

ORIGINAL ARTICLE

MAGNITUDE AND DETERMINANTS OF STILLBIRTH IN MIZAN-TEPI TEACHING HOSPITAL, SOUTHWEST ETHIOPIA: UNMATCHED CASE CONTROL STUDY

Mahilet Berhanu Habte¹, Gurmesa Tura Debelew¹, Selamawit Baye Bezabih²

ABSTRACT

Background: The stillbirth rate is an important indicator of the quality of care during pregnancy and childbirth. It is one of a public health problem in low and middle-income countries including Ethiopia. Therefore, this study aimed to assess the magnitude and determinants of stillbirth in Mizan-Tepi teaching hospital, Ethiopia.

Method: Institutional based unmatched case-control study was conducted from January 2017 - December 31, 2019. Simple random sampling was used to choose 87 cases and 174 controls. Data were extracted from the medical records using a structured checklist. The collected data were entered into EPI data version 3.1 and exported to SPSS version 21 for analysis. Finally, multivariable logistic regression was used to identify determinants of stillbirth at 95% confidence and a P-value < 0.05.

Result: The stillbirth rate is 44 per1000 (95%CI: 38.9-49.7) in the study area. Previous history of stillbirth [adjusted odds ratio (AOR)=4.4, 95% CI: 1.36 - 14.4], referral status [AOR=2.3, 95% CI: 1.06 - 5.00], partograph use [AOR=4.0, 95% CI: 1.88 - 8.47], Antenatal care follow up [AOR=3.1, 95% CI: 1.51 - 6.40], history of obstetric complication [AOR=2.8, 95% CI: 1.38 - 5.80] and hemoglobin level of less than 11.5mg/dl [AOR=2.6, 95% CI: 1.28 - 5.56] were the independent factors affecting stillbirth

Conclusion: The magnitude of stillbirth in the study area was high. Therefore, concerted effort should be taken in improving partograph use, ANC visit, prevention of anemia, and overall strengthening maternal health service to prevent stillbirth outcomes.

Keywords: magnitude, determinants, stillbirth, Mizan-Tepi, Ethiopia

Introduction

Stillbirth is one of the adverse birth outcomes, which is defined as a baby born with no signs of life at or after 28 weeks gestation [1]. It is a sensitive marker of health system strength measurement and progress in achieving sus-

tainable development goals (SDG) [2].

Globally in 2015, there were 2.6 million stillbirths, with more than 7,178 deaths occurring per day which is unacceptably high. The majority of these deaths occurred in developing countries, 98% occurred in low

¹ Department of Population and Family Health, Jimma University, Jimma, Ethiopia

² Department of Nursing, Mizan Tepi University, Mizan, Ethiopia

Corresponding author: Mahilet Berhanu Habte, email: mahitesfa.mt@gmail.com

and middle-income countries of which three-fourth occurred in sub-Saharan Africa and South Asia. The stillbirth rate in sub-Saharan Africa is approximately ten times that of developed countries [1, 3].

Ethiopia has made tremendous efforts towards improving maternal and child health conditions. Notwithstanding the expansion of free basic and comprehensive emergency obstetric care and prenatal care, stillbirth is still a public health problem in Ethiopia [4]. The 2016 Ethiopian demographic and health survey showed that the stillbirth rate was 11.8 per 1000 pregnancies at national and 20 deaths per 1000 pregnancies at Southern Nation Nationalities and Peoples Region (SNNPR), where the study was conducted. [5].

The long-lasting impact of stillbirth puts a significant burden on couples as well families. Its consequences will be grief, stigma, blame, marginalization, depression. Additionally, it causes marital instability and will hinder productivity in general. On the other side, it shows the poor quality of the health care system of the country. Therefore, the whole journey of pregnancy ends to a devastating and painful to mothers as well to families [6].

Several factors impede progress in the efforts to reduce the burden of preventable stillbirths. Compounding stillbirths with early neonatal deaths further obscure the specificity in addressing the associated factors of stillbirth [5&7]. Most stillbirths are believed to

be preventable with high-quality service and evidence-based intervention during pregnancy and delivery. However, indicators in SDG show that stillbirth is a hidden agenda. Evidence from literature shows that: antenatal care (ANC) visit, place of delivery, preterm delivery, antepartum hemorrhage, prolonged labor, and infection are some of the factors that contribute to the high prevalence of stillbirth in Ethiopia [8-10]. However limited evidence exists as to why women who commenced their labor in health facilities end up with stillbirth. So, this study aimed to assess the magnitude and identify determinants of stillbirth in Mizan tepi teaching hospital which will be very helpful for decision-makers to design and implement strategies on evidence-based findings and increasing rate of live birth.

Methods and materials

Study design, setting and population

An institutional-based unmatched case-control study was conducted from January 01, 2017- to December 31, 2018, among mothers who gave birth in one of the teaching and referral public hospital to identify determinants of stillbirth. The study was conducted in Mizan-Tepi teaching hospital which is found in Benchi Maji Zone in southwest Ethiopia. Mizan-Tepi teaching hospital is the only one in the Benchi Maji zone and it gives different clinical services including maternal and child health services for about 1.5 million populations. The

maternity unit in the department of obstetrics and gynecology ward has one obstetrician/gynecologist and three emergency surgeons.

For this particular study, the source population was all mothers who gave birth and neonates in pairs. Cases were mothers with stillbirth and controls were mothers gave to live birth

Cases were defined as fetal death after 28 weeks of pregnancy and Control were defined as live births after 28 weeks of pregnancy registered during the study period.

Inclusion and exclusion criteria

Inclusion criteria for cases

- All stillbirth deliveries attended in Mizan-Tepi teaching hospital from January 2017- December 2018
- Complete documentation of intra-partum care intervention available

Inclusion criteria for controls

- All live births attended in Mizan-Tepi teaching hospital from January 2017- December 2018
- Complete documentation of intra-partum care intervention available

Exclusion criteria for cases and controls

- Missed charts from the archive but, registered on registration book were excluded from the study
- Charts that didn't include the status of new born were excluded from the analysis

Sample size and sampling procedure

The sample size was determined using EPI info version 7.1 statistical software. The assumption for sample size determination were:

labor length > 24hr [11] with estimated exposure among cases 43.8% and among controls 58.2% where AOR is 2.4, with 80% power and 95% confidence interval and 1:2 ratios for cases to controls. The total sample size was 270 (90 cases and 180 controls). All stillbirths' identification numbers that occurred between January 01, 2017- December 31, 2018, were taken from the delivery room registration logbook and a computer-generated simple random sampling method was used for the selection of cases.

Data collection tool and procedure

Data were extracted using a structured checklist from the medical records of mothers which is prepared based on the medical charts of the mother. Five data collectors and one supervisor were recruited and trained for one day on how to extract the data from medical records. The data collection process was closely monitored by the principal investigator.

Data processing and analysis

Data were coded, cleaned, and entered to Epi data version 3.1 and exported to SPSS version 21 for analysis. Descriptive statistics such as means and proportions were used to summarize the data as necessary. Bivariate logistic regression analysis was done to identify candidate variables for the multivariable logistic regression model at p-value 0.25. Model fitness was checked by Hosmer and Lemeshow test. Finally, variables at P-value < 0.05 were considered statistically significant in the final multivariable logistic

regression model. Adjusted odds ratio (AOR) with 95% CI was computed to determine the strength of association and identify determinants of stillbirth.

Result

Socio demographic characteristics

A total of 261 mothers (87 cases and 174 controls) were included in the study giving 96.7% retrieval rate. The mean age of the cases and controls was 27.1 (SD=6.63) and 24.04 (SD=4.46) respectively. Mothers resi-

dence among cases 72 (82.8%) and 81 (46.6%) controls were from rural areas.

Majority, 166 (63.6%) were Para I of which 46.0% were cases and 72.4% were controls. Most of them, 194 (74.3%) had labor duration less than 12hrs which includes 69 (79.3%) among cases and 125 (71.8%) among controls. Two hundred twenty-three (85.4%) labor was initiated spontaneously (74.7%) among cases and 90.8% among controls) (Table1).

Table 1: Obstetric characteristics of mothers who gave birth in Mizan Tepi teaching and referral hospital, in Benchi Maji Zone, south west Ethiopia, 2019. (n=261; cases: 87 and controls: 174)

Variables	Categories	Cases (n=87)	Controls (n=174)	Total (n=261)	p-value
Parity	1	40(46.0%)	126 (72.4%)	166(63.6%)	< 0.001*
	2-3	26(29.9%)	39 (22.4%)	65(24.9%)	
	≥4	21(24.1%)	9 (5.2%)	30(11.5%)	
History of still birth	Yes	18(20.7%)	8 (4.6%)	26(10.0%)	< 0.001*
	No	69(79.3%)	166 (95.4%)	235(90.0)	
History of abortion	Yes	13(14.9%)	17 (9.8%)	30(11.5%)	0.22
	No	74(85.1%)	157 (90.2%)	231(88.5%)	
Gestational age	28-36	31(35.6%)	16 (9.2%)	47(18.0%)	< 0.001*
	37-42	56(64.4%)	158 (90.8%)	214(82.0%)	
Initiation of labour	Spontaneous	65(74.4%)	158 (90.8%)	223(85.4%)	< 0.001*
	Induced	22(25.3%)	16 (9.2%)	38(14.6%)	
ANC follow up	Yes	26(29.9%)	130 (74.7%)	156(59.8%)	< 0.001*
	No	61(70.1%)	44 (25.3%)	105(40.2%)	
No. of ANC visits	1-3	23(29.9%)	78 (60.0%)	101(64.7%)	0.006*
	≥4	3(11.5%)	52 (40.05%)	55(35.3%)	
Current Obstetric complication	Yes	58 (66.7%)	47 (27.0%)	105(40.2%)	< 0.001*
	No	29 (33.3%)	127 (73.0%)	156(59.8%)	
Maternal RH factor	Positive	80 (92%)	159 (91.3%)	239 (91.5%)	0.86
	Negative	7 (8%)	15 (8.7%)	22 (8.5%)	
Level of hemoglobin	≤ 11.5	46 (52.9%)	37 (21.3%)	83 (31.8%)	< 0.001*
	>11.5	41 (47.1%)	137 (78.7%)	178 (68.2%)	

Magnitude of stillbirth

During the study period there were a total of 5636 deliveries. Among them, 5388 were live birth and 248 were Stillbirth. The overall stillbirth rate was 44 per1000 births with (95%CI: 38.9-49.7). Hemoglobin level was tested for all and 83(31.8%) mothers had <11.5mg/dl which were 46 (52.9%) among cases and 37 (21.3%) among controls. Among the reviewed records 62(71.3%) of cases and 53(30.5%) of controls were referred from other health facility for delivery.

Determinants of stillbirth

In the bivariate analysis, factors found to be significantly associated with stillbirth outcome were: residence, maternal age, parity, history of stillbirth, history of abortion, gestational age, referral status to facility, initiation of labor, partograph use, ANC follow up, history of obstetric complication and hemoglobin level.

After controlling for confounders using multivariate analysis, previous history of stillbirth, referral status, partograph use, ANC follow up, history of obstetric complication and level of hemoglobin level were identified as independent determinant factors of stillbirth outcome. Mothers who had previous history of stillbirth were more than four times

at risk of experiencing stillbirth outcome than mothers who had no previous history of stillbirth [AOR=4.4, 95% CI: 1.36 - 14.4]. Mothers who were referred from other health facility were more than two times at higher risk of experiencing stillbirth outcome compared to their counterpart [AOR=2.3, 95% CI: 1.06 - 5.00]. Mothers whose labors were not monitored using partograph were four times more likely to experience stillbirth outcome than their counterpart [AOR=4.0, 95% CI: 1.88 - 8.47]. ANC follow up during pregnancy is an independent determinant factor of stillbirth; mothers who had no ANC follow up were three times more likely to experience still birth outcome compared to those had ANC follow up [AOR=3.1, 95% CI: 1.51 - 6.40]. Mothers those who had at least one obstetric complication during pregnancy or delivery were nearly three times more likely to experience stillbirth outcome than their counterpart [AOR=2.8, 95% CI: 1.38 - 5.80]. Furthermore, mothers with hemoglobin level of less than 11.5mg/dl were two and half times at higher risk to experience stillbirth compared to their counterpart [AOR=2.6, 95% CI: 1.28 - 5.56] (Table 2).

Table 2: Determinants of stillbirth outcome among mothers who gave birth in Mizan Tepi teaching and referral hospital in Benchi Maji Zone, south west Ethiopia, 2019.

Variable	Categories	Cases (n=87)	Controls (n=174)	COR(95% CI)	AOR(95%CI)	P-value
Place of residence	Urban	15(17.2%)	93(53.4%)	1.00	1.00	
	Rural	72(82.8%)	81(46.6%)	5.51(2.9-10.3)	2.08(0.93-4.6)	0.07
Age	<20	9(10.3%)	18(10.3%)	1.00	1.00	
	20-34	60(69.0%)	149(85.6%)	0.8(0.34-1.89)	0.7(0.13-3.76)	0.68
	≥34	18(20.7%)	7 (4.15%)	5.14(1.57-16.8)	8.67(0.41-179.7)	0.16
Parity	1	40(46.0%)	126 (72.4)	0.13(0.05-0.3)	0.3(0.1-1.35)	0.13
	2-3	26(29.9%)	39 (22.4)	0.28(0.11-0.7)	0.43(0.12-1.5)	0.19
	≥4	21(24.1%)	9 (5.2)	1.00	1.00	
History of still birth	Yes	18(20.7%)	8 (4.6)	5.4(2.24-13.0)	4.4(1.36-14.4)	0.013*
	No	69(79.3%)	166 (95.4)	1.00	1.00	
History of abortion	Yes	13(14.9%)	17 (9.8)	1.62(0.74-3.5)	0.7(0.23-2.1)	0.53
	No	74(85.1%)	157 (90.2)	1.00	1.00	
Gestational age	28-36	31(35.6%)	16 (9.2)	5.4(2.7-10.7)	1.8(0.65-4.92)	0.25
	37-42	56(64.4%)	158 (90.8)	1.00	1.00	
Referral status	From health fac.	62 (71.3)	53 (30.5)	5.66(3.21-9.9)	2.3(1.06-5.0)	0.013*
	From home	25 (28.7)	121 (69.5)	1.00	1.00	
Labour start	Spontaneous	65(74.4%)	158 (90.8)	1.00	1.00	
	Induced	22(25.3%)	16 (9.2)	3.34(1.65-6.7)	2.47(0.95-6.4)	0.63
Partograph use	Yes	16 (18.4)	102 (58.6)	1.00	1.00	
	No	71 (81.6)	72 (41.4)	6.28(3.3-11.6)	4(1.88-8.47)	<0.001*
ANC follow up	Yes	26(29.9%)	130 (74.7)	1.00	1.00	
	No	61(70.1%)	44 (25.3)	6.9(3.91-12.2)	3.1(1.5-6.4)	0.002*
Obstetric complication	Yes	58(66.7%)	47 (27.0%)	5.4(3.09-9.43)	2.8(1.38-5.8)	0.005*
	No	29(33.3%)	127(73.0%)	1.00	1.00	
Preeclampsia	Yes	11(12.6%)	10 (5.7%)	2.37(0.96-5.8)	1.43(0.2-9.97)	0.71
	No	76(87.4%)	164(94.3%)	1.00	1.00	
Hgb level	<11.5	46(52.9%)	37(21.3%)	4.5(2.38-7.24)	2.6(1.28-5.56)	0.008*
	≥11.5	41(47.1%)	137(78.7%)	1.00	1.00	

*significant at p value <0.05

Discussion

In this study magnitude of stillbirth was high. This is consistent with study conducted in Aksum hospital, Ethiopia in 2019 [12]. This similarity might be both studies were facility based. However, this finding was lower than study done in Jimma university specialized hospital, Ethiopia in 2011 [9]. The difference might be due to study period difference. Additionally, after post millennium development goal the Ethiopian government has done a lot in strengthening maternal and child health service.

In this study previous history of stillbirth were determinant of stillbirth. This finding is in line to similar study done in urban hospital of Dar es salaam Tanzania in 2009, Sub Saharan Africa in 2017 and systematic review conducted in low- and middle-income countries in 2014 [10,13,14]. The possible reason for this finding might be related to the maternal Rh-factor, which leads to erythroblastosis fetalis. The other reason might be that repeated pregnancy related complications which end in fetal deaths [15].

Referral status is an independent predictor of stillbirth in this study which in agreement with study conducted in a rural hospital in Gambia and rural hospital in Ghana [16-17]. This similarity could be explained, these studies also conducted hospital based and in rural setting.

In this study not using partograph were significantly associated with occurrence of stillbirth. The partograph use in this study is on-

ly 16 (18.5%) among cases where as 102 (58.6%) among controls. This is similar with other similar studies done in Aksum, Ethiopia in 2019 and a rural hospital in Ghana [12, 17]. This suggests that partograph use for labor monitoring helps to alert health care providers about the maternal and fetal well-being status and the progress of labor which is directing the possible type of intervention to be taken.

Not having ANC follow up was associated with stillbirth. This finding is supported with study conducted Tikur Anbessa hospital in Addis Ababa Ethiopia in 2008, Mutare district hospitals, Zimbabwe in 2014, Ekiti State University Teaching Hospital, Nigeria in 2017 and systematic review in low- and middle-income countries [14, 18-20]. This could be justified by the fact that during ANC visit mothers can get information on birth preparedness and complication readiness, maternal nutrition and supplementation which can improve the health status and awareness level of mothers. This implies that strengthening maternal health service would reduce the stillbirth outcome.

Preterm and preeclampsia are the leading obstetric complication in this study. Mothers those who had at least one obstetric complication during pregnancy or delivery were at increased risk to experience stillbirth outcome. This is in line to study done in Butajira hospital southern Ethiopia in 2019, Gambia in 2010 and Mutare district hospitals, Zimbabwe in 2014 [16, 19 &21].

This could be due to the fact that obstetric complications like preterm are the leading cause of death. The others preeclampsia and eclampsia that occur before reaching term could have adverse birth outcome as the fetal lung not mature well. Premature rupture of membrane also results to death of fetus due to infections if not managed early.

Furthermore, hemoglobin level less than 11.5mg/dl was another determinant of stillbirth. This is supported by study done in Tigray region, northern Ethiopia in 2016 [22]. This could be explained that hemoglobin level is used to determine the diagnosis of anemia in low resource setting countries like Ethiopia. So the decrement in hemoglobin level during pregnancy would have the direct influence on fetus as the fetus is dependent on nutritional status of mother. Anemia during pregnancy is a risk factor for prematurity, preterm delivery, low for gestational age and poor fetal supply of oxygen and nutrient. On the other hand it tells the maternal nutritional status which could lead to growth restriction and finally death to fetus.

The program implication of the finding of this study supports WHO recommendation on health promotion interventions for maternal and newborn health and national strategy for newborn and child survival in Ethiopia which intends making all birth count. Therefore, strengthening maternal health service is important to reduce stillbirth. It demands scale up of emergency obstetric service and early

detection of complication.

This study has its own limitation. There might be over representation of determinants because of commonly complicated cases referred to referral hospital. The other might be due to the secondary nature of data, the contribution of some important variables like maternal nutritional practice, wealth index and socio-cultural related factors were missed.

Conclusion

In this study magnitude of stillbirth in the Mizan-Tepi teaching hospital, Ethiopia was high compared to the national target for 2020. Previous history of stillbirth, referral status, use of partograph, ANC follow-up, obstetric complication and maternal hemoglobin level less than 11.5mg/dl were factors independently associated to stillbirth outcome.

Recommendation

To overcome the burden of stillbirth, concerted effort should be taken and strengthen appropriate maternal health service. Further research, a follow up study on large sample of pregnant women should be done for better understanding of stillbirth predictors.

Availability of data and materials

The authors agreed to provide any required data as per the guidelines of the Ethiopian journal of pediatrics and child health up on request.

Declaration**Competing interests**

The authors declare that they have no competing interests.

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Authors' contributions

All authors contribute equally

Ethics approval

The study was conducted after ethical review and clearance of the proposal by the Institutional Ethical Review Board (IRB) of Jimma University Institute of Health (JUIH). Permission letter was obtained from chief executive officer and medical director of Mizan Tepi teaching and referral Hospital. There were no unique identifiers of mothers on the checklist and all the data collected were handled confidentially and were safely disposed.

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