

Quality of Antenatal Care and Associated Factors Among Pregnant Women in East Africa: Evidence from Demographic and Health Surveys (2008 to 2018)

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Abstract

Introduction: Antenatal care (ANC) offers a forum for critical healthcare functions, including health education, screening and diagnosis, and disease prevention. According to WHO, "Quality of care is the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with evidence-based professional knowledge. Several pocket studies carried out in specific localities of East African countries were investigated factors influencing the ANC utilization. However, these factors were neither representative of the country nor specific to the recommended minimum of four ANC visits. Therefore, this study aimed to estimate the overall magnitude and factors associated with ANC quality among pregnant women in the six East African Countries from 2008 to 2018 data of Demographic and Health Surveys (DHS).

Methods: A secondary data analysis was done using DHS data of six East African Countries from 2008 to 2018. A total weighted sample of 46,656 women who gave birth in the five years preceding the survey was included in this study. A multilevel mixed effect logistic regression model was fitted. Variables with a p-value<0.05 were declared significant factors associated with the quality of ANC.

Results: The overall magnitude of quality of ANC in the six East African Countries was 11.16% (95% CI: 10.87-11.45). An average age of the women was 28.95. Women of age 20-34 (AOR= 1.29; 95% CI; 1.11-1.50), 35-49 (AOR = 1.51; 95% CI; 1.25-1.80), primary education (AOR = 1.35; 95% CI; 1.18-1.55), richest wealth index (AOR = 2.35; 95% CI; 2.02-2.74), being in rural resident (AOR = 0.62; 95% CI; 0.55,0.69), and living in Rwanda (AOR = 3.03; 95% CI; 2.52-3.66) were factors significantly associated with quality of ANC.

Conclusion and Recommendations: The magnitude of ANC quality was low in the East African countries. Age, level of education, wealth index, birth order, husband/partners' level of education, residence, and living countries were factors associated with ANC quality. It would be helpful to increase financial support strategies that enable mothers from poor households to use health services and enhance women's understanding of the significance of ANC utilization through health education; targeting both women and partners with no education is crucial.

Plain English Summary

Having good quality antenatal care is critical for the prevention and detection of potential causes of maternal obstetric complications and to avert newborn deaths and stillbirths. Higher quality antenatal care has also been linked to a higher promising of retention in care and of giving birth in a health facility, which might further improve maternal and newborn outcomes.

Quality of antenatal care is measured by six components like blood pressure measurement, blood test, urine test, informed on possible complications, counseling on nutrition and advice on birth preparedness plan during pregnancy.

Of the 46,656 respondents only 5,207 (11.16%) of the respondents had received quality antenatal care. The major factors that helps the women to had quality antenatal care were their educational attainment, wealth index and place of residence.

In conclusion; women's who improves their financial problem and had good knowledge regarding family planning can get a quality of antenatal care service utilization.

Introduction

Pregnancy is a vital time to prepare women and their families mentally and emotionally for good health and parenthood. Antenatal care (ANC) can be described as care given to pregnant women and teenage girls by professional health care providers to ensure the best health outcomes for both mothers and babies during pregnancy. ANC offers a forum for receiving health education, screening and diagnosis, and disease prevention. It has been proven that ANC can save lives. ANC also offers women, families, and communities the ability to connect with and support them at a crucial time (1, 2). The primary purpose of focused ANC is to help women sustain normal pregnancies through early identification of pre-existing conditions, complications that arise during childbirth, and promotion of wellbeing (3). Moreover, one of the main strategies to improve maternal outcomes is ANC. ANC programs provide early detection of risks and complications associated with pregnancy and ensure access to care, including health education, vaccines, medical testing, and therapies (4).

With 546 maternal deaths per 10,000 live births, Sub-Saharan Africa has the world's highest regional maternal mortality ratio. The risk of maternal mortality peaks around birth, when treatment coverage is at its lowest. A successful continuum of professional maternal care ensures that mothers receive critical health packages, minimizing the risk of maternal death from pre-pregnancy to childbirth and postnatal care (1, 5). A change in the burden of maternal deaths from Asia to Sub-Saharan Africa is associated with differential patterns in fertility, the HIV/AIDS epidemic, and access to reproductive health services(6). Moreover, a quarter of infant deaths are accounted for by newborn deaths in the first 28 days of life, and the regional neonatal mortality rate (NMR) has not decreased over the last two decades at the same rate as under-5 mortality (6).

According to WHO, "Quality of care is the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with evidence-based professional knowledge (7). However, despite the increasing coverage of ANC in developing nations, maternal and neonatal death is still high (8). This shows that though the coverage of ANC is increasing, the undesirable health outcomes are still prominent.

In addition, several studies carried out in different areas of East African countries investigated factors influencing the use of ANCs, but these factors were neither representative of the country nor specific to the recommended minimum of four ANC visits (9, 10). The only person and household features associated with ANC facilities were included in the studies literature. However, it indicated that context might affect the outcomes of individual health (11). Therefore, this study aimed to estimate the overall

magnitude and factors associated with the quality of ANC in the six East Africa Countries from 2008 to 2018 data of DHS.

Methods

Study Setting and Design

The United Nations (UN) Statistics Division has subdivided the African continent into five regions. Among these regions, East African countries make the most significant region that includes 19 countries (Burundi, Comoros, Djibouti, Ethiopia, Eritrea, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Reunion, Rwanda, Seychelles, Somalia, Somaliland, Tanzania, Uganda, Zambia, and Zimbabwe). This study was a secondary data analysis based on DHS. Of these 19 East African countries, six countries (Djibouti, Somalia, Somaliland, Seychelles and Mauritius, Reunion) have no data on their history and Eritrea has no recent data. In addition, six countries (Zambia, Zimbabwe, Tanzania, Uganda, Burundi, and Malawi) have no all the six components of ANC services for the most recent birth during ANC, developed by WHO on their recent DHS data. So, the final analysis was conducted from the data of six countries, including Ethiopia, Kenya, Comoros, Madagascar, Mozambique, and Rwanda. During the measure DHS survey, a community-based cross-sectional study design was used.

Data Source, Extraction and Sampling Strategy

The data of these six East Africa countries were accessed from the DHS program official database (www.measuredhs.com) after authorization was granted through an online request by explaining the goal of our study. We used the individual Record (IR file) data set and extracted the dependent and independent variables. To collect knowledge comparable across countries globally, the DHS program adopts standardized methods involving uniform questionnaires, manuals, and field procedures. DHS is a nationally representative household survey that offers data from a wide variety of population, health, and nutrition tracking and effect assessment measures with face-to-face interviews of women aged 15 to 49. Stratified, multi-stage, random sampling is used in the surveys. Detailed survey techniques and methods of sampling used to collect data have been recorded elsewhere (12).

Measurements

Quality of ANC refers to receiving all essential components of ANC services such as blood pressure measurement, blood test, urine test, informed on possible complications, counseling on nutrition, and advice on birth preparedness plan during pregnancy (13, 14). The outcome variable consists of these six questions. Each question has a binary response (1 = Yes and 0 = No). If the pregnant women are received all six essential ANC components, it is said to be quality ANC, and if not, it is said to be no quality ANC. Explanatory variables were age, residence, women's level of education, literacy, wealth index, birth order, country, husband education level, number of ANC visits, and ANC provider.

Data Processing and Analysis

Data processing and analysis were performed using STATA 15 software. The data were weighted using sampling weight, primary sampling unit, and strata before any statistical analysis to restore the survey's representativeness and tell the STATA to consider the sampling design when calculating standard errors to get reliable statistical estimates. Cross tabulations and summary statistics were conducted to describe the study population.

Since the DHS data has a hierarchical nature, women within a cluster may be like each other more than women in the other cluster. Due to this, the assumption of independence of observations and equal variance across clusters might be violated. Therefore, an advanced statistical model must consider the between cluster variability to get a reliable standard error and unbiased estimate. Furthermore, by considering the dichotomous nature of the outcome variable, multilevel mixed-effect logistic regression was fitted. Model comparison was made based on Akaike and Bayesian Information Criteria (AIC and BIC). A mixed-effect model with the lowest Information Criteria (AIC and BIC) was selected.

The individual and community level variables associated with the Quality of ANC were checked independently in the bi-variable multilevel mixed-effect logistic regression model, and variables that were statistically significant at p-value 0.20 in the bi-variable multilevel mixed-effects logistic regression analysis were considered for the final individual and community level model adjustments. In the multivariable multilevel mixed-effect analysis, variables with a p-value \leq 0.05 were declared significant determinants of the Quality of ANC service. Intraclass correlation coefficient (ICC) was used to check whether the multilevel model is appropriate and how much of the overall variation in the response is explained by clustering.

Four models were fitted. The first was the null model that did not include exposure variables used to verify community variance and provide evidence to assess random effects at the community level. Then, model I was the multivariable model adjustment for individual-level variables, and model II was adjusted for community-level factors. In model III, the outcome variable was equipped with potential candidate variables from individual and community-level variables.

The fixed effects (a measure of association) were used to estimate the association between the Quality of ANC service and explanatory variables and expressed as an odds ratio with a 95% confidence interval. Regarding the variation (random-effects) measures, Community-level variance with standard deviation and intra-cluster correlation coefficient (ICC) was used.

Results

Socio-Demographic and Economic Characteristics

A total of 46,656 women who gave birth in the five years preceding each country's DHS survey were included in this study. The mean age of the women was found to be 28.95 with 95%CI of (28.88 29.01). The majority of the 32396.20(69.44%) women lie in 20–34. Most of the women included were from Kenya 14428.92(30.93%), and the smallest number of women included from Comoros 2059.93(4.42%).

Three-fourth of the women were from rural residents, 35110.17 (75.25%), and 50.65% of the women had primary education (Table 1).

Table 1: Socio-demographic and Economic characteristics of quality of ANC in selected East African Countries from DHS 2008 to 2018.

Variable	Weighted Frequency	Percentage (%)	Weighted % of Quality ANC
Age			
15-19	3374.44	7.23	8.50
20-34	32396.20	69.44	11.80
35-49	10885.71	23.33	10.08
Place of Residence			
Urban	11546.17	24.75	19.61
Rural	35110.17	75.25	8.39
Women Level Education			
No education	12760.65	27.35	4.99
Primary	23630.34	50.65	10.59
Secondary	8210.00	17.60	18.30
Higher	2055.35	4.41	27.62
Literacy			
Cannot read at all	18164.73	38.93	6.14
Able to read only parts of the sentence	4694.28	10.06	8.89
Able to read the whole sentence	23652.54	50.70	15.50
No card with required language	82.99	0.18	6.52
Blind/visually impaired	61.78	0.13	4.41
Wealth index			
Poorest	10234.08	21.94	5.81
Poorer	9640.43	20.66	7.28
Middle	9137.37	19.58	9.19
Richer	8883.13	19.04	12.12
Richest	8761.32	18.78	2.76
Country			
Ethiopia	7589.77	16.27	5.55
Kenya	14428.92	30.93	12.80
Comoros	2059.93	4.42	14.52

Madagascar	8644.51	18.53	6.77
Mozambique	7874.21	16.88	11.91
Rwanda	6059.00	12.99	18.43
Partner's Education			
No education	9019.55	19.33	5.94
Primary	17847.10	38.25	11.22
Secondary	6748.18	14.46	21.16
Higher	1923.15	4.12	37.32
Do not Know	11118.36	23.83	4.70

Maternal Characteristics and Magnitude of Quality of ANC in Six East African Countries

The magnitude of Quality of ANC in selected East African Countries was 11.16% (95% CI: 10.87-11.45), with the Highest Quality of ANC in Rwanda (18.43%) and the lowest quality of ANC in Ethiopia (5.55%) (Table 2).

Table 2: Maternal Characteristics and Magnitude of Quality of ANC in the six East African Countries from 2008 to 2018 DHS Data

Variable	Weighted Frequency	Percentage (%)	Weighted % of Quality ANC
Quality of ANC			
No	41448.63	88.84	
Yes	5207.71	11.16	100
Birth Order			
1	10608.42	22.74	15.07
2-4	22560.01	48.35	11.92
>=5	13487.91	28.91	6.82
Number of ANC Visit			
No Visit	5575.71	11.95	0.77
One to three visits	18400.67	39.44	8.75
At least four visits	22679.97	48.61	15.67
ANC Provider			
Doctor	8030.27	17.21	14.78
Nurse	29130.43	62.44	12.74
TBAs	582.67	1.25	2.28
Others*	8912.974	19.1	3.32

NB: * include Midwife, Health officer, and so on

Factors Associated with Quality of ANC in East African Countries from 2008 to 2018 DHS Data.

In the random effects, the results of the null model revealed that there was statistically significant variability in the odds of Quality of ANC with community variance 1.69, and the ICC in the null model suggested that 33.96% of the total variability in the Quality of ANC was ascribed to the differences between communities. In the full model (model adjusted for both individual and community-level factors), community variance = 0.98; SE 0.05 remained significant but reduced, and 23.08% of the total variance of Quality of ANC can be ascribed to the community (Table 2).

In the fixed effects, the model with smaller Akaike Information Criteria (AIC) and Bayesian Information Criteria (BIC) was best fit the data, and the interpretation of the fixed effects was based on this model. Model III was adjusted for individual and community-level factors, and this model fits the data well. In the multivariable analysis, respondent's age group, place of residence, women's education, wealth index, birth order, husband/partner's education, number of ANC visit, and living country were significantly associated with the Quality of ANC in East Africa at 5% level of significance.

The odds of Quality of ANC were 1.29 and 1.51 times higher among the women in the age group of 20-34 (AOR = 1.28; 95% CI; 1.11-1.50) and 35-49 (AOR = 1.51; 95% CI; 1.25-1.80) respectively as compared to the women in the age group of 15-19. Richest women were 2.35 times more likely to have Quality of ANC than women who are poorest (AOR = 2.35; 95% CI; 2.02-2.74). The odds of Quality of ANC are reduced by 38% among women living in rural residences (AOR = 0.62; 95% CI; 0.55-0.69) compared to women residing in urban areas. Women whose partners had a higher education are 2.27 times (AOR = 2.27; 95% CI; 1.89-2.70) more likely to have Quality of ANC than the women whose partners had no education. Pregnant women living in the following East African Countries are more likely to have quality of ANC, Kenya (AOR = 2.14; 95% CI; 1.82-2.53), Comoros (AOR = 1.61; 95% CI; 1.27-2.05), Mozambique (AOR = 1.53; 95% CI; 1.28-1.83), Rwanda (AOR = 3.03; 95%CI; 2.52-3.66), than women living in Ethiopia (**Table 3**).

*** Table 3***

Discussion

In this study, the overall magnitude of quality of ANC in selected Eastern African countries was 11.16%. Maternal age, birth order, wealth status, maternal and husband's educational status, residence, and the country in which the women were living were significantly associated with the Quality of antenatal care.

This study revealed that the quality of ANC was higher among the women in the age group of 20–34, compared to the younger women in the age group of 15–19. These findings are aligned with the result from Kenya and Nigeria (15, 16). This might be because older mothers may have a better understanding of the importance of utilizing the service. The older mother might get the opportunity of repeated health education and counseling in the preceding pregnancy that might enhance their knowledge about the benefits of ANC.

This study also revealed that the women classified under the richest wealth index had Quality of ANC than the poorest women. This finding was in line with the finding from Nepal (17) and Kenya (15). This might be due to the high probability of attending the highest ANC follow-up by the richest women. In addition, this might be due to the person-centered services provided by healthcare providers at the governmental or non-government organization can increase the Quality of ANC for women from the richest family.

In addition, the study showed that women who had a higher level of education had quality ANC. This result was in line with the study conducted in Tanzania (18) Southern Ethiopia(19). This might be since the educated person can understand healthcare providers' instructions, education, and counseling. In addition, they can easily obtain information from radio and televisions, printed materials prepared for enhancing awareness of pregnant women about the importance of ANC, and adherence to follow-up schedules.

Moreover, the current study revealed that the odds of Quality of ANC were reduced by 38% among women living in rural residences. This finding agreed with the report from Nigeria and Ghana (16, 20). This can be

due to the proximity of the women who live in urban to health facilities since the facilities should be situated in the Urban. In addition, women who live in the urban can easily access important information about ANC from different sources such as NGOs, governmental and private health facilities.

According to this study, ANC quality was reduced by 48% among women who had at least five children, as reported consistently by studies in Ethiopia (21), Haiti (22), Nigeria (23), and Brussels Metropolitan region (24). This result could be due to less desire of women with multiple parities to attend whole ANC recommended visits. This might be due to having experience giving birth during the last pregnancies and the belief that they do not need services as they have experience with pregnancy and childbirth.

The study also showed that women whose partners had higher education had Quality of ANC. This finding agreed with the report from Nepal (17) that women whom their husbands educated had increased ANC quality. This can be since educated husbands might be supportive and involved in the decision-making in the women's ANC utilization.

Furthermore, the pregnant women living in Rwanda had a Quality of ANC when compared with others. This can be due to differences in the health service coverage, particularly ANC coverage varies across the country.

Conclusions

The quality of ANC was low in the six East African countries. The influences of several covariates on the Quality of ANC were identified. Maternal age, educational level, wealth index, birth order, husband/partners' educational level, residence, and living countries were significant factors associated with the Quality of ANC. It would be useful to increase financial support strategies that enable mothers from poor households to use health services. To increase women's understanding of the significance of ANC utilization, health education targeting mothers with no education and husbands/partners with no education is very crucial.

Strength And Limitations Of The Study

The strength of this study was using the DHS data from different nations with large sample sizes, which is nationally representative for each nation. Despite the strength mentioned above, this study had some limitations: we used the most recent live birth in the past five years before the survey for calculation of Quality of ANC. There might be a recall bias since we put only six essential services due primarily to data availability.

Declarations

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Authors' contributions

TB, BS and BN conceived the study, variable extraction, data cleaning, analysis, interpretation, drafted the final report write up, prepared the manuscript and reviewed the article. GM, TB, BS, AB, LD, AT, NB, AD, AA, AB, MY, BT, SL, and BN participated in data analysis, involved in report write up, and extensively reviewed the article. All authors read and approved the final manuscript.

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Conflict of interests

The authors declare that they have no competing interests.

Consent to publication

Not applicable

Ethics approval and consent to participate

Ethical clearance for the current study was obtained from international review board (IRB) of Demographic and Health Surveys (DHS) Program. Data are available to the general public by request in different formats from the Measure DHS website [www.measuredhsprogram.com]. We applied the measure DHS by briefly stating the objectives of the study and got the permission to download the dataset in STATA format. Permission letter for access to database was received from Measure DHS program. The DHS research protocol complies with the Helsinki declaration.

Data availability and materials

The EDHS data sets are open and can be accessed from the Measure DHS website www.measuredhs.com through an online request by explaining the objective of the study. The datasets analyzed during the current study are available from the corresponding author upon reasonable request.

Abbreviations

AIC

Akaike Information Criteria, ANC:Antenatal Care, AOR:Adjusted Odds Ratio, BIC:Bayesian Information Criteria, DHS:Demographic and Health Survey, ICC:Intra-class Correlation Coefficient's and TBAs:Traditional Birth Attendants

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Table 3

Table 3 is available in the Supplementary Files section.

Supplementary Files

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