MAGNITUDE AND DETERMINANTS OF STILLBIRTH IN MIZAN-TEPI TEACHING HOSPITAL, SOUTHWEST ETHIOPIA

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ABSTRACT

Introduction: Stillbirth rate is an important indicator of quality of care in pregnancy and childbirth, as well as a sensitive marker of health systems' strength. Despite, continues efforts for several decades globally, still nearly 2.6 million stillbirths occur each year. About 98% of this occurs in low and middle-income countries and three quarters in south Asia and sub-Saharan Africa. Despite its importance, up to date data on the magnitude and determinants of stillbirth are limited in Ethiopia in general and in Mizan-Tepi teaching hospital in particular. Hence, this study aimed to fill this gap.

Objective: To determine the magnitude and identify determinants of stillbirth in Mizan-Tepi teaching hospital, South west Ethiopia.

Methods: Facility-based unmatched case-control study was conducted using delivery data from January 01, 2017-December31, 2019.Stillbirths were taken as cases and live births were taken as controls. A sample of 270 (90cases and180 controls) were included in the study. The collected data were entered into EPI Data Version 3.1and exported to SPSS Version 21 for analysis. Descriptive statics was used to check distribution of stillbirth and to describe the study population in relation to each variable. Candidate variables with p value< 0.25 in bivariate logistic regression were entered into multivariate logistic regression model to identify determinants of stillbirth. After the multivariate logistic regression analysis variables having p-values <0.05 was taken as statistically significant. Odds ratio with 95% confidence interval was used to measure the existence and strength of the association.

Result: A total of 261 maternal cards were included in the analysis. The overall stillbirth rate was 44 per 1000 deliveries. The odds of not having ANC follow-up were significantly higher among cases as compared to controls (AOR=3.1; 95%CI: 1.51, 6.40). Similarly, the odds of having at least one complication during pregnancy(AOR=2.8; 95%CI: 1.38, 5.80), not using partograph for labor monitoring(AOR=4.0; 95%CI:1.88,8.47), being anemic mother (AOR=2.6; 95%CI:1.28,5.56), coming after referral from other facilities (AOR=2.3; 95%CI:1.06,5.00) and having past history of stillbirth(AOR=4.4; 95%CI:1.36,14.4) were significantly higher among cases as compared to controls.

Conclusion and recommendation: The magnitude of stillbirth in this study is found to be high. History of stillbirth, referral status, use of partograph, ANC follow-up, obstetric complication and maternal hemoglobin were found to be determinants of stillbirth. Appropriate ANC follow up, routine iron supplementation during pregnancy are recommended. In addition, proper use of Partograph for labor monitoring and timely referrals can reduce the high rate of stillbirth

Key words: stillbirth, determinants, Mizan-Tepi and Ethiopia

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Abbreviation/Acronyms

ANC: Antenatal Care

APH: Antepartum Hemorrhage

AOR: Adjusted Odd Ratio

BEMONC: Basic Emergency Obstetric and Newborn Care

CEMONC: Comprehensive Emergency Obstetric and Newborn Care

C/S: Cesarean Section

CI: Confidence Interval

DM: Diabetic Mellitus

DHS: Demographic Health Survey

EDHS: Ethiopian Demographic Health Survey

HMIS: Health Management Information System

HIV: Human Immunodeficiency Virus

JUIH: Jimma University Institute of Health

LMICs: Lower and Middle Income Countries

MPH: Masters of Public Health

OR: Odds Ratio

PROM: Pre Rupture of Membrane

SPSS: Statistical Package for Social Science

VDRL: Vernereable Disease Research Laboratory

WHO: World Health Organization

Chapter one: - Introduction

1.1 Back ground

Stillbirth is defined by world health organization (WHO) as the birth of a baby with a birth weight of ≥ 500g, ≥ 22 completed weeks of gestation, or a body length of ≥ 25 cm who died before or during labour and birth. For international comparisons, WHO recommends reporting of stillbirths with birth weight of ≥ 1000, ≥ 28 weeks gestation or a body length of ≥35 cm(1). Ethiopia uses definition of stillbirth as viability age of greater than 28 weeks(2).

Every stillbirth is a tragedy and a potential life lost. There are in addition many psycho-social consequences for parents, including anxiety, long-term depression, posttraumatic stress disorder and stigmatization(3).

Despite concentration for maternal and neonatal health, stillbirths remain as one of the main health issues worldwide. About2.6 million stillbirths occurred globally in 2015.Most of these were in low- and middle income countries (LMICs),where three quarters in south Asia and Sub-Saharan Africa(4). Ethiopia remained one of the 10 high-burden countries, with estimated stillbirth rate of 25 per 1000 births (5).

Studies in LAMIC suggests different factors for stillbirths. These includes lack of adequate access to obstetric care, inadequate care, maternal infections and complications like antepartum bleeding and pregnancy-induced hypertensive disease, poor care during labour and delivery, fetal growth restriction and congenital abnormalities and socio-demographic characteristics (age, parity, religion, residence and healthcare) are the most important risk factors, while some causal pathways remain unknown(6,4).Although studies have identified a number of risk factors for stillbirth, in both the high income and LAMIC there is very little published literature that focuses on the determinants of stillbirth in Ethiopia, particularly on determinants of stillbirth among women that gave birth in hospital.

Therefore, a clear understanding of the determinants of stillbirth in Ethiopia is vital to the success of programs aimed at reducing the burden of stillbirth. This will require a more intensive research to identify the determinants of stillbirth.

1.2 Statement of the problem

The stillbirth rate is an important indicator of quality of care in pregnancy and childbirth, as well as a sensitive marker of health systems' strength, measuring not only progress in achieving SDG targets for reduction of neonatal, maternal, and under 5 mortality, but also progress on other targets aimed at reducing poverty and increasing equity and access to health care (5).

Prevention and reduction of stillbirth is especially important with the endorsement of the Global Every Newborn Action Plan by World Health organization , which sets the global target to reach a national still birth rate of 12 or less per 1000 total births by 2030(7).

Worldwide approximately 2.7 million stillbirths occurred annually(4), making it the fifth leading global cause of death when compared with leading global causes of death in all age categories, outranking diarrhea, HIV/AIDS, tuberculosis, road traffic accidents and any form of cancer(3). The stillbirth rate for developed countries is estimated between 4.2 and 6.8 per 1000 births, whereas for the developing world, the estimate ranges from 20 to 32 per 1000 births. Two thirds of all stillbirths occur in just two regions: South- East Asia and Africa(5)

Studies confirm that the huge variation that ranges from 2 per 1000 total births in six western European countries to more than 40 per 1000 birth in Nigeria and Pakistan (8) Worldwide stillbirth rate has declined by 14%, from 22.1 stillbirths per 1000 births in 1995 to 18.9 stillbirths per 1000 births in 2009.But in the African region, there was only an annual decline of less than 1%(5).

The average annual rate of reduction for stillbirths (2.0%) has been far slower when compared to that of either maternal (3.0%) or post-neonatal mortality of children younger than 5 years (4.5%) (9).Beside this the true mortality rate is under estimated in low and middle income countries where vital registration is not available (10).

Stillbirths constitute a major part of perinatal deaths, yet they largely remain invisible (11).. However, most of the high quality epidemiological studies have been conducted in high income countries (3). leading to a worldwide 10/90 gap in health research; only 10% of the research addresses 90% of the burden(12)

Ethiopia like other sub-Saharan African countries has a high stillbirth rate. According to UNICEF report stillbirth rate was 30 per 1000 total births in 2015(13). Therefore, to reduce the

current national stillbirth rate in order to reach the global target by 2030, reduction of still birth will be critical.

Neither the Health Management Information System (HMIS) nor national surveys like DHS provide specific descriptions on the magnitude and trends of stillbirth in Ethiopia. Compounding stillbirths with early neonatal deaths further obscure the specificity in addressing the associated factors of stillbirth.

Very limited attempts have been made in Ethiopia to analyze clinical records of women who still experienced birth to determine the association between different factors against the outcome. In addition to this, very little scientific studies have been undertaken to establish evidence on factors associated to the disproportionately higher magnitude of stillbirth occurring in health facilities in Ethiopia. Factors affecting stillbirth are different in different settings because of the difference in the health care system. Up to the knowledge of principal investigator while searching different literatures, there are limited numbers of studies done related to stillbirth in our country including Mizan. Therefore in order to get a timely and representative data, further research is needed to assess and identify factors that are associated with stillbirth. Therefore, this study addressed such knowledge gaps by determining the magnitude as well as identifying the determinants of stillbirth in Mizan-Tepi teaching hospital, Mizan, Ethiopia.

Chapter two: Literature review

2.1 Magnitude of stillbirth

Approximately 98% of all stillbirths occur in low and middle-income countries (LMIC), three quarters in south Asia and sub-Saharan Africa (4).Studies confirm that the huge variation that ranges from 2 per 1000 total births in six western European countries to more than 40 per 1000 birth in Nigeria and Pakistan (8). The stillbirth rates varied greatly across geographies which ranged from 1.2 per 1000 in Iceland to 56.3 per 1000 in South Sudan(14).

Based on the results from the Global Network's Population-Based Birth Registry survey done in Zambia ,Kenya ,India ,Pakistan and Guatemala, The mean stillbirth rates of 21.3 per 1000 births for Africa, 25.3 per 1000 births for India, 56.9 per 1000 births for Pakistan and 19.9 per 1000 births for Guatemala. From 2010 to 2016.9global network) In Europe, nine countries documented stillbirth rates lower than two per 1000(15).

The study done in Brazil revealed that stillbirth rate of 14.8per 1000 total births(16).similarly the study conducted in China revealed that there is 8.8 stillbirths per 1000 total births(17).Finding from a retrospective study done in rural hospitals in Gambia shows that still birth rate of 156/1000 total births(18).

A case control study conducted in Bangladesh shows that The stillbirth rate was 26 per 1000 total births(19). Analysis of five-year HMIS data from FMOH indicated that the prevalence of stillbirth in the public health facilities across the country was above 25 per 1000 births with no clear pattern of decline from 2010 through 2015(20).

A case control study done in public health facilities in Addis Abeba revealed that there is high prevalence of stillbirth at an average rate of 28 per 1000 births during the period 2010-2015(14).

2.2. Determinants of stillbirth

2.2.1 Socio demographic determinants of stillbirth

A case control study conducted in Nepal in 2013 to determine the risk factors for stillbirth showed a significant association between stillbirth and maternal age over 35 years (21).Similarly A case control study conducted in a tertiary hospital in Papua Guinea to determine the causes and

risk factors for stillbirth showed a significant association between stillbirth with maternal age over 35 years and rural residence(22).

A case control study done in Ghana to assess determinants of stillbirths in Tamale metropolitan area shows significant association between maternal age ≤ 24 with stillbirth(23).

Finding from a case control study done in public health facilities in Addis Abeba during the period 2010-2015 revealed that there is no significant association between different maternal age groups and stillbirth during the period 2010-2015(14).

A case control study done in Zimbabwe rural residence was associated with increased risk of all stillbirth (24). Similarly the study done in Ethiopia shows that Women's place of residence was significantly associated with experiencing stillbirth. Those women residing in rural areas were found to be more likely to experience stillbirth than those in urban areas (25).

2.2.2 Obstetric factors

In low socioeconomic settings null parity and grand multiparty were significantly associated with stillbirths(26).Similarly hospital based study done in Gambia revealed that pregnancies ≥4 was associated with high stillbirth(18).

A case control study done in Ghana to assess determinants of stillbirths in Tamale metropolitan area shows that the risk of stillbirth decreased with increasing parity Grand multiparous (≥births) mothers had a similar risk of stillbirth as the nulliparous but it doesn't show significant association between parity and stillbirth (23).

Finding from a case control study to identify factor influencing stillbirth in Bangladesh revealed that women having a preterm delivery (<37 weeks) were five times more likely to deliver a stillbirth(19). A study done in Pakistan shows that preterm delivery associated with still birth(27).

A case control study in Bangladesh revealed that those women having prolonged labour and failure to progress in labour were more than twice as likely to have stillbirths(19).

A study done in India shows that there was significant association between vaginal delivery and induction of labour with stillbirth(11).

A study done in Ethiopia in 2015 to assess determinants of stillbirth shows that those women who had labor length greater than 24 h were 2.4 times more at risk to have stillbirth than labor

less than 24hrs(28).A study on determinants of stillbirths occurred in health facilities in Zamia shows that Caesarean delivery, assisted breech delivery and operative vaginal delivery are associated with stillbirth (29).

A finding from systematic review and meta-analysis reveals that women who experienced a stillbirth in an initial pregnancy experienced nearly a fivefold increase in the odds of stillbirth in a subsequent pregnancy. Even when restricting the analysis to first and second pregnancies, the risk of stillbirth in the second pregnancy was increased if the first pregnancy ended in still birth(30).

According to a case control study done in Nepal the risk of stillbirth increased for women who had a previous stillbirth(21).a study done in Babol, northern Iran revealed that history of previous stillbirth to be associated with stillbirth(31).

According to the study result from a case control study in Ghana a history of abortion and previous stillbirth were not significantly associated with stillbirth (23).

A study done in Gambia shows that half of the Gambia rural women who experienced stillbirth had no antenatal care (18).

Finding in Ethiopia revealed that utilization of antenatal care (ANC) is significantly associated with experiencing stillbirth (25).Similarly a study done in Ethiopia shows that that women who were attending ANC were 40% less likely to have still birth than those who did not attend(28).

2.2.3. Obstetric complications

A case control study done in Pakistan revealed that obstetric factors significantly associated with stillbirth were obstructed labour, hypertensive disorders and preterm labour(27).

Study in rural India shows that maternal risk factors were the most common cause of Stillbirth, Pregnancy-induced hypertension and antepartum hemorrhage are the most common cause of stillbirth(32).

According to a case control study done in Nepal antepartum hemorrhage or hypertensive disorder during pregnancy are associated with stillbirth(21).

A case control study in Ghana shows prolonged labour> 12hr is significantly associated with stillbirth (23).

Finding from a case control study revealed that the presence of antenatal risks like APH were significantly associated with stillbirth. Similarly women who have uterine rupture were an important cause of stillbirth in this study (28).

A study in Pakistan shows that obstructed labour associated with stillbirth(27) .

A study done in USA revealed that PROM regardless of fever were strongly associated with still birth(33).

A study done in the Hawassa University Hospital, Ethiopia in2012 shows antepartum hemorrhage, hypertensive disorders and obstructed labour are independent risk factors associated with stillbirths (34).

2.2.4. Maternal medical factors

A study done in USA revealed that chronic hypertension were strongly associated with still birth(33).Findings shows that approximately 52% of pregnancies in mothers with untreated or inadequately treated syphilis result in some adverse pregnancy outcome including stillbirth (35)A study done in Zambia shows that there were no significant difference in HIV positivity when postpartum women with a reported stillbirth and those without were compared(29).

A study done in Sudan revealed that anemic women had eight times higher risk of stillbirth (36).

2.2.5. Fetal factor

A study done in India revealed that congenital anomaly (66.6%) was the most common fetal factor responsible for stillbirth(32).Similarly a study done in low and middle countries revealed congenital anomaly were significantly associated with stillbirth(6).

2.2.6. Health care related factors

A case control study done in Cameroon revealed that the odds of delivering stillbirth were 14 times higher in parturient referred compared to those that came from home to the maternity Of DGH(37).in contrast a study done in Jimma revealed that there was decrement in stillbirth by 70% among those referred pregnant women from other health facility compared to those not referred(38).

A study done in Nepal revealed that not using partograph were significantly associated with stillbirth(39).

2.3. Conceptual framework of stillbirth

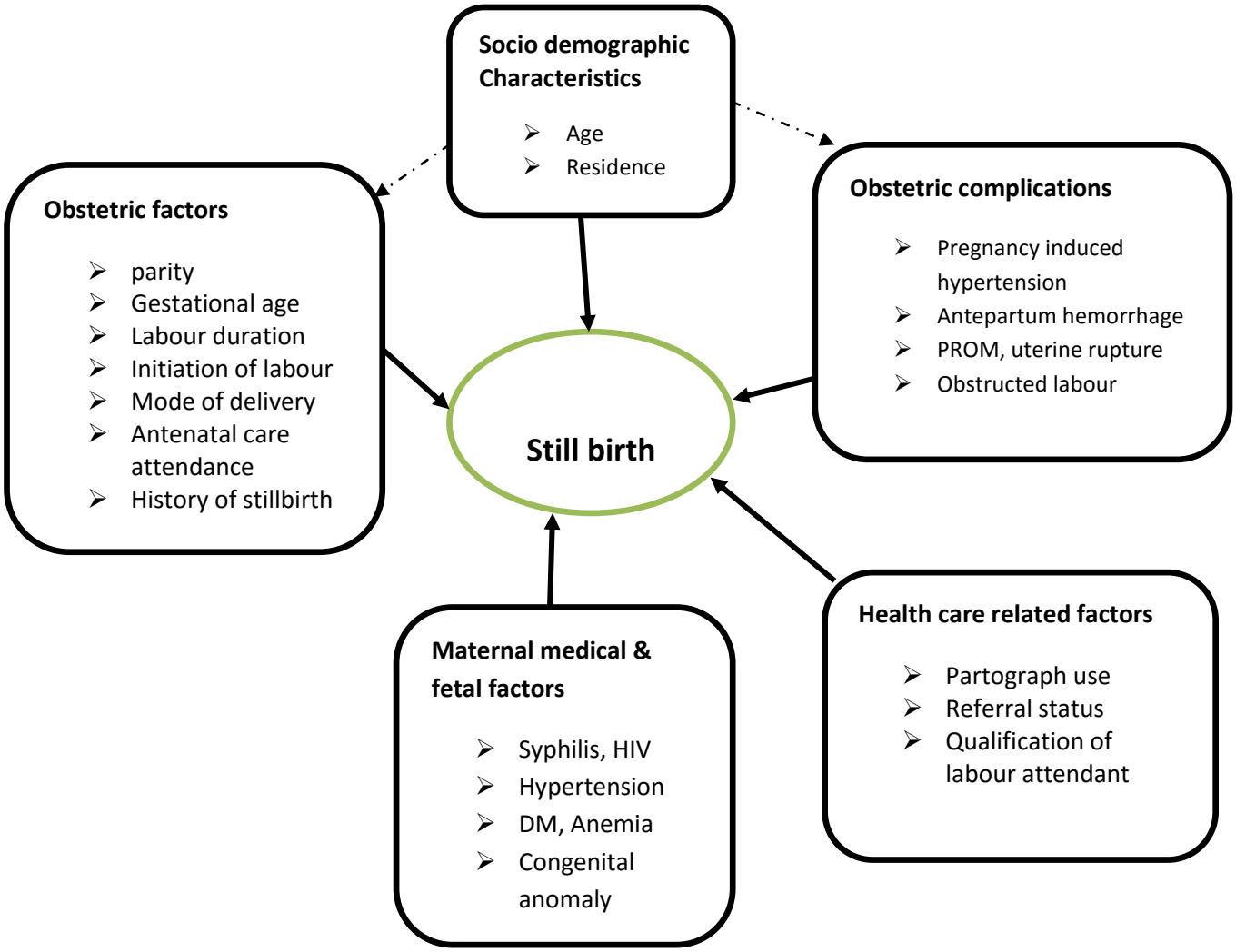

Figure1.Conceptual frame work for the determinants of stillbirth after reviewed different literature(21,23,29)

Significance of the study:

The objective of Sustainable Development Goal related to new born survival cannot be attain unless affords are made to reduce stillbirth. The findings of this study will be utilized by local, regional and national program planners to design evidence based interventions aimed at improving newborns' survival and achieving goals of the country. The study will also benefit the community by informing on factors related to stillbirth, helps to create and increase awareness on stillbirth and its associated factors and finally identify what things have to be done at community level to reduce the risk factors, to decrease stillbirth. The study will also use for researchers as a literature poll for further investigation.

Chapter Three Objective: -

3.1. General Objective

To determine the magnitude and identify the determinants of stillbirth in Mizan-Tepi teaching hospital from January01, 2017- December31, 2018

3.2. Specific objectives

- To determine the magnitude of stillbirth in Mizan-Tepi teaching hospital
- To identify determinants of stillbirth in Mizan-Tepi teaching hospital

Chapter four: -Methods and Materials

4.1. Study area and period

The study was conducted in Mizan-Tepi teaching hospital from April 01-30, 2019 by using delivery records from January 01, 2017- December 31, 2018.The hospital is found in Mizan Town, South Nations, Nationalities and People's regional State (SNNPR).Which is located at 561 kms from Addis Ababa. Mizan-Tepi teaching hospital is the only teaching and referral hospital in Bench-Maji zone and 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 gynecologist and three emergency surgeons.

4.2. Study design

For the magnitude:

- Retrospective record review of two years data

For the determinants:

- Institution based unmatched case-control study design was employed

4.3. Population

4.3.1 Source population

For objective 1: magnitude of stillbirth

- All deliveries that has been attended in mizan-tepi teaching hospital, during the period targeted by the study period January01, 2017- December31, 2018

For objective 2: determinants of stillbirth

Cases: Source population for cases were all stillbirths happening during the study period January01, 2017- December31, 2018

Controls: Source population for controls were all live births happening during the study period January01, 2017–December31, 2018

4.3.2 Study population

For the magnitude: All the two years' delivery records

Cases: The study populations for cases were all randomly selected stillbirths happening during the study period January01, 2017- December31, 2018

Controls: The study populations for controls were all randomly selected live births happening during the study period January01, 2017- December31, 2018

4.4. Inclusion and Exclusion criteria

- **Inclusion criteria for cases**

  All stillbirth deliveries attended in Mizan-Tepi teaching hospital from January2017-December 2018

Complete documentation of intrapartum care intervention available

- **Inclusion criteria for controls**
  All live births attended in Mizan-Tepi teaching hospital from January 2017- December 2018
  Complete documentation of intrapartum care intervention available
- **Exclusion criteria for 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
- **Exclusion criteria for 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

4.5. Sample size determination:

The required sample size was determined by using EPI info version 7.1.

The formula for the difference between two population proportions by considering one variable assumed to bring difference in two groups, in this study labour length ≥ 24hr is the variable used to calculate the sample size with estimated exposure among cases 43.8% and 58.2% among controls AOR of 2.4, with 80% power and 95% confidence interval and 1:2 ratios for cases to controls.

After calculating variables that are associated with stillbirth taken from the study done in Ethiopia in 2015 (28)labour length ≥ 24hr is the variable used to calculate the sample size. Therefore, after adjusted 10% non-response rate for both cases and controls the required sample size is 270labour length ≥ 24hr gives the largest sample size 270among this 90 cases and 180 controls

Table 1 sample size determination

Variables	AOR	%of controls exposed	Number of cases	Number of controls	Total sample size	Non responses (10%)	Final sample size
Labour duration (≥ 24hr(exposed)) VS< 24hr(unexposed))	2.4	58.2	82	163	245	25	270
Uterine (exposed VS unexposed)	4.9	32%	24	47	71	7	78
Antenatal risks(placenta previa, abruption placenta, other causes of APH)(yes VS no)	4.58	53.6%	32	64	96	10	106
Weight of baby(≥2.5kgVS<2.5kg)	0.27	77.6%	36	71	107	11	118

4.6. Sampling procedure and sampling technique

4.6.1. Selection of cases

All stillbirths' identification number occurred between January01, 2017- December31, 2018 were taken from delivery room registration log book and computer generated simple random sampling method was used for selection of cases.

4.6.2 Selection of controls

Controls were selected from live births. The two controls were selected from the same period registration books one before and after each case for stillbirth.

4.7. Data collection procedure

4.7.1 Data collection tool

Data were collected using structured checklist from medical records of mothers. The tools were adapted from different literatures(23,29,21).Admission history, labor follow up sheet, delivery summary and antenatal care (ANC) follow up sheet used to get information for the study variables. This includes socio demographic, obstetric, medical, fetal and health care factors. During data collection primary, daily registry log books were reviewed and selection of cases and controls were done from the registration log books then the cards of both the selected cases and controls were traced from the archive using card numbers found in the registration logbook.

Data collectors

Five data collectors who are diploma midwives and one supervisor (BSc nurse) were recruited by their experience of working in delivery room.

4.8. Study variables

4.8.1 Dependent variable

Birth status (stillbirth Vs live-birth)

4.8.2 Independent variables

Socio demographic factors

- Maternal age
- Residence

Obstetric factor

- Parity
- Mode of delivery
- previous history of stillbirth
- Gestational age
- Labour duration
- Initiation of labour
- History of abortion
- ANC follow up

Obstetric complications

- Pregnancy induced hypertension
- APH
- PROM
- Obstructed labour
- Uterine rupture

Maternal medical factors

- Syphilis
- HIV
- Chronic hypertension

- Malaria
- DM
- Anemia (Hemoglobin level)

Fetal factor

- Congenital anomaly

Health care factors

- Referral status to facility for delivery
- Partograph use
- Qualification of the person who attended delivery

4.9. Operational definition

Obstetrics complication: - if the mother has one of the any types of pregnancy related complications during pregnancy and delivery such as (pregnancy induced hypertension, antepartum hemorrhage, obstructed labour and PROM).

Stillbirth: - Based on the status outcome of the baby obtained from the card (chart) of the mother recorded as stillbirth

Live birth: - Based on the status outcome of the baby obtained from the card (chart) of the mother recorded as live birth

4.10. Data processing and analysis

Magnitude were calculated by dividing all stillbirths occurred from January01,2017to December30,2018 for total deliveries in the same year.CI was calculated by using online calculator.

The collected data were coded, checked and entered to Epi data version 3.1 and exported to SPSS version 21 and checked for missing value before analysis. Descriptive statistics was used to measure central tendency and dispersion, frequencies were used to check its distribution and describe the study population in relation to relevant variables. Bivariate logistic regression analysis was used to assess the degree of association between dependent and independent variables. Before fitting the model multicollinarity were checked. Candidate variables with p

value< 0.25 in bivariate logistic regression were entered into multivariate logistic regression model to identify determinants of stillbirth. In the multivariate logistic regression analysis variables having p-values <0.05 were taken as statistically significant. Odds ratio with 95% confidence interval was used to measure the existence and the strength of association. The adequacies of the model were checked by Hosmer and Lemeshow goodness of fit at p-value ≥0.05.

A total of 270 (90 cases and 180 controls) maternal cards were included in the study. Finally, 261(87 cases and 174 controls) were included in the analysis. The remaining was discarded due to missing information greater than40% of the variables under the study.

4.11. Data quality assurance

Careful modification of the data collection tool was made. Data collectors and supervisors were trained for 2 days. The data collection procedure was checked daily through supervision. The collected data were reviewed and checked for omissions, legibility of handwriting, completeness and consistency by principal investigator and supervisor on daily bases during data collection time. Coding and data cleaning were done. Double data entry was done in Epi data version 3.1 to validate for consistency.

4.12. Ethical consideration

Ethical clearance was obtained from the institutional review board of Jimma University Institute of Health (JUIH). Permission was obtained from Mizan Tepi teaching Hospital. Only card numbers were written on the data collection tool and the collected information's were not used for other purpose except in this study to ensure the Confidentiality of the study subjects.

4.13. Dissemination plan

The final research findings will be presented to Jimma university department of population and Family health and disseminated to the relevant stakeholders: -

- ✓ Jimma University research office
- ✓ Mizan town health office
- ✓ Other nongovernmental organizations supporting maternal and child health services and
- ✓ Efforts will be made to published on reputable journals

Chapter-Five: Results

A total of 261 (87 cases and 174 controls) maternal cards from a total of 270 were reviewed. Which make the response rate of 96.7%

5.1 Magnitude of stillbirth

During the study period there were a total of 5636 delivers. Among them, 5388werelive birth and 248 was Stillbirth, making the overall stillbirth rate of 44 per1000 births with 95%CI of (38.9-49.7).

5.2 socio-demographic characteristics

Among the respondents, 72(82.8%) of the cases and 81(46.6%) of the controls were from rural areas. The mean age of the cases was 27.1±6.63 years and that of the controls was 24.04±4.46 (Table 2).

Table 2 Socio demographic characterstics of cases and controls in Mizan Tepi teaching hospital,Ethioia,2019

Variable	Categories	Cases (n=87)	Controls (n=174)	Total (n=261)
Place of Residence	Urban	15 (17.2%)	93 (53.4%)	108(41.1%)
	Rural	72 (82.8%)	81 (46.6%)	153(58.6%)
Age	<20	9(10.3%)	18(10.3%)	27(10.3%)
	20-34	60(69.0%)	149(85.6%)	209(80.1%)
	≥35	18(20.7%)	7 (4.15%)	25(9.6%)

5.3 Obstetrics characteristics

Majority of the participants, 166(63.6%) were Para one (46.0% among cases and 72.4% among controls). In addition among the study participants 26(10.0%) had previous history of stillbirth. (20.7% among cases and 4.6% among controls), among them 22(84.6%) had one still birth history (88.9% among cases and 75% among controls).thirty (11.5%) of the participants had history of abortion (14.95%among cases and 9.8% among controls).

Among the study participants, 194(74.3%) had labour duration less than 12hrs (79.3% among cases and 71.8% among controls).Two hundred twenty three (85.4%) labour was initiated spontaneously (74.7%among cases and90.8% among controls) (Table 3)

Table3: Obstetric characteristics of cases and controls in Mizan Tepi teaching hospital, Ethiopia, 2019

Variable	Categories	Cases (n=87)	Controls (n=174)	Total (n=261)
Parity	1	40(46.0%)	126 (72.4%)	166(63.6%)
	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%)
	No	69(79.3%)	166 (95.4%)	235(90.0)
No. of stillbirth	1	16(88.9%)	6 (75.0%)	22(84.6%)
	≥2	2(11.1%)	2 (25.0%)	4(15.4%)
History of abortion	Yes	13(14.9%)	17 (9.8%)	30(11.5%)

	No	74(85.1%)	157 (90.2%)	231(88.5%)
No. of abortion	1	11(84.6%)	13 (76.5%)	24(80.0%)
	≥2	2(15.4%)	4 (23.5%)	6(20.0%)
Gestational age	28-36	31(35.6%)	16 (9.2%)	47(18.0%)
	37-42	56(64.4%)	158 (90.8%)	214(82.0%)
Labour duration	<12hr	69(79.3%)	125(71.8%)	194(74.3%)
	≥12hr	18(20.6 %)	49 (28.2%)	67(25.7%)
Initiation of labour	Spontaneous	65(74.4%)	158 (90.8%)	223(85.4%)
	Induced	22(25.3%)	16 (9.2%)	38(14.6%)
Mode of delivery	SVD	61(70.1%)	123 (70.7%)	184(70.5%)
	CS	13(14.9%)	38 (21.8%)	51(19.5%)
	Others*	13(14.9%)	13 (7.5%)	26(10.0%)
ANC follow up	Yes	26(29.9%)	130 (74.7%)	156(59.8%)
	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%)
	≥4	3(11.5%)	52 (40.05%)	55(35.3%)

Others*- assisted breech delivery, vacuum delivery, forceps delivery, destructive delivery

5.4 Obstetric complications during pregnancy and delivery

Majority of the participants, 105 (40.2%) had obstetric complication during pregnancy and delivery (66.7% among cases and 27.0% among controls). Forty-seven (18.0%) of the participants had Preterm delivery (35.6% among cases and9.2% among controls) (Table 4).

Table4: Obstetric complication of cases and controls in Mizan Tepi teaching hospital, Ethiopia, 2019

Variable	Categories	Cases (n=87)	Controls (n=174)	Total (n=261)
Obstetric complication	Yes	58 (66.7%)	47 (27.0%)	105(40.2%)
	No	29 (33.3%)	127 (73.0%)	156(59.8%)
Eclampsia	Yes	2 (2.3%)	2 (1.1%)	14(1.5%)
	No	85(97.7%)	172 (98.9%)	257(98.5%)
Preeclampsia	Yes	11 (12.6%)	10 (5.7%)	21(8.5%)

	No	76(87.4%)	164 (94.3%)	24(92.0%)
APH	Yes	9 (10.3%)	2 (1.1%)	11(4.2%)
	No	78 (89.7%)	172 (98.9%)	250(95.8%)
Polyhydraminous	Yes	4 (4.6%)	2(1.1%)	6(2.3%)
	No	83 (95.4%)	172 (98.9%)	225(97.7%)
Oligohydraminous	Yes	2 (2.3%)	7 (4.0%)	9(3.4%)
	No	85 (97.7%)	167 (96.0%)	252(96.6%)
Preterm	Yes	31 (35.6%)	16 (9.2%)	47(18.0%)
	No	56 (64.4%)	158 (90.8%)	214(82.0%)
PROM	Yes	3 (3.4%)	7 (4.0%)	10(3.8%)
	No	84 (96.4%)	167 (96.0%)	251(96.2%)
Obstructed labour	Yes	4 (4.6%)	3 (1.7%)	7(2.7%)
	No	83 (95.4%)	171 98.3%)	254(97.3%)
Uterine rupture	Yes	10 (11.5%)	2(1.1%)	12(4.6%)
	No	77 (88.5%)	172(98.3%)	249(95.4%)

5.5 Maternal medical conditions

Among the study participants 224 mothers were screened for VDRL (95.4% among cases and 92.5% among controls) were non-reactive. Majority of participants 254(97.3%) were non-reactive for HIV (97.3among cases and 97.1%among controls) (Table 5).

Table 5 Maternal medical condition of cases and controls in Mizan Tepi teaching hospital, Ethiopia, 2019

Variable	Categories	Cases (n=87)	Controls (n=174)	Total (n=261)
VDRLA	Non- reactive	83 (95.4%)	161 (92.5%)	244(93.5%)
	Not done	4 (4.6%)	13 (7.5%)	17(6.5%)
HIV	Reactive	2(2.3%)	5 (2.9%)	7(2.7%)
	Non- reactive	85 (97.7%)	169. (97.1%)	254(97.3%)

Chronic hypertension	Yes	12 (13.8%)	8 (4.6%)	20(7.7%)
	No	75 (86.2%)	166 (95.4%)	241(92.3%)
Malaria	Yes	1 (1.1%)	4 (2.3%)	5(1.9%)
	No	86 (98.9%)	170 (97.7%)	256(98.1%)
DM	Yes	2(2.3%)	2 (1.1%)	4(1.5%)
	No	85 (97.7%)	172 (98.9%)	257(98.5%)
Blood group and RH	A+	16 (18.4%)	43 (24.7%)	59(22.6%)
	A-	2 (2.3%)	6 (3.4%)	8(3.1%)
	B+	24 (27.6%)	37 (21.3%)	61(23.4%)
	B-	1 (1.1%)	3 (1.7%)	4(1.5%)
	AB+	3 (3.4%)	11 (6.3%)	14(5.4%)
	AB-	2(2.3%)	2 (1.1%)	4(1.5%)
	O+	37 (42.5%)	68 (39.1%)	105(40.2%)
	O-	2(2.3%)	4(2.3%)	6(2.3%)
Level of hemoglobin	≤ 11.5	46 (52.9%)	37 (21.3%)	83 (311.8)
	>11.5	41 (47.1%)	137 (78.7%)	178 (68.2)

5.6 New born factor

From the total delivers 13(5.0%) had congenital anomaly (11.5%among cases and 1.1%among controls).

5.7 Health care related factors

Among the study participants 62(71.3%) of cases and 53(30.5%) of controls were come from other health facility for delivery. Most of the respondents 189 (72.4%) delivery were attended by midwife. From the total respondents 16(18.4%) of cases and 102(58.6%)of controls labour were followed by partograph (Table 6).

Table6: Health care related factors of cases and controls in Mizan Tepi teaching hospital, Ethiopia, 2019

Variable	Categories	Cases (n=87)	Controls (n=174)	Total (n=261)
Referral status	Referred from another health facility	62 (71.3%)	53 (30.5%)	115(44.1%)
		25 (28.7%)	121 (69.5%)	146(55.9%)

	Came from home directly			
Qualification of birth attendant	doctor	18 (20.7%)	18 (10.3%)	36(13.8%)
	Midwife	60 (69.0%)	129 (74.1%)	189(72.4%)
	Emergency surgeon	9 (10.3%)	27 (15.5%)	36(13.8%)
Partograph use	yes	16 (18.5%)	102 (58.6%)	118(45.2%)
	No	71 (81.6%)	72 (41.4%)	143(54.8%)

5.8Determinants of stillbirth

In bivariate logistic regression, residence, maternal age, parity, history of stillbirth, history of abortion, gestational age, referral status to facility, initiation of labour, partograph use, ANC follow up, history of obstetric complication, preeclampsia and hemoglobin level were found to be significantly associated with stillbirth.

However, in the multivariate logistic regression model, history of stillbirth, referral status, partograph use, ANC follow up, history of obstetric complication and level of hemoglobin remained significantly associated with the occurrence of stillbirth.

The odds of having past history of stillbirth (AOR=4.4; 95%CI: 1.36, 14.4) were significantly higher among cases as compared to controls. Similarly, the odds of coming after referral from other facilities (AOR=2.3; 95%CI: 1.06, 5.00), not using partograph for labor monitoring (AOR=4.0; 95%CI: 1.88, 8.47), not having ANC follow-up (AOR=3.1; 95%CI: 1.51, 6.40), having at least one complication during pregnancy and delivery (AOR=2.8; 95%CI: 1.38, 5.80) and being anemic mother (AOR=2.6; 95%CI:1.28,5.56) were significantly higher among cases as compared to controls(Table 7).

Table7: The association between different factors and stillbirth in Mizan Tepi teaching hospital, 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	

*-P value <0.05

Chapter six: Discussion

The still birth rate in this study 44 per 1000 total birth, which was higher than a case control study conducted in Bangladesh 26 per 1000 birth(19).It is also higher than a case control study done in public health facilities in Addis Ababa (28 per 1000 births) during the period 2010-2015(14).This may be due to the reason that the current study is done only at referral hospital, where most risky mothers came by referral and gave birth in the hospital. However, it was lower than the study done in Gambia hospital (156 per 1000births)(18).This difference may be in part due to difference in health care quality and labour management.

In this study, the odds of having past history of stillbirth were four times at higher among cases than controls. This is in line with to a study done in Nepal (21) and Iran(31).This suggests the need for close follow up in subsequent pregnancies if the woman has a history of stillbirth as the odds of repeating are higher after one stillbirth.

According to the finding of this study, odds of coming referral from other health facility for delivery were two times higher among cases than controls. This is consistent with a study done in Cameron(37).This could be explained by delayed referral, long distance, poor condition of transportation, poor communication, lack of specialties and lack of comprehensive package to provide comprehensive emergency obstetric and neonatal care (EMOC).But the study done in Jimma specialized hospital showed a decrement in still birth by 70% among those referred

pregnant women from other health facility compared to those not referred(38).This discrepancy might be due to the difference of study setting and the number of the study population.

Based on the finding of this study, odds of not using partograph for labour monitoring were four times higher among cases than controls. This finding is in agreement with a study done in Nepal showed that not using of partograph during labour following were significant factor for stillbirth(39).This could be explained by appropriate use of partograph can help health professionals to pick any abnormalities during the course of labour and to take appropriate action.

This research finding shows that, odds of not having ANC follow-up were three times higher among cases than controls. This study is in line with a study done in Gambia(18) and Ethiopia(28) showed that women who had not ANC follow up were at higher risk of still birth when compared to their counterpart. This could be explained by that antenatal care provide high opportunity to identify high risk pregnancies for early and proper action of any danger signs.

The Odds of having obstetric complication during pregnancy and delivery were 3 times among cases than controls, this study is similar with the study done in Pakistan(27) and India (32)showed that obstetric complication were significantly associated with stillbirth. This is because at least having one obstetrics complication was mainly seen on stillbirth.

This study also identified that, Odds of being anemic mother were three times higher among cases than controls. This is in line with the study done in Sudan(36)showed that anemic women had an eight times higher risk for stillbirth. This can be explained by the fact that anemia can result an increase in maternal morbidity and poor pregnancy outcome including stillbirth.

Strength

The type of study design used is strong to see an association of exposure towards the outcome variable and better study design to look multiple exposures for stillbirth.

Stillbirth is assumed to be a rare event and most researchers usually do not address such rare cases. But, this study tried to address it.

Limitation

The study is institutional based and conducted on one hospital only that can't be generalized for the stillbirths occurred at community level.

It used patient records (secondary data); as a result, some variables might have been missed, e.g. socio-economy.

Conclusion

The magnitude of stillbirth in this study is found to be high. History of stillbirth, coming after referral from other health facility, non-use of partograph, not having ANC follow-up, having obstetric complication and maternal hemoglobin were found to be determinants of stillbirth.

Recommendations

Based on the findings, the following recommendations are forwarded to responsible bodies:

Bench-Maji zone health office

- The zonal health office should be able to educate health facilities on its proper usage and implementation of referral system.
- Zonal health office should create awareness of the community about the use of ANC follow up during pregnancy.

Facility level

- Health facilities should refer on time and use appropriate means available
- Health care providers should give special attention for early recognition and management of obstetric complications during ANC and labour follow up. They should use partograph regularly and appropriately while following labour.
- Health care provider should perform routine investigations; iron supplementation and management of pregnant women during ANC follow up.

Researchers

- Large scale, facility and community based longitudinal study would be helpful to see the actual magnitude of stillbirth and to get other unmeasured risk factors.

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Annex

Magnitude and determinants of stillbirth in Mizan-Tepi teaching hospital

Questionnaire number----------

Card number----------

Date of completion of form----------

Name and signature of data collector----------

Name and signature of supervisor----------

- ✓ Status of the chart 1. Stillbirth (case)

2. Live birth (control)

Check list for stillbirth

Section one: Socio demographic characteristics

Q.NO	Question	Answer	Skip
101	Residence	1. Urban 2. Rural	
102	Age of mother(in years)	_____in years	

Section: Two Obstetric factors

Q.NO	Question	Answer	Skip
201	Parity	_____ in number	
202	Did mother hadPrevious history of stillbirth	1. Yes 2. No	If no skip to Q.no

			204
203	If yes for Q.no 202 how many times	_____in number	
204	Did the mother had history of abortion	1. Yes 2. No	If no skip to Q.no 206
205	If yes for Q.no 204 how many times	_____in number	
206	Gestational age at delivery (in weeks)	_____in weeks	
207	Labour duration(time between delivery and admission)	_____in hr	
208	How did labour start	1. Spontaneous 2. Induced	
209	Mode of delivery	1. Spontaneous vaginal delivery 2. Cesarean section 3. Forceps delivery 4. Vacuum delivery 5. Assisted breech delivery 6. Destructive delivery 7. Hysterectomy	
210	ANC follow up	1. yes 2. No	If no skip to Q.no 213
211	If yes for Q.no 212 how	1. One times	

	many times	2. Two times 3. Three times 4. Four times 5. Greater than four times	

Section Three: Obstetric complications

Q.no	Question	Answer	Skip
301	Does the mother have any obstetric complication during pregnancy and delivery)	1. yes 2. No	If no skip to Q.no303
302	If yes for Q.no what is the complication	1. Eclampsia 2. Preeclampsia 3. Gestational DM 4. Ante partum hemorrhage 5. Polyhydraminous 6. Oligohydraminous 7. Preterm labour 8. Premature rupture of membrane 9. Post term 10. Obstructed labour 11. Uterine rupture 12. Other, specify_____	

Section four: Maternal medical factors

Q.no	Question	Answer	skip
401	VDRL status	1. Reactive	If non

		2. Non reactive 3. Not done	reactive and note done skip to Q.no 403
402	If reactive for Q.no 401 did treatment given for VDRL	1. Yes 2. No	
403	Sero status for HIV	1. Reactive 2. Non reactive 3. Not done	If non reactive and not done skip to Q.no405
404	Did treatment given for HIV infection	1. Yes 2. No	
405	Does the mother have chronichypertension	1. Yes 2. No	If no skip to Q.no 407
406	If yes for Q.no 404does the mother gets treatment	1. Yes 2. No	
407	Does the mother had malaria during pregnancy	1. Yes 2. No	If no skip to Q.no409
408	If yes for Q.no 407does the mother gets treatment	1. yes 2. No	
409	Does the mother have DM	1. yes 2. No	
410	Blood group & Rh factor of the mother	1. Positive 2. Negative	
411	Hg level	_____	

Section five: Fetal factor

Q.no	Question	Answer	Skip
501	Does the new born baby have congenital anomaly	1. Yes 2. No	
506	Does the stillbirth multiple pregnancy	1. Yes 2. No	

Section six: health care related factor

601	Referral status to facility for delivery	1. Referred 2. From home	
602	Partograph use	3. Yes 4. No	
603	Qualification of the person who attended the delivery	1. Gynecologist 2. Doctor(GP) 3. Nurse 4. Midwife 5. Health officer 6. Emergency surgeon	