Original Research Article

SAGE Open Medicine

SAGE Open Medicine
Volume 10: 1–7

DOI: 10.1177/20503121221076370
journals.sagepub.com/home/smo
SAGE

Determinants of stillbirth among women who gave birth at Hiwot Fana Specialized University Hospital, Eastern Ethiopia: A facility-based cross-sectional study

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Abstract

Introduction/objectives: Stillbirths are an adverse birth outcome and a significant public health problem in low- and high-income countries. Ethiopia is ranked seventh among ten countries that constitute 66% of the world's stillbirths. However, there is a dearth of evidence about stillbirths and the determinants in the country, particularly in Eastern Ethiopia. Hence, this study aimed to assess the prevalence and determinants of stillbirths among women who gave birth at Hiwot Fana Specialized University Hospital, Eastern Ethiopia.

Methods: We conducted a hospital-based cross-sectional study among women who gave birth from October to December 2017. The study participants were selected through a systematic random sampling method. We collected the data using a pretested questionnaire through face-to-face interviews and maternal medical record reviews. The multi-variable logistic regression model was applied to identify the determinants with adjusted odds ratios at a 95% confidence interval. Statistical significance was declared at a *p*-value less than 0.05.

Results: Five hundred fifty-five women were included in the study, and 6.7% ((95% confidence interval = 4.7%, 9.2%)) experienced a stillbirth. Previous history of adverse birth outcome (adjusted odds ratio = 9.55; 95% confidence interval = (4.37, 20.85), $p = 0.003$), multiple pregnancies (adjusted odds ratio = 7.04; 95% confidence interval = (2.12, 23.40), $p = 0.000$), and spontaneous vaginal delivery (adjusted odds ratio = 0.17; 95% confidence interval = (0.05, 0.51), $p = 0.002$) were the identified determinants of stillbirth.

Conclusion: The prevalence of stillbirth in this study was similar to previous reports in the country. Early detection and treatment of complications among mothers with multiple pregnancies and prior history of adverse outcomes are vital to alleviate the problem.

Keywords

Determinants, stillbirth, deliveries, hospital, Ethiopia

Date received: 25 May 2021; accepted: 10 January 2022

Introduction

Stillbirths, defined as babies born with no signs of life at or after 28 weeks of gestation, are adverse birth outcomes causing significant public health problems in low- and high-income countries.[1] Despite the vast burden, stillbirths are underestimated in many settings. Every Newborn Action Plan (ENAP) has set a stillbirth target of 12 per 1000 births or less by 2030;[2,3] this may be seen as unrealistic to achieve since the documented reduction during the Millennium Development Goal (MDG) was only from 24.7 to 18.4 per 1000 births.[4]

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Approximately 2 million babies were stillbirths worldwide in 2019, or 13.9 stillbirths per 1000 total births, implying that one stillbirth occurred every 16 s. Furthermore, 75% of the stillbirths happened in sub-Saharan Africa and Southern Asia.[3,5]

Ten countries accounted for 66% of the world's stillbirths, while Ethiopia ranked seventh among the top ten countries.[4] Evidence from the Ethiopian Demographic Health Survey (EDHS) portrayed stillbirth rates of 25.5–85 per 1000 births in Ethiopia, with significant variability across regions.[6,7] Since the cause of stillbirths is multi-factorial, the health system alone cannot address the entire problem. The commonly reported determinants are behavioral, socioeconomic, reproductive and environmental health, and healthcare infrastructure-related factors.[8–10]

Moreover, results from different studies revealed maternal age above 35, place of residence, level of education, parity, antenatal care (ANC) utilization, place of delivery and mode of delivery, maternal infection and a variety of maternal medical conditions, feto-maternal complications related to pregnancy and labor, inadequate care during pregnancy and immediate childbirth, obstructed/prolonged labor, antepartum hemorrhage, preterm labor, premature rupture of membrane, and intrauterine growth restriction are common obstetric determinants associated with an increased risk of stillbirths, and particularly in resource-limited areas/countries.[11–13]

Although studies have identified several determinants of stillbirths in high-income and low-and-middle-income countries, limited published evidence focuses on the determinants of stillbirth among women who gave birth in hospitals in Ethiopia,[14–16] particularly in Eastern Ethiopia. Moreover, most studies focused on the association of stillbirth and socio-demographic characteristics. Obstetric and reproductive health characteristics were examined through retrospective data records. Therefore, this study assessed the prevalence of stillbirths and the determinants among women who gave birth in Hiwot Fana Specialized University Hospital, Eastern Ethiopia, using primarily collected data.

Methods

Study setting

The study was conducted in Hiwot Fana Specialized University Hospital, located in Harar, 526 km away from Addis Ababa to the East. The hospital serves about 5.8 million people from the Harari region, Dire Dawa Administration, Oromia region, and Somali region, and it is a teaching center of Eastern Ethiopia, providing various healthcare services. In addition, the hospital offers ANC, labor and delivery care for an average of 5800 pregnant women annually.[17,18] We conducted this study from 1 October to 30 December 2017.

Study design and populations. This was a hospital-based cross-sectional study conducted among randomly selected mothers who gave birth at 28 weeks or more gestation during the data collection period. Women with serious illnesses who were unable to respond were excluded.

Sample size and sampling techniques. The sample size was calculated using single population proportion formula (i.e. $n=z^2\ p\ (1-p)/d^2$)[19] by assuming the proportion of stillbirth (p) = 9.6%,[20] margin of error (d) = 3%, and 95% confidence level

$$n = \frac{(1.96)^2 \times 0.096(1-0.096)}{(0.03)^2} = 370$$

Then, correction formula was applied as the population was less than 10,000

$$\mathrm{nf} = \frac{n}{\left(1+\frac{n}{N}\right)} = \frac{370}{\left(1+\frac{370}{880}\right)} = 260.48$$

where nf is the final sample size, n is the calculated sample size, and N is the average total number of mothers who gave birth during the specific data collection period (over 3 months).

Considering Design Effect of 2 and adding 10% for possible non-response rate, the final sample size was 573. Dividing the average total number of deliveries during the data collection period yields $K = 885/573 = 1.5\sim2$. Participants were selected using systematic random sampling, where every second mother was enrolled in the study. The delivery register was used as a reference.

Data collection procedure and instrument

We used a pretested, structured interview-based questionnaire and performed a chart review to collect the data from the maternal medical record. The tool was adapted from similar studies after reviewing various articles.[15,21–24] The tool contains information about socio-demographic characteristics, medical and obstetric conditions of the mother, and the fetal birth outcome. Researchers reviewed all maternal records found in the charts and extracted information pertinent to the mother and newborn using a checklist.

The data were collected by four diploma Midwives and supervised by two BSc midwives. Two days of training were given to data collectors and supervisors on the objectives of the study, the questionnaire contents, and particularly on issues related to the confidentiality of the responses and the rights of the respondents. The tool was pretested on 5% of the sample size (29 participants) in Jugol hospital, which is different from the study hospital. Corrections and modifications were made to the tool based on the pretest results.

The interview was conducted 24-h post-partum once the mother was stabilized; birth outcomes were cross-checked with their medical records. Any information that the women were not familiar with or able to recall was obtained from their medical records, including obstetric complications with current pregnancy, current maternal medical conditions, like anemia, HIV status, ultrasound findings and reports, and other cases which need a diagnosis for confirmation. Stillbirth was ascertained from the mother's medical records confirmed with professionals. Collected data were checked for accuracy and completeness daily.

Statistical analysis

The collected data were entered into the computer using Epi info-7. Data cleaning and analysis were done using SPSS-20. A frequency table and cross-tabulation were generated to show any missing values. Finally, descriptive statistics presented the stillbirth prevalence with 95% confidence interval (CI).

Bi-variable logistic regression analysis analyzed the association between the dependent and independent variables. Finally, Hosmer and Lemeshow's goodness-of-fit test assessed whether the necessary assumptions were fulfilled or not.

Accordingly, all continuous variables were transformed into categories and coded. The outcome variable was coded as one for stillbirth and zero for live birth to dichotomize to yes/no responses. Then, a bi-variable logistic regression model was used to assess the relationship of variables and the outcome variable. Maternal age, parity, ANC, residence, educational status, history of stillbirth/adverse birth outcomes, obstetric complication, presence of medical diseases, multiple pregnancies, fetal complications, and mode of delivery were assessed to check whether they are associated with the outcome variable.

Furthermore, all the variables associated with the outcome variable in the bi-variable analysis at a p-value $\leqslant 0.2$ were used in the multi-variable model to control for possible confounders. The findings from the bi-variable logistic regression model revealed residence, maternal education, history of adverse birth outcome, multiple pregnancies, obstetric complications, fetal complications, and mode of delivery were the independent determinants of stillbirth. However, after adjusting for other variables, history of adverse birth outcome, multiple pregnancies, and spontaneous vaginal delivery remained significantly associated with stillbirth in the multi-variable logistic regression analysis model. Therefore, the multi-variable logistic regression analysis results were presented with an adjusted odds ratio (AOR) at 95% CIs, and the level of statistical significance was declared at a p-value less than 0.05.

Ethical considerations

Ethical clearance for the study was obtained from the Institute of Health Research and Ethical Review Committee of Haramaya University College of Medical and Health Sciences. Informed voluntary, written, and signed consent was obtained from study participants after explaining the purpose and procedure of the study. In case of minor subjects/who could not read or write, informed consent was obtained from their companion (legally authorized representatives) prior to study initiation.

All the basic principles of human research ethics, including autonomy, were respected. Confidentiality of the information was assured from all the data collectors and supervisors' sides. Those who had stillbirths were linked to all necessary care after delivery. They were reassured and told to return to the facility if there was a health problem and a need for help arose. They were also counseled about the risk factors and prevention of stillbirth for subsequent pregnancies.

Results

Of 573 women who gave birth during the study period, 555 were included, yielding a response rate of 96.8%. Their mean age was 26.6 (±standard deviation = 4.62) years. About three-fifths (65.8%) were Muslim in religion, Oromo 353 (63.6%) in ethnicity, and 526 (94.7%) were married. Nearly one-third (33.3%) were unable to read and write (illiterate) (Table 1).

Maternal and obstetric history

Among all participants, 365 (65.8%) were multiparous, and 120 (27.4%) had four ANC visits and only 29 (6.6%) had more than four ANC follow-up visits (Figure 1).

About one-in-three, 127 (32.3%) had obstetric complications where the leading cause was prolonged labor 63 (25.3%) followed by multiple pregnancies 37 (20.7%) and pre-eclampsia/eclampsia 36 (20.1%), respectively. Spontaneous vaginal delivery was the main mode of delivery, 396 (71.4%). About one-fifth, 124 (22.3%) had an existing health condition, of whom 10 (8.1%) were HIV positive, 29 (23.4%) had hypertension, and 75 (60.5%) were anemic (hemoglobin level less than 11 gm/dL) (Table 2).

Prevalence of stillbirth

The prevalence of stillbirths in this study was 6.7% ((95% CI = 4.7%, 9.2%)).

Factors associated with stillbirth

Mothers who had a previous history of adverse birth outcomes were 9.55 times more likely to have a stillbirth (adjusted odds ratio (AOR) = 9.55; 95% CI = (4.37, 20.85), $p = 0.003$) than their counterparts, and likewise, mothers with multiple pregnancies were about seven times more likely to have a stillbirth (AOR = 7.04; 95% CI = (2.12, 23.40), $p = 0.000$) than those with a singleton pregnancy. The

Table 1. Socio-demographic characteristics of women who gave birth in Hiwot Fana Specialized University Hospital, Harar, Eastern Ethiopia, 2017 ($n=555$).

Variables	Frequencies	Percentages
Age in years		
<20	192	34.6
20–34	339	61.1
35+	24	4.3
Residence		
Rural	218	39.3
Urban	337	60.7
Marital status		
Married	526	94.7
Single	29	5.3
Age at first birth		
⩽20	220	39.6
>20	335	60.4
Ethnicity		
Oromo	353	63.6
Amhara	120	21.6
Somali	46	8.3
Harari	26	4.7
Others[a]	10	1.8
Religion		
Muslim	365	65.8
Orthodox	159	28.6
Protestant	27	4.9
Others[b]	4	0.7
Maternal education		
Unable to read and write	185	33.3
Primary school	152	27.4
Secondary school	112	20.2
College/university	106	19.1
Mother occupation		
Housewife	285	51.4
Government employee	74	13.3
Private employee	132	23.8
Merchants	48	8.6
Others[c]	16	2.9

[a]Others: Tigray, Gurage, and Wolaita.
[b]Others: Catholic and Adventist.
[c]Others: waiter, daily laborer, and housemaid.

likelihood of stillbirth was 17% lower among those who gave birth through spontaneous vaginal delivery than those women who had a cesarean section (C/S) (AOR=0.17; 95% CI=(0.05, 0.51), $p=0.002$) (Table 3).

Discussion

This study examined the prevalence of stillbirths and the determinants among women who delivered at Hiwot Fana Specialized University Hospital in Harar town, Eastern Ethiopia. The prevalence of stillbirths in this study was 6.7% (95% CI=4.7%, 9.2%), which was in line with the study

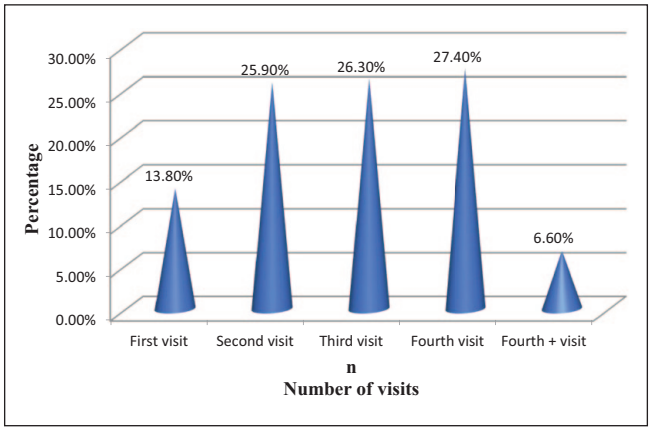

Figure 1. Number of ANC follow-ups or visits among women who gave birth at Hiwot Fana Specialized University Hospital, Harar, Eastern Ethiopia, 2017 ($n=441$).

Table 2. Maternal and obstetric history of women who gave birth at Hiwot Fana Specialized University Hospital, Harar, Eastern Ethiopia, 2017 ($n=555$).

Variables	Frequency	Percentage
Parity		
Multipara	365	65.8
Primipara	190	34.2
ANC follow-up		
Yes	441	79.5
No	114	20.5
Medical conditions/ diseases ($n=124$)		
Hypertension	29	23.4
Diabetes mellitus	5	4. 0
Anemia	75	60.5
HIV	10	8.1
Others[a]	5	4.0
History of adverse birth outcome		
Yes	99	17.8
No	456	82.2
Current birth outcome		
Alive	518	93.3
Stillbirth	37	6.7
Obstetric complications ($n=179$)		
Antepartum hemorrhage	23	12.8
Multiple pregnancy	37	20.7
PROM	13	7.2
Pre-eclampsia/eclampsia	36	20.1
Prolonged/obstructed labor	63	35.2
Post-partum hemorrhage	20	11.2
Fetal complications	12	6.7
Mode of delivery		
Spontaneous vaginal delivery	396	71.4
Assisted instrumental delivery	28	5
Cesarean section	131	23.6

ANC: antenatal care; PROM: premature rupture of membrane.
[a]Others: malaria, tuberculosis, and cardiac diseases and genitourinary diseases.

Table 3. Factors associated with stillbirth among women who gave birth at Hiwot Fana Specialized University Hospital, Harar, Eastern Ethiopia, 2017 ($n = 555$).

Variables	Stillbirth		Odds ratio (95% confidence interval)			
	Yes (%)	No (%)	COR (95% CI)	*p*-value	AOR (95% CI)	*p*-value
Residence						
Rural	21 (9.6)	197 (89.9)	2.14 (1.09, 4.12)	0.12	1.15 (0.45, 2.92)	0.250
Urban	16 (2.8)	321 (57.8)	1		1	
Maternal education						
Unable to read and write	20 (3.6)	165 (29.7)	0. 23 (0.92, 0.59)	0.39	0.42 (0.12, 1.45)	0.340
Primary school	11 (1.9)	141 (25.4)	0.36 (0.13, 1.00)	0.88	0.35 (0.11, 1.13)	0.830
Secondary school and above	6 (1.1)	212 (38.2)	1		1	
History of adverse birth outcome						
Yes	24 (4.3)	75 (13.5)	10.90 (5.32, 22.36)	0.023	9.55 (4.37, 20.85)	0.003***
No	13 (2.3)	443 (79.8)	1		1	
Obstetric complications						
Yes	19 (3.4)	160 (2.8)	2.36 (1.20, 4.62)	0.125	1.51 (0.56, 4.06)	0.150
No	18 (3.2)	358 (6.4)	1		1	
Multiple pregnancy						
Yes	9 (1.6)	28 (5.1)	5.26 (2.42, 13.06)	0.011	7.04 (2.12, 23.40)	0.000***
No	28 (5.1)	490 (88.3)	1		1	
Fetal complications						
Yes	3 (0.5)	9 (1.6)	4.99 (1.29, 19.29)	0.016	4.95 (0.80, 30.38)	0.085
No	34 (6.1)	509 (91.7)	1		1	
Mode of delivery						
SVD	21 (3.8)	375 (67.5)	0.22 (0.07, 0.66)	0.13	0.17 (0.05, 0.51)	0.002***
Instrumental delivery	7 (1.3)	21 (3.8)	1.32 (0.58, 2.95)	0.29	0.84 (0.32, 2.23)	0.680
Cesarean section	9 (1.6)	122 (21.9)	1		1	

COR: crude odds ratio; CI: confidence interval; AOR: adjusted odds ratio; SVD: spontaneous vaginal delivery.
Maternal age, parity, ANC, and medical diseases were adjusted in the model.
***Significant at $p < 0.05$ in multi-variate analysis.

from Gondar (7.1%),[25] Jimma (8.0%),[21] and another national study conducted in Ethiopia which reported the overall pooled prevalence of stillbirths to be 7.1%.[26] In comparison, the magnitude of stillbirths observed in this study was higher compared to the studies conducted in Axum (3.7%), Ethiopia,[16] Nigeria (4.8%),[27] and Tanzania (3.5%).[28] This high prevalence of stillbirths could be attributed to poor referral systems, poor transport facilities, and long distances to this referral hospital, which are all significant in this study setting.

This study and several other studies show that women with a history of adverse birth outcomes are at increased risk of stillbirths. Consequently, the odds of stillbirths were 9.55 times higher among women with a previous history of adverse birth outcomes than those without; this is similar to previous studies.[24,25,29,30] This might be because a prior history of adverse birth outcomes (preterm birth, low birth weight (LBW), and history of stillbirth) places the woman at increased risk of adverse pregnancy outcomes in subsequent pregnancies and potential stillbirths. For example, preterm delivery combined with LBW or small for gestational age carries a high risk for intrapartum stillbirth, increasing the chance of death from premature complications. This finding was in line with reports from other studies in Ethiopia and Nepal.[25,29,31]

The other determinant factor for stillbirths was multiple pregnancies. Multiple pregnancies can be associated with maternal morbidities, such as preterm labor, premature rupture of membranes, and antepartum hemorrhage, leading to fetal death during the antepartum and intrapartum period.[28,31] This study results also revealed the odds of stillbirth were about seven times higher among women with multiple pregnancies than those women with a singleton pregnancy, which agrees with other study findings done on similar topics.[24,30] Monochorionic pregnancies can have a vascular anastomosis within the placenta, affecting the perfusion of each twin, resulting in increased morbidity and mortality. In addition, investigations also revealed the risk of anemia and pregnancy-related complications were raised in multiple pregnancies, more likely resulting in stillbirths.[32,33] Hence, the association between multiple pregnancies and stillbirth in this study revealed the importance of screening for multiple pregnancies as one key component of ANC to reduce the risk of stillbirths, particularly in developing countries.

We found the likelihood of stillbirths was 17% lower among women who gave birth through spontaneous vaginal

delivery than those who delivered through C/S. This study finding is in agreement with other studies conducted in different contexts.[13,34] This may be because most of the mothers delivered with C/S were referred from peripheral facilities due to complications which may increase the chance of stillbirths. This emphasizes the importance of timing and performing a C/S because an early C/S could save more lives. In addition, this showed that when performed in later stages of labor, stillbirths are more common. Nevertheless, one limitation of this study is that since it was conducted as a single facility-based study, this may limit the generalizability of the findings for other facilities.

Conclusion

In this study, the stillbirth prevalence was higher than the UN stillbirth rate recommendation of ENAP to end preventable causes of stillbirth, which recommends the stillbirth rate to be reduced below 12/1000 live births. Early complication detection among mothers with multiple pregnancies and a previous history of adverse birth outcomes play a significant role in avoiding this problem. Therefore, a concerted effort is expected from all concerned bodies to devise strategies for improved pregnancy outcomes by providing comprehensive maternal care, including referral systems, to reduce this significant public health problem.

Operational definitions

Stillbirth: any newborn delivered at 28 weeks of gestation or more with no evidence of life.[1]

History of adverse birth outcomes: if the mother had previously given birth to a preterm fetus, LBW, or if she had a previous history of stillbirth.[25,35]

Obstetric complication: if the mother encountered any of the complications related to pregnancy and childbirth during the current pregnancy/labor/delivery process.[24,36]

Fetal complications: it includes fetal distress, malpresentation, cord accidents, and so on. If the fetus had any of these complications during current pregnancy, labor/delivery process.[37]

Acknowledgements

The authors express their deepest thanks to Haramaya University research and partnership directorates for funding and supporting this study. The authors are also grateful to the study participants, data collectors, and site supervisors for their unreserved contribution. This study finding is a part of our original work submitted elsewhere as a preprint under creative commons attribution.[38]

Author contributions

T.M., A.D., T.F., and Y.D. conceived the study and involved in the study design, reviewed the article, analysis, report writing, and drafted the manuscript. All authors have read and approved the final manuscript.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

Ethical approval was obtained from the Institutional Health Research Ethics Review Committee (IHRERC) of the College of Health and Medical Sciences, Haramaya University. The ethical approval number is IHRERC/060/2017.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Informed consent

Formal letters were written to all concerned authorities and permission was secured at all levels. Informed, voluntary, written, and signed consent was obtained from each respondent after explaining the purpose and procedure of the study. In case of minor subjects/who could not read or write, informed consent was obtained from their companion (legally authorized representatives) prior to study initiation. All the basic principles of human research ethics (respect of persons, beneficence, voluntary participation, confidentiality, and justice) were respected.

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Supplemental material

Supplemental material for this article is available online.

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