

Determinants of Adverse Birth Outcome in West Shewa Zone, Oromia Regional State, Ethiopia Hospital Based Unmatched Case-control Study

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Abstract

Back ground The adverse birth outcomes can lead to higher rates of illness and infection for newborns, as well as long-term neurological and health problems. Hence, this study aims to identify determinants of adverse birth outcomes among mothers who gave birth in hospitals in the west shewa zone, Ethiopia.

Methods Unmatched case-control study was conducted among 591 mothers (146 cases and 445 controls) who gave birth at hospitals found in the west Shewa zone from March 2020 and July 2020. All cases during the data collection period and every 3rd control after cases were selected as a study population. The data were collected from the mothers, measurements from neonates. The questionnaire template was coded by using open source software for Computer-Assisted Personal Interviewing using census and survey processing system (CS-Pro) version 7.1. The collected data were exported to SPSS version 23 for analysis. Finally, presented and interpreted at P-value < 0.05 were considered as statistically significant in multivariable logistic regression.

Result: on multivariable analysis; urban residence (AOR=0.56, 95%, CI=0.36-0.88), lack of family support during child bearing (AOR=5.07, 95% ,CI: 3.01-8.54), pregnancy type(3.994 (AOR=3.4, 95% ,CI: 2.04-7.83,)), short inter pregnancy interval (AOR=1.6, 95% CI: 1.99-2.48), not provided all initial newborn care (AOR=2.19, 95% CI: 1.39-3.41), less than four antenatal care visits (AOR=1.6, 95% CI: 1.02-2.61) and having current obstetric complication (AOR=2.7, 95% CI: 1.55-4.84) were significantly associated with adverse birth outcomes.

Conclusions: Residence, lack of family support during child bearing, Pregnancy type, short inter pregnancy interval, not provided first initial newborn care, having current obstetric complications, and Number of ANC visits were identified as determinants of adverse birth outcome. Therefore, improving family support, inter-pregnancy interval through family planning counselling and provision, providing all initial newborn cares, and having the recommended ANC follow-up was recommended.

Background

An adverse birth outcome (ABOs), which includes preterm births (PTB) and low birth weight (LBW) are major drivers of morbidity and mortality in neonates and infants. ABOs is also an important contributor to serious, short and long term, physical and mental disabilities, including perinatal and infant death, chronic health problems later in life, such as hypertension, ischemic heart disease, metabolic syndrome, stroke, diabetes, malignancies, osteoarthritis, and dementia, learning difficulties, and hearing and visual impairments (1-4). Preterm is defined as babies born alive before 37 weeks of pregnancy are completed (5). Low birth weight is defined by the World Health Organization (WHO) as a weight of less than 2500 grams for a live-born infant at birth (6). A huge gap has been reported in birth outcomes between high income and low-income countries. Maternal mortality ratio is 100-fold greater than maternal mortality in high-income countries in most high-income countries' pregnancies are planned, complications are reduced and birth outcomes are grossly favorable. The most severe adverse outcome of pregnancy is the

death of the mother or her offspring (7-8). In the year of 2018 a total of 2.5 million children died in the first month of life globally. There are approximately 7000 newborn deaths every day, amounting to 47% of all under 5 year's mortality. Sub-Saharan Africa had the highest neonatal mortality rate at 28 deaths per 1,000 live births, followed by Central and Southern Asia with 25 deaths per 1,000 live births. A child born in sub-Saharan Africa is 10 times more likely to die in the first month of life than a child born in a high-income country (5).

Adverse birth outcomes are influenced by a different of biological, psychosocial and environmental factors. Different studies indicated that socioeconomic status, maternal education, marital status, pregnancy desire and teenage pregnancy, maternal co-morbidities and genetic vulnerabilities have also each been linked to poor pregnancy outcomes. Moreover, low pre-pregnancy body mass index (BMI), inadequate weight gain, and poor prenatal care utilization, female fetus, and self-reported cigarette smoking history are related to poor birth outcomes. A high level of anxiety and depressive symptoms among mothers has been associated with a higher risk of adverse birth outcomes (9-10).

In Ethiopia different studies have shown that the prevalence of adverse pregnancy outcomes is within the range of 13.9%- 32. 5%. Low birth weight and prematurity were the common adverse birth outcomes reported and antenatal care follow-up, rural in residency, pregnancy-induced hypertension, advanced maternal age, having current complication of pregnancy, anemia and multiple pregnancy were factors associated with adverse birth outcomes (11-16). Though there are few studies conducted earlier in Ethiopia, those studies were cross sectional which is weak in identifying those factors and those studies were mainly conducted in single town or district. Additionally, there is no study conducted on determinants of ABOs in the study area. Therefore, the current study aimed at identifying the determinants of adverse birth outcomes in the study area by using unmatched case control study design.

Methods

Study area and period

The study was carried out in west Shewa zone, Oromia region, Ethiopia from March 2020 and July 2020. Ambo town is the capital of the zone and it is found at 114 km to the west of Addis Ababa. There are eight public Hospitals in the zone, 96 public health centres, 77 private clinics, 526 health posts. The zone has a total population of 2,058,676 of which are 1,030,175 women in 2018/2019 (zonal health office).

Study design and population

Hospital based unmatched case-control study design was carried out. All mothers who delivered at hospitals in west Shewa zone and their infants were our source population. All mothers who gave birth to low birth weight infant weighing less than 2500gm or gave birth at gestational age of less than 37 completed weeks, or stillbirth) were cases. Mothers who gave birth to an infant weighting greater than 2500gm or at term and live birth were considered as controls.

Sample size determination and Sampling procedure

The sample size was calculated using EPI-Info 3.7.1 statistical software. Considering the proportion of complication during child birth of 55.8% among controls (16), odds ratio of 2.65, confidence level of 95%, power of 80%, a case to control ratio of 1:2. The maximum sample size was 591 of which 197 were cases and 394 were controls. All government hospitals providing 24 hours delivery services in west Shewa zone were included in the study. The numbers of mothers were allocated to each hospital based on their last quarters institutional delivery performance report prior to data collection time. All women who gave birth to low birth weight infant weighing less than 2500gm or gave birth at gestational age of less than 37 completed weeks, or stillbirth) were included as cases. Controls were mothers who gave birth to an infant weighting greater than 2500gm, or at term and live birth were selected every 3rd after each case.

Data collection tool, quality control and measurements

A structured, interview administered questionnaire was prepared in English and translated into local language, Afan Oromo by the translator, and then translated back to English by a third person to check for consistency. The tool adapted from previous literature in different parts of the world and modified according to the local context (7, 13-17). The data were collected from the mothers, measurements from neonates. The questionnaire template was coded by using open source software for Computer Assisted Personal Interviewing using census and survey processing system (CS-Pro) version 7.1 and deployed to Census and survey entry (CS-Entry) android application. Eight nurses were recruited as data collectors and Assistant professors with a background of health professionals were hired as supervisors. In addition, the data collectors were trained for two days on the techniques of data collection and the purpose of the study for study participants before the start of data collection. Pre-test was done on 5% of the total study participant and necessary adjustment was made. The weight of the newborns was measured using a baby measuring weight scale to the nearest 100g within 15min after delivery.

Operational Definition

Pregnancy interval: It is the time elapsed between two consecutive pregnancies

Adverse birth outcome: in this study the adverse birth outcome was measured if least one or more of the following conditions in the current pregnancies occurred. These include women who gave birth to low birth weight infant weighing less than 2500gm or gave birth at gestational age of less than 37 completed weeks, or still birth.

Data processing and analysis

The data was collected and entered using CS-Entry for the android version and exported to SPSS version 23 for analysis. Multivariable logistic regression was done to determine determinants of adverse birth outcome. The goodness of fit of the model was checked using Hosmer–Lemeshow test. All assumptions of logistic regression were checked. Collinearity of the variables was checked variance inflation factors (VIF) and tolerance. If VIF < 10 and tolerance > 0.1 indicating that no multicollinearity among variables. Data was finally presented and interpreted at P-value < 0.05 were considered as statistically significant in multivariable logistic regression

Ethical Consideration

Ethical clearance was obtained from Ambo University ethical review Committee of College of medicine and health science with reference number CHMS/R/WM/04/2020.

Results

A total of 591 mothers (146 cases and 445 controls) were included with response rate of 100%. Concerning educational status of mothers, 45 (7.6%) of the cases are unable to read and write and 91 (15.4%) of the controls are college and above. 124 (21.0%) of the control were farmers and 45 (7.6%) of the case were housewives on mother occupation. Majority of the cases (15.7%) and the controls (43.35%) were protestant by religion. Eighty four (14.2%) of the cases and 170 (28.8%) of the controls were living in rural (**Table 1**)

Obstetric characteristics of participants

Forty nine 49 (8.3%) cases has history of one-time pregnancy and 115 (19.5%) controls has greater or equals to four pregnancy. 118 (20%) cases and 371 (62.8%) their pregnancy was planned. Among the study participants 104 (17.6%) cases and 288 (48.7%) controls had used family planning. Majority of the participants of the study, 80 (22%) of cases and 238 (65.4%) controls had history of medical disorder. Among participants of the study 11 (3%) cases and 30 (8.3%) had history of previous obstetrics complications. One hundred twenty four (21%) cases and 408 (69%) controls have no current obstetrics complication. 58 (9.8%) cases and 151 (25.5%) controls females develop adverse birth outcome. (**Table 2**)

Determinants of adverse birth outcome

After controlling for confounders using multivariate analysis residence, lack of family support during child bearing, Pregnancy type, short inter pregnancy interval, not provided first initial newborn care, having current obstetric complications and Number of ANC visit were identified as determinants of adverse birth outcome.

Mothers who live in urban areas fifty-six times less likely to develop adverse birth outcome when compared with rural living women (AOR=0.56, 95% CI=0.36-0.88). The odds of having adverse birth outcomes increases by two folds in mothers whose birth intervals are less than two years compared to their counterparts (AOR = 1.57,95% CI= 1.99-2.47). Furthermore, mothers who have no family support during child bearing had five times chance to develop adverse birth outcome when compared with mothers who had family support, (AOR =5.07, 95% CI=3.01-8.54). Number of antenatal care follow-up was found to be associated with adverse birth outcome; in which mothers who had less than four antenatal care visits were two times more likely to develop adverse birth outcomes compared to their counterparts, (AOR =1.63 ,95%CI: 1.02-2.62). Mothers who gave birth to twins had four times chance to develop adverse birth outcomes compared to mothers who gave birth to singleton, (AOR = 3.99, 95% CI: 2.04-7.83). Also, the new borns who does not get initial new born care had two times chance to experience adverse birth outcomes compared to their counterparts, (AOR=2.18, 95% CI: 1.39-3.41).Having current obstetric complication three times more likely to develop adverse birth outcome when compared with no current obstetric complication (AOR=2.72, 95% CI: 1.55-4.82) (**Table 3**).

Discussion

This study tried to identify determinants of adverse birth outcome among mothers who delivered at public hospitals in west Shewa zone, Oromia region, Ethiopia. Women's place of residence was found to be significantly associated with adverse birth outcome. Those women residing in urban areas were found to be 56.2% less likely to experience adverse birth outcome than those in rural areas. Similar studies reported in china, Gamo Gofa, Hosana town and northern Wollo (17-20). This could be lack of access for quality pregnancy related cares, the accessibility of medical services, health information, and nutritional awareness which are more prominent in rural area.

Number of ANC follow up is significantly associated with adverse birth outcome, mothers who had history of less than four ANC visits were two times more likely to have ABOs than those who had more than four ANC visits. This finding is supported by study conducted Cameroon, India, Malawi, Addis Ababa, Tigray region, Amahara region, North shewa zone, central Ethiopia (21-27). This might be due to the fact that those mothers who had four or more ANC visits have access to different health promotive and preventive interventions which are used to enhances health of both the mother and fetus.

Having current obstetric complication history was also found to significantly associate with adverse birth outcome. The chance of developing an abnormal birth outcome among mothers with current history of child-related abnormal birth outcome was by three times higher than those mothers without complication. A similar study conducted in Gambia and Nigeria showed that those mothers with the current history of child related abnormal birth outcome are at greater risk of giving birth to a baby with abnormal outcome (28-29). Similar findings were previously reported in Ethiopia (16, 19and 20).The link may be explained in terms of the fact that the complications that have occurred during pregnancy have affected the well-being of the fetus in the uterus.

Mothers who have no support during child bearing had five times chance to develop adverse birth outcome when compared with mothers who have partner support. This study was in line with the study done in united states women with a supportive partner were 63% less likely to experience LBW and nearly two times less likely to have pregnancy loss compared to those with no partner support (30). This might be those who have paternal support may experience less stress and be more likely to enter prenatal care and they also may be more likely to indicate a desired pregnancy which may reduce their risk of poor birth outcomes.

Inter-pregnancy interval is also found to be a determinant of ABOs. The odd of having ABOs was 1.57 times more likely to among those mothers with short birth interval as compared to optimal spacers. This result is in line with studies in united states, China, Tanzania ,Bangladesh, Mekele, (31-34, and 25), in which short inter-pregnancy interval was a risk factor for low birth weight and/or preterm birth. This could be due to the fact that short inter-pregnancy interval results in maternal nutrition reduction which compromises the mother's ability to support fetal growth and development which in turn increases the risks of preterm birth, growth restriction as well as maternal morbidity and mortality in the subsequent pregnancy.

The study result showed that the new borns who does not get initial new born care had two times chance to experience adverse birth outcomes compared to their counterparts, In this study having current obstetric complication was three times more likely to develop adverse birth outcome when compared with no history of current complication. This result is supported with studies conducted in Gondar, Hosanna, Utah India (13, 19 and 22)

Conclusions

The result revealed that residence, lack of family support during child bearing, Pregnancy type, short inter pregnancy interval, not provided first initial newborn care, having current obstetric complications and Number of ANC visit were identified as determinants of adverse birth outcome. Therefore, improving family support, inter-pregnancy interval through family planning counseling and provision, providing all initial newborn cares and having the recommended ANC follow-up were recommended.

Abbreviations

ABO Adverse birth outcome

ANC: Antenatal care

AOR: Adjusted odds ratio

CI: Confidence interval

COR: Crude odds ratio

GA: Gestational age

LBW: Low birth weight

PTB: Preterm birth

SD: Standard deviation

WHO: World Health Organization?

MM Maternal mortality

Declarations

Ethics approval and consent to participate

Ethical clearance and approval letter to conduct study was obtained from Ambo university institutional review board and a letter of cooperation was taken from the Ambo university institute of health to west shewa health bureau. Written consent was obtained from the study participants after explaining the study objectives and procedures and their right to refuse not to participate in the study any time they want was assured. For this very purpose, a one-page consent letter was attached to the cover page of each questionnaire stating about the general objective of the study and issues of confidentiality which was discussed by the data collectors before proceeding with the interview. Confidentiality of the information was ensured by coding. Only authorized person was getting access to the raw data collected from the field.

Consent for publication

Not applicable.

Availability of data and materials

Full data for this research is available through the corresponding author up on request.

Competing interests

The authors declare that they have no competing interests.

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Ambo University provide the fund, but has no role and no influence in the design of the study and collection, analysis, and interpretation of data and in writing of the manuscript.

Authors' contributions

All authors (DB, GA BS, GD and KM) contributed to the design of the study and the interpretation of data. GD performed the data analysis and drafted the manuscript. All others authors critically revised the manuscript and approved the final version. All authors read and approved the final manuscript.

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Tables

Table 1. Socio-demographic characteristics of mothers who gave birth in public hospitals, West shewa, Ethiopia, 2020

Variables	Cases (%)	Control (%)
Age categories		
25	64(10.8%)	211(35.7%)
26-29	29(4, 9%)	91(15.4%)
30+	53(9.0%)	143(24.2%)
Religion		
Orthodox	45(7.6%)	150(25.4%)
Muslim	8(1.4%)	39(6.6%)
Protestant	93(15.7%)	256(43.35%)
Ethnicity		
Oromo	138(23.4%)	417(70.6%)
Amhara	8(1.4%)	27(4.6%)
Gurage	-	1(0.2%)
Occupation of mother		
Civil servant	22(3.7%)	74(12.5%)
Private employee	12(2.0%)	38(6.4%)
Farmers	48(8.1%)	124(21.0%)
Merchant	19(3.2%)	54(9.1%)
House wife	45(7.6%)	155(26.2%)
Occupation of husband		
Civil servant	37(6.3%)	136(23.0%)
Private employee	14(2.4%)	61(10.3%)
Farmers	68(11.5%)	175(29.6%)
Merchant	27(4.6%)	73(12.4%)
Educational status of mother		
Unable to read and write	45(7.6%)	151(25.5%)
Primary education (1-8)	51(8.6%)	114(19.3%)
Secondary education (9-12)	25(4.2%)	89(15.1%)
Collage and above	25(4.2%)	91(15.4%)

Educational status of husband		
Unable to read and write	32(5.4%)	108(18.3%)
Primary education (1-8)	50(8.5%)	99(16.8%)
Secondary education (9-12)	30(5.1%)	108(18.3%)
Collage and above	34(5.8%)	130(22.0%)
Monthly income		
<1000	73(12.4%)	164(27.7%)
1001-3000	41(6.9%)	139(23.5%)
3000+	32(5.4%)	142(24.0%)
Residence		
Rural	84(14.2%)	170(28.8%)
Urban	62(10.5%)	275(46.5%)

Table 2 Obstetric characteristics of mothers who gave birth in public hospitals, West shewa, Ethiopia, 2020.

Variables	Cases 197 N%	Control 394 N%
Number of pregnancy		
<=1	49(8.3%)	184(31.1%)
2-3	52(8.8%)	146(24.7%)
>=4	45(7.6%)	115(19.5%)
ANC		
Yes	117(19.8%)	383(64.8%)
No	29(4.9%)	62(10.5%)
Number of ANC visit		
<4	100(16.9%)	243(41.1%)
>4	46(7.8%)	202(34.2%)
Planned pregnancy		
Yes	118(20%)	371(62.8%)
No	28(4.7%)	74(12.5%)
Family planning use		
Yes	104(17.6%)	288(48.7%)
No	42(7.1%)	157(26.6%)
Medical disorder		
Yes	19(5.2%)	27(7.4%)
No	80(22%)	238(65.4%)
History of obstetrics complication		
Yes	11(3%)	30(8.3%)
No	88(24.4%)	232(64.3%)
Current Obstetrics complication		
Yes	22(3.7%)	37(6.3%)
No	124(21%)	408(69%)
Sex		
Male	86(14.6%)	289(48.9%)

female	58(9.8%)	151(25.5%)
Twins, one male, one female	2(0.3%)	5(0.8%)

Table 3 Bivariate and multivariate logistic regression analysis of determinants of adverse birth outcome.

Variables	Adverse birth outcome		COR95%CI	AOR95%CI	p-value
	Yes	No			
Residence					
Urban	62(10.5%)	275(46.6%)	0.456 (0.312,0.667)	0.56 (0.36-0.88)*	0.011
Rural	84(14.2%)	170(28.8%)	1	1	
Family support during child bearing					
No	85(14.4%)	406(68.7%)	7.471(4.693-11.893)	5.07 (3.01-8.54)*	.000
Yes	61(10.3%)	39(6.6%)	1	1	
Pregnancy type					
Twins	32(5.2%)	26(4.4%)	4.524(2.591-7.899)	3.99 (2.04-7.83)*	0.000
Single	114 (19.3%)	419 (70.9%)	1	1	
Birth interval					
<2 years	99(16.8%)	206(34.9%)	2.444(1.648-3.624)	1.57 (1.99-2.48)*	0.0001
>2 years	47(8%)	239(40.4%)	1	1	
Provided first initial newborn care					
No	56(9.5%)	279(47.2%)	2.701(1.838-3.969)	2.19 (1.39-3.41)*	0.001
Yes	90(15.2%)	166(28.1%)	1	1	
Number of ANC visit					
<4	100(16.9%)	243(41.1%)	1.807(1.216-2.685)	1.63 (1.02-2.62)*	0.006
>=4	46(7.8%)	202(34.2%)	1	1	
Current obstetrics complication					
Yes	104(17.6%)	405(68.5%)	4.089(2.521-6.632)	2.74 (1.55-4.84)*	0.000
NO	42(7.1%)	40(6.5%)	1	1	

Keys: 1=Reference category

*Statistically significant at p<0.05 in multivariate