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Alex Bapula, Sam Kofi Newton, William Dormechele, Beatrice Baah Rahinatu, Easmon Otupiri

Corresponding author: Alex Bapula, Health Service, Sissala East Municipality, Tumu, Ghana. alexbapula@gmail.com

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Birth preparedness and complication readiness among pregnant women in resource-limited setting in rural Northern Ghana

Alex Bapula[1,&], Sam Kofi Newton[2], William Dormechele[3], Beatrice Baah Rahinatu[4], Easmon Otupiri[2]

[1]Health Service, Sissala East Municipality, Tumu, Ghana, [2]School of Public Health, Kwame Nkrumah University of Science and Technology Kumasi, Kumasi, Ghana, [3]School of Public Health, University of Health and Allied Sciences, Ho, Ghana, [4]Tumu Midwifery Training College, Tumu, Ghana

[&]Corresponding author

Alex Bapula, Health Service, Sissala East Municipality, Tumu, Ghana

Abstract

Introduction: *in developing countries, complications during pregnancy and childbirth are still a leading cause of maternal morbidity and mortality. Birth preparedness and complication readiness (BPCR) is a key strategy to encourage pregnant women to seek care from skilled birth attendants. Birth preparedness and complication readiness status and its associated factors are currently unknown in rural Northern Ghana. This study assessed BPCR status among pregnant women in Sissala East and Sissala West Districts of Rural Northern Ghana.* ***Methods:*** *we conducted a community-based descriptive cross-sectional study in two districts in rural Northern Ghana. A total of 549 participants were sampled using the multi-stage sampling technique and data were analyzed both descriptively and analytically using binary logistic regression.* ***Results:*** *the study enrolled 549 mothers. Less than half (4.7%) of respondents had adequate knowledge of warning signs during pregnancy. With respect to BPCR, only 46.5% of the mothers were well prepared. With respect to multivariate analysis, respondents who had attended primary (aOR = 1.77, 95% CI: 1.15, 2.73), secondary (aOR = 4.43, 95% CI: 2.61, 7.52) or tertiary education (aOR = 4.78, 95% CI: 1.89, 12.11) were significantly associated with good birth preparedness and complication readiness. Pregnant Islamic women were less likely to have adequate knowledge of warning signs during pregnancy when compared with Christian women (aOR = 0.14, 95% CI: 0.02, 0.81).* ***Conclusion:*** *this study showed that poor knowledge of warning signs during pregnancy and inadequate BPCR among mothers. Providing adequate BPCR information and counseling, with emphasis on warning signs during pregnancy and delivery is essential.*

Introduction

Worldwide, women die due to complications during and succeeding pregnancy and childbirth. Utmost of these complications develop during pregnancy and most are preventable or treatable [1]. Universally, 810 women die every day from preventable causes related to pregnancy and childbirth [1]. Approximately 30 million women become pregnant annually in Africa, and 250,000 of them die as a result of pregnancy-related causes [2]. It is not possible to forecast which women will experience life-threatening obstetric complications that lead to maternal death. In general, 42% of all pregnancies experience complications both in the rich and poor countries alike. Of the 42%, 15% of the complications are life-threatening [2]. Maternal mortality is a significant global concern [3] with sub-Saharan Africa been the heaviest hit [4]. Sub-Saharan Africa has the highest maternal mortality ratio (MMR) averaging 500 maternal deaths per 100,000 live births [4,5]. Ghana is among the developing countries contributing to the high MMR in sub-Saharan Africa estimated to be 308 maternal deaths per 100,000 live births in 2017 [1]. Among the reasons for the high MMR is inadequacy or dearth of birth and emergency preparedness, which is a central component of internationally documented safe motherhood programs [6]. Birth preparedness and complication (BPCR) readiness is a comprehensive strategy and the action of planning for normal birth and the key intervention to decrease maternal mortality [7,8]. This BPCR can encourage health care seeking behavior and utilization of apposite health care facilities and skilled personnel for delivery and hence decrease maternal mortality [9].

Also, the BPCR strategy reassures women to be knowledgeable of danger signs of obstetric complications and emergencies, choose a preferred birthplace and attendant at birth, make an advance arrangement with the attendant at birth, arrange for transport to skilled care site in case of emergence, saving or arranging alternative funds for costs of skilled and emergency care, finding a companion to be with the woman at birth or to accompany her to emergency care and identifying blood donor to facilitate swift decision-making and reduce delays in reaching care once a problem arises [10,11]. Birth preparedness and complication (BPCR) responsibilities must be communal among

all safe motherhood stakeholders since coordinated is required to scale back the delays that contribute to maternal and newborn deaths [12]. Two previous cross-sectional studies conducted at a different time in Adigrat town, Northern Ethiopia and Aleta Wondo district, South Ethiopia revealed 22% and 17% birth preparedness and complication readiness respectively [6,9,13]. According to a study conducted in rural Uganda, 35% of the respondents were well prepared for birth by making arrangements in three of the four birth preparedness practices [14]. Studies in Indore city of India [15] and Uganda [9] revealed only 47.8% and 35% women respectively who have already given birth were prepared for birth and its complication. According to a study on birth preparedness and complication readiness of pregnant women, it was discovered that majority (79.4%) of respondents have not identified a blood donor, while many respondents (72.8%) had identified someone who can make decisions on their behalf in case they are unable to make them [16]. Additionally, 65%, 81.9%, 60.8%, and 91.2% of the respondents had identified the source of emergency funds, means of transport, identified a health facility, and had identified a way of communication in case of an emergency [16].

Parallel studies have also shown low rates of birth preparedness and complication readiness among women in Kenya [17], Ethiopia [6], Gambia [18], and Burkina Faso [19]. The low awareness of danger signs among pregnant women contributes to the delay in seeking skilled care henceforth resulting in high levels of maternal mortality and morbidity [20]. Various cross-sectional studies in Addis Ababa have shown that the level of BPCR ranged from as low as 16.5% to as high as 56.3% [20,21]. A community-based cross-sectional study in the rural district of Ghana on BPCR among women showed that only a few of the women knew three or more obstetric danger signs [22,23]. Nevertheless, findings from [24] study in Thailand revealed greater birth preparedness than prior reports in India (30%-57%) [25], Ghana (15-19%) [26], Nigeria (48.8%) [27], Ethiopia (17%-54%) [28] and in Tanzania (58%) [29]. Although birth preparedness and complication readiness are essential for further improvement of maternal and child health, little is known about the current magnitude and associated factors in resource-poor communities of rural Northern Ghana. This study, therefore, aimed to fill this gap by assessing the current status and factors associated with birth preparedness and complication readiness among pregnant women in Sissala West and East District of rural Northern Ghana.

Methods

Study design, data collection tool and technique: a community-based cross-sectional study was conducted in two rural setting districts (Sissala East and Sissala West) in the Upper West Region of Ghana. The study was intended to represent all pregnant women who had the chance to be sampled in the two rural districts. A semi-structured questionnaire deployed on an electronic device was used to obtain data from respondents. Interviewer-administered questionnaire approach was adopted. This approach was used since it enhances the accuracy, reliability, and eligibility of responses from respondents. Data collected from respondents was protected under key and lock in cabinet whilst password and encryption were used to protect the electronic data.

Study setting: the study was conducted in the Sissala East and Sissala West District of the Upper West Region of Ghana. The Sissala East and Sissala West Districts are largely a rural setting located in the Eastern part of the Upper West Region [30]. The district capital for Sissala East is Tumu and West is Gwollu which is located 140km away from Wa the regional capital. Both districts have one hospital and twelve (12) health centers and 65 functional community-based health planning and and services (CHPS) compounds in both districts (44 in the Sissala East and 21 in the Sissala West). Some of the communities are hard to reach which makes physical accessibility to health facilities a challenge. According to the 2010 population census, the

district had a total fertility rate (TFR) of 3.9 births per woman and a General Fertility Rate of 114 births per 1,000 women aged 15-49 years [30]. The crude birth rate (CBR) was 25 births per 1000 population. Based on the 2010 population and housing census projections, the Sissala East district had a total population of 67,029 out of which 32,946 are males and 34,083 are females [30]. Whilst Sissala West had a projected population of 58,741 out of which 28,868 are males and 29,873 are females.

Sample size determination and sampling procedure: the required sample size of the study was determined using Cochran´s sample size formula for categorical data. In determining the sample size, the proportion (p) of BPCR [18], the margin of error or precision (d), and confidence level were assumed to 95%, respectively. Moreover, a design effect of 2 and a non-response rate of 3% were applied to the initial sample size to get the final one as 549. In each of the two districts, 2,500 women were estimated to be eligible, which is expected to be pregnant. Multistage sampling approach was employed to select participants. First, the district was stratified into east and west to deal with the effect of residence. Two sub-districts with similar characteristics out of the five were randomly selected for the study. Pregnant women for the study were selected from communities being directly served by the selected sub-districts. There were no community-specific population records so the number of women recruited for the study (per sample size calculation) was evenly distributed among communities. To prepare the frame of pregnant mothers, trained female educators and enumerators were engaged to identify and list all prospective eligible women for the study. With this list, a random selection was used to arrive at the number of women required for the study.

Operational definitions: a woman was considered as prepared for birth and its complication if she reported that she identified the place of delivery, saved money, identify skilled provider at birth, identified a means of transport to the place of childbirth, prepared material for safe delivery and identify danger sign. Mothers who followed at least four of the six BPCR components were considered as “well prepared for birth and its complication”. The remaining women were considered as “not prepared for birth and its complication” [9]. Then again, a woman was classified as “knowledgeable in key danger signs of labor” if she spontaneously mentioned at least five key danger signs of labor/childbirth [9].

Data sources, measurement and variables: primary data source was collected and used using a designed questionnaire. Birth preparedness was used as a dependent variable, while age, marital status, religion, ethnicity, education, income, family size, husband´s occupation and education, knowledge of danger signs, parity and complications experienced a history of stillbirth, antenatal care (ANC) follow up and the number of visits was used as independent variables.

Data collection procedure: a pre-tested, close-ended structured, interviewer-administered questionnaire was used to collect data on socio-demographic and obstetric characteristics, knowledge questions on key obstetric danger signs, birth preparedness, and complication readiness. The questionnaire used in our study was developed for this study and has not been published elsewhere. All data collectors and supervisors were oriented and trained for four days on the data collection process. After review of the instruments, all suggested revisions and corrections were made before being administered in the actual study. For each of the birth preparedness, and complication readiness questions, having the practice was rendered a score of 1, and lack of the practice was rendered a score of zero.

Inclusion criteria: women with at least 3 months of current pregnancy and above, permanent residents of the study area, and who gave written consent were interviewed.

Exclusion criteria: pregnant women who were seriously ill and incapable of being interviewed, and

those who did not consent were excluded in the study.

Data management and analysis: data were cleaned, coded, and entered into Epi-data version 4.6.0 statistical software and exported to STATA SE version 16 for analysis. Frequency tables, graphs, and descriptive summaries were used to describe the study variables and determine the prevalence of birth preparedness and complication readiness. In bivariate analysis part, the chi-square test was used and variables with p-value of < 0.05 were selected for multivariate analysis. To control the effect of confounding variables and to identify factors associated with birth preparedness and complication readiness practice, multivariate binary logistic regression analysis was used. P-value < 0.05 with a 95% confidence level was used as a cutoff point to declare statistical significance and adjusted odds ratios were used to determine the strength of associations.

Ethical consideration: before commencing this study, ethical clearance and approval was obtained from Kwame Nkrumah University of Science and Technology School of Committee on Human Research Publication and Ethics (CHRPE) with approval number CHRPE/AP/190/19. Also, administrative permission was obtained from the Upper West Regional health directorate, and the Sissala East and Sissala West District Health Directorate to carry out the study. The objectives of the study were explicitly explained to the respondents, the right to withdraw from the study at any time was carefully explained to the respondents and then both oral and written informed consent was obtained from the study participants. To ensure confidentiality, anonymous, and coding of questioners were used.

Results

Socio-demographic characteristics of respondents: the median age of participants in both districts was 25 (range: 21 - 31). A little above half (54.48%) of the respondents were aged between 20-29 years. Of the total respondents, 535 (97.45%) were married. Most of the respondents (96.90%) were Islam, and 518 (94.35%) of the pregnant women were Sissala´s. Majority of the respondent´s husbands were illiterate 300 (56.07%) and unemployed (91.03%) (Table 1).

Obstetric characteristics and knowledge on danger signs: in the assessment of obstetric characteristics, 353 (64.42%) of the respondents were multigravida, and 195 (35.58%) were primigravida. Regarding parity, the utmost of the respondents (74.68%) was multiparous (two and above parity). More than three fourth (86.70%) of the respondents had four and more ANC visits. Overall, only 4.74% of the women were knowledgeable of obstetric danger signs (Table 2).

Characteristics of women with adequate knowledge on obstetric danger signs vs those with inadequate knowledge on obstetric danger signs: respondents from Sissala East were more knowledgeable on obstetric danger signs (76.92%) compared to those from Sissala West (23.08%). Most of the respondents who had no form of education had high inadequate knowledge of obstetric danger signs (43.59%) compared to respondents who had tertiary education (4.21%). Respondents who were Islam had high inadequate knowledge (97.51%) compared to Christians (2.49%) (Table 3). The adjusted multivariate model showed that significant predictors of having adequate knowledge on obstetric danger signs were the district of residence (p=0.049), and religion (0.033). Respondents from the Sissala East were 2.9 times more likely to have adequate knowledge on obstetric danger signs compared to those from Sissala West, and the difference was statistically significant after adjusting for confounding variables (AOR=2.87; 95% CI 1.09-7.53). Islam respondents were 86% less likely to have adequate knowledge on obstetric danger signs compared to those from Christian respondents, and the difference was statistically significant after adjusting for confounding variables (AOR=0.14; 95% CI 1.02-0.81) (Table 3).

Knowledge on BPCR among pregnant women in Tumu District, Ghana: most of the respondents reported making arrangements for some of the recommended elements of BPCR. Out of 549 participants, 355 (64.66%), 349 (63.57%), 330 (60.11%), and 380 (69.22%) identified health facilities for delivery, financial sources for delivery and possible obstetric emergencies, modes of transport, and skilled birth attendant, respectively. Regarding identifying blood donors, most (56.65%) did not identify a blood donor. Overall, 50.46% of the women were knowledgeable of BPCR (Table 2), and 46.5% were well prepared for birth.

Predictors of well-prepared women versus those less-prepared: a little above half (56.85%) of the women from Sissala East were considered as well prepared for birth and its complication as compared to those from Sissala West (n=110; 43.14%). In the bivariate analysis district of residence, maternal age, educational status, and parity were significantly associated with birth preparedness and complication readiness. The adjusted multivariate model showed that significant predictors for being well prepared were district of residence (p=0.0001, and education status (p<0.0001). The odds of being well prepared for birth and its complications were 2.1 times higher among women from Sissala East than those residing in Sissala West (aOR = 2.1; (95% CI: 1.16, 4.54)). Similarly, it was more than 4.5 times higher among women with tertiary education status than those who had no form education (aOR = 4.78; (95% CI: 1.89, 12.11)). The odds of being well prepared for birth and its complications were 1.8 and 4.4 times higher among women with a primary and secondary level of education than those with no form education (aOR = 1.77; (95% CI: 1.15,2.73) and aOR = 4.43; (95% CI: 2.61,7.52)) respectively (Table 3).

Discussion

This study was conducted to assess the level of knowledge on danger signs, and identify factors associated with birth preparedness and complication readiness among pregnant women residing in Rural Northern Ghana. District of residence, and educational status (primary, secondary, tertiary) were found as the factors influencing well preparedness for BPCR among pregnant women. The finding of this study revealed that the magnitude of birth preparedness and complication readiness (BPCR) was 46.45%. It infers for the necessity of both community and facility-level interventions to improve maternal survival and the importance of quality ANC interventions to increase BPCR practice in the setup. This finding is lower than the study conducted in Addis Ababa 68% [31], in West Bengal, India (57%) [32], and in Osun State, Nigeria (61%) [33]. The disparity could be attributed to the fact that the study conducted in Addis Ababa sampled pregnant women who attended ANC visit. In divergence, our study was higher than a study conducted in Adigrat, North Ethiopia [13], and Robe district, Oromia region, Ethiopia [21], in Uganda [14], in Gambia [18] which reported BPCR as 22%, 16.5%, 35%, 14% respectively. This could be due to variance in the study setting. Also, the difference might be due to socio-cultural issues such as the use of traditional birth attendants, economic status, and the difference in the implementation of quality antenatal care prenatal health programs. Failure to identify signs of birth complications is one of the key contributions to the delay in deciding to seek care [17,34]. In the present study, only 4.74% of the pregnant women had adequate knowledge of obstetric danger signs of pregnancy. This result is less than and in disagreement with a study conducted in Ethiopia [35], Mpwapwa district, Tanzania [36], Tamale District, Ghana [22], West Bengal, India [32], and Abia State, southern Nigeria [27,37]. To improve the knowledge of women on danger signs of pregnancy the government and ministry of health should work intensively on empowering women´s education and economic level.

Lack of transport during emergency complications is among the barriers to the delay in reaching a health facility to save both the mother and baby.

The result of this study showed two-thirds (60.11%) of pregnant women had arranged transportation for birth and emergency case; this is relatively consistent with a study conducted in Nepal (64.8%) [10]. Contrary, this finding was higher compared to studies carried out in rural district of Ghana (53.3%) [22], Burkina Faso (41.6%) [19], Kenya (81.9%) [38], West Bengal, India (44.5%) [32] and Ethiopia (33.93%) [35]. This variance could be due to the unavailability of roads in some of the rural setups. Another reason might be due to cultural differences such as the use of home delivery, the presence of traditional birth attendants as a choice for delivery service, and lack of awareness. Also, our study finding reveals the preparation of potential blood donors for the emergency case was the poorly utilized elements of birth preparedness and complication readiness plan in Ghana. This goes to support similar study findings in Ethiopia [35], Osun State, Nigeria (11.3%) [33], Nairobi, Kenya (28.7%) [17] and Accra, Ghana (31.6%) [39]. Those women who did not prepare potential blood donor are at higher risk of severe mortality since bleeding is a life-threatening situation which needs prompt intervention [40,41]. Hence women and support persons should be conscious of the need of preparing potential blood donors to prepare for birth and addressing complications. The finding of this study also showed that 64.66% of pregnant women identified the place of delivery. This result was lower than studies done in India (90.13%) [42] and Nigeria (87.50%) [33] but higher than 54.85% in Ethiopia [35]. The difference could be due to a lack of awareness of the importance of skilled health facility deliveries, cultural beliefs, and transport challenges [43]. This infers that health care providers working at community and antenatal care facilities should improve awareness through strengthening information, education, and counseling at the institutional and community level to plan women´s place of delivery.

Our findings further indicated a low level of adequate knowledge on obstetric danger signs, lower than in other low-income countries [44]. This may be due to our community-based rather than facility-based study setting. Nonetheless, the underlying principles and methods used to study danger signs are the same. After adjusting for confounding effects using multiple logistic regression analysis, this study found that education status, as well as residing district during pregnancy, were the two main effective strategies to promote birth preparedness and complication readiness. Women with good BPCR had 4.78 times higher education than women with no form of education. This goes to confirm similar study findings in the rural district of Ghana [22], Thailand [24], and Kamineni Hospital, Hyderabad [45]. Contrary, although factors such as advanced maternal age, higher education, better antenatal care attendance, and occupation of a woman or her partner were previously found to be associated with increased BP/CR in other studies [15,21,46], this was not the case in our population setting. The strength of the study includes it is a community based; census was conducted before data collection to identify currently pregnant women and also large sample size was used. The limitations of the study are: it was a cross-sectional study, hence the relationship between variables could not be proven. The answers were self-reported with no means of verification and thus subject to recall bias. Moreover, participants were interviewed while currently pregnant, instead of after completing their pregnancies; they will not yet have had the chance or need to decide on BPCR. Another limitation of this study includes factors that might affect BPCR statuses, such as attitudes of health staffs, sub-optimal health services and beliefs about birth preparedness, decision-making power, male partner influence, accessibility to health care services and reasons for seeking health care service that was not evaluated. Other research could study the effect of BPCR implementation of BPCR interventions among pregnant women. Moreover, suggestions for future research should be extended to the study of family and community roles in BPCR.

Conclusion

The present study identified that there has been poor knowledge of obstetric danger signs, and poor preparedness for birth and complications. Religion and educational status were significantly associated with knowledge level on obstetric danger signs and BPCR respectively. Investments in health promotion concerning BPCR, at all phases of a woman´s reproductive life, and with support from community health workers are much desired. We recommend the implementation of a BPCR program as a part of antenatal education, as it is essential to increase BPCR awareness and knowledge on obstetric danger signs. Also, we recommend health care personnel to engage and encourage pregnant women to attend early ANC.

Competing interests

The authors declare no competing interest.

Authors' contributions

Alex Bapula Kassim was the principal researcher and contributed to proposal development, pretesting of the questionnaires, supervising of the data collectors, data entry, and the writing of Manuscript. William Dormechele contributed to data cleaning, data analysis, and manuscript preparation. Beatrice Baah Rahinatu contributed to proposal development, pretesting of the questionnaires, supervising of the data collectors, and data entry. All authors have read and approved the final manuscript. Sam Kofi Newton and Easmon Otupiri was the main supervisors who contributed to the approval of ethical clearance and editing of the manuscript.

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Tables

Table 1: socio-demographic characteristics of respondents

Table 2: obstetric characteristics and knowledge of respondents on BPCR

Table 3: characteristics of women with adequate knowledge on obstetric danger signs vs those with inadequate knowledge on obstetric danger signs

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Table 1: socio-demographic characteristics of respondents			
Variables	**Category**	**Frequency**	**Percentage**
District of residence	Sissala West	275	50.09
	Sissala East	274	49.91
Age in years	<20	68	12.43
	20-29	298	54.48
	30+	181	33.09
Educational status	Illiterate	242	44.08
	Primary	180	32.79
	Secondary	101	18.40
	Tertiary	26	4.74
Occupational status	Housewife	131	23.91
	Others	417	76.09
Marital status	Married	535	97.45
	Not married	14	2.55
Religion	Christianity	17	3.10
	Islam	532	96.90
Ethnicity	Sissala	518	94.35
	Others	31	5.65
Husband educational status	Illiterate	300	56.07
	Primary	101	18.88
	Secondary	80	14.95
	Tertiary	54	10.09
Husband occupation	Employed	48	8.97
	Unemployed	487	91.03

Table 2: obstetric characteristics and knowledge of respondents on BPCR			
Variables	**Category**	**Frequency**	**Percentage**
Obstetric characteristics			
Gravidity	One	195	35.58
	2 and above	353	64.42
Parity	One	139	25.32
	Two to four	377	68.67
	Five and above	33	6.01
Ever had stillbirth	Yes	22	4.01
	No	527	95.99
Experienced obstetric complication	Yes	96	17.58
	No	450	82.42
ANC visit	Yes	460	83.94
	No	88	16.06
Frequency of ANC	<4 visits	73	13.30
	≥4 visits	476	86.70
Knowledge of BPCR			
Identification of health facility	Yes	355	64.66
	No	194	35.34
Saved money	Yes	349	63.57
	No	200	36.43
Preparation of transport	Yes	330	60.11
	No	219	39.89
Identified blood donor	Yes	238	43.35
	No	311	56.65
Identified skilled birth attendant	Yes	380	69.22
	No	169	30.78
Knowledgeable about BPCR	Yes	277	50.46
	No	272	49.54

Table 3: characteristics of women with adequate knowledge on obstetric danger signs vs those with inadequate knowledge on obstetric danger signs

Characteristics	Knowledge of obstetric danger signs		COR (95% CI)	AOR (95% CI)
	Inadequate (n=521)	Adequate (n=26)		
District of residence				
Sissala West	269 (51.43)	20 (76.92)	1	1
Sissala East	254 (48.57)	6 (23.08)	3.53 (1.40-8.93) *	2.87 (1.09-7.53) *
Age in years				
<20	65 (12.48)	3 (11.54)	1	1
20-29	285 (54.70)	13 (50.00)	0.99 (0.27-3.57)	0.67 (0.17-2.60)
30+	171 (32.82)	10 (38.46)	1.27 (0.34-4.75)	0.67 (0.16-2.89)
Educational status				
Illiterate	228 (43.59)	14 (53.85)	1	1
Primary	175 (33.46)	5 (19.23)	0.47 (0.16-1.32) *	0.40 (0.13-1.25)
Secondary	98 (18.74)	3 (11.54)	0.50 (0.14-1.77) *	0.39 (0.09-1.64)
Tertiary	22 (4.21)	4 (15.38)	2.96 (0.90-9.77) *	1.32 (0.30-5.86)
Occupational status				
Housewife	128 (24.52)	3 (11.54)	0.40 (0.12-1.36)	2.61 (0.72-9.45)
Others	394 (75.48)	23 (88.46)	1	1
Religion				
Christianity	13 (2.49)	4 (15.38)	1	1
Islam	510 (97.51)	22 (84.62)	0.14 (0.04-0.47) *	0.14 (0.02-0.81) *
Ethnicity				
Sissala	497 (95.03)	21 (80.77)	0.22 (0.08-0.63) *	0.54 (0.12-2.38)
Others	26 (4.97)	5 (19.23)	1	1
ANC visit				
No	87 (16.67)	1 (3.85)	1	-
Yes	435 (83.33)	25 (96.15)	5.00 (0.67-37.39)	-

* Statistically significant p-value<0.05