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Factors associated with optimal antenatal care use in Northern region, Ghana

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ABSTRACT

Background: The objective of this study was to investigate the factors associated with the optimal use of antenatal care (ANC) during pregnancy.

Methods: A facility-based cross-sectional survey was conducted between February and August 2014 among nursing mothers ($n = 578$) attending postnatal and child welfare clinics in three districts in Northern Ghana, representing urban, peri-urban, and rural zones. The developed questionnaire aided the collection of information on maternal demographic characteristics, health status, household assets, and ANC attendance. Binary logistic regression was modeled to estimate the association between optimal ANC use and mothers' characteristics.

Results: Approximately 81% of the respondents had ≥ 4 ANC visits during pregnancy, and coverage was over 99%. Mothers who had any formal education (adjusted odds ratio [AOR] = 1.7, 95% confidence interval [CI] = 1.0–2.8, $P = 0.040$) lived in middle class socioeconomic households (AOR = 2.6, 95%CI = 1.4–4.8, $P = 0.003$) and resided in urban areas (AOR = 2.0, 95%CI = 1.2–3.3, $P = 0.006$) were significantly more likely to report the optimal ANC use.

Conclusions: Mothers' education, socioeconomic status, and proximity to a health facility were positively associated with the optimal ANC use. Education of females and policy initiatives aimed at improving the rural–urban divide are essential to optimize the use of ANC.

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Introduction

Antenatal care (ANC) offers a window of opportunity for the prevention of maternal and infant mortality and to improve birth outcomes (Babalola and Fatusi 2009; Gabrysch and Campbell 2009). Essential interventions that occur during ANC include identification and management of obstetric complications, such as pre-eclampsia, assessment of fetal growth, and tetanus toxoid

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immunization; intermittent preventive treatment for malaria during pregnancy (IPTp); identification and management of infections including HIV, syphilis, and other sexually transmitted infections (STIs); and client counseling. In addition, ANC promotes the use of skilled attendance at birth and stimulates healthy behaviors, such as skin-to-skin contact and early initiation of breastfeeding, early postnatal care, and planning for optimal pregnancy spacing. Magadi, Madise, and Rodrigues (2000) showed that if a mother fails to receive the required ANC during pregnancy, it could lead to undesirable pregnancy outcomes, such as maternal and neonatal morbidity, low infant birth weight, and perinatal mortality. In addition, a strong association exists between the use of antenatal care use and the optimization of safe delivery services (Bayou and Gacho 2013).

Despite evidence of the effect of ANC on maternal and infant health, within sub-Saharan Africa (SSA), a number of barriers still limit access to optimal maternal care, particularly ANC (Gabrysch and Campbell 2009; Gage 2007; Idris, Sambo, and Ibrahim 2013). These barriers include user fees, delay in the process of care seeking and care giving, and increased preference to use informal care (Gabrysch and Campbell 2009; Hutton 2004; Ridde 2003). The negative effects of the user fees have compelled the scientific community and policy makers to argue that its abolition will facilitate progress toward realization of the Millennium Development Goal 5 to improve maternal health (Kippenberg, Sahokwasama, and Amon 2008; Meda et al. 2008; Prata et al. 2004) and more recently the Sustainable Development Goals 3.1–3.2 for reducing maternal and neonatal mortality by the year 2030. A number of countries in SSA responded positively to this international call and either significantly reduced or fully removed user fees for maternal care services (Ridde 2003). In 2008, the Government of Ghana implemented a policy of providing free maternal health care service, including ANC, to all pregnant women registered under the national health insurance scheme (Johnson, Frempong-Ainguah, and Padmadas 2016)

Despite this intervention, evidence revealed that in SSA, including in Ghana, many women are not able to take full advantage of this user fee abolition to receive optimal ANC (Mills et al. 2008). A minimum of four ANC visits is recommended by the World Health Organization (WHO) as optimal for uncomplicated pregnancy, and more visits are required in case of complications (Villar et al. 2001; WHO 2016). The ANC delivery process of Ghana is driven by this WHO recommendation (WHO 2016). However, available evidence has shown that, although overall use of ANC is high in Ghana, many mothers are not able to meet the optimal minimum of four visits (Mills et al. 2008).

Financial barriers defined in terms of ability to pay, geographical location, cultural, and socioeconomic barriers have been attributed to the persistent low use of optimal ANC. For instance, socioeconomic factors, including woman's educational status, husband's occupation, household wealth status, and financial stress, have been associated with the use of maternity services

(Adamu 2011; Dhakal et al. 2007; Moore, Alex-Hart, and George 2011; Titaley et al. 2010) and are indicators of economic resources, which empower women to regulate their own health and facilitate easy access to quality maternal health care (Gage 2007).

In Columbia, wealthy mothers were more likely to go for a first ANC visit and subsequent visits than poorer mothers (Vecino-Ortiz 2008). Using nationally representative data, the Ghana Statistical Service (GSS/GHS/ICF Macro 2009) also reported a positive association between skilled antenatal care coverage and wealth quintile. Thus, in Ghana, women in the middle and highest wealth quintiles are more likely to receive ANC from a health professional than those in the lowest wealth quintile (GSS/GHS/ICF Macro 2009). This is because even within such context in which user fee exemptions exist for maternal care, the poor might not still be able to take advantage of these exemptions owing to lack of information, other costs (such as purchase of drugs and supplies that are not available at health facilities, transportation cost, and unofficial fees), and discrimination by health providers (Quaye 2004).

Theoretically, Grossman (1972) postulated that education makes a person efficient in the use of health services and may enable the individual to choose a more health conscious behavior to improve health. Empirical evidence has also demonstrated a positive association between education of the mother and maternal health care use (Alexandre et al. 2005; Tayie and Laryey 2008; Vecino-Ortiz 2008). As observed in Ghana, women's attitude toward ANC is related to their level of education, with more years of education associated with a demand for adequate ANC (Overbosch et al. 2004). Residential location of the mother as an important factor that is associated with ANC utilization has been reported by a number of empirical studies. In most developing countries, urban dwellers have been reported to use ANC more than rural women because of the former's locational proximity to health care facilities (Abor et al. 2008). More than a third of rural Ghanaian women travel over 5 km to obtain ANC services (Overbosch et al. 2004).

A number of studies have examined socioeconomic factors related to using ANC in Ghana. However, the literature is limited about the factors related to the optimal ANC use in particular. The few studies that have examined this topic have often assessed the situation at the national level, relying on secondary data collected through the Ghana Demographic and Health Survey (GDHS). Although the GDHS data-set is nationally representative, given the socioeconomic peculiarities of the poor Northern regions of Ghana, more context-specific evidence is essential to understand the situation at this local level. The northern regions are the poorest regions in Ghana and also fare poorly with respect to all health indicators in Ghana (GSS/GHS 2014). It is against this background that this study was designed to investigate the factors that are associated with the optimal ANC use in the Northern region of Ghana.

Methodology

Study design and setting

A facility-based cross-sectional survey was conducted in three districts in the Northern region of Ghana to assess the factors associated with the optimal use of ANC. The selected districts were the Tamale Metropolis, Sagnarigu district, and Savelugu-Nanton District. Sagnarigu district is a suburb of Tamale Metropolis; the inhabitants attend the hospitals in the Tamale Metropolis. Tamale Metropolis is predominantly urban, Sagnarigu district is peri-urban, and Savelugu Nanton District is predominantly rural. These districts were purposively sampled to represent a mix of urban, peri-urban, and rural populations, in an attempt to make the distribution of social groups of the study population similar to the entire population of the Northern region.

Study participants

The study targeted women (mothers) receiving postnatal and child welfare clinic services. Only those who agreed to participate in the study were sampled. They were selected from four hospitals, which included the Tamale Teaching Hospital, Tamale Central and West Hospitals, and Savelugu District Hospital. The selection criteria for the mothers included the following: regular attendance (monthly visit) to a child welfare clinic; the mother was never severely ill during the pregnancy and had a baby between 0 and 1 month of age. A consecutive sampling procedure was used to select the pregnant women. This implied that all mothers who met the criteria enumerated above were selected at every visit made to the hospitals until all the 600 were recruited.

In all, 900 mothers were approached, 820 women participated in the screening, and 600 of these mothers (73.2%) were eligible to participate in the survey. The high disqualification rate was largely due to the inability of mothers to confirm their availability for the next child welfare clinic session when the interviews were scheduled to take place. These comprised 96 mothers each, attending the Tamale Central, Tamale West, and Savelugu District Hospitals, and 312 mothers from the Tamale Teaching Hospital, which is the largest referral hospital in the region. Five hundred seventy-eight (578) mothers completed the questionnaires, providing a participation rate of 96%. The survey took place between February and August 2014.

Data collection

The information collected consisted of both primary and secondary data. Primary data were generated using a structured questionnaire specifically designed to achieve the objectives of the study. However, the questions that sought to determine the wealth index were adopted from the 2014 Ghana

Demographic and Health Survey (GSS/GHS 2014). The secondary data on ANC attendance and respondents' health status during pregnancy were extracted from the ANC medical records. Trained research assistants administered the questionnaire through one-on-one interviews and gathered information on the demographic characteristics of the mothers and household assets.

Data analysis

The data was entered using Epi Info version 4.1 and later imported to STATA 12.1 for analysis. According to WHO criteria (WHO 2016), which is also the standard policy recommendation of Ghana, low use of ANC was defined as less than four visits (<4 visits), and the optimal use was defined as greater than or equal to four visits (≥ 4 visits). The explanatory variables included the following: age of the mother, occupation, parity, location, assets index (socio-economic status), level of education, and reported illness (such as diarrhea) or pre-existing chronic disease during pregnancy, such as diabetes, hypertension, tuberculosis, asthma, and sickle cell diseases. The socioeconomic status of the household was estimated using household wealth index as a proxy, derived from household assets, such as possession of a television, refrigerator, gas cooker, motorcycle, livestock, car/tractor/truck, land, house, and/or availability of portable water and electricity. These durable goods and amenities are frequently regarded as reflecting household socioeconomic status (Filmer and Pritchett 2001). Principal component analysis (PCA) was used to compute the household wealth index. This was further divided into tertiles. The first tertile represented the lower socioeconomic group; the middle tertile represented the middle class, and the last tertile represented the upper socioeconomic class.

The first procedure in the analysis was to compute the descriptive statistics to ascertain the mother's basic characteristics and to screen all the potential factors individually for their relationship with the dependent variable using Pearson chi-square tests. A histogram was used to illustrate the frequency of using ANC services. The associations between the dependent variable (optimal ANC use) and the independent variables were computed using simple binary logistic regression, producing odds ratios (OR) and 95% confidence intervals (CI). Adequate ANC use was analyzed as a binary variable. The fit for the model was determined using the likelihood chi-square ratio and the associated p-value. p-values < .05 were considered statistically significant.

Ethics approval and consent to participate

The mothers were asked to sign a written consent form before they were interviewed. For those who could not read and write, this was performed through an interpreter. The guardians or parents were asked to sign a written parental or guardian consent form on behalf of teenage mothers, while the minors were asked to sign an assent form. The Ethics Committee of Navarongo Health Research Center (Ref. No: App/Mat-Nut/01/2014) approved the research protocol.

Results

Almost all of the study participants were married (99.13%), from the Dagomba tribe (79.76%), the largest ethnic group in the Northern region, and Muslims (94.29%) (Table 1). Approximately 60% of the participants had some formal education, 77% were employed either in the formal or informal sectors; whereas, the remainder were housewives and students and were not income earners. Moreover, approximately 78% of the participants were urban and peri-urban dwellers; 60% of mothers had one or two children; whereas, the remaining mothers had three or more children.

Almost all respondents (99.34%) attended the ANC at least once within the entire course of their most recent pregnancy (Figure 1). However, with regard to the optimal ANC use, approximately 81% of the respondents had four or more ANC visits. Only 4 (0.66%) did not attend the ANC during the entire period of their pregnancy; whereas, 104 (18.0%) used ANC but less than the optimal threshold of four times during the entire period of pregnancy.

Table 1. Maternal characteristics.

Variable	Measurement	N (%)
Education	No formal education	231 (40.0%)
	Any formal education	347 (60.0%)
Mother's occupation	Housewife/student	134 (23.2%)
	Informal sector	444 (76.8%)
Location	Urban	452 (78.2%)
	Rural	126 (21.8%)
Parity	No previous child	58 (10.0%)
	1–2	292 (50.5%)
	≥3	228 (39.5%)
Age group of mother, years	15–20	58 (10.0%)
	21–30 years	372 (64.4%)
	>30	148 (25.6%)
Socioeconomic status	Lowest quintile	193 (33.4%)
	Middle quintile	197 (34.0%)
	Upper quintile	188 (32.5%)
Pre-existing diseases	No	556 (96.2%)
	Yes	22 (3.8%)
Episode of diarrhea	No	78 (13.7%)
	Yes	493 (86.3%)
Physical violence during pregnancy	No	474 (82.4%)
	Yes	101 (17.6%)

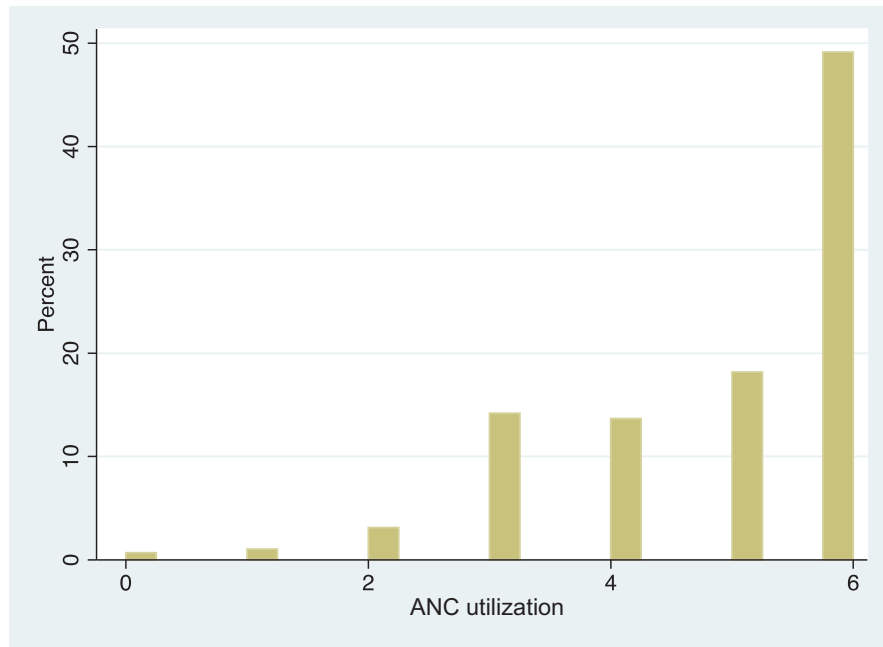


Figure 1. ANC utilization.

A higher proportion of those who had some formal education had four or more ANC visits before delivery (84.6%) compared to those who had no formal education (75%) (Table 2). A positive association ($p = 0.009$) was observed between higher educational status of mothers and greater ANC attendance. In addition, approximately 83% of primiparous mothers had ≥ 4 visits compared to those who had >3 children (78%). However, no statistically significant association was observed between parity and ANC attendance. Furthermore, approximately 84% of women living in urban areas attained optimum ANC visits compared to 68% of those in the rural areas ($p < 0.0001$). A statistically significant positive association also was observed between urban residency of a mother and optimal ANC attendance. Moreover, a lower proportion (74%) of women who fell in the lowest socioeconomic households had four or more ANC attendance, compared to the middle (87%) and upper (80%) classes. A positive association was also observed between household socioeconomic status and optimal ANC attendance ($p = 0.010$). Approximately 87% of women who suffered physical violence during pregnancy had four or more ANC visits compared to 80% of those who did not suffer any physical violence. This difference was also statistically significant ($p = 0.042$).

The results of the logistic regression revealed that the mother's educational status, middle class socioeconomic status, and urban residential location were statistically significantly associated with the optimal ANC use (Table 3). Pregnant women who had some form of education (basic,

Table 2. Mother's characteristics in relation to ANC attendance.

Variable	Sub-group	ANC attendance during pregnancy <i>N</i> (%)				p-value
		<3 times	3 times	4 times	>4 times	
Education	No formal education	16 (6.9)	42 (18.2)	35 (15.1)	138 (60.0)	.009
	Any formal education	12 (3.5)	40 (11.5)	44 (12.7)	251 (72.3)	
Mother's occupation	Housewife/student	6 (4.5)	21 (15.7)	24 (17.9)	83 (61.9)	.339
	Any form of work	22 (5.0)	61 (13.7)	55 (12.4)	306 (68.9)	
Residential location	Urban	18 (4.0)	53 (11.7)	57 (12.6)	324 (71.7)	.0001
	Rural	10 (7.9)	29 (23.0)	22 (17.5)	65 (51.6)	
Parity	No previous child	4 (6.9)	6 (10.3)	7 (12.0)	41 (70.7)	.166
	1–2	17 (5.8)	34 (11.6)	37 (12.7)	204 (69.9)	
	≥3	7 (3.0)	42 (18.4)	35 (15.4)	144 (63.2)	
Age group of mother (years)	15–20	6 (10.3)	8 (13.8)	9 (15.5)	35 (60.3)	.432
	21–30	14 (3.8)	52 (14.0)	48 (12.9)	258 (69.4)	
	>30	8 (5.4)	22 (14.8)	22 (14.9)	96 (64.9)	
Socioeconomic status (quintile)	Lowest	12 (6.0)	38 (19.2)	33 (16.7)	115 (58.1)	.010
	Middle	4 (2.1)	19 (10.1)	22 (11.7)	143 (76.1)	
	Upper	12 (6.3)	25 (13.0)	24 (12.5)	131 (68.2)	
Pre-existing diseases	No	28 (5.0)	79 (14.2)	78 (14.0)	371 (66.7)	.359
	Yes	0	3 (13.6)	1 (4.6)	18 (81.8)	
Episode of diarrhea	No	22 (4.4)	75 (14.8)	68 (13.4)	341 (67.4)	.336
	Yes	6 (8.3)	7 (9.7)	11 (15.3)	48 (66.7)	
Gestational physical violence	No	19 (4.0)	75 (15.8)	66 (13.9)	314 (66.2)	.042
	Yes	7 (6.9)	6 (5.9)	13 (12.9)	75 (74.3)	

Table 3. Factors associated with optimal ANC use.

Variables	Categories	AOR (95% CI)	p-value
Education	No formal education	Reference	
	Any formal education	1.7 (1.0–2.8)	.040
Socioeconomic characteristics (wealth index)	Lower socioeconomic group	Reference	
	Middle socioeconomic group	2.6 (1.4–4.8)	.003
	Upper socioeconomic group	0.8 (0.4–1.3)	.363
Mother's occupation	Housewife/student	Reference	
	Any form of work	1.0 (0.6–1.6)	.950
Residential location of mother	Rural	Reference	
	Urban	2.0 (1.2–3.3)	.006
Parity	Had no previous child	0.8 (0.3–1.7)	.513
	1–2	Reference	
	≥3	0.7 (0.4–1.2)	.198
Age group of mother, years	15–20	0.4 (0.1–1.4)	.163
	21–30	Reference	
	>30	1.4 (0.3–1.7)	.660
Pre-existing disease	No	Reference	
	Yes	1.2 (0.3–4.4)	.692
Episode of diarrhea	No	Reference	
	Yes	1.3 (0.6–2.5)	.524
Physical violence	No	Reference	
	Yes	0.6 (0.3–1.1)	.097

Pseudo $R^2 = 0.0706$, Prob>chi² = 0.0000, LR chi² = 39.78, Observation (*N*) = 578, AOR = Adjusted odds ratio, CI = confidence interval.

secondary, or tertiary) were 1.7 times as likely to attend ≥ 4 ANC visits during pregnancy compared to their counterparts without any formal education (AOR = 1.7, 95%CI = 1.0–2.8, $p = 0.040$). Furthermore, pregnant women from middle class households were 2.7 times as likely to record ≥ 4 ANC visits compared to those from the lower socioeconomic class (AOR = 2.6, 95% CI = 1.4–4.8, $p = 0.003$). In addition, pregnant women who lived in the urban areas were 2.1 times as likely to have optimal ANC attendance as those in rural areas (AOR = 2.0, 95% CI = 1.2–3.3, $p = 0.006$).

Discussion

This study examined the factors associated with the optimal ANC use in one of the poorest regions of Ghana. Our study showed that almost all respondents (99.34%) in their most recent pregnancy had visited a skilled ANC provider at least once, while 81% achieved the recommended ≥ 4 visits. In addition, educational status, socioeconomic class, and urban residence of the mother were significantly positively associated with the optimum ANC use.

Our findings are consistent with the findings of other studies conducted in some African countries (Bosu et al. 2007; De Allegri et al. 2011; Penfold et al. 2007). In Ghana, the studies conducted in the Upper East Region showed similar results. The researchers found that approximately 98% of pregnant women used ANC services at least once during pregnancy, but only approximately 81% used ANC for at least four or more times (Mills et al. 2008). However, our findings were different from that of the Ghana Demographic and Health Survey (GDHS), which used a nationally representative data in 2013. The GDHS showed that 87.3% of women in Ghana used ANC for at least four or more times before delivery, while 97.3% had at least one visit to a skilled ANC attendant (GSS/GHS 2014). This confirms some variation in the ANC use among different geographic areas of Ghana. Hence, nationally representative data does not necessarily reflect the situation at the local levels.

Additionally, a significantly positive association between formal education and optimal ANC use was observed. This is consistent with the theoretical literature (Grossman 1972) and many other empirical studies within Africa and other developing countries (Alexandre et al. 2005, Tayie and Laryey 2008, Ortiz-Andrellucchi et al. 2009; Abor et al. 2008). Other studies conducted in the southern part of Ghana also found a similar association between education of the mother and ANC use (Overbosch et al. 2004). However, the northern part of Ghana has a lower literacy rate, particularly among girl children (Ghana Statistical Service 2010), buttressing the fact that to reduce maternal and child mortality in Northern Ghana through the optimal ANC use, it is important to promote and support girl children's education. Free maternal care for ANC could help but

women without any formal education may not be able to take advantage of it. This is because they may be unable to appreciate the importance of ANC.

A significantly positive association was also found between urban residency and optimal ANC use. This is also in line with the findings from other studies, which showed urban–rural differences in the ANC use (Abor et al. 2008). Several factors could explain this observation. First is proximity of health care facilities to urban dwellers. Bad road networks in rural communities, particularly the northern part of Ghana pose transportation challenges in obtaining ANC. Consequently, some pregnant women attend ANC when the market day of the next bigger town coincides with the clinic day. Furthermore, because of unfavorable conditions in rural communities, qualified midwives do not want to accept postings to these communities (Lehmann, Dieleman, and Martineau 2008). Therefore, to address the bottlenecks in the optimal ANC use requires a holistic approach that will ensure that more health facilities are provided together with basic social amenities.

Lastly, a significantly positive association between middle socioeconomic class and ANC use was observed. This observation is similar to the findings of other studies conducted in Africa and other developing countries (Adamu 2011; Dhakal et al. 2007; Titaley et al. 2010). Although, user fees for ANC was withdrawn in Ghana, poor households are still unable to optimize the use of ANC services because of associated costs such as transportation, purchase of medicines, and other supplies (Quaye 2004, Sephiri and Chernomas 2001).

The strength of this study was the high response rate, coupled with the varied social backgrounds of respondents. However, an important limitation was that the study participants were recruited from health facilities. Hence, the observations made in this study may not reflect those of the general population, as the respondents could have had more use of and positive attitudes toward seeking health care. Additionally, because standardized instruments were not used for data generation, the data may be subject to misclassification or lack of comparability to findings from similar studies that have used standard instruments.

Conclusion

Our findings showed that the ANC coverage was approximately 100% in our sample, with over one third of all pregnancies obtaining optimal ANC by skilled attendants. The evidence from our study also suggests that although free maternal care can reduce some of the financial barriers to ANC use, within poor settings such as the Northern Region of Ghana, a number of complementary factors such as mother' education, socioeconomic status of the household, and proximity to health facilities are associated with women's ability to take full advantage of the free ANC policy.

Implications for practice and policy

To facilitate current progress toward universal ANC coverage in Ghana, deliberate policy interventions targeted at reducing poverty and improving access to health facilities within rural settings, promoting maternal and girl child education, and improving the general livelihood and socioeconomic conditions of the poor are recommended. These have the potential of empowering women particularly those in deprived areas to cultivate health seeking habits that would lead to the optimal use of ANC, and eventually mitigate maternal and child mortality.

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Notes on contributors

Conceived and designed the study: AA. Data analysis and interpretation: AA FA GAA. Wrote the first draft of the manuscript: AA. Contributed to writing: AA FA GAA. Have given final approval of the version to be published: AA FA GAA. Criteria for authorship read and met: AA FA GAA. Agreed with manuscript results and conclusion: AA FA GAA.

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