 3.38 times higher than pregnant women who received unacceptable ANC quality service (AOR = 3.38, 95% CI: 1.67, 6.83). The odds of giving birth at health facilities among younger pregnant women (<25 years of age) was 3.69 higher than older pregnant women (age 35 years) (AOR = 3.69, 95% CI: 1.44, 9.49). The odds of giving birth at health facilities among pregnant women living in urban areas was 9.91 times higher than pregnant women who live in rural areas (AOR = 9.91, 95% CI: 2.52, 38.91). Educational status of pregnant women had also positive association with health facility delivery; the odds of giving birth at health facility among pregnant women with educational status of secondary and above was 6.83 times higher compared to those women with no formal

education (AOR = 6.83, 95% CI; 3.33,13.97). However, the odds of giving birth at the health facilities among pregnant women who attend primary school and those who had no formal education (AOR = 1.80, 95% CI; 0.97,3.35) did not show statistically significant difference (Table 4).

Fig 3. Routine laboratory tests done for pregnant women during ANC visits at public health facilities of Bahir -Dar city administration (n = 823), October 2015 to August 2016.

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Discussion

In this study only about one in four of the observed pregnant women received acceptable quality of antenatal care service; this is consistent with a study done in rural Mexico that reported 28.4% received acceptable ANC quality [13]. Even if the proportion of women who received quality antenatal care in this study and the study done in Mexico was almost the same, there is 17 years gap in between two studies which indicates that the quality of ANC service in the study area is far behind. This might be due to the reason that the health facilities in the study area might not be well equipped with the necessary inputs and competent professionals for quality ANC service provision. The facility audit also supported the low quality of ANC service in the study area as almost half of ANC providers were not trained on FANC protocol; one health facility did not do syphilis screening test (VDRL/RPR) for the last two years due to lack of the test kit and no health facility had the focused antenatal care guide line. The quality of ANC service is critical to ensure the intended benefits for both the mother and the baby otherwise the whole process loses credibility. It is one of the interventions that reduce morbidity and mortality risks for the mother and child during pregnancy, delivery, and the postnatal period. Hence achieving the sustainable development goal of reducing global Maternal mortality to <70/100,000 live birth or the target of no country should have a maternal mortality rate > 140/100,000 by 2030 cannot be achieved without quality antenatal care provision [14–16].

Though, the number of women who received quality antenatal care service was low, those who received acceptable quality of antenatal care services with respect to the focused antenatal

care protocol had increased odds of giving birth at health facility. This association suggests that a high level of adherence to quality antenatal care by complying with the focused antenatal care protocol could promote skilled institutional delivery, which is directly related to reductions in maternal mortality. This is supported with other study findings [13, 17, 18].

Table 4. Multivariable generalized estimating equation logistic regression to identify determinants of institutional delivery among pregnant women attending ANC at public health facilities of Bahir- Dar city administration (n = 823), October 2015 to August 2016.

Variables		Health Facility Delivery, n (%)	Home Delivery, n (%)	COR(95%CI)	AOR(95% CI)
ANC quality	Acceptable	215 (94.7)	12 (5.3)	5.41(4.34,6.75)	3.38(1.67, 6.83)*
	Not acceptable	508 (85.2)	88 (14.8)	1.00	1.00
Age	15-24 years	319(90.11)	35(9.9)	3.46 (1.59, 7.52)	3.69(1.44, 9.49)*
	25-34 years	370(86.2)	59(13.8)	2.38(1.13, 5.02)	2.14(0.91, 5.01)
	≥ 35 years	29(72.5)	11(27.5)	1.00	1.00
Resident	Urban	680 (93.4)	48 (6.6)	16.41(10.02,26.87)	9.91(2.52,38.91)*
	Rural	43 (45.3)	52(54.7)	1.00	1.00
Occupation	Employee ^a	164 (95.3)	8 (4.7)	25.11(11.02,57.21)	0.77(0.13,4.59)
	House wife	383 (90.5)	40 (9.5)	10.83(6.42,18.27)	0.73(0.17,3.09)
	Others ^b	134 (96.4)	5 (3.6)	32.83(12.25,87.96)	1.33(0.23,7.72)
	farmer	41(46.1)	48 (53.9)	1.00	1.00
Education	Secondary and above	455 (96.2)	18(3.8)	1.75 (1.28,2.38)	6.83 (3.33,13.97)*
	Primary school	153(86.4)	24(13.6)	14.48(8.24,25.44)	1.80 (0.97,3.35)
	No formal education	110(63.6)	63(36.4)	1.00	1.00
Parity	Nuli para	328 (93.2)	24 (6.8)	4.96 (3.90,6.32)	0.98 (0.54, 1.75)
	Multi para	395 (83.9)	76 (16.1)	1.00	1.00

Indicates significant difference at $p < 0.05$ a = Government, private and Nongovernmental organization employees b = Merchants, students, daily laborers and waiters

NB: AOR = Adjusted Odds Ratio, CI = Confidence Interval and COR = Crude Odds Ratio.

This might be due to the fact that a better quality and packages of ANC services provided to pregnant women may increase their expectations and enthusiasms for future use of the continuum of care like to give birth at health institution and to have postnatal care follow up. Similarly, ANC service quality allows early detection of obstetric complications and gives an opportunity to influence women's decision to have a skilled attendant during child birth.[19] In addition, if women received quality ANC service, there is a tendency to be provided with information on the importance of giving birth at health facility and having a birth preparedness and complication readiness plan during emergency conditions like during labor. Especially in Ethiopia where home delivery is the norm (almost three-fourth of the mothers are giving birth at home) [7] planning in advance for delivery event is not part of traditional practice and health facilities are sought as a last resort after serious complications have developed. Hence, if pregnant women are counselled during ANC to have a plan for facility delivery together with arrangement for transport and other amenities like money, blood and companions for emergency conditions; there by highly likely to give birth at health facility. Furthermore, if women receive quality ANC they will have better knowledge and information on the benefits of accessing maternal health care services thereby increasing their state of preventive health care practice and are more likely to go to the health institutions for delivery before complications occurred.

Other studies also reported women who had three or more visits were more likely to have skilled birth attendant as compared to those who didn't have follow up[20–22]. This might be due to the fact that; as the frequency of ANC visits increased the packages of ANC services and the information provided to pregnant women by ANC providers might increase their knowledge on the importance of having skilled birth attendant at birth there by increasing the women's likely hood to give birth at the health facility.

The current study also showed that there were substantial inequalities in the use of health facility delivery service by residence and educational status of the mother. Urban women were more likely to give birth at health facility compared to the rural women. This is consistent with other studies [7, 20, 23].

The possible reasons might be due to urban women tend to have better access to health facilities and can reach to the health facility easily in urgent conditions like during labor as

they are accessible to transportation but a rural mother who is in labor and without access to transport will be obliged to walk on foot for a long distance and may further limit their likelihood to give birth at the health institution. Moreover, rural women are more readily influenced by traditional practices that run contrary to modern health care and accept fate about whatever might happen when they delivered at home.

This study also revealed as the educational status of a mother increases beyond secondary school the odds of giving birth at the health institution also increases. This is consistent with other studies [7, 24–26].

This might be explained by educated women are more likely to have a better income and able to afford the costs associated with the health care. compared to uneducated women In addition education may also increase self-confidence and enhance their level of autonomy and freedom to make health-related decisions, including maternal services [27]. This study also revealed that younger pregnant women (<25 years) had higher odds of giving birth at the health facility compared to older pregnant women (≥ 35 years) but when the age of women became 25 years and above it had no significant effect on the odds of giving birth at health institution. This finding is in line with a study done in Andhra Pradesh that reported older pregnant women with age ≥ 30 years were more likely to give birth at home.

However this finding is contradictory to a study in India that reported age had no impact on the decision to undergo health facility delivery [29]. The possible reasons for this difference might be due to the reason that older women might have an experience of giving birth before (became multi para) and might have a belief that subsequent pregnancies will result in successful outcome thereby increasing their chance to give birth at home. However this study reported that parity and occupation of the mother had no statistically significant effect on health facility delivery service use. As this study was a prospective observational follow up study it avoids recall and social desirability biases unlike that of retrospective follow up studies In addition employing a generalized estimating equation analysis controls the clustering effect among women who received ANC services within the same facility by the same ANC provider. To increase the generalizability of the study findings, adequate sample size was calculated and the participants were selected using a probability sampling method which was systematic sampling

method; thus, selection bias was unlikely to happen or its effect would be minimal. All these could be mentioned as strength of the current study.

However, ANC providers might work with their maximum effort while the data collectors observed their service provision (Hawthorn effect) even if its effect might slowly decrease when the providers adapt their presence as the data collection period was long (one year). To minimize the bias data collectors did not tell the ANC providers about what specific ANC services they were observing rather than telling them in general way. Though midwifery professional data collectors and standardized observation checklist adapted from FANC protocol was used to minimize observation bias, its effect might not be zero due to a difference in their competency.

Lack of qualitative study component to explore the cultural factors affecting the use of health facility delivery as delivery is highly culturally held event could also be the limitation of this study.

Conclusion and recommendations

The quality of antenatal care service in public health facilities of the study area was compromised/low and adherence to FANC protocol had a great role in promoting the use of health facility delivery. However, the provision of essential ANC services was heterogeneous. Provision of acceptable quality of ANC service, being urban dweller, being younger age and having higher educational status of pregnant women were the predictors that increase the use of institutional delivery. Hence the local authorities at each level of health sector or the nongovernmental organizations working to improve maternal health need to provide trainings for ANC providers on FANC protocol focusing on the importance of information provision on BPCR, danger signs of pregnancy, comprehensive history taking on past & current obstetric history. In addition, ANC providers should be committed to comply with the focused antenatal care protocol so that no mother might not be missed without informing the danger signs, BPCR and other recommended ANC services giving emphasis for rural and lower educational status women and they also need to request their necessary inputs before they become out of stock. Moreover the Federal Ministry of Education should work towards universal access for education beyond primary education level by giving emphasis for females.

Supporting information S1 Dataset. Data set for a study on the link between quality of ANC service and institutional delivery. (SAV)

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Providers Adherence to Essential Contents of Antenatal Care Services
Increases Birth Weight in Bahir Dar City Administration, North West
Ethiopia: a Prospective Follow up Study

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Abstract

Back ground: Low birth weight (LBW) is one of the most important factors affecting child morbidity and mortality worldwide. Antenatal care (ANC) is an opportunity for reaching pregnant women with a number of interventions that may be vital to their health and well-being of their infants. However data on the link between ANC quality and LBW remain limited especially in developing countries. Therefore this study was aimed at investigating the effect of ANC service quality on birth weight among pregnant women attending ANC at public health facilities of Bahir Dar City Administration, Bahir Dar, Ethiopia.

Methods: Nine hundred seventy pregnant women with gestational age ≤ 16 weeks who came for their first ANC visit were enrolled and followed until delivery. Longitudinal data was collected during consultation with ANC providers using structured observation checklist. Women who gave birth at home and those who deliver a premature or still birth baby were excluded as data on birth weight could not be obtained and as the birth weight of the baby might be affected due to the underlying condition respectively. Completed data were obtained from 718 women. The overall ANC service was considered as acceptable quality if women received $\geq 75^{\text{th}}$ percentile of the essential ANC services. Generalized Estimating Equation was carried out to identify predictors of birth weight by controlling the cluster effect among women who received ANC services in the same facility.

Results: The prevalence of low birth weight ($<2500\text{grams}$) was 7.8% (95%CI= 6.0%, 9.7%) with 1.4% versus 10.5% among those who received acceptable and not acceptable quality ANC services respectively, $P\text{-value}<0.001$. Maternal nutritional advice, iron-folic acid supplementation, tetanus toxoid vaccination, maternal educational status, parity and age at birth were determinants for birth weight.

Conclusion and recommendation: The study showed that access to quality ANC services led to good birth weight outcome. Strengthening adherence of providers to essential components of antenatal care through regular monitoring and need based capacity building is very important for reducing the risk of low birth weight.

Key words: Quality of antenatal care, Birth weight, Pregnancy outcome, neonatal mortality.

Background

The World Health Organization (WHO) has defined low birth weight (LBW) as the weight of live born infants of <2,500 grams regardless of gestational age or any other factor that might have an influence on it. A child's birth weight or size at birth is an important indicator of the child's vulnerability to the risk of childhood illnesses and the child's chances of survival. The global prevalence of LBW is in the range between 15% and 20%, which accounts to about 20 million infants born; approximately one third of neonatal deaths are attributable to LBW [1]. The prevalence of LBW in Ethiopia and Amhara region in particular was 11% and 11.2% respectively. It is also worth noting these rates might be higher as only 5% of children in Ethiopia are weighed at birth [2]. The goal set by WHO is to achieve a 30% reduction of the number of infants born with a weight < 2500 g by the year 2025; 3.9% relative reduction per year between 2012 and 2025 [3].

Antenatal care (ANC) is an opportunity for reaching pregnant women with a number of interventions that may be vital to their health and well-being of their infants [4]. Its putative benefits to babies include increased intra uterine growth, reduced risk of infection and increased survival [5].

The assessment of prenatal care uptake and quality are essential steps toward improving accessibility and birth outcomes. Some elements of the ANC package (Iron –folic acid supplementation, nutritional advice, tetanus toxoid vaccination, screening for pre-eclampsia, screening and treatment of asymptomatic bacteriuria and syphilis) have been shown to be cost effective in a Sub-Saharan African context [6, 7].

Even though the prevalence of LBW is higher in developing countries, most of the researches on the link between antenatal care and birth weight has been conducted in developed nations [1] and many of these were cross sectional studies that focus on assessing the association between frequency (uptake) of antenatal visit rather than adherence of providers to essential services of antenatal care and birth weight. In addition, developing countries usually follow guidelines based on research findings conducted in developed nations. However the results from research conducted in these countries are not necessarily applicable to less developed nations. Therefore the aim of this study was to investigate the association between adherences of providers to essential services of antenatal care and birth weight which might have an input for the design of guidelines and policies to improve child survival in developing countries like Ethiopia.

Methods

Study design, setting and Population

A facility based prospective follow up study was conducted from October 2015 to August 2016 in Bahir Dar City Administration, Amhara National Regional State, which is located in the North West part of Ethiopia. According to the Amhara National Regional State Bureau of Finance and Economic Development report, the projected population by 2015/16 was 297,775 (80.5% urban Vs 19.5% rural), of these 156,515 (52.6%) were females and there were 10,035 eligible pregnant women in the same year [8].

The study was conducted on seven public health facilities, one hospital and six health centers. All selected first visit pregnant women with gestational age ≤ 16 weeks and attending ANC service during data collection period that were voluntary to participate were included in the study. Women who gave birth at home were excluded as data on birth weight could not be obtained. In addition those who gave a premature or still-birth baby; those who had any medical complication while pregnant (diabetes mellitus, heart disease, eclamptic and multiple pregnancy or give birth by caesarian section) were excluded as the birth weight of the baby might be affected due to the underlying conditions.

Sample size and Sampling technique

The current study is part of a large follow up study with multiple objectives. The detail of the sample size calculation to address all objectives (considering the maximum sample size) and the sampling procedure is described elsewhere. For the current study a sample size was calculated with the predicted incidence of LBW babies as 6% among mothers completing four antenatal visits (compared to 25% among mothers with less than four visits) [9], and with 80% power, 95% confidence level and 15% non response rate. The final calculated sample size was 304. However, to increase the power of the study, all 718 women who deliver a singleton baby at the study health facilities were included in the analysis.

Women who gave birth at home or gave premature or still-birth baby or those women who had any medical complication while pregnant were excluded

Data collection procedure:

A structured observation check list to measure ANC quality was developed based on focused antenatal care protocol and used to observe the routine ANC practice for each visit. The weight of naked neonates was measured in kilograms to the nearest 100 grams by using standard beam

balance in the delivery room immediately after birth (preferably within one hour) by trained diploma midwives. Seven female diploma Midwives and two Bachelor of Science female Midwives were recruited as data collectors and supervisors respectively. Both data collectors and supervisors were not working in health facilities under the study. Training was given on the data collection instrument and how to approach and observe the ANC service provision. Pretest of the instrument, close supervision and daily checkup of the filled questionnaire for completeness were also done to maintain the data quality.

Dependent- Birth weight in kilograms; which was measured within one hour after birth.

Independent- Quality of ANC service was the main exposure variable.

Quality of ANC service was measured based on the interventions that the mother received during antenatal care: laboratory tests done like blood and urine tests, physical examinations like weight, height, blood pressure ,providing TT vaccination, iron - folic acid supplementation, deworming, nutritional advice, information on immunization and breast feeding. If the essential ANC service was given it was coded as 1 otherwise 0 and a composite index for the overall ANC service quality was calculated. Percentile was computed to categorize the quality of the services a woman received. If she scored $\geq 75^{\text{th}}$ percentile, of essential ANC services, ANC service was considered acceptable quality otherwise not [10]. The detail of the methods is described elsewhere

Data Analysis: Data were coded and entered into EPI data version3.1 and exported to SPSS version 20 for analysis. Descriptive statistics were used to describe the data. Generalized Estimating Equation linear regression analysis with robust estimator and exchangeable working correlation matrix was carried out to control the cluster effect of women who received ANC services within the same facility and to identify the predictor variables for birth weight of neonates. A p-value <0.2 was considered to retain variables for the multivariable Generalized Estimating Equation linear regression analysis and P-value <0.05 was considered to identify statistically significant predictors for birth weight.

Results

Characteristics of ANC attendants

Among 718 women who gave birth at health facilities, those with age ≤ 19 years (teen age pregnancy) and those with age ≥ 35 years (elderly pregnancy) were 4.9% and 4.0% respectively. The mean ($\pm$ standard deviation) age at birth was 25.32 ± 4.21 years. Above ninety percent,

(94.2%) of women were urban residents and more than half of them (52.9%) were house wives. Above ninety percent, (90.9%) of study participants were Orthodox Christian and almost all women (98.8%) were currently married. With regard to their educational status, 11.4% of women had no formal education while 63.3% of women had joined secondary school and above (Table 1). Greater than two out of five of the pregnant women, 326 (45.4%) were primi-para; while more than one out of two 378 (52.6%) of women were multi-para and 14 (1.9 %) of them were grand multi para.

Table 1: Socio-demographic characteristics and birth weight among study participants in public health facilities of Bahir Dar City administration (N=718), October 2015 to August 2016.

Variables	Birth weight			Total frequency
	low	normal	over weight	
Age				
≤19	0 (0.0%)	34(97.1%)	1(2.9%)	35(100.0%)
20-24	20(7.0%)	260(91.5%)	4(1.4%)	284(100.0%)
25-29	16(5.9%)	245(9.1%)	8(3.0%)	269(100.0%)
30-34	7(7.0%)	93(92.1%)	1(0.9%)	101(100.0%)
≥35	13(44.8%)	16(55.2%)	0(0.0%)	29 (100.0%)
Residence				
Urban	43(6.4%)	619(91.6%)	14(2.1%)	676(100.0%)
Rural	13(31.0%)	29(69.0%)	0(0.0%)	42(100.0%)
Educational status				
No formal education	23(20.9%)	86((78.2%)	1(0.9%)	110(100.0%)
Primary	15(9.8%)	138(90.2%)	0(0.0%)	153(100.0%)
Secondary	18(4.0%)	424(93.1%)	13(2.9%)	455(100.0%)
Occupation				
Farmer	13(32.5%)	27(67.5%)	0(0.0%)	40(100.0%)
House wife	31(8.2%)	346(91.0%)	3(0.8%)	380(100.0%)
Employee*	12(4.0%)	275(92.3%)	11(3.7%)	298(100.0%)
Religion				
Orthodox	51(7.8%)	589(90.2%)	13(2.0%)	653(100.0%)
Muslim	5(7.9%)	57(90.5%)	1(1.6%)	63(100.0%)
Protestant	0(0.0%)	2(100.0%)	0(0.0%)	2(100.0%)
Marital status				
Married	54(7.6%)	641(90.4%)	14(2.0%)	709(100.0%)
Divorced	1(12.5%)	7(87.5%)	0(0.0%)	8(100.0%)
Widowed	1(100.0%)	0(0.0%)	0(0.0%)	1(100.0%)
Ethnicity				
Amhara	55(8.1%)	619(90.2%)	12(1.7%)	686(100.0%)
Tigre	1(4.5%)	19(86.4%)	2(9.1%)	22(100.0%)
Awii	0(0.0%)	7(100.0%)	0(0.0%)	7(100.0%)
Oromo	0(0.0%)	3(100.0%)	0(0.0%)	3(100.0%)
Grand total	56(7.8%)	648(90.3%)	14(1.9%)	718(100.0%)
* = governmental employees, nongovernmental employees ,daily laborers and waiters				

Adherence to Essential Contents of Antenatal Care and Birth weight

Above ninety five percent, 701(97.6%) of pregnant women received two doses of tetanus toxoid vaccine but the rest 17 (2.4%) missed one dose. With regard to iron supplementation, 304(42.3%), 327(45.5%), 77 (10.7%) and 10(1.4%) of pregnant women were supplemented with 120, 90, 60 and 30 tablets of iron- folic acid respectively. In addition, 509(70.9%) and 564 (78.6%) of pregnant women received anti-helminths for deworming and were advised to use insecticide treated bed net for prevention of malaria respectively (Table 3). About two third (57.1%) of the pregnant women were counselled about BPCR at least once in their four ANC visits. The information provision on maternal nutrition, breast feeding and immunization was also heterogeneous (Table 2).

Table 2: Information provided to pregnant women during ANC visits at public health facilities of Bahir Dar City Administration, Bahir Dar, Ethiopia; October 2015 to August 2016 (N=718).

ANC services given	During 1st visit, n (%)	During 2nd visit, n (%)	During 3rd visit, n (%)	During 4 th visit, n (%)
Advised on maternal nutrition	496(69.1)	608 (84.7)	506 (70.5)	296 (41.2)
Advised on breast feeding	-	-	14(1.9)	205 (28.6)
Advised immunization	-	-	11(1.5)	196 (27.3)
Checked conjunctiva for pallor	575 (80.1)	238 (33.1)	507 (70.6)	272 (37.9)

The mean ($\pm$ SD) birth weight of neonates was 3113.0 ($\pm$ 474.9) gram with the minimum and maximum birth weights of 1800 and 4400 grams respectively. Of the total pregnant women who deliver at health facilities, 56 (7.8%; 95%CI= 6.0%, 9.7%) gave a low birth weight baby, 648 (90.3%; 95%CI= 88.0%, 92.2%) gave a baby with normal birth weight (2500-4000grams) and 14 (1.9%; 95%CI= 1.0%, 3.1%) gave birth overweight babies (>4000 grams).

Table 3: Birth weight status of neonates among pregnant women who received different ANC services at public health facilities of Bahir Dar City Administration, Bahir Dar, Ethiopia; October 2015 to August 2016 (N=718).

Variables		Low birth weight, n (%)	Normal birth weight, n (%)	Over weight, n (%)	Total, n (%)
Quality of ANC	Received acceptable quality	3(1.4%)	203(94.4%)	9(4.2%)	215(100.0%)
	Received not acceptable quality	53(10.5%)	445(88.5%)	5(1.0%)	503(100.0%)
Maternal nutritional advice	Not advised at all	4(13.3%)	25(83.3%)	1(3.3%)	30(100.0%)
	Advised in one visit	7(53.8%)	6(46.1%)	0(0.0%)	13(100.0%)
	Advised in two visits	30(11.7%)	225(87.5%)	2(0.8%)	257(100.0%)
	Advised in three visits	12(4.1%)	275(93.8%)	6(2.0%)	293(100.0%)
	Advised in four visits	3(2.4%)	117(93.6%)	5(4.0%)	125(100.0%)
Iron - folic acid supplementation	Given 30 tablets	9(90.0%)	1(10.0%)	0(0.0%)	10(100.0%)
	Given 60 tablets	18(23.4%)	59(76.6%)	0(0.0%)	77(100.0%)
	Given 90 tablets	15(4.7%)	307(93.8%)	5(1.5%)	327(100.0%)
	Given 120 tablets	14(4.5%)	281(92.5%)	9(3.0%)	304(100.0%)
Deworming	Not given	16 (7.7%)	191(91.3%)	2(1.0%)	209(100.0%)
	Given at 3 rd /4 th visit	40 (7.9%)	457 (89.8%)	12(2.4%)	509(100.0%)
Tetanus toxoid vaccine	Given one dose	12(70.6%)	5(29.4%)	0(0.0%)	17(100.0%)
	Given two doses	44(6.3%)	643(91.7%)	14(2.0%)	701(100.0%)

Association between Contents of ANC Service with birth weight

In a bivariate Generalized Estimating Equation linear regression analysis, there was a positive association between birth weight of neonates with the maternal nutritional advice during ANC, Iron –folic acid supplementation, deworming with anti-heliments, doses of tetanus toxoid vaccination of the mother, Venereal Disease Research Laboratory (VDRL) test of the mother, hematocrit test of the mother at first ANC visit, hematocrit test of the mother at fourth ANC visit, advice on Insecticide Treated Bed Net (ITN) use and most of the socio-demographic factors such as residence, maternal age, educational status, occupation and parity. Therefore all these variables were fitted to the multivariable GEE linear regression analysis. In multivariable Generalized Estimating Equation linear regression analysis, maternal nutritional advice during ANC, Iron supplementation, tetanus toxoid vaccination, educational status and parity remained to have statistically significant association with birth weight. In addition, deworming with anti-heliments, advice on ITN use, having VDRL test, having hemoglobin test at fourth ANC visits and living in urban areas showed an increase in birth weight but the association was not statistically significant.

When the frequency of maternal nutritional advice during ANC visits was increased by one, the birth weight of a neonate was increased by 147 grams ($\beta = 0.147$, 95%CI= 0.11, 0.19). When the number of iron tablet supplementation to pregnant women during ANC visits decreased from 90 or more tablets to less than 90 tablets, the birth weight of their neonates decreased by 358 grams ($\beta = -0.358$, 95%CI= -0.476,-0.240). When the dose of tetanus toxoid vaccine given to pregnant women during ANC visits increased from one to two doses till delivery, the birth weight of their neonates increased by 609 grams ($\beta = 0.609$, 95%CI= 0.316,0.903). When the educational status of women increased by one unit, the birth weight also increased by 79 grams ($\beta = 0.079$, 95%CI= 0.06, 0.10). When the parity of women increased by one the birth weight of their neonates decreased by 174 grams ($\beta = -0.174$, 95%CI= 0.24, 0.11) (Table 4).

Table 4: Multivariable Generalized Estimating Equation linear regression to identify determinants of birth weight among pregnant women attending ANC at public health facilities of Bahir- Dar City Administration (n=718), October 2015 to August 2016

*(indicates statistical significance at p-value <0.05); 0^a, indicates a reference category for the categorical predictor variables.

Dummy variables		Number (%)	Un-Standardized β with 95%CI	Standardized β with 95%CI	P-value
Maternal nutritional advice during ANC		718(100)	0.147(0.11,0.19)	0.138(0.10,0.17)	0.001*
Residence	Urban	676 (94.2)	0.398(0.249,0.547)	0.122(-0.02,0.26)	0.09
	Rural	42(5.8)	0 ^a	0 ^a	
Iron supplementation	Took <90 tabs	87(12.1)	-0.358(-0.476,-0.240)	-0.240(-0.34,-0.14)	0.001*
	Took $\geq$ 90 tabs	631(87.9)	0 ^a	0 ^a	
TT vaccination	Took two doses	701(97.6)	0.609(0.316,0.903)	0.286(0.03,0.54)	0.03*
	Took one dose	17(2.4)	0 ^a	0 ^a	
Deworming at 3 rd /4 th visit	Yes	509(70.9)	0.109(0.035,0.183)	0.031(-0.04,0.11)	0.41
	No	209(29.1)	0 ^a	0 ^a	
Hematocrit test at 1 st visit	Yes	684(95.3)	0.115(-0.041,0.271)	-0.002(-0.15, 0.15)	0.98
	No	34(4.7)	0 ^a	0 ^a	
Hematocrit test 3rd visit	Yes	378(52.6)	0.121(0.052,0.190)	0.026(-0.04, 0.09)	0.46
	No	340(47.4)	0 ^a	0 ^a	
VDRL test	Yes	644(89.7)	0.120(0.008,0.231)	0.028(-0.08, 0.14)	0.61
	No	74(10.3)	0 ^a	0 ^a	
Advice about ITN use	Yes	564(78.6)	0.069(-0.011,0.149)	0.031(-0.05, 0.11)	0.42
	No	154(21.4)	0 ^a	0 ^a	
Educational status of the mother		718(100%)	0.079(0.06,0.10)	0.064(0.05,0.08)	0.001*
Maternal age		718(100%)	-0.067(-0.13,-0.01)	-0.037(-0.10, 0.03)	0.25
Parity		718(100%)	-0.174(0.24,0.11)	-0.092(-0.16,-0.03)	0.01*

NB: The data about birth weight were entered in kilograms to the data set and the betas are converted to grams by multiplying with 1000 for the ease of interpretation.

Discussion

World Health organization set a goal to reduce the number of infants with LBW by 30% by the year 2025 and similarly the Sustainable Development Goal (SDG) by 2030 also aimed to reduce neonatal mortality to at least as low as 12 per 1,000 live births. LBW contributes 60% to 80% of all neonatal deaths [3, 11]. However in this study about 7.8% (95%CI= 6.0%, 9.7%) pregnant women gave a low birth weight baby. This finding is consistent with other study findings in Ethiopia, 9%in urban population and 11% in the general population [2], in Ghana (6.1%)[12] , in Colombia (8.7%) [13], in Mexico (8%)[14] but is lower than study findings in Angola and (25.9%)[15], in India (26.8%)[16].

The possible reason might be due to the difference in the characteristics of study participants as all the participants in this study were enrolled if they started their ANC in their first trimester and were also followed till their four antenatal visits and most (94%) were from urban and peri-urban populations that might increase the tendency to get the essential components of antenatal care like maternal nutritional advice, Iron-folic acid supplementation and other services during subsequent ANC visits that might contribute positively for birth weight. The difference in the study period might also have its own effect for the difference in the findings as many interventions like the community based newborn care packages for improving maternal and newborn health are being implemented by different countries including Ethiopia. In addition, except the current study and the study in Ghana all other studies collect information about birth weight based on mother's recall or birth registration records that might affect accuracy of their result.

This study revealed that the frequency of nutritional advice given to pregnant women during their ANC visits have statistically significant effect on increasing the birth weight of their babies. In contrary to this finding a meta analysis done from thirty-three studies evidenced nutrition education and counselling significantly improved mean birth weight but was not significantly associated with the risk of low birth weight [17]. The difference might be due to the reason that this study considers dose –response relationship of nutritional advice unlike those studies included in the meta- analysis and the authors of the meta- analysis also indicated except one study, the overall quality of studies extracted were low. The other possible reason could be the difference since most of the studies included in the meta-analysis were conducted in developed

countries (USA, UK, Australia, Argentina and Greece). The participants of studies in these countries might have a better educational status and awareness on maternal education during pregnancy and other essential services needed for a pregnant woman so that there might not be a significant difference between women who were counselled and those who were not counselled about maternal nutrition during ANC.

In low-income countries, 25% of low birth weight was attributable to maternal anemia during pregnancy [18]. In spite of this, the current study also showed more than one in ten pregnant women were supplemented with less than 90 tablets throughout their pregnancy period. Iron folic acid supplementation had also a dose –response relationship with birth weight; this study found that the birth weight of babies among pregnant women who were not supplemented with Iron-folic acid tablets or those who were supplemented with <90 tablets during their ANC visits was significantly decreased compared to those who were supplemented with 90 tablets or more. This finding is also supported with a Meta analysis done from ten randomized control trials indicating two percent increase in birth weight for every two-fold increase in folate intake. Other studies conducted in Spain and Atlanta also revealed duration longer than four months of iron supplementation gave significant protective odds ratio for low birth weight and women with low folate intake (≤ 240 mg/d) had >3 times greater risk for low birth weight infant than women with folate intake >240 μ g/d respectively [19-22]. The physiological mechanism of iron supplementation on birth weight is not clearly understood, however, there are two hypotheses about improvements in birth weight due to iron supplements. First, iron deficiency anemia leads to changes in nor-epinephrine, cortisol and corticotrophin 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 [23]. In this study majority (97.6%) of pregnant women were given two doses of tetanus toxoid vaccinations compared to the Ethiopian Demographic and Health Survey report in 2016 revealed that only half of the pregnant women who gave birth five years prior to the survey took two doses (with 72% urban and 46% rural women) [24]. The current study also showed providing two doses of tetanus toxoid for pregnant women during their antenatal care visits significantly increased the birth weight of their babies compared to those women who were given only one dose. The increase in birth weight of babies born from women who received two doses of tetanus toxoid might not be due to the direct effect of tetanus toxoid vaccination on birth weight rather it

might be due to the fact that when women came to health facility for TT vaccinations, they are more likely to get nutritional advices or iron- folic acid supplementations that contribute for better birth weight.

This study also found that there was an increase in birth weight as educational status of pregnant women increased from no education or primary education to secondary education and above. This is also supported by studies conducted in Bangladesh and Beirut [25, 26]. In contrary to maternal education that had positive association to birth weight, multi parity or grand multi parity of mothers and older age of the mother (≥ 35 years) had negative association with birth weight.

Prospective follow up of pregnant women through observation while they get the ANC service; collecting information about birth weight of the neonate at the moment of birth and applying a generalized estimating equation analysis to control the cluster effect of women who received the ANC service in the same health facility could be taken as the strength of the study but excluding women who gave birth at home due to missing of birth weight data and Hawthorn effect could be the limitation as those women might have different characteristics.

Conclusion and recommendations

The study found that near to one in ten neonates were born with low birth weight. Access to quality antenatal care increases the birth weight of new born babies. Essential components of antenatal care (maternal nutritional advice, iron-folic acid supplementation, and tetanus toxoid vaccination) and socio- demographic variables like maternal educational status and parity were determinants for birth weight. Strengthening adherence of providers to essential components of antenatal care like nutritional advice, iron- folic acid supplementation and tetanus toxoid vaccination for every pregnant woman through regular monitoring and provision of feedback and need based capacity building is very important for reducing the risk of low birth weight.

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List of abbreviations:

ANC; Antenatal Care, CI; Confidence Interval, FANC; Focused Antenatal Care, GEE; Generalized Estimating Equation, ITN; Insecticide Treated Bed Net, LBW; Low Birth weight,

SPSS; Statistical Packages for Social Sciences, TT; Tetanus Toxoid, VDRL; Venereal Disease Research Laboratory.

Declarations

Ethical approval and consent

The study protocol was approved by the Institutional Review Board (IRB) of the College of Health Sciences, Addis Ababa University meeting number 004/2015 and an approval letter was written on the date of May 6, 2015 with protocol number 008/15/SPH. Letter of permission was obtained from Amhara Regional Health Bureau and Bahir-Dar City administration Zonal Health Office. Both ANC clients and providers were informed about the purpose of the study and verbal informed consent was also obtained before data collection. Study participants had the right to refuse participation or terminate their involvement at any point during observation. The information collected is kept confidential. Furthermore, report writing does not refer a specific respondent with identifiers.

Consent for publication

This manuscript does not contain any individual person's data in the form of image or video. Hence consent for publication is not applicable.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no any financial or non-financial competing interests (political, personal, religious, ideological, academic, intellectual, commercial or any other).

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Addis Ababa University and Bahir Dar University covered the transportation and Perdiem cost of data collectors and supervisors during the data collection process.

Authors' contributions

TE was involved in the conception, and design of the research project proposal; analysis, interpretation, report and manuscript writing. MF had been involved in the conception and design of the research project proposal and AW was involved in the conception, design of research project, analysis, interpretation and approval of manuscript writing. TE and AW read and approved the final manuscript.

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Counseling on Family planning during ANC service increases the likelihood of postpartum family planning use in Bahir Dar City Administration, Northwest Ethiopia: A prospective follow up Study.

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Abstract

Background: Closely spaced pregnancies within the first year postpartum increases the risk of death for both the mother and baby. Many countries recommend providing pregnant women with post partum family planning counselling during antenatal care visits. However data on the extent to which providers utilize these opportunities and the role of family planning counseling during antenatal care in promoting the use of postpartum modern family planning remain limited especially in developing countries. Therefore this study was aimed at investigating the role of family planning counseling during antenatal care in promoting postpartum modern family planning use within 6 weeks after birth.

Methods: Nine hundred seventy pregnant women with gestational age ≤ 16 weeks who came for their first ANC visit were enrolled and followed until 6 weeks after delivery. Longitudinal data was collected during consultation with ANC providers using structured observation checklist to assess whether or not the providers counsel pregnant women on postpartum family planning use during their four focused ANC visits. Exit interview was also conducted at 6 weeks after they gave birth when they came to immunize their child to assess whether they were starting to use postpartum modern family planning. Completed data were obtained from 823 women. Generalized Estimating Equation was carried out to identify predictors of postpartum modern family planning use by controlling the cluster effect among women who received ANC services in the same health facility.

Results: Postpartum modern family planning use within 6 weeks after delivery among the study women was 157(19.1%) with 95%CI (16.4, 21.9); Among 187 pregnant women who were counseled at least once, 72(38.5%) of them used post partum modern family planning compared to 13.4% of post partum women who were not counseled at all ($p < 0.001$).

Conclusion: Less than one in five post partum women were using postpartum family planning within 6 weeks after birth. Family planning counseling during ANC services had a significant effect on promoting postpartum modern family planning use. Therefore health providers need to ensure continuity of care through strengthening integration of family planning counseling services during ANC and referral linkages between community and health workers.

Key words: Postpartum family planning use, unmet need for family planning. Postpartum period

Background

The postpartum period provides a crucial window of opportunity to address unmet need for family planning. Rates of maternal and infant mortality and morbidity could be substantially decreased if unplanned and unwanted pregnancies were prevented and if all new pregnancies could be spaced at least two years after a birth.[1].

Family planning can avert more than 30% of maternal deaths and 10% of child mortality if couples space their pregnancies more than two years apart [2, 3]. On the contrary, closely spaced pregnancies within the first year postpartum increase the risk of death for both the mother and baby, resulting in increased risks for adverse outcomes, such as preterm birth, low birth weight and small for gestational age [4].

The period after delivery is complex and challenging, during which a woman has to care for her newborn child as well as cope with psychological and physical changes. Focused antenatal family planning counseling increased the possibility postpartum family planning use [5]. The service delivery guidelines for antenatal care services in many countries recommend providing pregnant women with counseling concerning post partum family planning, breastfeeding, danger signs birth preparedness and complication readiness plan and other topics. However, only a fraction of clients in Sub-Saharan Africa(SSA) receive information on any of these topics during their antenatal care visits [6].

In five countries of Latin America and the Caribbean, about half of pregnant women receive some family planning information during antenatal care visits [7]. In Sub-Saharan Africa, the proportion of postpartum women who are exposed to the risk of pregnancy by having sex while using no family planning method within two years after childbirth was nearly one third [8, 9]. In Ethiopia, evidence has been found that nearly half (47%) of all pregnancies occurred within a short birth interval of less than 24 months after the preceding birth and 86% of post partum women within six months have unmet need for family planning [10].

Postpartum women are an important target groups because they may not realize that they are at risk of pregnancy even if they are breastfeeding [11]. However, 37% of sexually active women are at risk of pregnancy during the first six months postpartum, this risk increases to 64% among women 6–11 months postpartum [10]. Therefore, concentrating efforts on increasing postpartum family planning use among these women could have a proportionally greater impact than focusing attention on other populations.

A very limited number of studies examined the role of ANC as a facilitator for post partum modern family planning use. Those studies were cross sectional focused on the assessment of the relationship between the frequency of ANC visits rather than the antenatal care family planning counseling and post partum family planning use. In addition those who assessed the association between provision of antenatal care family planning counseling during any of their ANC visits and postpartum family planning use were based on the womens' self report and they also assessed post partum family planning use within one or two years after birth rather than within the six months postpartum which is the WHO recommendation [12, 13].

Therefore this follow up study was intended to bring an insight about the role of family planning counseling during the four focused antenatal care visits in promoting the use of modern family planning use within 6 weeks after birth. More over to explore the relationship between other contents of antenatal care services (like counselling on birth preparedness and complication readiness plan, counselling on breast feeding, satisfaction on ANC) and the use of post natal care with post partum modern family planning use. The findings of this study will provide credible evidence for maternal and child health program implementers and policy makers to reduce maternal and child mortality.

Methods

Study design, Settings and Population

A facility based prospective follow up study was conducted from October 2015 to August 2016 in seven public health facilities; one hospital and six health centers. All selected first visit pregnant women with gestational age ≤ 16 weeks attending antenatal care services during data collection period and voluntary to participate in the study were included. Pregnant women were followed from their first to fourth antenatal care visits while they received their antenatal care services to investigate whether health professionals provide them with postpartum family planning counseling. Exit interview was also conducted just after their fourth ANC visit to measure their satisfaction on the ANC service they received and at 6 weeks after birth when they came to immunize their child to assess whether or not they started to use postpartum modern family planning and to identify the type of postpartum modern family planning. The detail of the method is described elsewhere.

Sample size and Sampling technique

The current study is part of a follow up study with multiple objectives. The detail of the sample size calculation to address all objectives (considering the maximum adequate sample size which was 970) and the sampling procedure is described elsewhere. For the current study a sample size was calculated with 2.8% postpartum modern family planning use among women who had no ANC (considering these women as they were not counseled on postpartum family planning during ANC) [14] and 5 % difference in post partum modern family planning use among women who were counseled, 80% power, 5% level of significance and 10% non-response rate. The final calculated sample size was 777. However, to increase the power of the study, all 823 women who completed the follow up period were included in the analysis.

Data collection process:

Seven female diploma midwives and two female Bachelor of Science midwives who were not the staffs in the study health facilities were recruited as data collectors and supervisors respectively to observe whether or not the ANC provider counsels a woman about postpartum family planning during each of the four ANC visits and provide other contents of ANC services. To measure the satisfaction of pregnant women on ANC services they received during their pregnancy period an exit interview was conducted just after their fourth ANC visit using eight items. Each item has five point likert scales from strongly disagree (1) to strongly agree (5). In addition, there was also another exit interview with women at 6 weeks after birth when they came to the health facility to immunize their child to assess whether or not they were using a modern family planning. If a woman doesn't come to the health facility for immunization, the data collectors were expected to trace her at home based on her address registered during the first visit.

Dependent- Post partum modern family planning use (yes/no)

Independent- Counseling on postpartum modern family planning during each of the four ANC visits was the main exposure variable and the other independent variables include: satisfaction on the ANC services that women received while they were pregnant, counseling services given about birth preparedness and complication readiness plan, breast feeding and immunization; postnatal care use and place of delivery.

The satisfaction score of pregnant women on the ANC services they received was computed from the eight items which had internal reliability (Cronbach's α of 0.74). A respondent had a

minimum of 8 and a maximum of 40 points on ANC satisfaction score. The satisfaction score was converted to percentage satisfaction score to make it standardized [15]. The percentage mean satisfaction score for client satisfaction on the ANC services received was 73.2. Clients were categorized as satisfied (if they score above the percentage mean satisfaction score) otherwise not satisfied.

Data Analysis: Data were coded and entered into EPI data version 3.1 and exported to SPSS version 20 for analysis. Descriptive statistics were used to describe the data. Generalized Estimating Equation logistic regression analysis with robust estimator and exchangeable working correlation matrix was carried out to control the cluster effect of women who received ANC services within the same health facility and to identify the predictor variables for postpartum modern family planning use at 6 weeks after birth. A p-value <0.2 was considered to retain variables for the multivariable Generalized Estimating Equation logistic regression analysis. And P-value <0.05 was considered to identify statistically significant predictors for postpartum modern family planning use.

Results

Characteristics of study participants

Among 970 pregnant women who were enrolled to the larger study 823(84.8%) completed the follow up period. The reasons for 15.2% loss to follow up were abortion, self-referral to other health facilities permanent change in work place and the long distance to reach health facilities especially when the gestational age increases. There was no statistically significant difference in family planning counseling service during ANC between those women who completed the follow up and those who were loss to follow up. The mean age ($\pm$ standard deviation) of 823 women who completed the follow up period was 25.46 ± 4.37 years. Nearly ninety percent of women were urban residents (88.5%) and Orthodox Christian (90.9%). With regard to their educational status, 21.0 % of women had no formal education while 57.5% of women had completed secondary school and above (Table 1).

Table 1: Socio-demographic characteristics and postpartum family planning counseling (PPFP) of ANC attendants at public health facilities of Bahir Dar City administration (N=823), October 2015 to August 2016.

Variables	PPFP counseling at least once during ANC		Total frequency
	Yes (%)	No (%)	
Age			
15-24 years	81(22.9)	273(77.1)	354(100.0)
25-34years	101(23.5)	328 (76.5)	429(100.0)
≥35years	5 (12.5)	35(87.5)	40(100.0)
Residence			
Urban	174(23.9)	554(76.1)	728(100.0)
Rural	13(13.7)	82(86.3)	95(100.0)
Educational status			
No formal education	36(20.8)	137(79.2)	173(100.0)
Primary	37(20.7)	140(79.1)	177(100.0)
Secondary and above	114(24.1)	359(75.9)	473(100.0)
Occupation			
Farmer	11(12.4)	78(87.6)	89(100.0)
House wife	108(25.5)	315(74.5)	423(100.0)
Employee*	68(21.9)	243(78.1)	311(100.0)
Religion			
Orthodox	175(23.4)	573(76.6)	748(100.0)
Muslim	12(16.4)	61(83.6)	73(100.0)
Protestant	0(0.0)	2(100.0)	2(100.0)
Marital status			
Married	184(22.7)	627(77.3)	811(100.0)
Divorced	2(20.0)	8(80.0)	10(100.0)
Widowed	1(5.0)	1(50.0)	2(100.0)
Ethnicity			
Amhara	179(22.7)	609(77.3)	788(100.0)
Tigre	6(24.0)	19(26.0)	25(100.0)
Awi	2(28.6)	5(71.4)	7(100.0)
Oromo	0(0.0)	3(100.0)	3(100.0)
Grand total	187(22.7)	636(77.3)	823(100.0)
* governmental employees, nongovernmental employees ,daily laborers and waiters			

Family planning counselling during antenatal care and post partum modern family planning use

Among 823 pregnant women, 187(22.7%) of pregnant women were counseled about postpartum family planning at least once during their four ANC visits. All pregnant women were not counseled about postpartum family planning during their first and second ANC visits; however, 60(7.3%) and 186(22.6%) of pregnant women were counseled about postpartum modern family planning during their third and fourth visits respectively.

The magnitude of postpartum modern family planning use within 6 weeks after delivery among the study women was 157 (19.1%) with 95%CI (16.4, 21.9). Of those women who adopted post partum modern family planning method, Injectables, Implanon, pills and IUCD were used by 111(70.7%), 34 (21.7%), 10(6.4%) and 2(1.3%) post partum women respectively.

Among 187 pregnant women who were counseled at least once during their ANC visits, 72(38.5%) of them used postpartum modern family planning compared to 13.4% of postpartum women who were not counseled at all during their four ANC visits ($p < 0.001$). With regard to satisfaction on the ANC service provision, among 376(45.7%) women who were satisfied with their ANC service, 265(70.5%) were using postpartum family planning. However, among 447(54.3%) who were not satisfied by the service, only 46(10.3%) were using postpartum modern family planning ($p < 0.001$) in their postpartum period within 6 weeks after delivery.

Factors associated with postpartum modern family planning use

In a Generalized Estimating Equation binary logistic regression analysis, there was a positive association between postpartum modern family planning use and family planning counselling during ANC, satisfaction on the ANC service, birth preparedness and complication readiness plan, place of delivery, post natal care service utilization, counselling on breast feeding, residence, educational status and occupation of the mother.

In multivariable Generalized Estimating Equation logistic regression analysis, since post natal care use and place of delivery showed co linearity effect, place of delivery was not fitted in the final model. Family planning counselling during antenatal care, birth preparedness and complication readiness plan, counselling on breast feeding at least once during ANC visits, satisfaction on the antenatal care service while she was pregnant and post natal care visit

remained to have statistically significant association with postpartum modern family planning use. The odds of postpartum modern family planning use within 6 weeks after birth among women who were counseled about postpartum family planning at their third or fourth visit were 3.5 times higher compared to those who were not counselled at any of their visits (AOR=3.5; 95% CI:2.19,5.49). The odds of postpartum modern family planning use within 6 weeks after birth among women who were counseled about birth preparedness and complication readiness plan at their third or fourth ANC visit were 2.2 times higher compared to those who were not counselled at all (AOR= 2.2; 95% CI:1.32,3.55). The odds of postpartum modern family planning use within 6 weeks after birth among women who were counseled about breast feeding at least once during their ANC visits were 1.8 times higher compared to those women who were not counselled during their ANC visits (AOR= 1.8; 95% CI:1.15,2.82). The odds of postpartum modern family planning use within 6 weeks after birth among women who had at least one post natal care visit during their postpartum period were 13.5 times higher compared to those who had no any post natal care visit ((AOR= 13.5; 95% CI:8.24,22.07). In addition, the odds of partum modern family planning use within 6 weeks after birth among women who were satisfied by the ANC service they received for their recent pregnancy were 4.1 times higher compared to their counter parts (AOR= 4.12; 95% CI:2.55,6.66) (Table 2).

Table 2 : Multivariable GEE logistic regression results to assess the association between counseling on postpartum family planning (PPFP) during ANC and PPFP use at public health facilities of Bahir- Dar City Administration (N=823), October 2015 to August 2016
 * Indicates significant difference at $p<0.05$; a = Government, private and Nongovernmental organization employees.

Variables		Postpartum modern family planning use		COR(95%CI)	AOR(95%CI)
		Yes (%)	No (%)		
PPFP counselling during ANC	Counselled at least in one visit	72(38.5)	115(61.5)	4.06(2.80,5.89)	3.47(2.19,5.49)*
	Not counselled at all	85(13.4)	551(86.6)	1.00	1.00
Residence	Urban	154(21.2)	574(78.8)	8.23(2.57,26.34)	1,02(0.33,3.12)
	Rural	3(3.2)	92(96.8)	1.00	1.00
Educational status	Secondary school and above	118(24.9)	355(75.1)	3.78(2.10,6.77)	1.47(0,67,3.25)
	Primary school	25(14.1)	152(85.9)	1.87(0.936,3.73)	1.12(0.47,2.71)
	No formal education	14(8.1)	159(91.9)	1.00	1.00
Occupation	Employee ^a	84(27.0)	227(73.0)	10.61(3.27,34.46)	1.93(0.50,7.48)
	House wife	70(16.5)	353(83.5)	5.67(1.75,18.49)	1.47(0.41,5.32)
	Farmer	3(3.4)	86(96.6)	1.00	1.00
Counselling on BPRCP	Counselled at least in one visit	116(26.9)	315(73.1)	3.15(2.14,4.64)	2.16(1.32,3.55)*
	Not counselled at all	41(10.5)	351(89.5)	1.00	1.00
Counselling on breast feeding	Counselled at least in one visit	72(32.6)	149(67.4)	2.94(2.04,4.23)	1.80(1.15,2.82)*
	Not counselled at all	85(14.1)	517(85.9)	1.00	1.00
At least one PNC visit	yes	96(60.4)	63(39.6)	15.06(9.97,22.80)	13.49(8.24,22.07)*
	no	61(9.2)	603(90.8)	1.00	1.00
Satisfaction on ANC service during pregnancy	Satisfied	111(29.5)	265(70.5)	3.65(2.50,5.32)	4.12 (2.55,6.66)*
	Not satisfied	46(10.3)	401(89.7)	1.00	1.00

Discussion

Based on the 2016 Ethiopian Demographic and Health Survey (EDHS) report, with only 35% modern family planning use, and high unmet need (22%) [16], investigating the effectiveness of providing postpartum family planning information through antenatal care services on postpartum family planning use, and the extent to which providers utilize these opportunities, are increasingly important. For women who are not breastfeeding, pregnancy can occur within 45 days of giving birth [17].

The current study found that less than one out of five postpartum women were using modern family planning at 6 weeks of after birth. The finding is consistent with a study done in Adigrat Northern Ethiopia 24.6% [18] but is higher than a study done including different countries using their respective most recent (2008-2012 DHS data); Ethiopia (8%), Comoros (6.4%) and Burundi (5.8%) [19].

The possible explanations for higher postpartum family planning use compared to studies done in some of the afore mentioned countries could be attributed to the time gap between the current study and DHS data collected in different countries; all participants of the current study had four ANC visits that might increase their tendency to use postpartum family planning and the difference in background characteristics of study participants, for instance most (88.5%) of the participants of this study were urban dwellers so that they might have better awareness and access to family planning methods compared to DHS studies that includes both rural and urban population groups. In addition, efforts by the Ethiopian government to strengthen strategies for maternal and child health mortality reduction like the different community based reproductive health services and health education being given on house to house basis by health extension workers might also have an effect for the increase in postpartum modern family planning use. Among postpartum women who adopted postpartum modern family planning, Injectables and implants were the most common methods reported by the current study and this is also in line with the analysis done to assess method mix among PFP users from DHS 2011 data [20] except that there is improvement in utilization of Implanon compared to EDHS 2011 report (21.7% Vs 10%). Similarly, studies done on the general population in Gondar and 2016 EDHS report also reported that the most commonly used PFP methods are injectables and implants [14, 16] .

This implied method mix in Ethiopia relies heavily on short-acting methods, with the majority of women using injectables and only a fraction of postpartum family planning users are using long acting methods (implants and IUDs).

This study also revealed that even if less than one-fourth of the women were given counseling on postpartum family planning; information on family planning during antenatal care had significant effect on improving the use of postpartum modern family planning. This finding is also supported by studies done in Mexico [21], Uttar Pradesh [22] and systematic review published in 2014 that reported integration of family planning into antenatal care services showed increased modern family planning use where the demand is high [23]. This might be due to the reason that frequent exposure of pregnant women to health professionals during antenatal care offers ample opportunity to discuss about family planning when couples are not distracted by a new baby and when they have time to consider all the options.

Satisfaction by the ANC services during pregnancy was significant in predicting the likelihood of using postpartum modern family planning within 6 weeks by the current study. The study in Mexico among low-income women also supported this finding as it reported women living in communities with high quality care were more likely to use a family planning method than those in communities with lower quality of care [21].

This might be attributed to high quality care increases the confidence of women on the health system there by comply with the advice given by health professionals and might have a positive effect to use the continuum of care (antenatal care to post natal care including postpartum family planning use).

The use of modern family planning is significantly associated with the use of post natal care in this study. This relationship is also evidenced by other studies findings conducted in North West Ethiopia [14], India [24] and Mexico [21].

The present study showed women who were counseled about birth preparedness and complication readiness plan during antenatal care were more likely to use post partum modern family planning compared to their counter parts. This might be due to the reason that when

health professionals discuss about birth preparedness and complication readiness plan they are more likely to discuss with the danger signs of pregnancy and the probability of their occurrence in closely spaced pregnancy; which might have an influence on the decision of women to use postpartum family planning. Similarly, this study also reported women who were counseled about breast feeding were more likely to use postpartum modern family planning. As the data collection was done by direct observation while women received antenatal care services using observation checklist adapted from WHO Basic Emergency Obstetric and Newborn Care (BEmONC) guideline, the study might not be affected by self-report bias but it might have hawthorn effect. In addition, this study might also have selection bias since it was a facility based study and women who came to health facilities might have different characteristics from those who didn't come.

Conclusion and recommendation

A fraction (less than one-fourth) of pregnant women was provided with family planning counselling during antenatal care. Family planning counseling during antenatal care services had a significant effect on postpartum modern family planning use. Counseling about postpartum family planning during antenatal care, satisfaction on the antenatal care services women received while they were pregnant, counseling on birth preparedness and complication readiness plan, counseling on breast feeding and post natal care use were independent predictors for postpartum modern family planning use.

Therefore, programme managers and health providers need to ensure continuity of care through coordination within the health system such as integrating family planning counseling services during antenatal care and providing referral linkages between community and health facility for antenatal care, postnatal care and postpartum modern family planning use to reach postpartum women when their demand for family planning is high.

List of abbreviations

ANC; Antenatal Care, CI; Confidence Interval, FANC; Focused Antenatal Care, GEE; Generalized Estimating Equation

Declarations

Ethical approval and consent

The study protocol was approved by the Institutional Review Board (IRB) of the College of Health Sciences, Addis Ababa University meeting number 004/2015 and an approval letter was written on the date of May 6, 2015 with protocol number 008/15/SPH. Letter of permission was obtained from Amhara Regional Health Bureau and Bahir-Dar City administration Zonal Health Office. Both ANC clients and providers were informed about the purpose of the study and verbal informed consent was also obtained before data collection. Study participants had the right to refuse participation or terminate their involvement at any point during observation. The information collected is kept confidential. Furthermore, report writing does not refer a specific respondent with identifiers.

Consent for publication

This manuscript does not contain any individual person's data in the form of image or video. Hence consent for publication is not applicable.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no any financial or non-financial competing interests (political, personal, religious, ideological, academic, intellectual, commercial or any other).

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Authors' contributions

TE was involved in the conception, and design of the research project proposal; analysis, interpretation, report and manuscript writing. MF had been involved in the conception and design of the research project proposal and AW was involved in the conception, design of research project, analysis, interpretation and approval of manuscript writing. TE and AW read and approved the final manuscript.

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Does antenatal care quality influence on essential newborn care practices? A follow up study Tadesse Ejigu^{1, 2}, Mesganaw Fanthahun³, Alemayehu Worku³

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Abstract:

Background: The neonatal period is only 1/60th of the first five years of life but it accounts for 63% of all infant deaths and 44% of all under-five deaths in Ethiopia. Most causes of neonatal death are preventable and related to cord care to decrease sepsis, temperature control by delaying first bath and initiation of early breastfeeding which has the additional benefit of controlling hypothermia.

Objective: To assess the link between quality of ANC service and implementation of essential newborn care practices among pregnant women attending ANC at public health facilities of BDR City Administration.

Methods: A facility based prospective follow up study was conducted and nine hundred seventy pregnant women with gestational age ≤ 16 weeks who came for their first ANC visit were enrolled. Women were followed from their first ANC visit until six weeks after delivery. Longitudinal data was collected during consultation with ANC providers using structured observation checklist. In addition exit interview at 6 weeks after birth when they came to immunize their child was also carried out to assess the essential newborn care practices that their babies received. ANC service was considered as acceptable quality if women received $\geq 75^{\text{th}}$ percentile of the essential ANC services. Generalized Estimating Equation (GEE) was carried out to control cluster effect among women who received ANC in the same facility.

Results: The composite essential newborn care practice indices were 13.7%, with 95% CI (11.3%, 16.2%) and 86.3 %, with 95% CI (83.8%, 88.7%) for good and poor essential newborn care practices respectively. Of those who received acceptable ANC quality and unacceptable ANC quality 24.7% and 9.6% had good essential newborn care practice respectively ($X^2=31.668$, $p<0.000$). ANC service quality, PNC use, parity and age of the women were predictors for essential newborn care practice (ENBC) practice.

Conclusion and recommendation: Quality ANC service is a facilitator for essential newborn care practice. Good essential newborn care practice is low which is mainly affected by clean cord care. To improve newborn survival, newborn care should be integrated into the current maternal and child interventions, and should be implemented at both community and health facility level as part of a universal coverage strategy

Key words: Newborn care, cord care, thermal care, neonatal mortality

Background

It is estimated that each year four million neonatal deaths occur globally and almost exclusively (99%) in low income countries[1].

In developing countries, progress towards achieving Millennium Development Goal 4 - to reduce under-5 mortality by two-thirds from the 1990 baseline is being hampered by slow progress in reducing neonatal death. Neonatal mortality has remained resistant to change [2-4]. Most causes of neonatal death are preventable and related to cord care to decrease sepsis, temperature control by delaying first bath and initiation of early breastfeeding which has additional benefit of controlling hypothermia [5].

The neonatal period is only 1/60th of the first five years of life but it accounts for 63% of all infant deaths and 44% of all under-five deaths in Ethiopia. Between 2000 and 2016, under-five mortality in Ethiopia declined dramatically, from 166 to 67 deaths per 1,000 live births. Nevertheless, like other developing countries, the reduction is mainly a result of fewer deaths in children one to 59 months old, while neonatal (first 28 days of life) mortality has shown little change (dropping from 49 to 29 deaths per 1,000 live births) [6, 7].

The World Health Organization recommends improving care practices at birth in order to reduce neonatal morbidity and mortality. These have been described as essential newborn care (ENC) practices and include clean cord care, thermal care and initiating breast feeding immediately or within the first hour after birth [8].

One of the instruments to obtain reduction in neonatal mortality is antenatal Care (ANC) by counselling pregnant women to have access for essential newborn care practices during delivery at health facility and preparing them to care for their newborn [9].

The period following birth is often marked by cultural practices in Sub-Saharan Africa (SSA). Some cultural practices hinder the health and survival of the newborn, like bathing the baby immediately after birth, putting different substances on the umbilical cord and giving different prelacteal feeds for the newborn. Even though understanding these cultural practices is an important part of ensuring effective and timely newborn care; there is limited documentation of this evidence in SSA where suboptimal newborn care practices has been widely reported [10]. Therefore the aim of this study was to assess whether or not quality antenatal care lead to essential newborn care practices which might have an input for the design of programs and policies to improve child survival in developing countries like Ethiopia.

Methods

Study design, setting and population

A facility based prospective follow up study was conducted from October 2015 to August 2016 in Bahir Dar City Administration, Amhara Regional State, which is located in the North West part of Ethiopia.

According to the Amhara National Regional State Bureau of Finance and Economic Development report, the projected population by 2015/16 was 297,775 (80.5% urban Vs 19.5% rural), of these 156,515 (52.6%) were females & there were 3,300 eligible pregnant women. The study was conducted on seven public health facilities, one hospital and six health centers. Currently two public hospitals and ten public health centers are providing maternal health care services but at the beginning of the data collection period of this study, one of the hospitals and two of the health centers were new and they were not included in the studied health facilities due to less flow of ANC service users.

All selected first visit pregnant women with gestational age ≤ 16 weeks attending ANC during data collection period that were voluntary to participate were included in the study. Those women with pregnancy outcome of intrauterine fetal death and a still birth baby were excluded in the analysis as data on newborn care practices were not applicable.

Sample size and Sampling technique

The current study is part of a large follow up study with multiple objectives. The detail of the sample size calculation to address all objectives (considering the maximum sample size) and the sampling procedure is described elsewhere. For the current study a sample size was calculated with the prevalence of optimal cord care (24.0%) among women with ≥ 4 ANC visits [10] considering these women as if they received acceptable quality ANC service due to the absence of other literature that showed ANC quality versus essential newborn care practice.

In addition we assume that there could be a 10% reduction in optimal cord care among mothers who received poor quality ANC service and 80% power, 95% confidence level, ratio of unexposed (women who received unacceptable quality ANC service) to exposed (women who received acceptable quality ANC service) is 2:1 and 15% non response rate. The final calculated sample size was 656. The optimal thermal care and breastfeeding care were also considered to calculate the sample size but the sample size calculated using the optimal cord care was the

maximum. However, to increase the power of the study, all 823 women who gave birth alive baby were included in the analysis.

Data collection procedure:

Seven female diploma Midwives and two Bachelor of Science female Midwives who were not the staffs in the study health facilities were recruited as data collectors and supervisors respectively to observe the quality of ANC service provided to pregnant women during their ANC visits using a structured observation check list adapted from the focused antenatal care protocol [11]. In addition, there was also an exit interview with women about their essential newborn care practices while they came to health facilities for immunization of their child. If women do not come to health facilities for immunizing their child, the data collectors were tracing them at home, based on their address registered during the first visit.

Dependent- Essential newborn care practice (good/poor) which is a composite variable and includes clean cord care, optimal thermal care and good neonatal feeding practices. Good newborn care practice (if all the three of them are full filled) will be coded as “1” otherwise “0” that indicates poor practice.

Clean cord care: use of a clean cutting instrument to cut the umbilical cord plus clean thread to tie the cord plus no substance applied to the cord.

Optimal thermal care: baby wrapped at birth plus first bath after 24 hours.

Good neonatal feeding: initiating breastfeeding within the first one hour after birth plus baby given no supplements at all in the first month of life.

Independent- quality of ANC service was the primary exposure of interest. The other exposure variables include: place of delivery, parity, residence, educational status, maternal occupation, marital status, maternal age,

Quality of ANC service is a composite index which was measured by the extent to which the pregnant women received the essential ANC services during the four focused ANC visits. If the essential ANC services were given it was coded as 1 otherwise 0. Percentile was computed to categorize the quality of the services a woman received. If she scored $\geq 75^{\text{th}}$ percentile, of essential ANC services, ANC service was considered acceptable quality otherwise not [12]. Calculation of a composite index for the overall ANC service quality received by each woman is described in detail elsewhere.

Data Analysis: Data were coded and entered into EPI data version 3.1 and exported to SPSS version 20 for analysis. Descriptive statistics were used to describe the data. Generalized estimating equation analysis with binary response variable using robust estimator and exchangeable working correlation matrix was carried out to control the cluster effect of the data among women who received ANC services within the same facility by the same ANC provider. Based on Hosmer and Lemeshow applied logistic regression guide a p-value <0.2 was considered to select eligible variables for the final model and p-value <0.05 was considered to identify statistically significant predictor variables for essential newborn care practice.

Results

Background Characteristics of respondents

Among 970 enrolled mothers 823 (84.8%) completed the follow up (from their first ANC visit to 6 weeks post partum period). There was no statistically significant difference in background characteristics and quality of services received between those who had loss to follow up and those who completed the follow up (quality of the service for those loss to follow up was considered by the services received only in the first visit). The mean age of respondents was 25.46 ± 4.37 years; majorities (88.5%) were from urban and 21.0 % of them had no formal education (Table 1).

Table 1: Socio-demographic characteristics of study participants in public health facilities of Bahir Dar City administration (N=823), October 2015 to August 2016.

Variables	Frequency	Percent
Age		
15-24	354	43.0
25-34	429	52.1
≥ 35	40	4.9
Residence		
Urban	728	88.5
Rural	95	11.5
Educational status		
No formal education	173	21.0
Primary	177	21.5
Secondary and above	473	57.5
Occupation		
Employee	311	37.8
House wife	423	51.4
Farmer	89	10.8
	748	90.9

Religion	73	8.9
Orthodox	2	0.2
Muslim		
Protestant		
Ethnicity	788	95.7
Amhara	25	3.0
Tigre	7	0.9
Agew	3	0.4
Oromo		
Total	823	100

Practice of essential newborn care interventions among study participants

Cord was cut mostly by the use of reused but boiled razorblade or scissor (87%). To keep the babies warm, 90.5% were immediately wrapped. Early bathing was common, with 14.6 % of the babies bathed during the first 24 hours after birth. Although prelacteal feeding was low 2.2% of babies were given butter as first feed (Table 2).

Table 2 Level of newborn care interventions during delivery and neonatal period study participants in public health facilities of Bahir Dar City administration (N=823), October 2015 to August 2016.

Characteristics	Frequency	percent
Place of delivery		
Health facility	718	87.2
Home	103	12.8
Type of instrument used to cut the cord		
Reused but boiled blade or scissor	716	87.0
New blade or scissor	107	13.0
What was used to tie the cord		
Plastic band	593	72.1
Sterile thread	123	14.9
Cloth strip	107	13.0
Substance applied on the cord		
None	819	99.5
Drug	3	0.4
powder	1	0.1

How long after birth was the baby rapped		
Immediately	745	90.5
Within 5 minutes	44	5.3
6-10 minutes	30	3.6
11-20 minutes	3	0.4
21-30 minutes	1	0.1
How long after birth was the baby first bathed		
Within one hour	3	0.4
2-6 hours	19	2.3
7-12 hours	50	6.1
13-24 hours	48	5.8
≥24 hours	703	85.4
How long after birth was the baby first breast fed		
Within one hour	725	88.1
2-6 hours	82	10.0
7-12 hours	15	1.8
13-24 hours	1	0.1
≥24 hours	0	0.0
What was given for the baby as the first feeding		
Colostrum	805	97.8
Butter	18	2.2

ANC quality and essential newborn care practices

Among 823 pregnant women who completed the follow up time (first ANC visit to 6 weeks after birth), 227 (27.6%) received acceptable antenatal care quality during their pregnancy where as 596(72.4%) received unacceptable quality of antenatal care.

About 87.2% of the respondents delivered in the health facility (hospital or health center) but the rest 12.8% gave birth at home. All mothers who gave birth at home practiced poor essential newborn care practice.

In general the composite essential newborn care practice indices were 13.7%, with 95%CI (11.3%, 16.2%) versus 86.3 %, with 95%CI (83.8%, 88.7%) for good and poor essential newborn care practices respectively. Of those who received acceptable ANC quality and unacceptable antenatal care quality 24.7% and 9.6% of them had good essential newborn care practice respectively ($\chi^2=31.668$, $p<0.000$).

The composite newborn care indices of clean cord care; good neonatal feeding and optimal thermal care were 14.8% with 95%CI (12.4%, 17.3%), 87.8% with 95%CI (85.7%, 89.8%) and 85.2% with 95%CI (82.7%, 87.6%) respectively (Table 3).

Table 3: Practice of essential newborn care interventions across socio demographic groups of study participants in public health facilities of Bahir Dar City administration (N=823), October 2015 to August 2016.

Variables	Essential newborn care (ENBC) practices		Frequency
	Good ENBC	Poor ENBC	
Age			
15-24	67(18.9)	287(81.1)	354 (100.0)
25-34	43(10.0)	386(90.0)	429 (100.0)
≥35	3(7.5)	37(92.5)	40 (100.0)
Residence			
Urban	108(14.8)	620(85.2)	728 (100.0)
Rural	5(5.3)	90(94.7)	95 (100.0)
Educational status			
No formal education	28(16.2)	145(83.1)	173 (100.0)
Primary	30(16.9)	147(83.1)	177 (100.0)
Secondary	55(11.6)	418(88.4)	96 (100.0)
Occupation			
Farmer	64(15.1)	359(84.9)	423 (100.0)
House wife	5(5.6)	84(94.4)	89 (100.0)
Employee*	44(14.1)	267(85.9)	311(100.0)
Religion			
Orthodox	108(14.4)	640(85.6)	748 (100.0)
Muslim	5(6.8)	68(93.2)	73 (100.0)
Protestant	0(0.0)	2(100.0)	2 (100.0)
Marital status			
Married	111(13.7)	700(86.3)	811(100.0)
Divorced	2(20.0)	8(80.0)	10 (100.0)
Widowed	0(0.0)	2(100.0)	2 (100.0)
Ethnicity			
Amhara	109(13.8)	679(86.2)	788(100.0)
Tigre	3(12.0)	22(88.0)	25 (100.0)
Awi	1(14.3)	6(85.7)	7 (100.0)
Oromo	0(0.0)	3(100.0)	3(100.0)
Grand total	113(13.7)	710(86.3)	823 (100.0)

Predictors of essential newborn care practices

In a Generalized Estimating Equation binary logistic regression analysis, good essential newborn care practice had a positive association with antenatal care quality, use of postnatal care, being urban residence and being an employee. However parity had a negative association with good essential newborn care practice. The other socio demographic backgrounds of the study women (educational status, ethnicity, marital status and religion) were not associated with essential newborn care practice.

In multivariable Generalized Estimating Equation logistic regression analysis antenatal care quality, PNC utilization, parity and age of the mother remained to have statistically significant association with essential newborn care practices.

The odds of good essential newborn care practice among women who received acceptable ANC quality during their pregnancy was 2.31 time higher compared to those who received unacceptable quality of ANC during their pregnancy (AOR= 2.31, 95% CI=1.47, 3.65). The odds of good essential newborn care practice among women who had PNC service within six weeks was 1.69 times higher compared to those women who had no PNC visit (AOR= 1.69,95%CI=1.03,2.79). The odds of good essential newborn care practice among prima-para women was reduced by58% compared to those women who were multi para or grand multi para (AOR= 0.43,95%CI= 0.27,0.69). The odds of good essential newborn care practice among young women with age 15-24 years was 3.94 times higher compared to elderly women with age ≥ 35 years (AOR= 3.94,95%CI=1.12,13.91) (Table 4).

Table 4: Multivariable GEE logistic regression results to assess the association between ANC quality and Essential newborn care (ENBC) practices (N=823), October 2015 to August 2016

Variables		ENBC practice		COR(95%CI)	AOR(95%CI)
		Good ENBC n (%)	Poor ENBC n (%)		
ANC quality	acceptable	56(24.7)	171(75.1)	3.01(2.06,4.65)	2.31(1.47,3.65)*
	unacceptable	57(9.6)	539(90.4)	1.00	1.00
Residence	Urban	108(14.8)	620(85.2)	3.14(1.25,7.90)	1.88(0.29,12.26)
	Rural	5(5.3)	90(94.7)	1.00	1.00
PNC use	Yes	39(23.4)	128(76.6)	2.34(1.55,3.69)	1.69(1.03,2.79)*
	No	74(11.3)	581(88.7)	1.00	1.00
Parity	Primi para	38(10.8)	314(89.2)	0.04(0.42,0.97)	0.43(0.27,0.69)*
	Multi/grand multi para	75(15.9)	396(84.1)	1.00	
Age of the mother (in years)	15-24	67(18.9)	287(81.1)	2.88(0.86,9.62)	3.94(1.12,13.91)*
	25-34	43(10.0)	386(90.0)	1.37(0.41,4.65)	1.37(0.39,4.82)
	≥35	3(7.5)	37(92.5)	1.00	1.00
Occupation	Employee	44(14.1)	267(85.9)	2.77(1.06,7.21)	1.65(0.24,11.46)
	House wife	64(15.1)	359(84.9)	3.00(1.17,7.67)	1.77(0.27,11.62)
	Farmer	5(5.6)	84(94.4)	1.00	1.00

* Indicates significant difference at $p<0.05$

Discussion

This study revealed the quality of antenatal care given for pregnant women during pregnancy had a positive effect on essential newborn care practices. This is also supported by a maternal and newborn care guide for skilled providers that noted if a woman and her family are well prepared for normal child birth as well as any possible maternal and newborn complications, the woman or baby is more likely to receive skilled and timely care needed to preserve their health and ensure survival [13]. However this finding is in contradictory to a study done Mangwi, Uganda that reported adherence to four or more ANC visits did not show statistically significant relations with newborn care practices [10]. The difference might be due to the reason that the current study tried to look the effect of antenatal care quality (contents of antenatal care services) that the women received on essential newborn care practices but the study in Uganda investigated the association between frequencies of ANC visits with the essential newborn care practices without considering the contents of services that a woman received.

The current study also noted the composite indices of good essential newborn care practices were low; only one in seven neonates had clean cord care. Unclean cord care was mainly affected by the use of any cloth strip or plastic band which was cut by unsterile scissor. This finding is also supported by a study finding in Uttar, Pradesh India that noted the number antenatal care was found to be independently associated with correct breast-feeding practices and thermal care but not with clean cord care implying more than the frequency of ANC visits; it is the quality of ANCs which matters[10, 14].

The current study finding is lower than a study done in eastern Uganda (46.9%) [15],in Mangwi, Uganda (23.7%) [10] Eastern Uganda (38%) [16]. This difference might be explained by the difference in the supplies for clean cord care at the health facilities and commitment of health professionals as well as the knowledge of her accompanies during delivery as most of newborn care practices are beyond the control of the mother alone. For example, the person who offers delivery care will cut and tie the cord without necessarily any input from the mother. In the same way drying, wrapping and bathing of the baby remains under the control of the person assisting her in the delivery or the relatives who will attend to her soon after delivery. Yet it is important to note that clean cord care is very important in preventing early neonatal infections [17].

In this study compared to clean cord care; optimal thermal care (85.2%) and good neonatal feeding interventions were well practiced (87.2%). Yet about one in eight neonates had poor thermal care and neonatal feeding practices. Poor thermal care was driven by first bath before 24 hours after birth. Optimal thermal care and good neonatal feeding practices were better practiced in this study compared to study done in eastern Uganda that reported 11.5% optimal feeding practices and 66.3% receiving thermal protection [15]. This difference might be explained by the cultural difference as breast feeding is a norm in Ethiopia even if it might not be based on WHO recommendation which is 8-12 times per 24 hours. The other reason for the difference might be the background characteristics of the study participants as all of the pregnant women for the current study had four ANC visits which is also supported by a previous study in India that reported frequency of ANC visit is independently associated with breast feeding and thermal care [14]. In addition, most of the pregnant women were from urban (88.5%) and more than half of them (57.5%) had secondary and above educational status for the current study compared to less than half (48.9%) of the study women had four or more ANC visits and only 33% of them had secondary and above educational status for a study done in eastern Uganda. The low level of composite indices of essential newborn care practices in this study was mainly driven by unclean cord care (85.2%) that might be an obstacle for the achievement of sustainable development goal of ending preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal and under-five mortality to at least as low as 12 and 25 per 1,000 live births by 2030 respectively [18]. Similarly it might also hinder meeting the Ethiopian health sector transformation plan of reducing neonatal mortality rates to 10 per 1,000 live births by 2020 [19].

In addition, post natal care utilization and mothers with young age (15-24years) had a positive association with essential newborn care practices. However parity of a woman had negative association with newborn care practices. The negative association of parity with essential newborn care practice might be due to the reason that multi para or grand multi para women are highly likely to give birth at home compared to primi para so that the instruments used for cord cut or cord tie could be unclean.

This study finding might suffer from some limitations as the study setting did have relatively good physical access to health facilities than would be expected for most areas of Ethiopia,

meaning that newborn care practices elsewhere may not be much better than those reported here. In addition, we were not able to verify the actual practices as some data were collected through recall. To minimize recall bias in this study, data collectors interview mothers about the newborn care practices while they came for immunization of their baby at six weeks after birth but similar studies report recall up to one year after birth [20, 21]

Conclusion and recommendations

Most neonatal interventions are not reaching newborns, indicating a “policy-to practice gap “. Quality ANC service is a facilitator for essential newborn care practice. Good essential newborn care practice is low which is mainly affected by clean cord care though there is a statistical significant difference in the implementation of essential newborn care interventions among women who received acceptable quality service and those who do not receive. To improve newborn and child survival, newborn care should be integrated into the current maternal and child interventions, and should be implemented at both community and health facility level as part of a universal coverage strategy. We want also to recommend that evaluation of newborn care practices need to include both the individual and composite practices as the coverage of individual practices may be high and yet when combined into a composite measure might be low.

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12.1. Annex I: Participant information sheet

Title of the project: “Effect of Antenatal Care Service quality on the continuum of maternal and newborn health care services”

Principal Investigator: Tadesse Ejigu

Supervisor: 1. Professor Mesganaw Fantahun

2. Professor Alemayehu Worku

Coordinating office: Addis Ababa University, School of Public Health

Introduction: Care during pregnancy is important for the health of the mother and the development of the unborn baby. However the importance of the care is dependent on the quality of the antenatal care.

Purpose: The Objective of this research is to assess the effect of antenatal care quality on the use of maternal and newborn health care services. This research undertaking is a PhD in Public Health partial fulfillment research dissertation.

Procedure and Participation: The method of the research is observational longitudinal study. The expected duration of the participant’s contact with the observer will be for about six months during each of the fourth antenatal visits while she is getting the antenatal care and at 6weeks after birth. You are asked to participate in this research because the trustful information which you will provide is important for the understanding of the proposed subject matter. Moreover, your particular participation is affirmed by the procedure of systematic sampling technique among all first visit pregnant mothers coming to the health facilities in the study area. While you are getting the antenatal care service the data collector will observe the service provision but the data collector will not have any involvement in the service provision. In addition to the observation you will be asked about your socio-demography, satisfaction, essential newborn care practice and post partum family planning use

Confidentiality: to establish secured safeguards of the confidentiality of research data, the PI will use codes during data collection period instead of using names. No person shall access the data except the PI and the supervisor. The use of information for any purpose other than that to which participants consented is unethical to the participants. The information you provide is not disclosed in the way it identified your personal characteristics and privacy. After the research defense and final work is approved by the school of public health and academic commission and university senate, the original data questionnaire will be burned in secure manner.

Benefit: The research does not have a short term financial, health care and capacity building benefit to the research participant as an individual or as a group but in the long run it will help the concerned organization and policy makers to have a policy consideration and direction and formulation of strategy and design of maternal and newborn health programs based on the recommendations and the findings. Moreover the research work will help as a base line data for other researches in the field.

Risk: The proposed research does not have any physical harm, social discrimination, psychological trauma and economic loss.

Inducement, incentive and Compensation: This study process has no any form of inducement, coercion and the study does not bring any risks that incur compensation.

Results Dissemination: The researcher is responsible for dissemination of findings moreover fully accountable to provide feedback to the health facilities under study, Woreda Health office and to the policy makers. In addition publication of the findings in peer reviewed journal will also be considered with maximum effort.

Freedom to withdraw: If you want to participate in the study, you have full right to withdraw from the study any time you wish. This would have no effect at all on your health benefit from the health facility moreover nobody will enforce you to explain the reason of withdrawal.

Person to Contact: The participant has the right to ask information that is not clear about the research context and content before and or during the research work. You can contact the principal investigator and his supervisor. Moreover this research is ethically reviewed and approved by Addis Ababa University College of Health Sciences IRB. If you want more information and check about this project you can contact the following people

Addis Ababa University College of Health Sciences IRB Secretary Office Tel. 0115512876

Principal Investigator name and address: Tadesse Ejigu Tel: 0920518380

Supervisor name and address: Professor Mesganaw Fantahun, Mobile: 0911240194,

Professor Alemayehu Worku Mobile: 0911405652.

School of Public Health, College of Health Science, Addis Ababa University, Ethiopia

ለተሳታፊዎች የሚሰጥ መረጃ

የጥቁር ርዕስ፡ - « የቅድመ ወሊድ አገልግሎት ጥራት በእናቶችና ጨቅላ ህፃናት የጤና አገልግሎት አጠቃቀም ላይ ያለው ተፅዕኖ ምን ይመስላል? »

ዋና ተመራማሪ፡- ታደሠ እጅጉ

ተቆጣጣሪ ፡ 1. ፕሮፌሰር ምስጋናው ፍንታሁን

2. ፕሮፌሰር አለማዬሁ ወርቁ

የአስተባባሪ ቢሮ፡ አዲስ አበባ ዩኒቨርሲቲ የህብረሰብ ጤና ት/ቤት

መግቢያ፡- በእርግዝና ወቅት የሚደረግ የጤና አገልግሎት ጥራት ለእናትየዋ ጤናም ሆነ ለፅንሱ እድገት ጠቀሜታ አለው ፡፡ ይሁን እንጂ ጠቀሜታው በቅድመ ወሊድ አገልግሎት ጥራቱ ይወሰናል፡፡

ዓላማ፡- የዚህ ጥናት ዋና ዓላማ የቅድመ ወሊድ አገልግሎት ጥራት በእናቶችና ጨቅላ ህፃናት የጤና አገልግሎት አጠቃቀም ላይ ያለው ተፅዕኖ ምን ይመስላል የሚለውን ለማወቅ ሲሆን ጥናቱ የሚደረገው የፍልስፍና ዶርትሬትዲግሪ በህብረተሰብ ጤና ለማግኘት በማሟያነት ስለሚያስፈለግ ነው፡፡

የአካሄድና ተሳትፎ፡- ጥናቱ የሚካሄደው ክትትል በማድረግ ነው፡፡ የጥናቱ ተሳታፊ ምልክታ/ክትትል ከሚያደርገው ሰው ጋር ግንኙነት ሊኖረው ይቻላል ተብሎ የሚታሰበው ለ6 ወር ያህል በአራቱም የቅድመ ወሊድ ክትትሎች ወቅት አገልግሎቱ በሚሰጥበት ጊዜና ጥናቱ ተሳታፊ በወለዱ በ6ኛ ሳምንታቸው ነው፡፡ እርስዎም በዚህ ጥናት እንዲሳተፉ የተጠየቁበት ምክኒያት የሚሰጡት ትክክለኛ መረጃ ከላይ የተገለፀውን ጉዳይ ለመረዳት ስለሚረዳ ነው፡፡ በተጨማሪም የእርስዎ ተሳትፎ የሚወሰነው ከሁሉም ለመጀመሪያ ጊዜ ለቅድመ ወሊድ ክትትል ከሚመጡ እናቶች መካከል በየተሰወነ ቁጥር ርቀት በመምረጥ ነው፡፡

እርስዎ የቅድመ ወሊድ አገልግሎት በሚገኙበት ወቅት የመረጃ ሰብሳቢዋ የአገልግሎት አሰጣጡን ትክታተላለች ይሁን እንጂ መረጃ ሰብሳቢዋ በአገልግሎት አሰጣጡ ላይ ምንም አይነት ተሳትፎ አይኖራትም፡፡ ከምልክታው በተጨማሪ እርስዎ ስለ ማህበራዊና ዲሞክራሲያዊ ታሪክዎን እንዲሁም በአገልግሎት አሰጣጡ ላይ ያለዎትን እርካታ፣ ለጨቅላ ህፃናት ስለሚያደርጉት የጤና እንክብካቤና ስለ ድህረ ወሊድ የቤተሰብ ምጣኔ አገልግሎት አጠቃቀም ይጠየቃሉ፡፡

የመረጃው ምስጢራዊነት፡- የመረጃውን ደህንነትና ምስጢራዊነት ለመጠበቅ ሲባል ዋና ተመራማሪው መረጃ ለመሰብሰብ በስም ፋንታ ኮድ ይጠቀማል፡፡ ከዋና ተመራማሪውና ተቆጣጣሪው በስተቀር ሌላ ሰው መረጃውን ሊያገኘው/ሊጠቀምበት አይችልም፡፡ መረጃውን ተሳታፊው ከፈቀደው ውጭ ለሌላ አገልግሎት ማዋል የተሳታፊውን መብት መጣስ ነው፡፡ እርስዎ የሚሰጡት መረጃ የእርስዎን ማንነት በሚያሳውቅ መልኩ አይገልፅም፡፡ የምርምር ውጤቱ ለውይይት ከቀረበ በኋላና በህብረተሰብ ጤና ት/ቤት፣ በአካዳሚክ ኮሚሽንና በዩኒቨርሲቲው ሴኔት ከፀደቀ በኋላ መረጃው የተሰበሰበበት መጠይቅ ይቃጠላል፡፡

ጥቅም፡- በጥናቱ በመሳተፍዎ እንደ ግለሰብም ሆነ በቡድን በአጭር ጊዜ በገንዘብም በጤና አገልግሎት ወይም አቅምን በመገንባት የሚያስገኘው ጥቅም የለም ነገር ግን ጥናቱ ለሚመለከታቸው አካት እና ለፕሊሲ አውጭዎች የእናቶችና ጨቅላ ህፃናትን ጤና ፕሮግራም የጥናቱ ውጤት በሚሰጠው አቅጣጫ መሰረት ለመቅርፅ ይጠቅማል፡፡ በተጨማሪም መረጃው በመስኩ ለሚደረጉ ሌሎች ጥናቶች እንደመነሻ ሆኖ ያገለግላል፡፡

አደጋ፡- ይህ ጥናት ምን አይነት አካላዊ ጉዳት ማህበራዊ መገለል፣ የስነ - ልቦና ጉዳት ወይም ኢኮኖሚያዊ ጉድለት አያስከትልም፡፡

መገፋፋት፣ ጥቅማጥቅምና ካሳ፡- ይህ ጥናት የጥናቱ ተሳታፊ እንዲሆኑ ምንም ዓይነት ግፊት እንዲሁም ማሰገደድና ካሳ የለውም፡፡

የውጤቱ ስርጭት፡- ተመራማሪው መረጃውን የማሳወቅ ግዴታ አለበት፡፡ በተጨማሪም ጥናቱ ለተካሄደባቸው ጤና ተቋማት፣ ለወረዳ ጤና ጥበቃ ጽ/ቤት እና ለፓሊሲ አውጭዎች ግብረ-መልስ መስጠት ይጠበቅበታል፡፡

ከዚህም በተጨማሪ የጥናቱ ውጤት በታወቁ ጆርናሎች ለማሳተም የሚቻለውን ሁሉ ጥረት ይደረጋል፡፡

የማቋረጥ መብት፡- የጥናቱ ተሳታፊ ላለመሆንና ማቋረጥ ከፈለጉ በማንኛውም ጊዜ ለማቋረጥ ይችላሉ፡፡ ይህ ደግሞ እርስዎ ከጤና ተቋሙ በሚያገኙት አገልግሎት ላይ የሚያመጣው ምንም አይነት ችግር የለም፡፡ በተጨማሪም ያቋረጡበትን ምክኒያት እንዲገልፁ ማንም አያስገድዶትም፡፡

መጠየቅ የሚችሉት ሰው፡- ተሳታፊዎች ማንኛውም ግልጽ ያልሆነላቸውን የጥናቱን ይዘቶች ከጥናቱ በፊትም ሆነ በጥናቱ ወቅት የመጠየቅ መብት አላቸው፡፡ ዋና ተመራማሪውን ወይም ተቆጣጣሪውን መጠየቅ ይችላሉ፡፡ በተጨማሪም ይህ ጥናት በአዲስ አበባ ዩኒቨርሲቲ ታይቶ ፀድቋል፡፡

ተጨማሪ መረጃ ከፈለጉ የሚከተሉትን ሰዎች ማግኘት ይችላሉ፡፡

**አዲስ አበባ ዩንቨርሲቲ የጤና ሳይንስ ኮሌጅ ተቋማዊ የጥናትና ምርምር የስነ-ምግባር ቦርድ
የፀኑፊ ቢሮ ስልክ :- 0115 55 12 876**

የዋና ተመራማሪ ስምና አድራሻ፡- ታደሰ እጅጉ ስልክ : 09 20 51 83 80

የተቆጣጣሪ ስምና አድራሻ 1. ፕሮፌሰር ምስጋናው ፈንታሁን ስልክ:09 11 24 01 94

2. ፕሮፌሰር አለማዬሁ ወርቁ ስልክ : 09 11 40 56 52

12.2: Informed consent form

Title of the project: “Effect of Antenatal Care Service quality on the continuum of maternal and newborn health care services”

I have been well aware of that this research undertaking is a PhD in Public Health partial fulfillment research dissertation which is fully supported and coordinated by AAU School of Public Health and the designate principal investigator is Tadesse Ejigu. I have been fully informed in the language I understand about the research project objective that is to assess the effect of antenatal care quality on the use of maternal and newborn health care services.

I have been informed that all the information I shall provide to the interviewer will be kept confidential. I understood that the research has no any risk and no compensation. I also knew that I have the right to withhold information, skip questions to answer or to withdraw from the study any time. I have acquainted nobody will impose me to explain the reason of withdrawal. It is also enlighten there would have no effect at all in my health benefit that I get from the health facility. I have assured that the right to ask information that is not clear about the research before and or during the research work and to contact

Addis Ababa University College of Health Sciences IRB Secretary Office Tel. 0115512876

Principal Investigator’s Name: Tadesse Ejigu Tel: 0920518380

Supervisor’s Name and Address: Professor Mesganaw Fantahun Tel: 0911240194;

Professor Alemayehu Worku Mobile; 0911405652

I have read this form, or it has been read to me in the language I comprehend and understood the condition stated above, therefore, I am willing and confirm my participation by signing the consent.

Name of the participant _____

Agreed to participate in the study: Yes /No (mark one of them for verbal consent)

Signature _____ (if written consent)

Name of witness signature _____ (Data collector, supervisor, any third person)

Signature _____

Date _____

መረጃን መሰረት ያደረገ ስምምነት ፎርም

የጥናቱ ርዕስ፡ - « የቅድመ ወሊድ አገልግሎት ጥራት በእናቶችና ጨቅላ ህፃናት የጤና አገልግሎት አጠቃቀም ላይ ያለው ተፅዕኖ ምን ይመስላል? »

እኔ ይህ ጥናት የፍልስፍና ዶክትሬት ዲግሪ በህብረተሰብ ጤና ለማግኘት የሚደረግ የማሟያ ጥናት እንደሆነ እንዲሁም በአዲስ አበባ ዩንቨርሲቲ ድጋፍ የሚደረግለት መሆኑን እና ዋና ተመራማሪው አቶ ታደሰ እጅዱ መሆኑን በሚገባ አውቂያለሁ፡፡ ጥናቱ የሚካሄደው የቅድመ ወሊድ አገልግሎት ጥራት በእናቶችና ጨቅላ ህፃናት የጤና አገልግሎት አጠቃቀም ላይ ያለው ተፅዕኖ ምን ይመስላል የሚለውን ለማወቅ የሚደረግ ጥናት እንደሆነ ሙሉ በሙሉ ልረዳው በምችለው ቋንቋ ተነግሮኛል፡፡

እኔ ለመረጃው ሰብሳቢው የምሰጠው መረጃ ምስጢራዊነቱ የተጠበቀ እንደሆነ ተነግሮኛል፡፡ ጥናቱ ምንም አይነት አደጋ ሆነ ካሳ የለውም ፡፡ በተጨማሪም ጥያቄዎችን ያለመመለስ ፣ የመዝለል፣ እንዲሁም ተሳታፊነቱን በማንኛውም ጊዜ የቋረጥ መብት እንዳለኝ አውቂያለሁ፡፡ ማንም ሰው ያቋረጥኩበትን ምክኒያት እንድገልፅ እንደማያስገድደኝም ተነግሮኛል፡፡ በማቋረጤ ምክኒያትም ከጤና ተቋሙ በማገኘው የጤና አገልግሎት ላይ ምንም አይነት ችግር ሊከሰት እንደማይችል ተገልጾኛል፡፡

ከጥናቱ በፊትም ሆነ በጥናቱ ወቅት ግልፅ ያልሆነልኝን ማንኛውም የጥናቱ ይዘት መጠየቅ እንደምችል ቸረጋግጫለሁ፡፡

ጥያቄዎችን ለማቅረብ ፡

አዲስ አበባ ዩንቨርሲቲ የጤና ሳይንስ ኮሌጅ ተቋማዊ የጥናትና ምርምር የስነ-ምግባር ቦርድ የፀኃፊ ቢሮ ስልክ ፡- 0115 55 12 876

የዋና ተመራማሪ ስምና አድራሻ፡- ታደሰ እጅዱ ስልክ ፡ 09 20 51 83 80

የተቆጣጣሪ ስምና አድራሻ 1. ፕሮፌሰር ምስጋናው ፈንታሁን ስልክ፡09 11 24 01 94

2. ፕሮፌሰር አለማዬሁ ወርቁ ስልክ ፡ 09 11 40 56

ይህን ፎርም እኔ አንብቤዋለሁ/በሚገባኝ ቋንቋ ተነግሮኛል፡፡ ከላይ የተገለፁትን ጉዳዮችም ተረድቻለሁ፡፡ ስለሆነም የጥናቱ ተሳታፊ መሆኔን በፊርማዬ አረጋግጣለሁ፡፡

የተሳታፊው ስም-----

ለመሳተፍ ተስማምቻለሁ አዎ ☐ አልተስማማሁም ☐

ፊርማ----- (ለፅሁፍ ስምምነት)

የእማኝ ስም----- (መረጃ ሰብሳቢ፣ ተቆጣጣሪ ወይም ሌላ ሦስተኛ ወገን)

ፊርማ-----

ቀን-----

12.3: Questionnaire- English Version

Section 1: Socio demographic information

Q101: Age ----- (in years)

Q102: Residence (specify Kebele and Got)

1. Urban (Kebele-----
-and Got-----

2. Rural (kebele-----
'Got-----
.Tel.

Q103: Religion

1. Orthodox

4. Catholic

2. Muslim

5. Other (specify)-----

3. Protestant

Q104: Ethnicity

1. Amhara

4. Oromo

2. Tigre

5. Other (specify) -----

3. Agew

Q105: Marital status

1. Single

3. Divorced

2. Married

4. Widowed/widower

Q106: Occupation

1. Farmer

5. Gov't employee

2. House wife

6. NGO employee

3. Merchant

7. Other (specify) -----

4. Private employee

Q107: Parity-----

Q108: Level of education

1. Cannot read and write

4. Grade 5-8

2. Can read and write (have
informal education)

5. Grade 9-10

3. Grade 1-4

6. Grade 11-12

7. Higher level(12+)

Antenatal Care quality observation Checklist

Section 2: Introduction and History Taking				
	1 st visit	2 nd visit	3 rd visit	4 th visit
Q201: Did the health worker greet the client (and others present) in a friendly and respectful manner?				
Q202: Did the health worker introduce her/himself and title (midwife, nurse, etc.)				
Q203: Did the health worker ask about her LMP?				
Q204: Did the health worker ask about Prior pregnancies?				
Q205: Number of prior pregnancies (if any)_____	If no prior pregnancy go to Q206			
Q205 Did the health worker or client discuss any of the following complications for prior pregnancies				
Q205_1: Heavy bleeding during or after delivery				
Q205_2: Anemia				
Q205_3: High blood pressure				
Q205_4: Convulsions				
Q205_5: Multiple pregnancies (twins or above)				
Q205_6: Prolonged labour				
Q205_7: C-section				
Q205_8: Assisted delivery (forceps, Vacuum)				
Q205_9: Prior abortion/miscarriage (loss of pregnancy)				
Q205_10: Prior stillbirth (baby born dead that does not breathe or cry)				
Q206: Did the health worker ask about or the client mentions any of the following for current pregnancy?				
Q206_1: Vaginal bleeding				
Q206_2: Fever				
Q206_3: Headaches or blurred vision				
Q206_4: Swollen face or hands				
Q206_5: Convulsions or loss of consciousness				
Q206_6: Severe difficulty breathing				

Q206_7: Severe abdominal pain				
Q206_8: Foul smelling discharge				
Q206_9: Frequent or painful urination				
Q206_10: Whether the client has felt a decrease or stop in fetal movement				
End of Section two				
Section 3: Tests and Treatments				
Q301: Did the health worker wash his/her hands with soap or use alcohol hand rub prior to examination?				
Q302: Did the health worker perform any of the following procedures?				
Q302_1: weigh the client				
Q302_1: Take the client's blood pressure				
Q302_3: Examine hands for edema				
Q302_3: Perform or refer for urine test				
Q302_4: Perform or refer for HCt/Hb test				
Q302_5: Perform or refer for a syphilis/VDRL test				
Q302_6: Check for signs of anemia				
Q302_7: Palpate the client's abdomen for uterine height				
Q302_8: Listen to the client's abdomen for fetal heartbeat				
Q302_9: Did the health worker perform, inquire about, or refer for an HIV test?				
Q302_10: PMTCT counseling? (at least once for HIV+)				
Q303: Did the health worker give the client any of the following treatments?				
Q303_1: Prescribed or gave iron or folic acid or both				
Q303_2: Explained the purpose of iron or folic acid				
Q303_3: Explained how to take iron or folic acid pills/syrup				
Q303_4: Explained side effects of iron or folic acid				
Q303_5: Prescribed or gave a tetanus toxoid (TT) injection				
Q303_6: Explained the purpose of the TT injection				

Q303_7: Importance of using ITN explained explicitly				
Q303_8: Prescribed or gave deworming medication				
Q303_9: Explained the purpose of deworming				
Q303_10: Explained side effects of deworming medication				
Section 4: Counseling				
Q401: Did the health worker counsel the client in any of the following reasons to seek immediate medical care?				
Q401_1: if she has vaginal bleeding				
Q401_2: If she has convulsions				
Q401_3: If she has severe headaches with blurred vision				
Q401_4: If she has fever and is too weak to get out of bed				
Q401_5: If she has severe abdominal pain				
Q401_6: If she has fast or difficult breathing				
Q402: Did the health worker counsel the client in any of the following ways about birth preparation?				
Q402_1: Asked the client where she will deliver				
Q402_2: Advised the client to prepare for delivery (e.g. set aside money, arrange for emergency transportation)				
Q402_3: Advised the client to use a skilled health worker during delivery				
Q402_4: Discussed with client what items to have on hand at home for emergencies (e.g. sterile blade)				
Q403: Did the health worker discuss nutrition and healthy eating during pregnancy?				
Q404: Did the health worker discuss breastfeeding?				
Q405: Did the health worker discuss about infant immunization? (at least once)				
Q406: Did the health worker discuss about the importance of post partum visit?				
Q407: Did the health worker discuss family planning for use after delivery?				
Q408: Did the health worker counsel on when to return for next				

visit?				
Q409: Did the health worker speak using easy-to-understand language for the client?				
Q410: Did the health worker ask whether the client had any questions?				
Q411: Did the health worker write on the client's ANC register? (Observer: choose DK if no card)				

Key: Write: **Yes** =when procedure is done; **No**= when procedure is not done.

DK= when you don't know

Section 5: Outcome attributes (client satisfaction).

Please encircle the number according to the client's agreement in the statement (3 points each).

No.	Questions	Coding category
501	Waiting time was fair	5.Strongly agree 4.Agree 3.Uncertain 2.Disagree 1.Strongly disagree
502	Waiting area was adequate & with seats	5.Strongly agree 4.Agree 3.Uncertain 2.Disagree 1.Strongly disagree
503	The provider was easy to understand	5.Strongly agree 4.Agree 3.Uncertain 2.Disagree 1.Strongly disagree
504	privacy during consultation was maintained	5.Strongly agree 4.Agree 3.Uncertain 2.Disagree

		1.Strongly disagree
505	The antenatal clinic has clean latrine & adequate water supply	5.Strongly agree 4.Agree 3.Uncertain 2.Disagree 1.Strongly disagree
506	You feel that today you received full information about ANC.	5.Strongly agree 4.Agree 3.Uncertain 2.Disagree 1.Strongly disagree
507	I want to give birth in this health facility.	1.Strongly agree 2.Agree 3.Uncertain 4.Disagree 5.Strongly disagree
508	you recommend your relatives & others to attend their antenatal visit in this facility	5.Strongly agree 4.Agree 3.Uncertain 2.Disagree 1.Strongly disagree

Section 6: Delivery, Newborn Care and Post partum family planning use

Q601: Place of delivery

1. Health institution
2. Home

Q602: Type of instrument used to cut the cord

- | | |
|--|--------------------------|
| 1. Un used new razor blade
/scissor | 3. Household knife |
| 2. Used (old unboiled) razor blade
/scissor | 4. Other (specify) ----- |

Q603: What was used to tie the cord?

- | | |
|-----------------|--------------------------|
| 1. Cloth strip | 3. Rubber band |
| 2. Clean thread | 4. Other (specify) ----- |

Q604: What was put on the cord?

- | | |
|------------------|--------------------------|
| 1. Nothing | 4. Cow dung |
| 2. Medical drugs | 5. Ash |
| 3. Powder | 6. Other (specify) ----- |

Q605: After how long was the baby wrapped?

- | | |
|----------------|----------------|
| 1. Immediately | 4. ≤20 minutes |
| 2. ≤5 minutes | 5. ≤30 minutes |
| 3. ≤10 minutes | 6. ≤60minutes |

Q606: Cloth used for wrapping the baby

- | | |
|-----------------------|---------------------|
| 1. Old washed cloth | 4. New washed cloth |
| 2. Old unwashed cloth | 5. I don't know |
| 3. New unwashed cloth | |

Q607: How soon after birth the baby was breastfed?

- | | |
|----------------------|-----------------|
| 1. Immediately | 3. 6 - 24 hours |
| 2. Less than 6 hours | 4. >24 hours |

Q608: How long after birth was baby first bathed?

- | | |
|---------------------|------------------|
| 1. Less than 1 hour | 4. 13 - 24 hours |
| 2. 2- 6 hours | 5. >24 hours |
| 3. 7 - 12 hours | |

Q609: what was newborn's first feed?

- | | |
|--------------------------------------|--------------------------|
| 1. Breast milk/colostrum | 5. Formula feed |
| 2. Breast milk from other woman | 6. Other (specify) ----- |
| 3. Tea | |
| 4. Plain water with or without sugar | |

Q610: Timing of first post natal check up

- | | |
|---------------------------|---------------------------------|
| 1. No post natal check up | 2. Within 2 days after delivery |
|---------------------------|---------------------------------|

3. Between 3days and 6 weeks

5. Other (specify) -----

4. After 6 weeks

Q611: Do you use any modern contraceptive method currently?

1. Yes

2. No

Q612: When did you start after birth? ----- (in weeks)

Q613: Type of contraceptive in use?

1. OCP

2. Depo-Provera

3. Implant

4. IUCD

5. Other (specify)

Section 7: Check list for inventory of Facility, Equipment and supplies for FANC

Key: put a tick mark on the space provided accordingly.

	Available & satisfactory (1)	Available & unsatisfactory (2)	Not available (3)
Availability of Infrastructure			
waiting area			
Generator in case of light problemxc			
Private examination room			
Examination couch			
Sufficient light source			
Toilet			
Water for hand washing			
Soap			
Equipment			
Screen			
Weight scale (adult)			
Sphygmomanometer			
stethoscope			
Fetal scope			
Thermometer			
Laboratory Facility			
Hemoglobin test reagents			

Urine dip stick test for glucose			
Urine dip stick test for albumin			
HIV test kits			
Blood group			
VDRL for syphilis test			
Pregnancy test			
Microscopic urine test			
Drugs			
Fe-sulphate			
Folic acid tablet			
Antimalarial tablet			
Anti helminthes			
TT vaccine			
Magnesium Sulfate			

FANC guidelines/reference materials			
Revised ANC cards			
ANC register			
Standard guideline for focused ANC			

12.4 Annex-II. የአማርኛ ቃለ መጠይቅ ፎርም

ክፍል 1: ማህበራዊ ና ዲሞክራሲያዊ

ጥያቄ ቁጥር 101. ዕድሜ (በዓመት) _____

ጥያቄ ቁጥር 102. መኖሪያ አድራሻ 1. ከተማ(-----ቀበሌ) 2. ገጠር(-----ቀበሌ)
-----ጎጥ ----- ጎጥ

ጥያቄ ቁጥር 103 : ሃይማኖት

- | | |
|------------------|-------------------|
| 1. ኦርቶዶክስ ክርስቲያን | 4. ካቶሊክ |
| 2. ሙስሊም | 5. ሌላ (ይጠቀስ)----- |
| 3. ፕሮቴስታንት | |

ጥያቄ ቁጥር 104. ብሄር

- | | |
|--------|--------------------|
| 1. አማራ | 4. አሮሞ |
| 2. ትግሬ | 5. ሌላ (ይጠቀስ) ----- |
| 3. አገው | - |

ጥያቄ ቁጥር 105. የጋብቻ ሁኔታ

- | | |
|----------|-------------|
| 1. የላገባች | 3. የፈታች |
| 2. የገባች | 4. ባሴ የሞተባት |

ጥያቄ ቁጥር 106. ሥራ

- | | |
|-------------|--------------------------|
| 1. ገበሬ | 4. የመንግስት ሠራተኛ |
| 2. የቢትዕመቢት | |
| 3. ነጋዴ | 5. መንግስት ዊ ያልሆነ ተቋም ተቀጣሪ |
| 4. የግል ተቀጣሪ | 6. ሌላ (የጠቀሰስ)----- |

ጥያቄ ቁጥር 107. ለስንት ጊዜ ወልደዋል?-----

ጥያቄ ቁጥር 108. የትምህርት ደረጃ

- | | |
|--------------------|-----------|
| 1. መፃፍና ማንበብ የማተችል | 5. ከ9-10 |
| 2. መፃፍና ማንበብ የምተችል | 6. ከ11-12 |

3. ከ1-4

7. ከ12ኛ ክፍል በላይ

4. ከ5-8

ክፍል 2: ትውውቅ ና የቃል ምርመራ

ጥያቄ ቁጥር	የመጀመርያ ምረመራ	2ኛ ምርመራ	3ኛ ምረመራ	4ኛ ምርመራ
201. ባለሙያው ለሴትዮቻቸው ሆነ ሌሎች አብረው ለነበሩት ሠዎች በአክብሮትና በጓደኝነት መልኩ ሠላምታ አቅርቧል፡፡				
202. ባለሙያው ሙያውንና ማዕረጉን አስተዋውቋል				
203. ባለሙያው የወር አበባ ለመጨረሻ ጊዜ የመጣበትን ቀን ጠይቋል				
204. ባለሙያው ስለበፊት ርግዝና ወቅት ጠይቋል				
205. ከዚህ በፊት ለምን ያልረዳው የሆነው ቃል	እርግዝናካልን በረዳው የጥያቄ ቁጥር 206 ይሂዱ			
205. ባለሙያው የበፊት ርግዝናን በተመለከተ ስለሚከተሉት ሁኔታዎች ጠይቋል				
205.1 በ ርግዝና / በወሊድ ወቅት ከባድ የደም መፍሰስ				
205.2 የደም ማነስ				
205.3 የደም ግፊት መጨመር				
205.4 መንቀጥቀጥ				
205.5 ሁለትና ከዚያ በላይ ርግዝና				
205.6 አሰፋፋይ ምጥ				
205.7 . በአፕራሲያን መውለድ				
205.8 በመሳሪያ መውለድ (ሻክያም ፣ ፎርሴፕስ)				
205.9 ውርጃ				
205.10 ሙቶ የተወለደ ህፃን				

ጥያቄ ቁጥር	የመጀመርያ ምረመራ	2ኛ ምርመራ	3ኛ ምረመራ	4ኛ ምርመራ
206. ለአሁኑ ዕርግዝና የሚከተሉትን ጥያቄዎች ጠይቃል				
206.1 በብልት ደም መፍሰስ				
206.2 የሙቀት መጨመር				
206.3 ከፍተኛ የረስ ምታት የአይን በሻርታ				
206.4 የ ጅ /የፊት መበጥ				
206.5 ማንቀጥቀጥ /ረስ ም ት				
206.6 የአተነፋፈስ ችግር				
206.7 ከፍተኛ የሆነ የሆድ ህመም				
206.8 መጥፎ ሽ ያለው ፈሳሽ				
206.9 ቶሎ ቶሎ መሸናት/ሽንት ሲሸኑ የህመም ስሜት መሠማት				
206.10 የፅንሱ ንቅስቃሴ መቀነስ/መቆም				
ክፍል 3 ምርመራና ህክምና				
301. ከምርመራ በፊት በለሙያው ጁን በሳሙና ወይም በአልኮል አፅድቷል				
302 በለሙያው የሚከተሉትን ምርመራዎች አከናውኗል				
302.1 ክብደቱን ለክታል				
302.2 የደም ግፊቱን ለክታል				
302.3 ጄ ማበጥ /አለማበጡን አይታል				
302.4 የሽንት ምረመራ አድርጎል ል				
302.5 የደም ማነስ ምርመራ				
302.6 የደም ማነስ ምልክቶች መኖር አለመኖራቸውን መርምሯል				
ጥያቄ ቁጥር	የመጀመርያ ምረመራ	2ኛ ምርመራ	3ኛ ምረመራ	4ኛ ምርመራ

	ያ ምረመራ	ምርመራ		ምርመ ራ
302.7 የማህፀኑን ቁመት ለከተዋል				
302.8 የፅንሱን የልብ ምት አዳመጠዋል				
302.9 የኤችአይቪ ምረመራ አድረጎል ል /ምርመራው ወዳለበት ተቋም ልኬል				
302.10 ቫይረሱ በደሜ ውስጥ ላለባት ናት ወደ ፅንሱ ነዳይተላለፍ ስለመድረግ ህክምና መረጃ ሰጥቷል				
303 ባለሙያው የሚከተሉትን መድሐኒቶች ሰጥቷል				
303.1 የደም ማነስ መድሀኒት				
303.2 ስለ ደም ማነስ መድሀኒት መውሰድ ጠቀሜ መረጃ ሰጥቷል				
303.3 የደም መነስ መድሀኒቱ ነዴት ንደሚወሰድ አስረድቷል				
303.4 ስለደምማነስ መድሀኒቱ ሊኖረው ስለሚቻለው የጎንዮሽ ጉዳት አስረድቷል				
303.5 የመነጋጋ ቆልፍ መከላከያ ክትባት ሰጥቷል				
303.6 ስለመንጋጋ ቆልፍ ክትባት ጠቀሜ አስረድቷል				
303.7 አጎበር መጠቀም ስላለው ጠቀሜ አስረድተዋል				
303.8 የትላትል መድሀኒት ሰጥቷል				
303.9 የትላትል መድሀኒት መውሰድ ስላለው ጠቀሜ አስረድቷል				
303.10 የትላትል መድሀኒቱ ስላሚኖረው የጎንዮሽ ጉዳት አስረድቷል				

ክፍል 4 የምክር አገልግሎት

ጥያቄ ቁጥር	1ኛ ምረመራ	2ኛ ምርመራ	3ኛ ምረመራ	4ኛ ምርመራ
401 የሚከተሉት ችግሮች ከጋጠሜት ወድያውኑ ነድት ከም መክረዋል				
401.1 በብልት ደም መፍሰስ ሲያጋጥም				
401.2 መነቀጥቀጥ ሲያጋጥም				
401.3 የራስ ም ት/የአይን ብሽር ሲያጋጥም				
401.4 የሙቀት መጨመርና መደከም ስያጋጥም				
401.5 ከፍተኛ የሆነ የሆድ ህመም ሲያጋጥም				
401.6 የአተነፋፈስ ችግር ሲያጋጥም				
402 ባለሙያው ስለሚከተሉት የወሊድ ዝግጅት መከራ				
402.1 የት መውለድ ንዳለባት				
402.2 በወሊድ ወቅት ስለሚያስፈልጉ ነገሮች (ለምሳሌ ገንዘብ ፣መጓጓዣ ወዘተ)				
402.3 የሚያዋልድ በለሙያን በተመለከተ				
402.4 በቤቱ ውስጥ መኖር ስላለባቸው የማዋለጃ መሣሪያዎች በተመለከተ (ለምሳሌ ንፅህናው የተጠበቀ ምለጭ ጓንት ወዘተ)				
403 ስለ አመጋገብ ስረዓት				
404 ስለ ጡት መጥባት				
405 ስለ ክትባት				
406 ስለ ድህረ ወሊድ ክትትል				
407 ስለ ድህረ ወሊድ የቤተሰብ ምጣኔ አገልግሎት				
408 ስለ ሚቀጥለው የቀጠሮ ቀን				
409 ባለ ሙያ ለማመካር የሚጠቀምበት ጽንጽ ቀላልና ግለፅ ነው				
410 ባለሙያው ሴትዮዋ ግልፅ ያልሆነላትን ጥያቄ ካለ ንድትጠይቅ ያደርጋል				
411 ባለሙያው በቅደመ ወሊድ ክትትል ከርዱ ላይ ይመዘግባል				

ክፍል 5: ተጠቃሚዎች በተለያዩ አገልግሎቶች ላይ ያላቸውን ርካ በተመለከተ፡፡

ከዚህ በ ች በሰንጠረዥውስጥየተቀመጡትነጥቦች ተጠቃሚዎች በአገልግሎቱ ላይያላቸውንየተለያዩ ርካ ደረጃዎችያሳያሉ፡፡ ተጠቃሚዎች በሚቀርብላቸው ሃሳብ በጣም የሚስማሙከሆነናበጣም ስማማሉ፡፡ በተወሰነደረጃየሚስማሙ ከሆነ ና ስማማሉ፡፡ በመስማማትና ባለመስማማት መካከል ከሆኑናተሀቅቦን ፣ በተወሰነደረጃየሚስማሙከሆነናአልስማማምን ፣ በጣም የማይስማሙከሆነናበጣም አልስማማምንየሚሉትንየመልስ አማራጭኮዶችያክብቡ፡፡

ተ.ቁ	ጥያቄ	የመልስ አማራጭና መለያ ኮድ	ይዘለል
501	ከደረስኩበት አገልግሎት ስክማገኘ በትያለውየቆይ ጊዜ በቂ ነው፡፡	5. በጣም ስማማሉ 4.ስማማሉ 3. ተሀቅቦ 2. አልስማማም 1. በጣም አልስማማም	
502	የመቆያ ቦ ው በቂና ምቹ መቀመጫአለው፡፡	5. በጣም ስማማሉ 4.ስማማሉ 3. ተሀቅቦ 2. አልስማማም 1. በጣም አልስማማም	
503	የቅድመ ወሊድ ክትትል አገልግሎት ሰጭውን ባለሙያ በቀላሉ መረዳት ይቻላል፡፡	5. በጣም ስማማሉ 4.ስማማሉ 3. ተሀቅቦ 2. አልስማማም 1. በጣም አልስማማም	
504	ከባለሙያው ጋር የነበረው ውይይት ለብቻ ነበር፡፡	5. በጣም ስማማሉ 4.ስማማሉ	

		3. ተህቅቦ 2. አልስማማም 1. በጣም አልስማማም	
505	የቅድመ ወሊድ ክትትል አገልግሎት መስጫ ክሊኒክ ንፁህ ሽንት ቤትና በቂ የውሃ አቅርቦት አለው።	5. በጣም ስማማለሁ 4. ስማማለሁ 3. ተህቅቦ 2. አልስማማም 1. በጣም አልስማማም	
506	ስለ ቅድመ ወሊድ ክትትል የተሰጠኝ መረጃ በቂ ነው።	5. በጣም ስማማለሁ 4. ስማማለሁ 3. ተህቅቦ 2. አልስማማም 1. በጣም አልስማማም	
507	መወለድ የምፈልገዉ ከዚህ ጤና ተቋም ነው	5. በጣም ስማማለሁ 4. ስማማለሁ 3. ተህቅቦ 2. አልስማማም 1. በጣም አልስማማም	
508	ለዘመዶቼና ለሌሎች ከዚህ ጤና ተቋም ቅድመ ወሊድ ክትትል ንዲያደርጉ መክራለሁ።	5. በጣም ስማማለሁ 4. ስማማለሁ 3. ተህቅቦ 2. አልስማማም 1. በጣም አልስማማም	

ክፍል 6: ወለድ ፣ የጨቅላ ህፃናት የሚደረግ ጥንቃቄ ና የድህረ ወሊድ የቤተሰብ ምጣኔ አገልግሎት

ጥያቄ ቁጥር 601 የወለዱበት ቦ

1. ጤና ተቋም
2. ቤት

ጥያቄ ቁጥር 602 ትብት የተቆረጠበት መሣሪያ

1. አዲስ ምላጭ/መቀስ
2. ጥቅም ላይ የዋለ ያልተቀቀለ ምላጭ/መቀስ
3. ቢላ
4. ሌላ (የጠቀስ) -----

ጥያቄ ቁጥር 603 ትብቱን ለማሰር የተጠቀሙት ምን ነበር

1. ጨርቅ ቁረጭ
2. ንፅህናው የተጠበቀ ክር
3. የፕላስቲክ ባንድ
4. ሌላ (ይጠቀስ)-----

ጥያቄ ቁጥር 604 ትብቱ ላይ የተቀመጠው/የተጨመረው ምን ነበር?

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|----------|--------------|
| 1. ምንም | 4. የክብት በት |
| 2. መድሀኒት | 5. አመድ |
| 3. ዱቄት | 6. ሌላ (ይጠቀስ) |

ጥያቄ ቁጥር 605. ህፃኑ ከተወለደ ከምን ያህል ጊዜ በ ላ ነበር የተጠቀለለው?

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|----------------|----------------|
| 1. ወዲያውኑ | 4. በ20 ደቂቃ ውስጥ |
| 2. በ5 ደቂቃ ውስጥ | 5. በ60 ደቂቃ ውስጥ |
| 3. በ10 ደቂቃ ውስጥ | |

ጥያቄ ቁጥር 606. የተጠቀለለበት ጨርቅ ምን አይነት ነበር

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|--------------|--------------|
| 1. አሮጌ የ ጠበ | 4. አዲስ የልታጠበ |
| 2. አሮጌ የልታጠበ | 5. አላውቅም |

3. አዲስ ያልተጠበ

ጥያቄ ቁጥር 607. ከተወለደ ከምን ያህል ጊዜ በ ላ ነበር ህፃኑ ጡት የጠባው?

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|--------------|---------------|
| 1. በአንድ ሰዓት | 4. ከ13-24 ሰዓት |
| 2. ከ2-6 ሰዓት | 5. ከ24ሰዓት በ ላ |
| 3. ከ7-12 ሰዓት | |

ጥያቄ ቁጥር 608 ህፃኑ ከተወለደ ከምን ያህል ጊዜ በ ላ ነበር የ ጠበው?

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|-----------------|---------------|
| 1. በአንድ ሰዓት ውስጥ | 4. ከ13-24 ሰዓት |
| 2. ከ2-6 ሰዓት | 5. ከ24ሰዓት በ ላ |
| 3. ከ7-12 ሰዓት | |

ጥያቄ ቁጥር609. ህፃኑ ለመጀመሪያ ጊዜ የተሰጠው ምግብ ምን ነበር?

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|-------------------|--------------------|
| 1. የጡት ወተት / ንገር | 4. የቧንቧ ውሃበስ ኳር |
| 2. የሌላ ሠው የጡት ወተት | 5. የ ሽጉ ምግቦች |
| 3. ሻይ | 6. ሌላ (ይጠቀስ) ----- |

ጥያቄ ቁጥር610. የድህረ ወሊድ ክትትል የጀመርሽው መቼ ነበር?

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|---------------|-------------------|
| 1. አልጀመርሁም | 4. ከ6 ሣምንት በ ላ |
| 2. በ 2 ቀን ውስጥ | 5. ሌላ (ይጠቀስ)----- |
| 3. 3ቀን 6 ሣምንት | |

ጥያቄ ቁጥር 611. ከወሊድ በ ላ የቤተሰብ ምጣኔ አገልግሎት ተጠቃሚ ነዎት?

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| 1. >- | 2. >ÃÅKG<U |
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ጥያቄ ቁጥር 612 ለጥያቄ ቁጥር 511 አዎ ከሆነ ከወሊዱ በ ላ የወሊድ መቆጣጠሪያ መጠቀም

የጀመርሽው ከስንት ሣምንት በ ላ ነው -----

ጥያቄ ቁጥር613 የምትጠቀሟቸው የወሊድ መቆጣጠሪያ አይነት ምንድን ነው?

1. የሚዋጥ ነክብል
2. በመርፌ የሚሰጠው
3. በክንደ ስር የሚቀበር
4. በማህፀን ውስጥ የሚቀመጥ
5. ሌላ (ይጠቀስ)-----

ክፍል 7: የቅድመ ወሊድ አገልግሎት ለማቅረብ የሚያስፈልጉ ግባቶችን በተመለከተ ለሚደረገው ቆጠራ የማጣሪያ ዝርዝር

ጥ.ቁ	ግባቶች	በበቂ ሁኔታ አለ	አለ ግን በቂ አይደለም	የለም
701	ተራ መጠበቂያ ቦታ			
702	መብራት ሲጠፋ አገልግሎት የሚሠጥ ጀኔራተር			
703	የቅድመ ወሊድ አገልግሎት ለመስጠት ብቻ የሚውል ራሱን የቻለ የምርመራ ክፍል			
704	የነፍሰጡር እናቶች መመርመሪያ አልጋ			
705	ሽንት ቤት			
706	በክፍሉ ውስጥ የእጅ መታጠቢያ ውሃ			
707	ሣሙና			
708	ባለ3 እጥፋት መለኪያ መጋረጃ			
709	የአዋቂ የክብደት መለኪያ ሚዛን			
710	የደም ግፊት መለኪያ			
711	ስቴቶስኮፕ			
712	የፅንሱ የልብ ትርታ ማዳመጫ			
713	ቴርሞሜትር			
	ላብራቴሪ ክፍልን በተመለከተ			
714	የእርግዝና ምርመራ			
715	የሽንት ውስጥ ያለን የስኳር መጠን ምርመራ			
716	የሽንት ውስጥ ያለን የፕሮቴን ምርመራ			
717	የኤች አይቪ ምርመራ			
718	የደም አይነት ምርመራ			

719	የቂጥኝ ምርመራ			
720	የሄምግሎቢን ምርመራ			
721	በማይክሮስኮፕ የሽንት ምርመራ			
	የመድኃኒት አቅርቦት			
722	አይረን ሰልፌት			
723	ፎሊክ አሲድ			
724	የፀረ- ወባ መድኃኒት			
725	የትላትል መድኃኒት			
726	የመንጋጋ ቆልፍ ክትባት			
727	ማግኒዜም ሰልፌት			
728	ቅድመ ወሊድአገልግሎት መስጫ እስታንዳርድ ጋይድ ላይን			
729	የቅድመ ወሊድ ካርድ			
730	የቅድመወሊድ መዝገብ			