Research Article

Assessment of Quality of Antenatal Care Services and Its Determinant Factors in Public Health Facilities of Hossana Town, Hadiya Zone, Southern Ethiopia: A Longitudinal Study

Trhas Tadesse Berehe ⬤[1] **and Lebitsi Maud Modibia**[2]

[1]*Yekatit 12 Hospitals, Department of Public Health, College of Medicine, Addis Ababa, Ethiopia*
[2]*University of South Africa, Department of Health Studies College of Human Sciences., Pretoria, South Africa*

Correspondence should be addressed to Trhas Tadesse Berehe; ttrhas@gmail.com

Background. Antenatal care is a care that links the woman and her family with the formal health system, increases the chance of using a skilled attendant at birth, and contributes to good health through the life cycle. Inadequate care during this time breaks a critical link in the continuum of care and affects both women and babies. Therefore, the main aim of this study was to determine the quality of ANC in Hadiya Zone, Southern Ethiopia. *Method*. A longitudinal facility-based study design was conducted among 1123 mothers whose gestational age of less than 16 weeks was identified and followed until birth and 40 days after birth to detect whether they gained the acceptable standard of quality of ANC from July 2017 to June 2018. A structured, predefined, and pretested observation check list and Likert scales were employed to obtain the necessary information after getting both written and verbal consent from the concerned bodies and study participants. Data was entered into Epi Info version 3.5 and transferred to STATA Version 14 software and cleaned by reviewing frequency tables, logical errors, and checking outliers. Generalized estimating equation (GEE) analysis was applied to get the average response observation of each visit of quality of ANC in the health facilities. *Result*. This study showed that the overall magnitude of good quality of antenatal care service that was provided in the whole visit at Hosanna Town's public health facilities was 1230 (31.38%). The most frequently identified problems were inability to take full history, lack of proper counseling, poor healthcare provider and client interaction, and improper registration and there was a variation in providing quality of care in each visit. Quality of antenatal care was significantly associated with residence, educational status gravidity, parity, and visit. In conclusion, the overall quality of antenatal care is low, so the health facilities need further modification on the identified problems.

1. Introduction

Antenatal care is a care directed towards the maintenance of healthy pregnancy outcomes through the accurate and consistent observation of the principles which are important in maternal and child health [1]. It also focuses on identifying and justifying preexisting medical conditions, risk factors, and negative health behaviors through a range of medical, educational, and nutritional interventions [2].

Every pregnancy carries a risk of complications and some pregnancies carry more risks than others. However, many complications occur among women deemed to have less risk, and even those women identified to be at a higher risk give birth with no complications. As a result, recent researches in the area tend to recommend considering all pregnancies as risky [3]. The authors go on to state that, in the alternative approach, focused antenatal care (FANC), goal-oriented ANC services are provided through the use of evidence-based interventions implemented at the times deemed to be critical in pregnancy. These critical times are first visit at 8–12 weeks' gestation, the second visit at 24–36 weeks' gestation, and the third visit at 32 weeks and fourth visit at 36–38 weeks. If problems or potential problems that will affect the pregnancy and newborns are detected, the

frequency and scopes of visits are increased. The customary approach emphasizes the number of ANC visits (quantity) while the latter approach acknowledges the importance of quality of care [4].

According to WHO's new recommendation, pregnant women should have at least eight contacts with the health care providers [5]. These contacts are having their first contact during the first 12 weeks' gestation, and the next consecutive contacts at 20th, 26th, 30th, 34th, 36th, 38th, and 40th weeks of gestation. As the number of contacts (the active connection between a pregnant woman and a provider) increases, the satisfaction of the mother also increases [6]. But in developing countries like Ethiopia, it is very difficult to make the mother satisfied by increasing the number of visits alone [7, 8] as there are limited resources like human power, poor provider training service, poor infrastructure, and administrative weakness at facilities [8, 9]. Still, now The Ethiopian Ministry of Health follows the WHO-recommended FANC visits and the core contents of ANC visits.

Quality is the most important issue and the main predictor variable in developing as well as developed countries to achieve the SDGs [10]. But quality is very difficult to define owing to the nature of complex concept and it is very difficult to measure directly [11–13]. There are many definitions in the literature. Quality is the degree to which services confirm to its intended design (process) [14], the one that provides service at an acceptable cost [13], and the capacity to satisfy the need of the client or patient [10, 15].

According to Beeckman et al., the APNCU (Adequacy of Prenatal Care Utilization) index was not a good measure of quality of ANC as this tool focused only on the time of initiation of ANC and the number of received visits. According to authors' ideas, ANC should measure only the time of initiation of care and number of visits but also the content of care given during the visits regardless of their parity and risk level [16]. Antenatal care research is now focusing on the quality of antenatal care provided because research trends have exposed quality of care as an equal or greater predictor than adequacy of care for usage of antenatal care services [17].

Making ANC visits an effective preventive measure of pregnancy-related problems requires monitoring the content and the quality of ANC [16]. According to WHO, the standard quality of ANC is comprised of three components: the first one is assessment (that is, history taking, physical examination, and laboratory tests), the second one is health promotion (that includes nutrition advice, planning the birth, information regarding pregnancy, subsequent contraception and breastfeeding, and immunization), and the last one is care provision (that is comprised of tetanus toxoid immunization, psychosocial support, and recordkeeping) [18]. Although there is a variation of strategies about the content of ANC in different countries, WHO recommends a core set of services which include blood pressure measurement, tetanus toxoid vaccination, urine testing, iron tablet supplementation, body weight measurement, and counseling about danger signs.

Nevertheless, in most of the developing countries, a large proportion of women do not receive the minimum four visits [5, 9, 19] and the compliance to a minimum level of recommended content for ANC appeared to be unmet due to different factors like poor accessibility and availability, poor provider-client interaction, and lack of facility resources like lack of equipment and drugs and lack of qualified professionals and other administrative issues [2, 20–24]. It may also be due to problems in individual socioeconomic and reproductive characteristics, like educational attainment, household, wealth, religion, parity, age, and marital status [25–27].

Studies in Ethiopia have examined the factors associated with ANC utilisation using a cross-sectional study design [16, 28–30]. However, these studies mainly focused on the quantitative coverage of ANC visits, obscuring the content and quality of ANC visits. Previous studies have demonstrated that, in addition to the number of ANC visits, the components covered by ANC visits greatly influence the effectiveness of the ANC services [8, 9]. The content and thus the quality of care may remain poor while the individual coverage of ANC visits could be observed to be high [31]. Therefore, the main aim of this study was to determine the quality of ANC service and associated factors in Hadiya Zone, Southern Nations and Nationalities of Peoples' Region (SNNPR), Ethiopia, using longitudinal study design.

A conceptual framework that addresses this study was adapted from the Donabedian model [32]. This model is universally accepted and has been widely used in the literature especially for the development of quality standards [33]. It defines three interconnected components of quality: structure, process, and outcomes [34]. The definition of quality was adapted based on the frameworks of the Donabedian model. Since "structure" is mainly considered as the channel 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 [35–37]. It is imperative to conduct this research as there is no study that describes the level of ANC quality using longitudinal study in Hosanna Town. This study may help to guide in designing quality-based interventions, in the modification of ANC quality at health facilities, and could serve as a source of information to develop an action plan for others who are working in the area of maternal and child health-related programs.

2. Objectives

The objectives of this study were as follows:

(i) To assess the overall level quality of antenatal care service provision in public health facilities

(ii) To identify the determinant factors for quality of ANC

3. Method

Health facility-based longitudinal study design (mothers whose gestational age was less than 16 weeks were identified and followed up until the delivery time to determine whether they received quality standard ANC), mainly quantitative

approach, was used to address the study objective. The study was conducted in all of the government health facilities found in Hossana Town (one zonal referral hospital and three health centers), Hadiya Zone, Southern Ethiopia, from July 2017 to July 2018. All of these facilities provide ANC, delivery, and postnatal care. According to the Southern Nations and Nationalities Regional State Finance and Economic Development Office, the population project report in 2014, the total population of this town administration is 102,922. Among these, 51,461 (49.9%) and 51,462 (50.1%) people are males and females, respectively. The number of childbearing age women (15–49 years) is 23,981. Of this, close to 4.3% (1032) of them are estimated to be pregnant every year. The study population was sampled pregnant women coming for ANC visit in Hosanna Town during the study period and fulfilling the inclusion criteria. To qualify for inclusion in this study, the pregnant women met the following criteria: pregnant women with gestational age ≤16 weeks, aged between 18 and 49 years, and able to consent to participate in the study. And the exclusion criteria were mothers who were very severely ill and unable to communicate. A total of 1123 sample size was determined using two population proportion formulas. To achieve the desired sample size, the number of pregnant women selected from each center was determined by a proportional to size allocation based on the average number of ANC users in the most recent quarterly report of each health facility (241 from Nigist Eleni Teaching Hospital, 451 from Hossana Town, 191 from Bobicho, and 241 from Lichi Amba Health Centre). Individual study subjects at each health facility were selected by systematic random sampling ($k = 2$) during the data collection period until the required sample size at each health facility was obtained. The first client was selected by simple random sampling among the first three ANC service users in the sample frame.

In this specific research, the data were collected through a standard structured predefined observation checklist adopted from maternal and child health integrated program [38] and modified based on the local situation. The tool consisted of the type of residence of the mother, sociodemographic characteristics of the mother, and component of ANC service and facility inventory. The components of ANC services that were assessed are the assessment section, diagnosis and management, and counseling/provision of information.

Besides, the participants' interview questionnaire was adapted from different works of literature [7, 39]. The Likert scale questions ranged from 1 = very dissatisfied, 2 = dissatisfied, and 3 = satisfied to 4 = very satisfied; ten reliable items (Cronbach's α of 0.857) were used to assess client satisfaction through an exit interview in a private room at the fourth visit.

For the first visit, the mother was asked about her sociodemographic characteristics and maternal risk factors and observing activities which included a detailed history taking, clinical examination (weight, blood pressure, pallor, and head-to-toe examination), and laboratory testing (Hgb, blood group & Rh factor, urine exam for infection and protein and VDRL, HIV, and stool exam). The provision of information on danger signs in pregnancy, immunization, nutrition, PMTCT, breastfeeding, birth preparedness, and complication readiness, and schedule of return visit, and distribution of drug including tetanus toxoid vaccine (first dose) and iron/folate, was assessed.

For the second visit, the following was obtained: history of complaints in current pregnancy; assessment for fetal heart sounds in addition to the clinical examination performed during the first visit; urine test; regarding the distribution of drug and information, provision was similar to the first visit.

For the third visit, data was collected by observation of the procedures carried out on the present pregnancy, assessment of breast examination and presentation in addition to the procedures conducted in the previous visit, urine for infection and Hgb test, iron folate and mebendazole, and information provision and availability of resources.

For the fourth visit, history of complaints in current pregnancy, clinical examination, laboratory test, and information provision similar to the 3rd visit were assessed. The checklist for the availability of resource assessment was used to collect the information on the current availability of staff, space, equipment, reagents, drugs, and guidelines/reference materials. The checklist was constructed using five indicators. Availability of infrastructure: ANC waiting area, private space for ANC counseling, and examination, electricity, generator, toilet, water for hand wash, and soap. Availability of essential drugs: tetanus toxoid vaccine, an antimalarial drug, ferrous-f sulfate, folic acid, anti-helminthic, and magnesium sulfate, each value giving a score of one for available and zero for non-available equipment and supplies.

Availability of essential equipment: screen, weighing scale, adult sphygmomanometer, stethoscope, fetoscope, and thermometer. Availability of laboratory supplies: reagents for a urine test for glucose, protein, microscopic urine test, VDRL for syphilis, HIV rapid test, reagents for anemia and blood group and RH factor tests, and pregnancy test, and availability of guidelines/reference materials had a value ranging from availability of ANC register, revised ANC cards, and standard ANC guideline (see additional file 1).

The dependent variable of this study was quality of ANC, in this study; the researcher used the process attributes of quality to measure the acceptable standard of quality of antenatal care. It was measured by the extent to which the pregnant women received the essential ANC services in each visit using 77 items. Based on this idea, if women get 75% or more of the expected essential ANC services, the researcher called it "good quality of care" and if not "poor quality" of ANC care [19, 20] (see additional 5).

3.1. Data Collection Process.

An observational checklist tool was pretested on 5% of mothers coming for ANC follow-up before data collection commenced. The researcher has used four visits based on the recommendation of focused ANC visit [3].

BSc midwifery nurses who were well trained and experienced collected the data. Moreover, two female MSc

midwifery nurse supervisors supervised the overall data collection process. To avoid observer bias, both the data collectors and supervisors were recruited from areas outside of the study area. Both the data collectors and supervisors were trained on the data collection instrument and how to approach and observe the service provision. The training was provided for data collectors and supervisors.

During the training, the data collectors were standardized by asking them to complete the observational checklist based on mock interviews on the standardized patient. During the data collection period, there was a strict supervision scheme. Completed checklist was checked daily and information regarding the study subjects was collected using the Amharic language since the Amharic language is a working language in the region (see additional file 2).

In this specific research, since the follow-up time for all women was the same, considering follow-up time may not alter the result. So, the researcher used a robust estimator and an exchangeable working correlation matrix [40]. The same ANC provider carried out the latter to control the cluster effect of the data among women who received ANC services within the same facility to identify the predictor variables for the quality of ANC. Finally, the result was presented in odds ratio because for longitudinal study with binary outcome data, and GEE logistic regression analysis, where the odds ratios are generated as part of the analysis, correlation is often measured in terms of odds ratios at 95% confidence interval (CI) [41, 42] (see additional file 2).

Ethical clearance was obtained from the Research and Ethics Committee, Department of Health Studies, University of South Africa (UNISA). Approval to collect data was obtained from SNNPR Health Bureau and Hossana City Government Health Bureau. The current study complied with the moral principles of respect for persons, avoidance of harm, beneficence, and justice (see additional file 4).

4. Results

A total of 1123 mothers participated in the study, and only 980 (87.3%) completed the follow-up (from their first ANC visit to forty days after delivery). The total attrition rate of this study was 143 (12.7%). The main reasons for the loss to follow-up were abortion (102) (71%), changing their place of residence (25) (17%), going to their families' home for delivery and to gain care and support from their mother (12) (9%), and maternal death (4) (3%), and 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 lost to follow-up was considered by the services received only in the first visit).

4.1. Sociodemographic Characteristics of the Participant.
Seven hundred and sixty-five (78.1%) of the women who participated in the study were found between 20 and 34 years of age and 34 (3.5%) of them were greater than 34 years old. The mean age of respondents was 25.6 years (SD ± 4.1), median 25, and the range of age was 18–39 years. It was found that 667 (69%) of the respondents were from rural areas. The study revealed that 947 (96.4%) of them were married. Of the total respondents, 570 (58.2%) of them were from Hadiya, and around 552 (56.3%) and 187 (19.1%) of the sampled women were followers of Protestant and Orthodox religion, respectively. Around half of the respondents, 464 (47.3%), were housewives. Regarding the monthly income, more than half (607) (61.9%) of the mothers earned less than 2000 Ethiopian birr per month.

4.2. Structural Attributes for Quality of Antenatal Care.
All the Hossana Town's public health facilities had permanently assigned ANC PNC and delivery rooms to work on rotation. The total number of providers who were working in those four facilities by rotation was 16. On average, each health facility had four providers for ANC and PNC service provision in the same room. Concerning the qualification of the health care provider, 7 (43.8%) and 3 (18.8%) were BSC and diploma midwives, respectively, whereas 1 (6.2%) and 3 (18.8%) were BSC and diploma nurses, respectively, and 2 (12.4%) were health officers. Five (32.2%) of the ANC providers were not trained on FANC protocol while 11 (68.8%) of them were trained in the past three years. Concerning the PMTCT training, only 9 (56.2%) were trained on PMTCT and 4 (25%) were trained on ANC screening in the past three years. All the health care providers (16) (100%) were not trained on the management of preeclampsia/eclampsia in the past three years. In this study, the result showed that the mean age of the health care provider was 23.5 with a standard deviation of ±1.52 and a median of 23 and the minimum and maximum age of the health care provider were 22 and 32, respectively. Around 14 (87.5%) of the health care providers are found in the age range of 22 to 24. Regarding the work experience of the health care providers related to ANC, almost 12 (75%) of them had less than three years of experience.

This finding showed that half (8) (50%) of the health care providers received technical support in their health facilities and only 6 (37.5%) of them received technical support in the last three months. Concerning the type of supervision received in the health facilities, checking the records or reports was the dominant one which accounts for 12 (77%) whereas observing their work accounts for 4 (23%). Concerning the way how feedback is given to the health care provider, giving verbal feedback is the most common one that accounts for 5 (89%).

4.3. Availability of Physical Infrastructure.
The observation was made on the ANC room as well as on the waiting area for the availability of infrastructure in the fourth health facility. Concerning the availability of generator, around 1 (25%) was not satisfied even if there was one generator at the three health centers for the whole services. However, most of the time, it was not functional because of the lack of fuel owing to the delay in the purchasing process. Concerning the waiting area in the four health facilities found in Hosanna Town, it was found that one health center (1) (25%) of the ANC waiting area was satisfactory and available whereas the

rest of the health facilities including the referral hospital had no adequate space and sites for the mothers. Regarding the presence of private examination room, in all health facilities, there was a problem in space as well as buildings, especially in one health centre, family planning, ANC, postnatal care, and PMTCT services were undertaken in one room so the availability of private examination was unlikely to happen. Furthermore, there is one couch in the ANC room in all health facilities. Owing to the fact that deficiency of couches in each facility sharing is common, only (1) (25%) of the health facilities had clean and accessible latrine throughout the study period. There was no water in the ANC room for handwashing in all health facilities.

4.4. Availability of Equipment. Regarding necessary equipment for ANC, all the public health facilities were equipped with a screen, fetoscope, stethoscope, FANC card, registration logbook, and thermometer. One health center (HC) has a BP apparatus specifically used in the ANC Unit. The other HCs and a hospital use BP apparatus and weight scale in common with other units. Moreover, even if they share from the other units sometimes, it may not function and some of the clients are referred to a private clinic in the town for BP measurement. None of the health facilities had working ANC guidelines.

4.5. Availability of Drugs and Laboratory Facilities. All the health facilities had necessary laboratory reagents for ANC clients' tests except urine dipstick tests for glucose and albumin. Besides, health facilities have a shortage of laboratory technicians. Only one laboratory technician was found in two health centers. Therefore, it was very difficult to perform laboratory investigations. Concerning the presence of ultrasound, only one ultrasound was found in the hospital, which was used for any circumstances and was available for examinations that needed to be performed on medical indications. Moreover, this ultrasound was not working appropriately but the rest of the health facilities had no functional ultrasound at all. Concerning the drugs for ANC, antimalarial tablets, antihelminthes, and TT vaccines were available and satisfactory in all health faculties. However, magnesium sulfate is valuable only in the hospital. Folic acid tablet is the problem regarding constant supplying in all health facilities.

4.6. Process Attributes for Quality of Antenatal Care. The overall client-provider interaction in this study was 359 (37%). As this was evidenced by the least score, 281 (28.7%) of the health workers greeted the client in a friendly and respectful manner while 446 (45.5%) of the clients got an introduction about themselves and titles. With regard to history taking, 367 (37%) of the pregnant women were asked about the appropriate history. Of those asked about appropriate history, past obstetric history accounted for 381 (38.9%).

In this current study, the standard protocols for clinical examination were not being fulfilled in most of the cases. As

this is evidenced by the overall clinical examination, 458 (46.7%) of the clients were not examined. The examination of hands for edema was practiced (259 (26.4%) and 460 (46.9%) in the 3rd and 4th visits, respectively). Around 435 (44.4%) at first, 553 (56.4%) at second, 558 (56.9%) at third, and 351 (35.8%) at fourth visits were checked for signs of anemia and heard fetal heart sound at second (896) (91.4%), at third (925) (94.4%), and at fourth visits. However, 879 (89.7%) and 882 (90%) of the mothers were palpated for abdomen at third and fourth visits, respectively. 882 (90%) of the mothers were measured for blood pressure at first and 851(86.8%) at second, 793(80.9%) at third, and 830 (84.7%) at fourth visits and all the mothers were not examined for breast during all visits.

Regarding the indicators of technical competence of service providers of the routine laboratory investigation, 364 (37.1%) of the women observed received a routine laboratory investigation from the five routine laboratory investigations (urinalysis, VDRL, hemoglobin, HIV test, blood group, and Rh) expected to be carried out. According to the standard for each client, only 454 (46.3%) at the first visit and 397 (40.5%) at fourth visit had hemoglobin test, 980 (100%) had blood group and RH test, 763 (77.9%) had VDRL test, 843 (86%) got tested for HIV, and 202 (20.6%) had urine test. Concerning ultrasound check-ups at 24 weeks, none of the pregnant women received ultrasound check-ups.

Concerning the overall appropriate treatments and supplementations during the whole pregnancy of their lifetime visits, only 242 (24.7%) of the pregnant women received the appropriate treatments. Out of these treatments and supplementations, the number of women who received iron or folic acid at first visit was 502 (51.2%), at second visit 547 (55.8%), at third visit 547 (55.8%), and at fourth visit 571 (58.3%).

Even if the mothers did not get the supplementation of iron or folic acid during the visit, Some of the pregnant mothers 551 (56.2%) and 502 (51.2%) at the first visit, 394 (40%) and 531 (54.2%) at the second visit, 358 (36.5%) and 547 (55.8%) at the third visit, and 374(38.2%) and 571 (58.3%) at the fourth visit received counseling on how to take the iron or folic acid supplementation and on the purpose of the supplementation, respectively. With regard to counselings on the side effect of the supplementation, only 371 (37.9%), 341 (34.8%), 347 (35.4%), and 338 (34.5%) received counseling.

Service delivery protocols practice for the prevention of tetanus toxoid (TT) was relatively better than the other treatments and supplementations. Relating to counselling on the purpose of TT vaccine, 541 (55.2%) and 493 (50.3%) of the pregnant women received counselling at the first and second visits, respectively. With regard to the importance using Insecticide Treated Bed net (ITNs), less than half (394) (40.2%), 390 (39.8%), 399 (40.7%), and 579 (59.1%) were given information in the first, second, third, and fourth visits, respectively. Furthermore, prescribed deworming was explained to the pregnant women, 504 (51.4%) at third and 362 (36.9%) at fourth visit, but only 333 (34%) at third visit and 239 (24.4%) at fourth visit of the pregnant women received explanation on the side effects of deworming. On

the contrary, 409 (41.7%) and 351 (35.9%) of the mothers received explanation on the purpose of deworming at third visit and fourth visit, respectively.

The last technical aspect of process attributes in this study was counseling. 320 (32.7%) of the mothers were counseled on the overall dangers of pregnancy, on birth preparedness and complication readiness, on PMTCT and healthy eating during pregnancy, and in general on the importance of postpartum visit (PPV) and breastfeeding, immunization, and family planning (see Table 1).

4.7. Patterns of Quality of Antenatal Care. In the current research findings, 232 (23.7%) (at 95% CI = 21.0, 26.4) of the observed clients were ranked as having received good quality of ANC in the first visit. With regard to the second visit quality, it was shown to be slightly increasing by 6% (291 (29.7%) with 95% CI = 26.8, 32.6). Again, the third visit increased by 7%, which accounted for 362 (36.9%) (at 95% CI = 33.7, 39.8). On the contrary, in the fourth visit, the quality of ANC care decreased by 2% (345 (35.2%) with 95% CI = 32.0, 38.0). The overall magnitude of quality of ANC in the whole visit was 1230 (31.38%) at 95% CI = 28.8, 34.7) (Figure 1).

4.8. Association between ANC Quality and Selected Variables. After Hosmer–Lemeshow model adequacy was checked (p-value = 0.81), the binary GEE logistic regression was conducted and those variables with p-values less than 0.2 were included in multivariable GEE logistic regression. In the binary GEE logistic regression, there was a statistically significant association between quality of ANC and age of the mother, residence, religion, educational status occupation, income gravidity, parity, and visits. In contrast, in the multivariable GEE logistic regression, residence, educational status gravidity, parity, and visits continued to have an association with quality of ANC. The odds of pregnant women residing in an urban area to receive a good quality of ANC services were seven times higher than those in the rural area (OR = 7.3; 95% CI: 4.29–12.41). Attending a higher education level (12+) had three and a half times higher odds of receiving good quality of ANC compared to women with grades 9 to 10(OR = 3.6; 95% CI: 1.78.7.41). Furthermore, mothers who had more than four pregnancies were 0.5-fold less likely to receive a good quality of ANC services as compared to mothers who had two to four pregnancies (OR = 0.5; 95% CI: 0.363, 0.749).

Women attending the fourth ANC visit were less likely to receive good quality of ANC services as compared to the first ANC visit (OR = 0.5; 95% CI: 0.44–0.59). Similarly, women who attended the fourth ANC visit were less likely to receive good quality of ANC services as compared to the second ANC visit (OR = 0.7; 95% CI: 0.62–0.82) (Table 2).

5. Discussion

The findings showed that the overall level of good quality of ANC was 31.38% (at 95% CI = 28.8, 34.7). This result is similar to the study conducted in Ethiopia, which showed

that 31.5% of the mothers received good quality of ANC [23] and 29% in Zambia [24]. These findings were higher than those in other studies: 24.5% in North Ethiopia [43], 17% in "Punjab" province of "Pakistan" [2], 23% in Souissi maternity in Rabat, capital of Morocco [44], 12.1% in Eastern Uganda [45], and 5% in Nigeria [35]. This discrepancy might be owing to the difference in study design as well as the cut point for quality of ANC, which was set as follows: if the pregnant woman received less than 60% of the acceptable quality of care, this was considered poor quality. In addition, it was lower than the following studies: 89 % in Ambo, Ethiopia [46], 48.3% in Jimma, South West Ethiopia [19], and 52.3% in Bahir Dar, Ethiopia [37]. In addition, it differs from the 52.6% in the study conducted in Chencha District, Gamo Gofa Zone, southern part of Ethiopia [47], 43% in Nepal [48], 66% in urban Slum Aligarha [49], 98.6% in Tamil Nadu, India [50], 50% in Selangor, Malaysia [15], 71.4% in Mexico [51], and 81% and 85% in Kassena-Nankana and Builsa district health center of Ghana [52]. This difference might be as it was described in this result; most health facilities have deficiency of trained human resources like laboratory technicians and lacking urine dipstick test for glucose and albumin. There was an inconsistent supply of folic acid tablet, and there was no magnesium sulfate in the three health centers throughout the study. In the same vein, this is consistent with the study conducted at maternity services in Nepal, in which availability of supplies and equipment was strongly associated with quality of care [53]. This is also in line with the study done in El-Beheira Governorate in Egypt, which stated that the poor quality of ANC was manifested by the lack of proper infrastructure for providing ANC, shortage of skilled staff [35], and lack of necessary medications, vaccination, equipment, and supplies [9].

In the literature, there are wide varieties of factors that influence the quality of ANC services. For example, a population-based study in Nepal identified that the most predictor variables for ANC were older age, high parity, higher education, and good economic status [27]. The current study identified that women with higher levels of education were four times more likely to receive good quality of care. This was in line with the study conducted in Urban India in which mothers with higher educational status were two and a half times more likely to receive good quality of ANC compared to illiterate mothers [25]. Moreover, a study conducted in Uganda demonstrated the importance of women's education for the receipt of all the recommended ANC components [54]. This is also consistent with the study conducted in Nepal [27] and in Bangladesh [55]. Moreover, it was consistent with the study conducted in public health facilities in the Accra Metropolitan Assembly (AMA) of Ghana, which showed that perceived quality of ANC increases with increasing access to education [56]. Therefore, this finding was reinforced by the need to make girls' education paramount in national development policies [57]. Pursuing enrolment and retention among girls in school could have both short- and long-term benefits. Firstly, it increases the knowledge of women regarding reproductive health matters and, secondly, it enables women to overcome

TABLE 1: Summary of the dimensions of good quality of antenatal care during all ANC visits of the study participants ($n = 980$) observed at Hossana Town's public health facilities, Southern Ethiopia, July 2017 to June 2018.

| Indicators of quality of ANC	Frequency	Percentage
History taking	363	37
Physical examination	458	47
Laboratory investigation	364	37
Treatments	242	25
Overall counseling score	320	32.7
Counseling on danger signs of pregnancy	422	43
Counseling on birth preparedness	260	27
Advice on importance of postpartum visit	193	20
Counseling on PMTCT and healthy eating	423	43
Handwashing practice	228	23
Client health care provider interaction	359	37
Counseling on follow-up visit	684	70
Registration practice	283	29
Overall quality of ANC	311	31.3
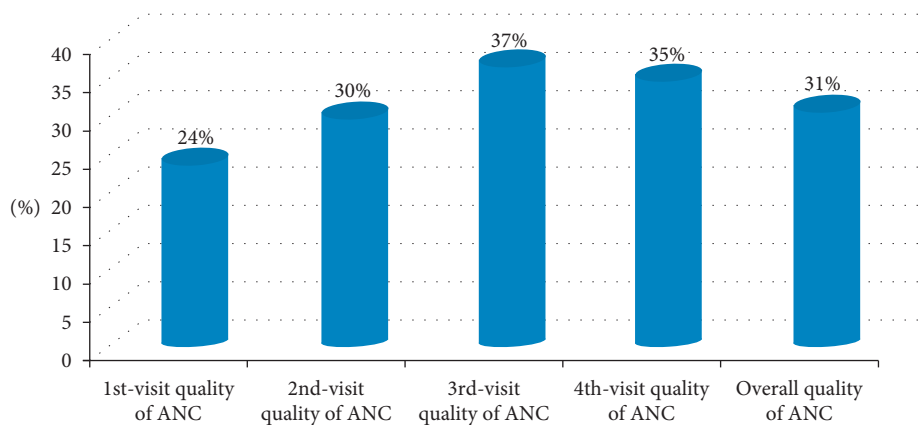
FIGURE 1: Quality of services during visit of study participants ($n = 980$) observed at Hossana Town's public health facilities, Southern Ethiopia, July 2017 to June 2018.

both family and societal factors constraining utilisation of quality maternal health services [58, 59]. This finding was also supported by the study conducted in Nigeria, which concluded that educated women utilised maternal health services compared to uneducated women [60]. Furthermore, the study conducted among 28 sub-Saharan African (SSA) countries, including Ethiopia, found that improving educational status of women might increase client quality of ANC services [54]. This is in line with the study conducted in Uganda [61]. Therefore, this study concludes that educating girls is an enabling tool for the utilisation of the quality of ANC.

Accordingly, the present research finding showed that urban women in Hossana, Ethiopia, were 7.3 times more likely to receive good quality of ANC than rural women (OR = 7.3; 95% CI: 4.29–12.41). These findings were confirmed by the study conducted in Nepal, which reported that women in urban areas had higher odds of receiving good quality of ANC compared to those in the rural areas [27]. This is also supported by the study conducted in India [15]. This could be explained by the distance of the health facilities [2].

In many literatures, household income was a significant predictor variable for receiving the high quality of ANC [27, 55, 60]. In addition, a study conducted in Uganda identified that wealthy women were more likely to receive high quality of ANC than poor women [26]. This was supported by the study conducted among adolescent girls living in Urban India, which concluded that mothers from the rich wealth quintiles were four times more likely to utilise quality of ANC than mothers from the poor wealth quintiles [25], and the study conducted in Nigeria [62]. However, the current research finding did not reveal any statistically significant association. Therefore, further evaluation is required to identify the factors related to this hindrance.

Furthermore, the current research finding identified that mothers who had more than four pregnancies were less likely to receive good quality of ANC services as compared to mothers who had two to four pregnancies (OR = 0.5; 95% CI: 0.363, 0.749). This finding is consistent with the study conducted in Nepal, which stated that parous women have decreased odds of attending four or more ANC visits [47], in the study conducted in Anambra

TABLE 2: Generalized estimating equation logistic regression to identify determinants of quality of ANC among pregnant women attending ANC at public health facilities of Hossana Town ($n = 980$), July 2017 to June 2018.

Variables	Category	Poor quality	Good quality	COR (95% CI)	AOR (95% CI)
Age	<20	124	57	1.8 (0.887, 3.835)*	0.7 (0.248, 1.823)
	20–30	521	244	1.9 (0.949, 3.768)*	1.9 (0.943, 3.936)
	>34	27	7	1	1
Residence	Urban	407	259	4.7 (3.354, 6.608)*	7.3 (4.292, 12.413)**
	Rural	265	39	1	1
Marital status	Single or divorced	19	14	0.6 (0.298, 1.167)	
	Married	654	293	1	
Religion	Orthodox	126	61	1.3 (0.821, 2.065)	0.9 (0.529, 1.849)
	Muslim	71	47	1.7 (1.059, 2.869)*	1.5 (0.759, 2.963)
	Protestant	388	164	1.1 (0.755, 1.678)	0.9 (0.514, 1.541)
	Catholic	3	3	2.7 (0.514, 13.721)	7.8 (1.346, 44.635)
	Hawariyat	85	32	1	1
Educational status	Illiterate	67	18	0.5 (0.269, 0.835)*	0.9 (0.456, 2.186)
	Reading and writing	31	19	1.1 (0.589, 2.057)	2.5 (0.964, 6.709)
	Grades 1–6	123	41	0.6 (0.380, 0.926)*	2.1 (1.026, 4.161)
	Grades 7–8	114	42	0.7 (0.439, 1.012)*	2.2 (1.059, 4.445)
	Grades 9–10	148	94	1.2 (0.792, 1.656)	3.6 (1.779, 7.405)**
	Grades 11–12	83	34	0.7 (0.457, 1.184)	12.2 (0.980, 4.864)
	Illiterate	107	60	1	1
	Higher level (12+)	67	18	0.5 (0.269, 0.835)*	0.9 (0.456, 2.186)
Occupation	Housewife				
	Merchant	310	154	3.7 (2.158, 6.403)*	1.6 (0.594, 4.218)
	Daily labourer	97	37	2.9 (1.552, 5.226)*	1.9 (0.716, 5.387)
	Gov. employee	107	41	2.9 (1.558, 5.254)*	1.2 (0.389, 3.565)
	Others*	79	64	6.1 (3.381, 11.129)*	3.4 (1.102, 10.380)
	Housewife	80	11	1	1
Income	<2000 ETB	339	168	0.6 (0.494, 0.814)*	1 (0.686, 1.532)
	≥2000 ETB	233	140	1	1
Gravidity	1	130	88	1.7 (1.235, 2.350)*	0.9 (0.144, 6.3460
	2–4	291	121	1.1 (0.801, 1.422)	0.5 (0.363, 0.749)**
	>4	251	98	1	1
Parity	1	135	70	3.8 (1.443, 9.756)*	6.4 (2.084, 20.245)**
	2–4	350	135	2.9 (1.094, 7.083)*	2.9 (1.065, 8.054)
	>4	31	4	1	1
Visit	First visit	187	58	0.6 (0.515, 0.633)*	0.5 (0.439, 0.592)**
	Second visit	172	73	0.8 (0.7.8, 0.853)*	0.7 (0.624, 0.818)**
	Third visit	155	90	1.1 (0.993, 1.169)*	1 (0.896, 1.151)
	Fourth visit	159	86	1	1

State, South East Nigeria [63], and in the study conducted in Nigeria [62]. This might be owing to the fact that mothers who had children are less eager to have another child because it is less likely to ask the health professionals compared to women who did not have kids. Despite the benefits of antenatal care visits for early prevention, detection, and treatment of potential complications in pregnancy, the health care provider should adhere to all visit antenatal care standards [64]. However, the current research identified that the quality of ANC services delivery varied across the whole follow-up period. Pregnant women at the first visit and second visit were less likely to receive good quality of ANC care compared to pregnant mothers at fourth visit (AOR = 0.5, 95%CI (0.439, 0.592)) and (AOR = 0.7, 95%CI (0.624, 0.818)), respectively. Therefore, one of the main reasons why mothers were not receiving the quality of ANC throughout the subsequent visit could be owing to the inconsistent quality of care given by the health professionals [39, 65, 66]. This might be also explained by the gap found in the delivering of drug supplies and equipment.

6. Limitations

The study was limited to a specific context of the Hossana Town pregnant women. Therefore, this factor would not allow for generalisation of the findings. One of the criticisms of the method of data collection is observer bias. So, this study could be subjected to observer bias, even though rigorous measures were used to ensure the collected data was true and clearly stated. It might have an overestimation of

quality because of the care provider's awareness of being observed.

7. Conclusion

In conclusion, quality of ANC was the most critical problem for pregnant women. Based on the current longitudinal observational study, the coverage of quality of ANC in the health facilities was extremely low (31.3%).

Based on the general estimating equation multivariate regression analysis, mothers' residing area, educational status, parity, gravidity, and time of ANC visit were significantly associated with quality of ANC. However, quality of ANC was not associated with age, marital status, religion, occupation, and income.

8. Recommendations

Based on the findings of the study, the level of ANC quality in the study area was low. Therefore, policymakers and concerned bodies should design appropriate training programs for the health care workers working in the area and strategies to help the study subjects acquire adequate quality of ANC and hence help them to reduce the risk of complications during pregnancy and to reduce the adverse outcomes of pregnancy.

Abbreviations

ANC: Antenatal care
CI: Confidence interval
EDHS: Ethiopian Demographic and Health Survey
FANC: Focused antenatal care
FMOH: Federal Ministry of Health
Hb: Hemoglobin
HSDP: Health Sector Development Plan
MMR: Maternal mortality ratio
OR: Odds ratio
PHCU: Primary Health Care Unit
PPS: Probability proportional for size
SD: Standard deviation
SDG3: Sustainable Development Goal 3
SPSS: Statistical Package for Social Sciences
TT: Tetanus toxoid
UN: United Nations
UNDP: United Nations Development Programme
WHO: World Health Organization
Y12HMC: Yekatit 12 Hospital Medical College.

Data Availability

The data will be available upon request.

Ethical Approval

The study protocol was performed in accordance with the ethics principles. Approval of institution review board of UNISA was obtained, and approval to collect data was obtained from Southern Nations and Nationalities of Peoples' Region, Ethiopia, Health Bureau, and Hossana City Government Health Bureau.

Consent

The authors obtained written consent from all participants. Analysis was conducted on anonymized data.

Disclosure

Yekatit 12 Hospital Medical College had no role in the design of the study and collection, analysis, and interpretation of data and in writing the manuscript.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

TT and LMM were involved in the conception, design, analysis and interpretation, and report and manuscript writing.

Supplementary Materials

The findings of this study were generated from the data collected and analyzed based on the stated methods and materials. There are supplementary files. The original data supporting this finding will be available at any time upon request. (*Supplementary Materials*)

References

[1] T. Tayebi, Z. Hamzehgardeshi, M. A. Shirvani, M. Dayhimi, and M. Danesh, "Relationship between revised graduated index (R-GINDEX) of prenatal care utilization & preterm labor and low birth weight," *Global Journal of Health Science*, vol. 6, no. 3, 2014.

[2] M. A. Majrooh, S. Hasnain, J. Akram, A. Siddiqui, and Z. A. Memon, "Coverage and quality of antenatal care provided at primary health care facilities in the "Punjab" province of "Pakistan"," *PLoS One*, vol. 9, no. 11, pp. e113390:1–e113390:8, 2014.

[3] Lincetto, O. Mothebesoane-Anoh, S. Gomez, and S. Munjanja, *Opportunities for Africa's Newborns: Practical Data, Policy, and Programmatic Support for Newborn Care in Africa*, World Health Organization, Geneva, Switzerland, 2006, http://www.who.int/pmnch/media/publications/aonsectionIII_2.pdf.

[4] WHO, *Antenatal Care in Developing Countries: Promises, Achievements and Missed Opportunities; an Analysis of Trends, Levels and Differentials 1990–2001*, WHO, Geneva, Switzerland, 2003.

[5] WHO, *WHO Recommendations on Antenatal Care for a Positive Pregnancy Experience*, WHO, Geneva, Switzerland,

2016, http://www.who.int/reproductivehealth/publications/maternal_perinatal_health/anc-positive-pregnancy-experience/en/.

[6] Ö. Tunçalp, J. Pena-Rosas, T. Lawrie et al., "WHO recommendations on antenatal care for a positive pregnancy experience-going beyond survival," *BJOG: An International Journal of Obstetrics & Gynaecology*, vol. 124, no. 6, pp. 860–862, 2017.

[7] F. Chemir, F. Alemseged, and D. Workneh, "Satisfaction with focused antenatal care service and associated factors among pregnant women attending focused antenatal care at health centers in Jimma town," *BMC Research Notes*, vol. 7, no. 1, pp. 1–7, 2014.

[8] F. Asefa, G. Fekadu, and A. Taye, "Quality of antenatal care at Jimma medical center South west Ethiopia," *Ethiopian Journal of Reproductive Health (EJRH)*, vol. 12, p. 1, 2020.

[9] M. M. Islam and M. S. &Masud, "Determinants of frequency and contents of antenatal care visits in Bangladesh: assessing the extent of compliance with the WHO recommendations," *PloS One*, vol. 13, no. 9, Article ID e0204752, 2018.

[10] Y. Akachi and M. E. Kruk, "Quality of care: measuring a neglected driver of improved health," *Bulletin of the World Health Organization: Policy & Practice*, vol. 96, no. 6, pp. 465–472, 2017.

[11] Health Information and Quality Authority, *Guidance on Developing Key Performance Indicators and Minimum Data Sets to Monitor Healthcare Quality: February 2013 (Version 1.1)*, Health Information and Quality Authority, Dublin, Ireland, 2013.

[12] A. M. Mosadeghrad, "Factors influencing healthcare service quality," *International Journal of Health Policy and Management*, vol. 3, no. 2, pp. 77–89, 2014.

[13] M. Nylenna, O. Bjertnaes, I. S. Saunes, and A. K. Lindahl, "What is good quality of health care?" *Professions and Professionalism*, vol. 5, no. 1, pp. 1–15, 2015.

[14] J. Mainz, "Defining and classifying clinical indicators for quality improvement," *International Journal for Quality in Health Care*, vol. 15, no. 6, pp. 523–530, 2003.

[15] P. L. Yeoh, K. Hornetz, and M. Dahlui, "Antenatal care utilisation and content between low-risk and high-risk pregnant women," *PLoS ONE*, vol. 11, no. 3, Article ID e0152167, 2016.

[16] K. Beeckman, F. Louckx, G. Masuy-Stroobant, S. Downe, and K. Putman, "The development and application of a new tool to assess the adequacy of the content and timing of antenatal care," *BioMed Central Health Services Research*, vol. 11, no. 213, pp. 1–10, 2011.

[17] H. H. Hijazi, M. S. Alyahya, A. M. Sindiani et al., "Determinants of antenatal care attendance among women residing in highly disadvantaged communities in northern Jordan: a cross-sectional study," *Reprod Health*, vol. 15, p. 106, 2018.

[18] A. H. Woyessa and T. H. Ahmed, "Assessment of focused antenatal care utilization and associated factors in Western Oromia, Nekemte, Ethiopia," *BMC Res Notes*, vol. 12, p. 277, 2019.

[19] T. M. Abate, B. S. Salgedo, and N. B. Bayou, "Evaluation of the quality of antenatal care (ANC) service at higher 2 health center in Jimma, South west Ethiopia," *Open Access Library Journal*, vol. 2, pp. e1398:1–e1398:9, 2015.

[20] E. Servan-Mori, S. G. Sosa-Rubí, E. Najera-Leon, and B. G. Darney, "Timeliness, frequency and content of antenatal care: which is most important to reducing indigenous disparities in birth weight in Mexico?" *Health Policy and Planning*, vol. 31, no. 4, pp. 444–453, 2016.

[21] E. Dansereau, C. R. McNellan, M. C. Gagnier et al., "Coverage and timing of antenatal care among poor women in 6 Mesoamerican countries," *BMC Pregnancy Childbirth*, vol. 16, no. 234, 2016.

[22] M. Amoakoh-Coleman, I. A. Agyepong, N. P. A. Zuithoff et al., "Client factors affect provider adherence to clinical guidelines during first antenatal care," *PLoS One*, vol. 11, no. 6, Article ID e0157542, 2016.

[23] K. F. Muchie, "Quality of antenatal care services and completion of four or more antenatal care visits in Ethiopia: a finding based on a demographic and health survey," *BMC Pregnancy Childbirth*, vol. 17, no. 300, 2017.

[24] M. Kyei-Nimakoh, M. Carolan-Olah, and T. V. McCann, "Access barriers to obstetric care at health facilities in sub-Saharan Africa—a systematic review," *Systematic Reviews*, vol. 6, no. 110, 2017.

[25] A. Singh, A. Kumar, and P. Pranjali, "Utilization of maternal healthcare among adolescent mothers in urban India: evidence from DLHS-3," *PeerJ*, vol. 2, p. e592, 2014.

[26] I. Kalule-Sabiti, A. Y. Amoateng, and M. Ngake, "The effect of socio-demographic factors on the utilization of maternal health care services in Uganda," *African Population Studies*, vol. 28, no. 1, pp. 515–525, 2014.

[27] C. Joshi, S. Torvaldsen, R. Hodgson, and H. A. Andrew, "Factors associated with the use and quality of antenatal care in Nepal: a population-based study using the demographic and health survey data," *BMC Pregnancy and Childbirth*, vol. 14, no. 94, 2014.

[28] N. Ngongo, "Health system predictors of antenatal care compliance among rural Congolese women," *Walden Dissertations and Doctoral Studies*, p. 2038, Walden University, Minneapolis, MN, USA, 2016, https://scholarworks.waldenu.edu/dissertations/2038.

[29] G. W. Basha, "Factors affecting the utilization of a minimum of four antenatal care services in Ethiopia," *Obstetrics and Gynecology International*, vol. 2019, pp. 1–6, 2019.

[30] G. Tura, "Antenatal care service utilization and associated factors in Metekel Zone, Northwest Ethiopia," *Ethiopian Journal of Health Sciences*, vol. 19, no. 2, 2011.

[31] T. Getachew, A. A. Abajobir, and M. Aychiluhim, "Focused antenatal care service utilization and associated factors in dejen and aneded districts, Northwest Ethiopia," *Primary Health Care*, vol. 4, p. 170, 2014.

[32] A.-B. Moller, M. Petzold, D. Chou, and L. Say, "Early antenatal care visit: a systematic analysis of regional and global levels and trends of coverage from 1990 to 2013," *The Lancet Global Health*, vol. 5, no. 10, pp. e977–e983, 2017.

[33] A. Donabedian, "Evaluating the quality of medical care," *Milbank Quarterly*, vol. 83, no. 4, pp. 691–729, 2005.

[34] F. Sardasht, G. Shourab, N. J. Jafarnejad, and F. Esmaily, "Application of donabedian quality-of-care framework to assess the outcomes of preconception care in urban health centers, Mashhad, Iran in 2012," *Journal of Midifiry and Reproductive Health*, vol. 2, no. 1, pp. 50–59, 2014.

[35] A. F. Fagbamigbe and E. S. Idemudia, "Assessment of quality of antenatal care services in Nigeria: evidence from a population-based survey," *Reproductive Health*, vol. 12, no. 88, pp. 1–9, 2015.

[36] A. Donabedian, "The quality of care. How can it be assessed?" *JAMA: The Journal of the American Medical Association*, vol. 260, no. 12, pp. 1743–1748, 1988.

[37] T. Ejigu, M. Woldie, and Y. Kifle, "Quality of antenatal care services at public health facilities of Bahir-Dar special zone,

Northwest Ethiopia," *BMC Health Services Research*, vol. 13, pp. 443:1–443:8, 2013.

[38] United States Agency for International Development (USAID), *Quality of Antenatal and Delivery Care Services in Six Countries in Sub-Saharan Africa*, USAID, Washington, DC, USA, 2012.

[39] A. A. Ewunetie, A. M. Munea, B. T. Meselu, M. M. Simeneh, and B. T. Meteku, "Delay on first antenatal care visit and its associated factors among pregnant women in public health facilities of Debre Markos town, North West Ethiopia," *BMC Pregnancy and Childbirth*, vol. 18, no. 1, p. 173, 2018.

[40] J. S. K. Chan, "Analysis of correlation structures using generalized estimating equation Approach for longitudinal binary data," *Journal of Data Science*, vol. 12, no. 2014, pp. 293–305, 2014.

[41] C. Andrade, "Understanding relative risk, odds ratio, and related terms: as simple as it can get," *The Journal of Clinical Psychiatry*, vol. 76, no. 7, pp. e857–e861, 2015.

[42] Z. Wang, "Converting odds ratio to relative risk in cohort studies with partial data information," *Journal of Statistical Software*, vol. 55, no. 5, 2013.

[43] G. Fesseha, M. Alemayehu, B. Etana, K. Haileslassie, and A. Zemene, "Perceived quality of antenatal care service by pregnant women in public and private health facilities in Northern Ethiopia," *American Journal of Health Research*, vol. 2, no. 4, pp. 146–151, 2014.

[44] Y. E. Housni, A. Khadmaoui, A. Kharbach, and E. Boussalwa, "Qual European journal of scientific researchity of antenatal care services in Morocco: case of the women delivering," *At Souissi Maternity*, vol. 147, no. 4, pp. 426–432, 2017.

[45] M. Tetui, E. K. Ekirapa, J. Bua et al., "Quality of Antenatal care services in eastern Uganda: implications for interventions," *Pan African Medical Journal*, vol. 13, no. 27, pp. 1–15, 2012.

[46] A. N. Yabo, M. A. Gebremicheal, and E. E. Chaka, "Assessment of quality of antenatal care (ANC) service provision among pregnant women in Ambo town public health institution, Ambo, Ethiopia, 2013," *American Journal of Nursing Science*, vol. 4, no. 3, pp. 57–62, 2015.

[47] N. Mekonnen, T. M. Berheto, S. Ololo, and F. Tafese, "Under nutrition and its association with infant and young child feeding summary index among 6 to 23 Months in demba Gofa Woreda, southern Ethiopia," *Journal of Nutritional Health & Food Science*, vol. 5, no. 3:502, pp. 1–15, 2017.

[48] P. Bastola, D. K. Yadav, and H. Gautam, "Quality of antenatal care services in selected health facilities of Kaski district, Nepal," *International Journal of Community Medicine and Public Health*, vol. 5, no. 6, pp. 2182–2189, 2018.

[49] S. Mehnaz, S. Abedi, Z. Fazli, M. Ansari, Mohammed, and A. Ansari, "Quality of care: predictor for utilization of ANC services in slums of Aligarh," *International Journal of Medical Science and Public Health*, vol. 5, no. 9, pp. 1869–1873, 2016.

[50] S. G., "Quality of antenatal care services at subcentres: an infrastructure, process and outcome evaluation in a district in Tamil Nadu," *International Journal of Community Medicine and Public Health*, vol. 4, no. 11, pp. 4071–4077, 2017.

[51] I. Heredia-Pi, E. Servan-Mori, G. Darney, H. Reyes-Morales, and R. Lozano, "Measuring the adequacy of antenatal health care: a national cross-sectional study in Mexico," *Bulletin of the World Health Organization*, vol. 94, no. 6, pp. 452–461, 2016.

[52] E. Duysburgh, A. Williams, J. Williams, S. Loukanova, and M. Temmerman, "Quality of antenatal and childbirth care in northern Ghana," *BJOG: An International Journal of Obstetrics & Gynaecology*, vol. 121, no. S4, pp. 117–126, 2014.

[53] R. Karkee, A. H. Lee, and P. K. Pokharel, "Women's perception of quality of maternity services: a longitudinal survey in Nepal," *BMC Pregnancy Childbirth*, vol. 14, p. 45, 2014.

[54] E. Bbaale, "Factors influencing the utilisation of antenatal care content in Uganda," *Australasian Medical Journal*, vol. 4, no. 9, pp. 516–526, 2011.

[55] A. Rahman, M. K. Nisha, T. Begum, S. Ahmed, N. Alam, and I. Anwar, "Trends, determinants and inequities of 4+ ANC utilisation in Bangladesh," *Journal of Health, Population and Nutrition*, vol. 36, no. 1, p. 2, 2017.

[56] R. A. Atinga and A. A. Baku, "Determinants of antenatal care quality in Ghana," *International Journal of Social Economics*, vol. 40, no. 10, 2013.

[57] K. Vladimirova and D. L. Blanc, *How Well Are the Links between Education and Other Sustainable Development Goals Covered in UN Flagship Reports? A Contribution to the Study of the Science-Policy Interface on Education in the UN System*, p. 146, Department of Economic & Social Affairs, New York, NY, USA, 2015.

[58] R. A. Bhat, "Role of education in the empowerment of women in India," *Journal of Education and Practice*, vol. 6, no. 10, pp. 188–199, 2015.

[59] T. Somani, "Importance of educating girls for the overall development of society: a global perspective," *Journal of Educational Research and Practice*, vol. 7, no. 1, pp. 125–139, 2017.

[60] M. O. Obiyan and A. Kumar, "Socioeconomic inequalities in the use of maternal health care services in Nigeria: trends between 1990 and 2008," *SAGE Open*, vol. 5, no. 4, pp. 1–11, 2015.

[61] A. Chukwuma, A. C. Wosu, C. Mbachu, and K. Weze, "Quality of antenatal care predicts retention in skilled birth attendance: a multilevel analysis of 28 African countries Quality of antenatal care predicts retention in skilled birth attendance: a multilevel analysis of 28 African countries," *BMC Pregnancy and Childbirth*, vol. 17, no. 1, 2017.

[62] T. Dahiru and O. M. Oche, "Determinants of antenatal care, institutional delivery and postnatal care services utilization in Nigeria," *Pan African Medical Journal*, vol. 21, no. 321, pp. 1–7, 2015.

[63] O. Emelumadu, A. Ukegbu, N. Ezeama, O. Kanu, C. Ifeadike, and U. Onyeonoro, "Socio-demographic determinants of maternal health-care service utilization among rural women in Anambra state, South East Nigeria," *Annals of Medical and Health Sciences Research*, vol. 4, no. 3, pp. 374–382, 2014.

[64] R. K. Paudel, B. Thepthien, B.-o. Thepthien, and S. A. Hong, "Factors related to regular use of ANC services among mothers of children under one year of age in rural communities of Banke district, Nepal," *Asian Pacific Journal of Health Sciences*, vol. 3, no. 3, pp. 216–222, 2016.

[65] A. A. G. Creanga, S. Anne, K. Kuhlmann, S. Thumbiko, and C. Galavotti, "Is quality of care a key predictor of perinatal health care utilization and patient satisfaction in Malawi?" *BMC Pregnancy and Childbirth*, vol. 17, no. 150, pp. 1–13, 2017.

[66] T. M. Tamang, "Factors associated with completion of continuum of care for maternal health in Nepal," in *IUSSP XXVIII International Population Conference*, Cape Town, South Africa, October-November 2017.