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Effect of Interpregnancy Interval on Low Birth Weight in Gondar and Bahir Dar Referral Hospital: A Case Control Study from North West Ethiopia

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Abstract
Background: Study findings on interpregnancy interval and its effect on low birth weight are contradictory. Some studies report that it is a risk factor for low birth weight while others say it has no association. Still less attention has been given to the way in which changes in family planning related behavior may affect low birth weight. Identifying the interpregnancy interval at which risk of low birth weight is occurred may benefit developing countries to prioritize family planning services.**Methods**: unmatched case control study design was used in a sample of 453 mothers (88 cases and 365 controls) who gave birth two or more times in Gondar and Bahir Dar teaching-referral hospital, Ethiopia. Cases were mothers who gave birth to low birth weight and controls were mothers who gave normal birth weight. Data was processed and analyzed using EPI Info and SPSS statistical software. A logistic regression was performed to identify the independent effect of interpregnancy interval on low birth weight.**Result:** The median of interpregnancy interval for cases and controls were 30 and 38 months respectively. The odd of low birth weight was 2.67 (95% CI = 1.36, 5.01) when interpregnancy interval was less than 24 months compared to the interval 24 and above months. Multivariate analysis showed that women who had interpregnancy interval less than 24 months were about 2.7 times more likely in delivering low birth weight infant compared to the interval 24 and above. Likewise women who were age of 20 or less, daily laborer, being moderately or severely food insecure and having pregnancy complication had a significant effect on low birth weight. **Conclusion:** interpregnancy interval less than 24 months had a significant effect on low birth weight. So mothers at the study area; not be pregnant before 24 months of the birth preceding child.
Keywords: birth weight, interpregnancy interval, referral hospital, Ethiopia

Background

Birth weight is a major determinant of neonatal and infant survival, mortality, and health outcomes later in life [1, 2]. Babies whose weights are weighing less than 2500 grams at birth, usually measured in the first hour of life are termed as low birth weight (LBW), irrespective of their gestational age [3]. Low birth weight accounted for two- third of neonatal deaths in Iraq and doubles the neonatal mortality rate in Bangladesh [1, 2]. Low birth weight infants have four times greater risk of dying from diarrheal disease and acute respiratory infections [4].

More than 20 million infants worldwide, represent 15.5% of all births are born with low birth weight, 95.6% of them are found in developing countries. The level of low birth weight in developing countries is 16.5% more than double the level in developed regions (7%) [5]. According to Ethiopian Demographic and Health Survey in 2011 report only 5% of children in Ethiopia are weighed at birth. Among children born in the five years before the survey with a reported birth weight, 11% weighed less than 2500 grams [6]. A study which is carried out in Gondar teaching hospital, the incidence of low birth weight (birth weight less than 2,500 gram) and very low birth weight (birth weight less than 1,500 gram) were 15.4% and 2.6% respectively [7].

A baby's low weight at birth is associated with Teen-age pregnancy, illiteracy, socioeconomic level, poor antenatal care, maternal anemia, pregnancy induced medical ailments, preterm birth (before 37 weeks of gestation) and infection [8, 9].

Several studies have reported that short interpregnancy intervals are associated with an increased risk of several adverse birth outcomes such as low birth weight, small for gestational age, and preterm birth [10-13]. Some studies have attributed the higher risk of poor pregnancy outcomes, low birth weight to factors associated with higher reproductive risk such as maternal socio-demographic characteristics and lifestyle rather than causally related to, short interpregnancy intervals [14]. On the other hand, other studies have reported that birth to pregnancy interval has no association in causing adverse birth outcome [15, 16].

The World Health Organization and other international organizations recommend that individuals and couples should wait after a live birth, the recommended interval before attempting the next pregnancy (i.e. birth-

to-pregnancy interval) is at least 24 months in order to reduce the risk of adverse maternal, perinatal and infant outcomes [17, 18].

According to Ethiopian Demographic and Health Survey 2011 report, the median birth interval is 34 months (25 months of interpregnancy interval), implying that half of non-first pregnancies to women in Ethiopia occur before 25 months after a previous birth. Twenty percent of pregnancies have an interval of less than fifteen months, and 9 percent of pregnancies are less than 9 months apart. Thirty-six percent of pregnancies occur 15-26 months after the previous birth and 44 percent are at least twenty seven months apart [6].

Previous research in this area has several methodological differences such as: study design, lack of control for potential confounding factors, dichotomization of the measure of birth spacing on the basis of an arbitrarily defined cut point, and use of birth interval (time elapsed between the woman's last delivery and the birth of the index child) instead of interpregnancy interval (time elapsed between the woman's last delivery and the conception of the next pregnancy) as the measure of birth spacing. The use of birth intervals overestimates the risk of low birth weight for very short intervals between pregnancies [12].

There is a scarcity of published studies in Ethiopia and specifically in the area, so this study was conducted in Amhara region, Gondar and Bahir Dar teaching-referral hospital with the aim of to, assess the effect of interpregnancy interval on low birth weight.

Methods

Health institution based unmatched case control study was conducted from January 10 – March 22, 2013. It tested the null hypothesis that short inter-pregnancy interval has no effect on low birth weight, against the alternative hypothesis; too soon inter-pregnancy interval risk factor for low birth weight. Mothers who gave birth of low birth weight baby were taken as cases and mothers who gave birth of normal weight baby were as controls group.

This study was conducted in Gondar and Bihar Dar referral hospital. Bahir Dar is the capital city of the Amhara National Regional State, in the Federal Democratic Republic of Ethiopia. It is located in North West Ethiopia on the southern side of Lake Tana, at the commencement of Blue Nile River and 565 Km far from Addis Ababa, the capital city of Ethiopia. The Hospital provides delivery services 24 hours all days of a week. The hospital provides about 472 deliveries in a month. Gondar referral hospital is located about 750 kilometers northwest of Addis Ababa and 194 kilometers far from regional city, Bahir Dar. The hospital provides the same delivery service with that of Bahir Dar. This hospital provides about 540 deliveries in a month.

The source population of the study was all mothers who gave non first birth after 28 weeks of gestational ages in Gondar and Bahir Dar referral hospital. These hospitals serve the majority of the population in delivery services especially deliveries of risk mothers. The study population was mothers who gave non first birth after 28 weeks of gestational age during the data collection period in Gondar and Bahir Dar teaching-referral hospital.

Sampling procedure

Two referral hospitals found in Gondar and Bahir Dar were included in the study. The number of subjects was selected from each hospital based on the cases load during the study period. All mothers who fulfill the inclusion criteria and give birth of low birth weight were included as cases. Four consecutive controls were selected after a case was identified from the same institution.

The classification of cases and controls were based on birth weight of babies born from those mothers in the two hospitals. Those mothers who were given birth of low birth weight baby (birth weight of less than 2,500 grams) were designated as cases, and those who were given normal birth weight baby (birth weight of 2,500 grams and above) were designated as controls.

Mothers with singleton birth and gave birth at least for the second time were included in the study and those who had abortion in the preceding pregnancy (since mothers who had abortion have recommended inter pregnancy interval of 6 months) and those who are unable to communicate were excluded from the study.

Sample size determination

A sample size of 94 cases and 374 controls were determined using the methods of "difference between population proportions" with 80% power, 95% confidence level, a ratio of cases to controls being 1:4 and by considering the proportion of short interpregnancy interval among controls is 23.47% which is taken from a previous study conducted in other parts of Ethiopia [15]; And taking odds ratio of 2.1 for low birth weight [19]. Non-response rate in this study was estimated to be 5%, and hence an overall sample size of 468 women were recruited in the study.

Data collection tools and quality control

Data were collected through structured questionnaires. Data collectors and supervisors were six and two in

number and, their qualification were degree midwives and masters of public health respectively. Recruitment is based on experience, qualification, and exam through interview. Two days training were given to have clear, appropriate level of explanation on the study; guideline for question explanation was given. The designed questionnaire was translated first into the local/national language (Amharic) and back translated to English to ensure its consistency. Data was collected through interviewer administered questionnaire and measurement (birth weight). The questionnaires were pretested in similar settings two weeks before the actual data collection process was commenced. The collected data were checked for completeness and consistency by supervisors and the principal investigator on daily basis. Any error or ambiguity and incompleteness were corrected before the women went to their home. To avoid errors in data entry software prohibiting out-of-range data was used and cleaning the data was done. Recall bias was minimized by relating questions with historical events and religious holiday.

Household food security level was determined using standardized set of questions derived from version 3 of the household food insecurity access scale measurement guide [20]. Household food security was categorized into 4 food security categories according to their insecurity severity.

To asses household dietary diversity score; twelve food groups were recommended by FANTA [21], but we used the common nine foods. Because making decisions on assigning individual foods to food groups can become cumbersome as the list of food groups increases. For example, the scores in the validation study based on 13 and 21 food groups require knowledge of both the vitamin A and vitamin C content of all fruits and vegetables available in the area. Mean consumption scores were used as discrete quantitative variables. Mean consumption score of the sample population were categorized as; high and low dietary diversity. High dietary diversity score is defined as a score of greater than or equal to the mean score. Low dietary diversity score is defined as a score of less than the mean score.

Birth weight status (low birth weight or normal birth weight) was considered as the outcome or dependent variable, while inter-pregnancy interval was the main explanatory or independent variables and socio demographic variables (age, residence, religion, ethnicity, income, occupation, education level), maternal reproductive history (parity, antenatal care follow up, pregnancy complication), chronic medical illness, household food security, household dietary diversity and alcohol use were considered as independent variables that need to control to see the independent effect of inter-pregnancy interval on low birth weight.

Data collection procedure

Data collectors (midwives) had checked the mother's history card for inclusion of the study; or they asked mothers about parity and abortion in the preceding pregnancy. Weight of the newborns was measured using a baby weighing scale and recorded in grams. Birth weight was taken within one hour after delivery, naked and before taking anything per mouth. Birth weight was taken first to identify cases and controls. Interview was carried out to measure explanatory variables. Birth to pregnancy interval was calculated by counting the time period from the start of the index pregnancy (as evidenced by last menstrual period) and the date of the preceding birth calculate to the nearest month.

Data processing and analysis

Data was entered and cleaned in Epi Info for windows version 3.5.1 and exported to SPSS version 16 statistical software for analysis. Inter-pregnancy interval was grouped as less than 24 months and 24 or above months. Principal component analysis was used to construct wealth index using household asset data. The wealth index was created for urban and rural areas separately after identifying the common asset data.

Frequencies and proportion was conducted to describe the data used in the study followed by a bi-variate logistic regression analysis to examine the impact of inter-pregnancy interval and other risk factors on low birth weight without adjusting for other covariates.

Potential interactions among exposure variables; that are inter-pregnancy intervals and other risk factors were assessed. Multivariate logistic regression model was performed and checked assumption; then after, to identify whether inter-pregnancy interval is the significant independent determinant of low birth weight adjusted odds ratios and 95% confidence interval was used. All variables with p-value less than or equal to 0.05 during bi-variate analysis were included in the multivariate logistic regression model. Odds ratio with 95% confidence intervals (CIs) were used to test the significance of the association after multivariate analysis.

Ethical consideration

Ethical clearance was obtained from Addis Ababa University, School of Public Health research and ethical committee before the start of field work. The official letter of co-operation was written to Amhara region health bureau from Addis Ababa University, School of Public Health. Then Amhara Regional Health Bureau wrote to Gondar and Bahir Dar teaching-referral hospital. In addition, verbal informed consent from each study participants was obtained after clear explanation about the purpose of the study. In order to assure confidentiality,

mothers' name weren't written on the questionnaire. All the participants in the questionnaire were told about their participation would be on voluntary basis. Privacy of clients was maintained. Moreover, respondents were clearly told about the study and variety of information need from them. Data collectors were trained to provide necessary health education to the respondents about fertility control and its importance after completing the data collection procedure.

Results

Out of the total 468 women recruited, 453 of them participated actively in this study of which 88 were cases and 365 were controls; making the overall response rate of 96.8%.

The following results relates to Table 1. The proportion of cases in the age group greater than 35 years was higher (21.6%) than controls (16.2%). Similarly proportion of cases in the age group below 20 was higher (5.7%) than controls (1.4%). About 48% of cases, and 26% controls reside in rural areas. Concerning educational status, 41 (46.6%) of cases and 99 (27.1%) of controls had no education, 13 (14.8%) cases and 97 (26.6%) controls had secondary education and 7 (8.0%) cases and 57 (15.6%) controls had tertiary education. About 45 (51.1%) of cases and 207 (56.7%) controls were housewives, 11 (12.5%) of cases and 90 (24.7%) of controls were government or private employers and 28 (31.8%) of cases and 63 (17.3%) controls were traders or farmers. There was significant difference between cases and controls in their age ($p = 0.029$), residence ($p = 0.000$), level of education of mothers ($p = 0.004$) and maternal occupation ($p = 0.002$). But there were no statistical significance difference on marital status and wealth index between cases and controls (Table 1).

Distribution of the study participants with respect to inter-pregnancy interval and other factors

The median of inter-pregnancy interval for cases and controls were 30 and 38 months respectively. The overall median of inter-pregnancy interval was 38 months. The following results relates to Table 2. Twenty two (25.0%) cases and 43 (11.8%) controls had inter-pregnancy interval less than 24 months. On the other hand 66 (75.0%) cases and 322 (88.2%) controls had inter-pregnancy interval of 24 and above months. About half (45.5%) of cases and 142 (38.9%) controls had low household dietary diversity score. About 8.0% of cases and 4.9% controls and 10 (11.4%) cases and 8 (2.2%) controls had mild food insecurity and moderate or severe food insecurity respectively. Twenty one (23.9%) of cases and 49 (13.4%) controls had no Antenatal care follow up to the index pregnancy. Among women who had Antenatal care follow up to the index pregnancy, 31 (35.2%) cases and 109 (29.9%) controls had Antenatal care follow up of 1-3 times and 35 (39.8%) cases and 207 (56.7%) controls had 4 and above visits. More than half (60.2%) of cases and 99 (27.1%) controls had pregnancy complications (Table 2).

Bi-variate analysis of Interpregnancy interval and other factors with low birth weight among *women delivering non first birth* in *Gondar and Bahir Dar referral hospital, Northwest Ethiopia*

In the bi-variate analysis inter-pregnancy interval had a significant effect on low birth weight ($p = 0.002$) (Table 2). There was a significant difference between cases and controls in their household food insecurity scale ($p = 0.001$), number of Antenatal care visit ($p = 0.026$), and pregnancy complication ($p < 0.0001$). But there were no statistically significant difference on parity, sex of the baby, chronic medical illness and drinking alcohol (Table 2).

Inter-pregnancy interval and other factors associated with low birth weight among *women delivering non first birth in Gondar and Bahir Dar referral hospital, Northwest Ethiopia*

We assessed the independent effect of short inter-pregnancy interval on delivery of low birth weight baby, controlling for the potential confounding effects of several socio-demographic, nutritional and reproductive history characteristics. To do so, we estimated logistic regression models that adjusted the effects of short (less than 24 months) intervals on the risks of low birth weight. The following results relates to Table 3. Women who had inter-pregnancy interval less than 24 months were 2.67 times [AOR & (95% CI) = 2.67 (1.36, 5.01)] more likely delivering low birth weight infant compared to the interval 24 and above. Moreover women who were age 20 or less than were found to be 5.5 times [AOR & (95% CI) = 5.51 (1.29, 23.50)] more likely delivering low birth weight infant compared to women in the age range of 21-35 years. Compared to women who were house wife, those who were daily laborer were 5.41 times [AOR & (95% CI) = 5.41 (1.14, 25.56)] more likely delivering low birth weight infant. Women who were moderately or severely food insecure were 3.25 times [AOR & (95% CI) = 3.25 (1.02, 10.32)] more likely delivering low birth weight infant compared to food secured women. Likewise, compared to women who had not pregnancy complication, women who had pregnancy complication were 4.39 times [AOR & (95% CI) = 4.39 (2.56, 7.52)] more likely delivering low birth weight baby (Table 3).

Discussion

Results of this study suggest that short (less than 24 months) inter-pregnancy interval were independently associated with a significant increase in risk of low birth weight in Gondar and Bahir Dar referral teaching hospital (Table 3).

Our results suggest that the length of the interval between pregnancies less than 24 months had a substantial effect on the risk of delivering low birth weight infant among mothers in Gondar and Bahir Dar referral teaching hospitals (Table 3). Compared with mothers with greater than 24 month intervals, mothers with less than 24 month intervals had about 2.7 times increased risk of delivering low birth weight infant that are not due to confounding by maternal age, geographical area, education, maternal occupation, food insecurity, prenatal care, pregnancy complication.

This is in line with study done in Pakistan, Latin America and Demographic Health Survey working paper [3, 8, 10, 12, 13]. Some investigators have attributed the higher risk of poor adverse birth outcome to several factors associated with short intervals, such as low socioeconomic status, adverse outcome of the previous pregnancy, failure to use health care services or inadequate use of such services, unplanned pregnancies, and other behavioral determinants [22]. Nevertheless, it is unlikely that the associations were entirely due to these factors because our study and other large ones [3, 8, 10, 13] adjusted for the great majority of them.

A cross sectional study done in Addis Ababa showed inter-pregnancy interval shorter than 18 and 24 months had no significant effect for low birth weight [15]. This is inconsistent with our study. The inconsistency could be due to the methods they used, lack of controlling confounders like socio-economic status and household food security (maternal nutrition).

The pregnancy risk assessment monitoring system report showed that no significant differences between short, optimal, and long inter-pregnancy intervals for low birth weight and preterm birth [23]. This difference might be the variables they considered for confounding include only maternal age, education, marital status, insurance status, parity, and pregnancy intendedness they were not consider pregnancy complications and nutrition as a confounder.

Our result also revealed that, women who were 20 years old or less than, being daily laborer, moderately or severely food insecure and women who had pregnancy complication had a significant effect in delivering low birth weight infant which is not the interest of this research to discuss in detailed (Table 3).

The association between short inter-pregnancy intervals and low birth weight may be due to maternal nutritional depletion hypothesis, which states that a close succession of pregnancies and period of lactation worsen the mother's nutritional status and there is no adequate time for the mother to recover from the physiological stresses of the preceding pregnancy before she is subjected to the stresses of the next.

Limitation

Some limitations should be considered when the results of this study are interpreted. First, our study was not population-based, but, it was based on two referral teaching hospitals found in Amhara region. So, caution should be used when generalizing our results to other populations. Second we were unable to evaluate other potential confounders for the relation between interpregnancy interval and low birth weight such as psychosocial status of the mother and Body Mass Index of the women before pregnancy. Despite this limitation, the study provides useful information that will inform health service planners to design preventive measures to reduce the rates of low birth weight need to be included in programs aimed at controlling fertility and reducing the proportion of short intervals between pregnancies.

Conclusion

From this study, considering all limitations, it can be concluded that Interpregnancy interval shorter than 24 months are associated with an increased risk of low birth weight in Gondar and Bahir Dar teaching-referral hospital; after controlling for socio demographic, socioeconomic, perinatal care, pregnancy complication and household food security variables. Hence, our study recommend Ethiopian health policy makers should provide assistance to strengthen birth spacing education, counseling, and services as integral elements of low birth weight reduction strategies. And at community level in the area; there is a need to empower individuals with knowledge on risks of short interpregnancy interval with low birth weight so that they can make fully informed reproductive health/family planning decisions.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

AY was involved in proposal writing, designing, and recruitment and training of supervisors and data collectors, analysis and write-up and in all stages of the project implementation. He did most of the analysis and write up of

the paper. **FE** contributed in the designing of the methodology, reviewing the proposal and paper and in the final approval of the paper. **SH** involved in designing of project proposal, design of questionnaires and in the final approval of the paper. **MA** involved in reviewing the proposal and paper. All authors read and approved the final manuscript.

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Table 1: Socio-demographic characteristics of *women delivering non first birth in Gondar and Bahir Dar referral hospital, Northwest Ethiopia, 2013*

Variables	**Cases n (%) N = 88**	**Controls n (%) N = 365**	**p-value**
Age			
20 or less than	5 (5.7)	5 (1.4)	0.029*
21-34	64 (72.7)	301 (82.5)	
35^{+}	19 (21.6)	59 (16.2)	
Resident type			
Urban	46 (52.3)	270 (74.0)	< 0.0001*
Rural	42 (47.7)	95 (26.0)	
Ethnicity			
Amhara	80 (90.9)	344 (94.2)	0.462
Tigray	8 (9.1)	20 (5.5)	
Religion			
Orthodox	80 (90.9)	304 (83.3)	0.401
Muslim	7 (8.0)	53 (14.5)	
Protestant	1 (1.1)	7 (1.9)	
Maternal Educational status			
No education	41 (46.6)	99 (27.1)	0.004*
Only read and write	4 (4.5)	22 (6.0)	
Primary education	23 (26.1)	90 (24.7)	
Secondary education	13 (14.8)	97 (26.6)	
Tertiary education	7 (8.0)	57 (15.6)	
Maternal occupation			
House wife	45 (51.1)	207 (56.7)	0.002*
Government or private employed	11 (12.5)	90 (24.7)	
Farmer or trader	28 (31.8)	63 (17.3)	
Daily laborer	4 (4.5)	5 (1.4)	
Marital status			
Married	83 (94.3)	352 (96.4)	0.365
Single	5 (5.7)	13 (3.6)	
Wealth quintile			
Lowest	24 (27.3)	61 (16.7)	0.122
Second	25 (28.4)	100 (27.4)	
Middle	11 (12.5)	41 (11.2)	
Fourth	15 (17.0)	76 (20.8)	
Highest	13 (14.8)	87 (23.8)	

*Significant at 0.05

Table 2: Inter-pregnancy interval and other characteristics of *women delivering non first birth in Gondar and Bahir Dar referral hospital, Northwest Ethiopia, 2013*

Variables	Cases n (%) N = 88	Controls n (%) N = 365	p-value
Inter-pregnancy interval in months			
Less than 24	22 (25.0)	43 (11.8)	0.002*
24 and above	66 (75.0)	322 (88.2)	
Household food insecurity scale			
Food secure	71 (80.7)	339 (92.9)	0.001*
Mildly food insecure	7 (8.0)	18 (4.9)	
Moderately or severely food insecure	10 (11.4)	8 (2.2)	
Household dietary diversity scale			
High	48 (54.5)	223 (61.1)	0.261
Low	40 (45.5)	142 (38.9)	
Parity			
1	34 (38.6)	181 (49.6)	0.155
2-3	36 (40.9)	130 (35.6)	
4^{+}	18 (20.5)	54 (14.8)	
Chronic medical illness			
Yes	11 (12.5)	42 (11.5)	0.795
No	77 (87.5)	323 (88.5)	
Number of Antenatal Care follow up			
None	21 (23.9)	49 (13.4)	0.026*
1-3	31 (35.2)	109 (29.9)	
4^{+}	35 (39.8)	207 (56.7)	
Have pregnancy complication			
Yes	53 (60.2)	99 (27.1)	< 0.0001*
No	35 (39.8)	266 (72.9)	
Sex of baby			
Male	58 (65.9)	215 (58.9)	0.229
Female	30 (34.1)	150 (41.1)	
Drink alcohol during pregnancy			
Yes	33 (37.5)	109 (29.9)	0.167
No	55 (62.5)	256 (70.1)	

*Significant at 0.05

Table 3: Inter-pregnancy interval and other factors and low birth weight among *women delivering non first birth in Gondar and Bahir Dar referral hospital, Northwest Ethiopia, 2013*

Variables	Cases n (%) N = 88	Controls n (%) N = 365	COR (95% CI)	AOR (95% CI)
Inter-pregnancy interval in months				
Less than 24	22 (25.0)	43 (11.8)	2.5 (1.4, 4.45)*	2.67 (1.36, 5.01)**
24 and above	66 (75.0)	322 (88.2)	1	1
Age				
20 or less than	5 (5.7)	5 (1.4)	4.70 (1.32, 16.72)*	5.51 (1.29, 23.50)**
21-34	64 (72.7)	301 (82.5)	1	1
35^{+}	19 (21.6)	59 (16.2)	1.52 (0.86, 2.71)	1.09 (0.56, 2.11)
Resident				
Urban	46 (52.3)	270 (74.0)	1	1
Rural	42 (47.7)	95 (26.0)	2.6 (1.61, 4.19)*	1.07 (0.45, 2.58)
Maternal educational status				
No education	41 (46.6)	99 (27.1)	1	1
Only read and write	4 (4.5)	22 (6.0)	0.44 (0.14, 1.35)	0.64 (0.18, 2.25)
Primary education	23 (26.1)	90 (24.7)	0.62 (0.34, 1.11)	0.82 (0.34, 1.96)
Secondary education	13 (14.8)	97 (26.6)	0.32 (0.16, 0.64)*	0.59 (0.22, 1.60)
Tertiary education	7 (8.0)	57 (15.6)	0.3 (0.13, 0.70)*	0.59 (0.16, 2.16)
Maternal occupation				
House wife	45 (51.1)	207 (56.7)	1	1
Government or private employed	11 (12.5)	90 (24.7)	0.56 (0.28, 1.14)	0.74 (0.29, 1.90)
Farmer or trader	28 (31.8)	63 (17.3)	2.04 (1.18, 3.54)*	1.52 (0.77, 3.02)
Daily laborer	4 (4.5)	5 (1.4)	3.68 (0.95, 14.25)	5.41 (1.14, 25.56)**
Household food insecurity scale				
Food secure	71 (80.7)	339 (92.9)	1	1
Mildly food insecure	7 (8.0)	18 (4.9)	1.86 (0.75, 4.61)	1.77 (0.62, 5.01)
Moderately or severely food insecure	10 (11.4)	8 (2.2)	5.97 (2.28, 15.65)*	3.25 (1.02, 10.32)**
Number of Antenatal Care follow up				
None	21 (23.9)	49 (13.4)	2.54 (1.36, 4.73)*	1.19 (0.53, 2.66)
1-3	31 (35.2)	109 (29.9)	1.68 (0.98, 2.88)	1.19 (0.63, 2.25)
4^{+}	35 (39.8)	207 (56.7)	1	1
Have pregnancy complication				
Yes	53 (60.2)	99 (27.1)	4.07 (2.50, 6.61)*	4.39 (2.56, 7.52)**
No	35 (39.8)	266 (72.9)	1	1

*Statistically significance in COR: P-value<0.05, **statistically significance in AOR:P-value<0.05