Perinatal Mortality and Associated Risk Factors among Singleton Babies in Unguja Island, Zanzibar

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Abstract

Background: Perinatal mortality is a major public health problem, particularly in developing countries where three quarters of neonatal deaths happen in the first week of life. Therefore, it is crucial to understand factors associated with perinatal mortality in order to design strategies and interventions that will improve newborn outcomes. **Methods:** A prospective cohort study was carried out, whereby pregnant women with gestational age ≥ 28 weeks were enrolled. Interviews were conducted during antenatal booking using structured questionnaire. Follow-up visits were made within 48 hours after delivery and on seventh day post delivery. **Results:** A total of 959 pregnant women were enrolled; 38 were lost to follow-up prior delivery. The remaining 921 participants, resulting in PMR of 45.5 per 1000 births. Over half of the deaths were stillbirths (SBR 29.6 per 1000 births) and early neonatal deaths (ENMR 16.8 per 1000 live births). Using Generalized Linear Model (GLM), risk factors associated with perinatal mortality included: maternal age ≥ 35 years (ARR 3.0, 95% CI: 1.0 to 9.0), nulliparous women (ARR 4.2, 95% CI: 1.6 to 11.1), assisted vaginal delivery (ARR 5.1, 95% CI: 1.4 to 19.0), home delivery (ARR 3.3, 95% CI: 1.6 to 6.6), previous newborn death (ARR 4.0, 95% CI: 1.5 to 10.1), pregnancy-induced hypertension (ARR 4.8, 95% CI: 2.4 to 9.4), herbal use during labour (ARR 2.4, 95% CI: 1.2 to 5.1) and newborn asphyxia (ARR 5.9, 95% CI: 1.3 to 26.5). **Conclusions:** Perinatal mortality was found to be high in Zanzibar. Healthcare providers should pay special attention to women with pregnancy-induced hypertension and nulliparous women throughout

pregnancy and delivery. However, home delivery and use of herbs during labour should be discouraged.

Keywords

Perinatal Mortality, Stillbirth, Early Neonatal Death

1. Introduction

Perinatal mortality remains a major public health problem, particularly in developing countries. Globally, neonatal survival remains an urgent concern. It is unacceptable that about 16,000 children should still die every single day, which is equivalent to 11 deaths occurring every minute [1].

The first day and week are most critical for the survival of newborns. In 2013, almost 1 million newborns (36%) died on the day they were born, another 1 million (37%) died within the next six days of birth, and 27% of deaths occurred between Day 7 and Day 27 of life [2].

Child survival must remain at the heart of the post-2015 SDG agenda [1]. Tanzania is one among 63 countries which needs to accelerate progress to reach the SDG target of a neonatal mortality rate of 12 deaths per 1000 live births, by 2030 [1]; hence, the challenge of meeting this SDG target calls for more concerted efforts than ever before.

Tanzania is one of the ten countries contributing to the 66% of global neonatal deaths and 61% of global maternal deaths [3]. It is estimated that more than 1.6 million babies are born every year, and of these, while 51,000 die within the first month of life and 140 die each day, most from preventable causes. The perinatal mortality rate is higher in Tanzania Island (Zanzibar) than in Tanzania Mainland (49 deaths versus 39 deaths per 1000 live births, respectively) [4]. To compare the rate of neonatal and prenatal mortality between Tanzania and global statistics is very important. This will allow countries to review their achievements in the area of maternal and neonatal health and compare their results with those obtained by other countries. Also, it is crucial for countries to know the magnitude of neonatal and prenatal mortality in order to assess needs and develop programmes that will reduce avoidable child deaths more quickly.

The awareness situation in Zanzibar is similar to many other developing countries where little is known about perinatal mortality and its associated risk factors. A recent study conducted in Zanzibar reported perinatal mortality rate of 27 per 1000 live births [5].

Zanzibar has made specific attempts to address maternal and newborn health challenges through the adoption of the Safe Motherhood Initiative, which aims to reduce maternal, neonatal and child deaths. Despite such efforts, maternal and newborn mortality remain a leading public health problem [6]. This study aimed to address perinatal mortality in Zanzibar and to determine the associated risk factors which will help in designing the appropriate interventions that could

be implemented to improve the survival of the newborn.

2. Methods

2.1. Study Design

A prospective cohort study to determine the perinatal mortality outcome was carried out in four out of the six districts in Unguja, from October 2014 to March 2015, in 16 randomly selected health facilities.

2.2. Study Setting

The semi-autonomous Islands of Zanzibar are located 40 kilometres east of Mainland Tanzania, in the Indian Ocean. Unguja Island is one of the two Islands in Zanzibar, the other being Pemba. Unguja Island has a total of six districts with a population of 896,721, mostly concentrated in the Urban-West districts [7]. The Gross Domestic Product (GDP) of the Revolution Government of Zanzibar, Tanzania has spent a total of 5.3% as a contribution to health care system; however the allocated amount of funds is below compared to Abuja Declaration of 15%. This resulted in weakening the health delivery system across all services in Zanzibar, Island including maternal, newborn and child health service delivery.

#### Selection of Study Sites and Health Facilities

Four districts were randomly selected for this study (North A, North B, West and Urban districts), which covered more than 50% of the population with urban and rural representation. Within each district, a random selection of health facilities was done; and eventually a total of sixteen of such facilities were selected all offering maternal and newborn health services.

2.3. Study Population

The study included pregnant women with gestational age ≥ 28 weeks, attending antenatal care in the selected health facilities and those who consented to participate during the study period. Women who were eligible and enrolled for the study were those who agreed to deliver in Unguja Island and be followed-up for the entire study period. Women who were aged below 18 years and those who planned to deliver outside Unguja Island, Zanzibar were excluded in the study. Nine hundred and fifty nine (959) pregnant women were included, out of whom 921 (96.0%) were followed-up until delivery, and 835 (87.07%) were followed-up until seven days after delivery (Figure 1). Women were followed up for pregnancy outcome and survival of their newborns at 48 hours and at 7th day after delivery.

2.4. Pre-Testing and Validation of Questionnaires

The research team organised a meeting and invited different stakeholders from Maternal, Newborn and Child Health (MNCH) services to share and discuss the questionnaires in Kiswahili. Comments and input received, which were based on
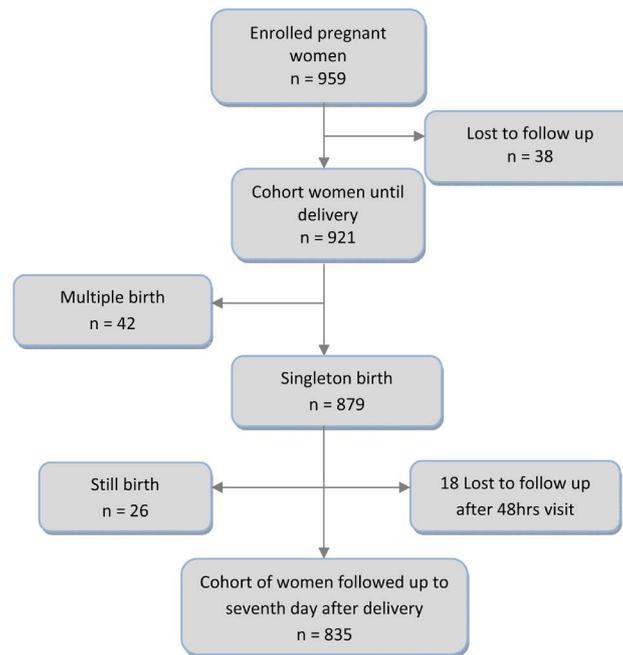
Figure 1. The characteristics and number of the study participants.

the existing practical situation at the MNCH services, were incorporated in the questionnaire which was later restructured to suit the local context. The English version of the questionnaire was also revised to capture the same content.

Secondly, pre-testing of the questionnaire was done to determine the validity and reliability of the responses. Pre-testing was conducted in four health facilities which were later dropped from the actual study. A total of twelve participants were involved for pretesting; each facility selected three respondents. The health facilities with high ANC and delivery services were selected purposively for piloting. After making the necessary corrections to the questionnaire, it was sent to the study sites.

2.5. Data Collection Tools

The study was conducted using a structured questionnaire, divided into three parts meant to collect information relating to three periods: Antenatal/ Pregnancy period (part one), Labour and Delivery (part two), and Postnatal period (part three). Part one was to collect information based on antenatal booking: previous and current pregnancy history, results of routine tests and examinations. It also included questions on demographic characteristics, social-cultural characteristics, maternal health status and social-economic characteristics. Part two collected information related to labour and delivery of the current pregnancy: onset of labour, type of delivery and delivery outcome. It also includes questions on obstetrical and gynaecological history, labour details, pregnancy outcomes and possible risk factors (maternal and newborn) for perinatal death. Part three collected information about the mother's and newborn's health status and care on the seventh day after delivery.

2.6 Data Collection Methods

Before data collection started, the principal investigator conducted a three-day training for the selected research assistants from all health facilities involved in the study. The main focus of the training was to brief the assistants on the study, its objectives, the work schedule and logistics, research ethics and administrative issues. From each health facility one nursing officer experienced in doing research was recruited as a research assistant for the study and one research supervisor for each district.

Study participants were interviewed using three different questionnaires with structured questions, and which targeted different periods of reproduction. The first round of interviews took place during antenatal booking, the second round took place within 48 hours after delivery, and the last round was conducted on the 7th day after delivery. The questionnaire administered at 48 hours and 7th day included mostly the health conditions of the newborn, and on subsequent follow up. Study participants were followed-up throughout the pregnancy to the seventh day after delivery, to observe the outcome of the pregnancy. Figure 1 shows the characteristics and number of the study participants.

2.7. Recruitment of Study Participants

Sample size of the study was estimated by using EpiTools Epidemiological Calculators. Assuming relative risk of two with expected incidence rate of 27 deaths per 1000 births [5] at 95% CI and power of 80%, the minimum sample size was 833 women. The study also assumed 10% attrition rate, hence the enrolment of 959 women.

First Interview: Data Collection during Antenatal Booking

Women recruited at the antenatal clinic with a gestational age from ≥28 weeks, were identified and recruited from the normal ANC system by using the same procedures used in these clinics to estimate the gestational age, using the last normal menstrual period (LNMP). The gestational age was calculated in weeks, based on the mentioned LNMP; however, a tape measure was also used to measure the fundal height by securing the tape measure at the fundus with one hand and then measuring from the top of the fundus to the top of the symphysis pubis. The finding was confirmed in line with the gestational age. All registered women were given an ID number and an open file. Data collection started when the study participant signed the consent form to participate in the study. Participants were asked to give their contact details such as phone number and physical address for better communication and follow-up during and after delivery. Information gathered during first round of interviews included maternal age, residence, pregnancy and delivery history (gravidity, parity, antenatal care, gestational age, fetal presentation, mode of previous delivery and obstetric and medical complications).

Second Interview: Data Collection within 48 Hours after Delivery

Research assistants traced the study participants through mobile phones and

followed them up within 48 hours after delivery, regardless of where delivery took place—whether in a hospital or at home—based on the contact information given during recruitment. Each study participant was contacted three times throughout the study period: on the 32nd week of the gestational age, during the documented expected date of delivery, and on the seventh day after delivery. However, a participant was required to call anytime she had a problem. Information gathered within 48 hours after delivery included labour and delivery information data was also extracted from the delivery notes using a structured questionnaire. Information on the newborn, including birth outcome, condition of the newborn, sex, weight and Apgar score were registered.

Third Interview: Data Collection on the Seventh Day after Delivery

Seventh day follow up mother and live baby at their home on the seventh day after delivery, to complete the information required on maternal and newborn health condition, including child status during early neonatal period; health baby, neonatal illness and early neonatal deaths.

2.8. Statistical Analysis

Data was analysed using SPSS 15.0 software. Categorical data was summarized using frequency, tables and percentages. Continuous variables were summarised using mode and mean. Descriptive analysis, frequencies, percentages and rates were calculated. Generalized Linear Model (GLM) was used for assessment of risk factors where univariate analysis was done. All factors with P value less than 0.05 in univariate analysis were considered for multivariable analysis in different steps to assess factors which remained as predictors of perinatal mortality. All categories with the lowest risk were used as a reference group in multivariable analysis. GLM was used so as to estimate directly the risk factors instead of odds ratio. 95% confidence intervals (CIs) were estimated in models to determine the association between perinatal mortality and number of explanatory variables. A P value of less than <0.05 was considered statistically significant.

2.9. Ethical Considerations

The study was approved by the Kilimanjaro Christian Medical University College Research and Ethical Review Committee (CRERC) with a certificate number 677. Permission to conduct the study was also obtained from the Zanzibar Research Council. A written informed consent was obtained from each study participant confirming willingness to participate in the study.

3. Results

3.1. Characteristics of Study Participants

A total of 959 pregnant women were enrolled in the study; the mean (±SD) age was 29 ± 6 years ranging from 15 to 48 years. Half of the population was old or younger than 27 years. The majority (932) 97.2% of the participants were Muslim, with the following characteristics: married (915) 95.4%, resident in urban

area (788) 82.2%, without formal employment (633) 66.8%, and with secondary school or higher education (640) 66.7%.

Of the enrolled women, 921 (96.0%) were followed up through delivery (Figure 1). Of these, 95.4% delivered singleton babies, while those with multiple births (4.6%) were excluded from the study. Of the 879 singleton births, 97% were alive at 48 hours, and 3% were stillborn. In the 7th day follow up period after delivery, eighteen women could not be followed up, leaving a cohort of 835 (95% of singleton births) and 14 early neonatal deaths, leaving 98.3% live infants.

3.2. Perinatal Mortality Estimation

From 879 singleton births, 40 perinatal deaths (26 stillbirths, 14 early neonatal deaths) occurred resulting in a perinatal mortality rate of 45.5 per 1000 births of which stillbirth rate (SBR) was 29.6 per 1000 births and early neonatal mortality rate (ENMR) was 16.8 per 1000 live births.

3.3. Risk Factors Associated with Perinatal Mortality

Socio-Demographic Characteristics of Women

Maternal age below 20 years had a threefold increase risk for perinatal mortality compared to those aged 20 - 34 years (RR 2.9, 95% CI: 1.0 to 8.0); however, after adjustment, the risk was not significant (Table 1). In multivariable analysis, perinatal mortality was 3 times higher in women ≥ 35 years compared to 20 - 34 year old groups (ARR 3.0, 95% CI: 1.0 to 9.0). Perinatal mortality was highest for mothers with no formal education (ARR 3.2, 95% CI: 1.1 to 9.3) followed by mothers with primary education (ARR 2.3, 95% CI: 1.0 to 5.3). Women with partners without formal education were at increased risk in unadjusted analysis (RR 3.7, 95% CI: 1.7 to 8.4), but after adjustment, the risk was not significant. Other risk factors include nullipara women (ARR 4.2, 95% CI: 1.6 to 11.1) and grand multipara women (RR 3.4, 95% CI: 1.4 to 8.3), but after adjustment, the risk was not significant, residing in Urban district (ARR 3.2, 95% CI: 1.6 to 6.6), and North A district (ARR 2.6, 95% CI: 1.1 to 6.3). The associations between socio-demographic and perinatal mortality are presented in Table 1.

Pregnancy Factors

In univariate analysis, women who had registered for antenatal booking at the third trimester had increased risk of perinatal death (RR 2.8, 95% CI: 1.1 to 7.1), but after adjustment, the risk was not significant. Using multivariable analysis women who attended antenatal clinic less than four times (ARR 5.2, 95% CI: 2.4 to 11.0) had increased risk of their babies dying during the perinatal period. Also maternal conditions such as pregnancy induced hypertension (ARR 4.8, 95% CI: 2.4 to 9.4) and previous newborn death (ARR 4.0, 95% CI: 1.5 to 10.1) were associated with perinatal mortality. The associations between pregnancy and maternal conditions and perinatal mortality are presented in Table 2.

Labour and Delivery Factors

In multivariable analysis, women who delivered at home were more likely to experience perinatal mortality compared to those who delivered at a health facility

Table 1. Socio-demographic and perinatal mortality among singletons (N = 879).

Risk Factor	Total	Perinatal Death n (%)	RR (95% CI)	ARR (95% CI)[#]
Maternal age				
<20 years	43	4 (9.3)	2.9 (1.0 - 8.0)	1.3 (0.4 - 3.8)
20 - 34 years	652	21 (3.2)	1.0	1.0
≥35 years	166	15 (9.0)	2.8 (1.5 - 5.3)	3.0 (1.0 - 9.0)
Maternal education				
No formal education	67	9 (13.4)	4.7 (2.2 - 10.1)	3.2 (1.1 - 9.3)
Primary education	200	14 (7.0)	2.4 (1.2 - 4.9)	2.3 (1.0 - 5.3)
Secondary & above	594	17 (2.9)	1.0	1.0
Partner education				
No formal education	57	7 (12.3)	3.7 (1.7 - 8.4)	1.8 (0.6 - 5.3)
Primary education	168	12 (7.1)	2.2 (1.1 - 4.3)	1.4 (0.6 - 3.2)
Secondary & above	636	21 (3.3)	1.0	1.0
Parity				
Nullipara (0)	216	15 (6.9)	2.6 (1.2 - 5.9)	4.2 (1.6 - 11.1)
Primapara (1)	198	6 (3.0)	1.1 (0.4 - 3.2)	1.8 (0.6 - 5.2)
Multipara (2 - 4)	338	9 (2.7)	1.0	1.0
Grandmultipara (5+)	109	10 (9.2)	3.4 (1.4 - 8.3)	1.2 (0.4 - 3.6)
District of residence				
West district	525	13 (2.5)	1.0	1.0
Urban district	183	14 (7.7)	3.1 (1.5 - 6.4)	3.2 (1.6 - 6.6)
North A district	80	10 (12.5)	5.0 (2.3 - 11.1)	2.6 (1.1 - 6.3)
North B district	73	3 (4.1)	1.7 (0.5 - 5.7)	1.5 (0.4 - 5.6)

[#]ARR has been adjusted to maternal age, maternal education, partner education, parity and maternal residence. ARR = Adjusted RR; CI = Confidence Interval; RR = Relative Risk.

Table 2. Pregnancy and maternal conditions associated with perinatal mortality among singletons (N = 879*).

Factor	Total	Perinatal death n (%)	RR (95% CI)	ARR (95% CI)[#]
Time for ANC booking				
1st trimester	208	8 (3.8)	1.0	1.0
2nd trimester	578	24 (4.2)	1.1 (0.5 - 2.4)	1.8 (0.2 - 13.1)
3rd trimester	75	8 (10.7)	2.8 (1.1 - 7.1)	7.0 (0.7 - 67.5)
Attended prenatal care				
>4 times	637	26 (4.1)	1.0	1.0
<4 times	140	14 (10.0)	2.5 (1.3 - 4.6)	5.2 (2.4 - 11.0)

Continued

Previous abortion				
Yes	188	14 (7.4)	2.7 (1.3 - 5.7)	1.6 (0.6 - 4.7)
No	477	13 (2.7)	1.0	1.0
Previous newborn death				
Yes	101	10 (9.9)	4.6 (2.0 - 10.5)	4.0 (1.5 - 10.1)
No	508	11 (2.2)	1.0	1.0
Gestational diabetes				
Yes	23	4 (17.4)	3.8 (1.5 - 9.9)	1.7 (0.6 - 5.1)
No	794	36 (4.5)	1.0	1.0
Pregnancy induced hypertension (PIH)				
Yes	50	8 (16.0)	4.0 (1.9 - 8.1)	4.8 (2.4 - 9.4)
No	790	32 (4.1)	1.0	1.0
Pre-eclampsia				
Yes	30	4 (13.3)	3.0 (1.1 - 7.8)	4.2 (0.6 - 30.0)
No	802	36 (4.5)	1.0	1.0
Use of iron tablet				
Yes	407	12 (2.9)	1.0	1.0
No	454	28 (6.2)	2.1 (1.1 - 4.1)	0.8 (0.0 - 15.2)
Use of folic acid tablet				
Yes	395	10 (2.5)	1.0	1.0
No	466	30 (6.4)	2.5 (1.3 - 5.1)	1.9 (0.1 - 38.7)

[#]ARR has been adjusted to time for ANC booking, attendance of prenatal care, previous abortion, previous newborn death, gestation diabetes, PIH, pre-eclampsia, use of iron tablets and use of folic tablets. ARR = Adjusted RR; CI = Confidence Interval; RR = Relative Risk. *Not all participants had all categories information available in each variable so the total in some variables may not make to 879.

(ARR 3.3, 95% CI: 1.6 to 6.6). Again, perinatal mortality was highest in mothers who had assisted deliveries by instruments compared to mothers delivering spontaneously (ARR 5.1, 95% CI: 1.4 to 19.0). Women who used herbs during labour were almost three times at risk for perinatal mortality (ARR 2.4, 95% CI: 1.2 to 5.1). The associations between labour and delivery factors and perinatal mortality are presented in Table 3.

Newborn Factors

Using multivariable analysis, newborn factors associated with perinatal mortality included neonatal asphyxia (ARR 5.9, 95% CI: 1.3 to 26.5). In univariate analysis, low birth weight (RR 2.5; 95% CI 1.1 to 6.0), and unable to breast-feed after delivery (RR 3.2, 95% CI: 1.0 to 9.9). However, in adjusted analysis inability to breast feed and low birth weight were not significant; instead, high birth weight (ARR 3.1, 95% CI: 1.0 to 9.2) was associated with perinatal death in adjusted analysis. The associations between newborn factors and perinatal mortality are presented in Table 4.

Table 3. Labour and delivery factors associated with perinatal mortality among singletons (N = 879*).

Factor	Total	Perinatal Death n (%)	RR (95% CI)	ARR (95% CI)#
Place of delivery				
Hospital	727	27 (3.7)	1.0	1.0
Home	134	13 (9.7)	2.6 (1.4 - 4.9)	3.3 (1.6 - 6.6)
Mode of delivery				
Vaginal	759	30 (4.0)	1.0	1.0
Caesarean section	72	7 (9.7)	2.5 (1.1 - 5.4)	5.1 (0.5 - 46.9)
Assisted vaginal	20	3 (15.0)	3.8 (1.3 - 11.4)	5.1 (1.4 - 19.0)
Birth attendant				
Nurse midwife	639	19 (3.0)	1.0	1.0
Physician	80	8 (10.0)	0.3 (0.1 - 0.7)	0.4 (0.0 - 4.5)
Traditional birth attendant (TBA)	134	13 (9.7)	1.0 (0.4 - 2.2)	1.0 (0.0 - 0.0)
Obstructed labour				
Yes	37	6 (16.2)	3.7 (1.7 - 8.2)	2.6 (0.6 - 10.3)
No	775	34 (4.4)	1.0	1.0
Use of herbs in labour				
Yes	61	8 (13.1)	3.1 (1.5 - 6.4)	2.4 (1.2 - 5.1)
No	756	32 (4.2)	1.0	1.0

#ARR has been adjusted to place of delivery, mode of delivery, birth attendant, obstructed labour and herbal use during labour. ARR = Adjusted RR; CI = Confidence Interval; RR = Relative Risk. *Not all participants had all categories information available in each variable so the total in some variables may not make to 879.

Table 4. Newborn factors associated with perinatal mortality among singletons (N = 835*).

Factor	Total	Perinatal Death n (%)	RR (95% CI)	ARR (95% CI)#
Sex				
Female	402	16 (4.0)	1.0	1.0
Male	459	24 (5.2)	1.3 (0.7 - 2.4)	1.4 (0.4 - 4.9)
Weight of newborn				
Normal	608	22 (3.6)	1.0	1.0
Small	66	6 (9.1)	2.5 (1.1 - 6.0)	0.6 (0.1 - 4.1)
Large	73	6 (8.2)	2.3 (0.1 - 5.4)	3.1 (1.0 - 9.2)
Newborn asphyxia				
Yes	49	9 (18.4)	4.3 (2.2 - 8.4)	5.9 (1.3 - 26.5)
No	720	31 (4.3)	1.0	1.0
Able to breastfeed				
Yes	536	10 (1.9)	1.0	1.0
No	67	4 (6.0)	3.2 (1.0 - 9.9)	2.2 (0.6 - 8.8)

#ARR has been adjusted to size of newborn, neonatal asphyxia and newborn ability to breast feeding after delivery. ARR = Adjusted RR; CI = Confidence Interval; RR = Relative Risk. *Singletons babies follow up to 7 days of life.

4. Discussion

4.1. Perinatal Mortality Estimation

This study aimed at estimating perinatal death in Zanzibar and associated risk factors. The PMR found was high (45.5 per 1000 births), compared to a recent study done in Zanzibar by Lund *et al.* which reported a perinatal mortality rate (PMR) of 27 per 1000 births [5]. However, in comparing the results of this study to similar prospective studies in North-eastern Tanzania, our findings show that PMR was lower compared to 52 per 1000 births [8], and 57.7 per 1000 births [9]. The lower PMR reported by Lund *et al.* might be due to the intervention done using SMS mobile in following mothers during pregnancy and neonatal care period. The high PMR by Mmbaga *et al.* might be due to the fact that the hospital is a tertiary care hospital with high referral cases referred due to complications; this was also indicated by their study having twice PMR in referred cases [9].

In this study, high rates of stillbirth were found, accounting for almost two thirds of perinatal deaths and this was similar to a study conducted at Kilimanjaro Christian Medical Centre (KCMC) [9] and in Tanga Region, Tanzania by Schmiegelow in which stillbirth was almost half of perinatal deaths [8]; the different in a former study might be due to the close follow-up and care given to pregnant women during the study period in Tanga. In this study, we observed a marked variation in perinatal mortality between districts, ranging from 24.8 per 1000 births in the West District to 125 per 1000 births in North A District. Differences might be due to the low socio-economic and education status, higher parity and preference of home delivery of study participants in North A District. These findings have important implications for maternal and newborn stakeholders and policy makers in the reduction of perinatal mortality in Zanzibar.

4.2. Maternal Age

Maternal young age was a significant factor for perinatal mortality but the risk decreased after adjustment; however, for advanced maternal age the risk remained throughout all steps of adjustment. Mothers of both age extremes of reproductive age carry greater risks for adverse pregnancy outcomes compared with those between 20 and 34 years. Advanced maternal age ≥ 35 is well known to increase the risk for perinatal complications and adverse pregnancy outcomes, compared to younger women; however, teenage deliveries also carry risk for perinatal death [10] [11] [12]. Similar to our findings, a study at Muhimbili National Hospital found that advanced maternal age was associated with poorer pregnancy outcome, a higher incidence of prenatal complications and higher incidences stillbirths and maternal mortality [11]. The risk might be linked to the fact that advanced maternal age has been associated with increased risk of medical complications as well as poor placental circulation.

4.3. Parity

Similar to older age women, nulliparous women remained a significant factor in

all steps after adjusting for other factors. Despite having a higher confident interval it was still an important predictor of perinatal death. Several studies provided similar results supporting primiparity as a significant risk factor [13]. In a similar study done in Sudan, primiparity was associated with neonatal mortality [14]. A study in Uganda found that perinatal mortality among nulliparous women was 3.3 times higher than in women who had given birth to a live baby in a prior pregnancy [13]. In addition, one study showed that nulliparous women of <18 years have the highest odds of adverse neonatal outcomes in general [15]. Women in developing countries generally tend to have many pregnancies [16] and research provides conflicting views about whether increasing parity increases the risk of perinatal mortality. Previous studies demonstrated that maternal parity > 4 [17] [18] was significantly associated with perinatal mortality and newborn deaths, respectively. A study done in Zimbabwe found the risk of obstetric complications and hence perinatal mortality increased with increasing parity [17]. In contrast, in Uganda, increasing parity had a lower risk for mortality, though not statistically significant [19].

4.4. District of Residence

In this study, women residing in Urban and Rural (North A and B) districts had higher perinatal mortality than women living in West District (urban). Using univariate analysis, women who resided in rural areas had a 34% increased risk of perinatal mortality compared to those living in urban areas. Living in rural areas can be a risk for pregnant women since quality health services and infrastructure are usually more accessible in urban centres. Similar to our study, the meta-analysis done on developing countries showed that perinatal mortality was significantly higher in rural areas [20]. In Tanzania, a demographic health survey which was conducted in 2010 found that both women living in urban areas as well as in rural areas have increased risk of perinatal death [21]. Our findings might have been influenced by the high number of referrals for pregnant women with complications from other districts of Zanzibar to the urban health facilities which might play a role in poor perinatal outcomes.

4.5. Previous Newborn Death

In this study, women with a history of previous newborn deaths had twice as much the risk of perinatal mortality than those with previous live births. This is in line with a birth registry study at KCMC which showed that women who lost a child in their first pregnancy had higher risk of perinatal death with a subsequent pregnancy than women with a surviving child [22]. Another study in Dar es Salaam involving women with a history of previous adverse pregnancy outcome were two times more likely to have a perinatal death than those who had a history of a live baby [23]. Women with a previous perinatal mortality had a greater risk of perinatal death in a subsequent pregnancy [22]. The complication from previous pregnant might play a role in subsequent pregnancy if no proper care and management is undertaken. Therefore, women with previous newborn

deaths need to be identified early as high risks mothers during antenatal visit, and close follow up and supervision could help in saving the newborn's life. The wired mother study conducted in Zanzibar noted that close follow up and communication with pregnant women decreased the perinatal deaths [5]. Babies who were born to women who had a previous history of losing their baby to perinatal death during their last pregnancy showed higher odds of perinatal death than their counterparts [24].

4.6. Pregnancy-Induced Hypertension

In this study, women with hypertension during pregnancy were almost ten times more likely to experience perinatal mortality than those without. This finding concurs with previous studies which found that pregnancy-induced hypertension and ante partum haemorrhage increase the risk of stillbirths and perinatal mortality [25]. Ante-partum haemorrhage is usually caused by placenta abruption which results in stillbirth [17] as a result of pregnant-induced hypertension. There might be multiple etiologic factors that affect foetal survival in relation to hypertension. This further emphasises the importance of quality antenatal and intrapartum care, and early attendance of ANC clinic for early detection and prompt management of maternal medical conditions including hypertensive disorders.

4.7. Place of Delivery

In this study, one of the most important factors for perinatal mortality was the place of delivery. Perinatal mortality was higher for women who delivered at home compared to women who delivered in health facilities. This might be influenced by social-economical factors as women needed to buy some of the equipment needed for delivery. Moreover, experience of non-complicated delivery at home, might influence some women to overlook the importance of delivering at a health facility. These findings are similar to findings from other studies; for example, in a meta-analysis study in Sub-Saharan Africa, perinatal mortality rate was significantly higher for home delivery compared to delivery in a facility [26]. In a study carried out in Zimbabwe, women who delivered at home were more likely to experience perinatal mortality, and home deliveries were often conducted by untrained birth attendants in unsanitary conditions [17]. In addition, a study conducted in Ethiopian found that mothers residing in urban areas were 3.3 times more likely to give birth in a health facility than mothers residing in rural areas [27]. In Zanzibar, the practice of home delivery is still common, increasing the risk of perinatal mortality which may be linked to lack of skilled care including resuscitation skills. Efforts to convince women to deliver at a health facility need to be continued on all levels particularly for women at high risk.

4.8. Use of Herbs in Labour

This study found that women who had used herbs during labour were more likely to have perinatal mortality than those who didn't use them in multivari-

able analysis. A previous study revealed that pregnant and delivering women commonly use herbs to gain therapeutic effects which may be beneficial in easing the labour process without any side effects to mother and baby [28]. In Kenya, about 12% of women used herbs during their most recent pregnancy [29]. A study in Tanzania found out that traditional medicines given by traditional providers were used in almost half the number of women who experienced unsafe abortion. Of the 21 plant species identified and analysed as abortion-inducing, 16 had effect on uterine contraction by significantly increasing the force and/or frequency of contractions [30]. Some women might use these medicines during labour with adverse effects. Until definitive data is put together, the best practice is to consider all herbal medicine products unsafe during pregnancy and lactation, and to advise patients accordingly [31]. Use of traditional medicine during labour was found to be very common in many pregnant women, and the adverse effects to the newborn are significantly high. Therefore, there is need to educate pregnant women during antenatal care attendance on the adverse outcomes of such practices to the health and survival of the newborn.

4.9. Newborn Factors

Newborn Asphyxia

In this study, we found out that a newborn with asphyxia at birth had an almost 30% higher risk of perinatal mortality compared to infants delivered in normal vaginal delivery. Birth asphyxia is a major cause of neonatal death as reported in many studies, in Northern Tanzania [32], Kenya [33], Uganda [18], and India [34]. As the study reported, nearly two thirds of perinatal mortality were fresh stillbirths—deaths that might have been due to asphyxia. Hence, the knowledge and practice of health care providers about the immediate care that they give to newly born babies including resuscitation, need to be checked and improved to ensure survival of the newborn.

5. Conclusion

The study showed that there was high perinatal mortality compared to overall perinatal mortality of 27 per 1000 total births reported in a cluster-randomised trials study, conducted in 2014, in Zanzibar. The most significant risk factors associated with perinatal mortality in this study were maternal age 35 years and above, nulliparous women, pregnancy induced hypertension, home delivery, assisted vaginal delivery, previous new born death, new born asphyxia and use of herbs during labour. Therefore, to reduce the burden of perinatal mortality, early identification and prompt management of risk factors during pregnancy and labour are paramount, and women should be strongly advised to deliver in a formal health facility.

Conflicts of Interest

The authors declare that they have no competing interests.

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