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Full Length Research Paper

Factors responsible for perinatal mortality in women giving birth in a health facility in Malawi

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The perinatal mortality rate in Malawi is estimated at 40/1,000 births. Annually 6.3 million babies die in the perinatal period globally, with Africa having the highest perinatal mortality rate. This study was conducted to determine perinatal mortality, to identify associated risk factors, and to determine causes of perinatal deaths at Chiradzulu District Hospital, Malawi. The study was designed as a cross sectional study that prospectively reviewed records of 606 births at the health facility. The perinatal mortality rate was 59.9/1,000 births; the stillbirth rate was 36/1,000 births; and the early neonatal death rate was 24/1,000 live births. Of 16 early neonatal deaths, 63% occurred on the day of birth and 19% in next 48 hours. The primary cause (75%) was birth asphyxia. Significant associations with perinatal death included: number of antenatal visits, most in one visit (29.4%); gestation ≤ 31 weeks (47%); prolonged second stage of labour (22%); premature babies with birth weight ≤1499 grams (61%); and severely asphyxiated babies (46%). There is a need to strengthen the care of delivering women for early provision of comprehensive obstetric care. The high perinatal mortality could be reduced by improving health workers' ability in resuscitation, as well as care of low birth weight babies.

Keywords: Comprehensive emergency obstetric and neonatal care, early neonatal deaths, perinatal mortality, millennium development goal 4.

INTRODUCTION

Perinatal deaths are common in most developing countries like Malawi. The perinatal mortality rate in Malawi is estimated at 40 deaths per 1,000 births (National Statistical Office (NSO) and ICF Macro., 2011). Annually an estimated 6.3 million babies die in the perinatal period globally. Ninety eight percent of these occur in developing countries with Africa having the highest perinatal mortality rate at 56 deaths per 1000 births (Åhman and Zupan, 2007). Reducing early neonatal mortality is warranted to achieve the millennium development goal 4 (MDG 4). Almost two-thirds of deaths occur in the first month of life. Among these, more than two-thirds die in their first week. Of those who die in the first week, two-thirds die in the first 24 hours of life (Beck, Ganges, Goldman, and Long, 2004). Child health experts have predicted that the MDG 4; to reduce under five mortality by two-thirds cannot be met unless neonatal mortality is reduced by 50% (Yinger and Ransom, 2003). Other authors have made similar observations that unless neonatal mortality is greatly reduced it is not possible to achieve millennium development goal 4 (Lawn, Cousens, and Zupan, 2005; Lawn, Kerber, Enweronu-Laryea, and Massee, 2009a).

Factors that contribute to perinatal deaths are maternal conditions and infections, asphyxia during delivery and preterm deliveries (Lawn et al., 2011). Engmann et al., in a study on community-based stillbirths, found that 37% of stillbirths were due to infections and 11% due to obstructed labour. Infection, birth asphyxia and preterm delivery caused 44%, 26% and 17% of early neonatal deaths, respectively (Engmann et al., 2012). Another study found that infection was the leading cause (37%) of neonatal deaths, prematurity 34% and birth asphyxia 16%. The causes of stillbirths were infections (26%), birth asphyxia (18%) and other obstetric complications 12% (Turnbull et al., 2011). A study in rural Ghana demonstrated a similar pattern, that birth asphyxia was the most important cause of first day neonatal deaths (Edmond et al., 2008). The studies done in Malawi have found that most perinatal deaths are due to prematurity (Kulmala et al., 2000; Metaferia and Muula, 2009; van den Broek, Ntonya, Kayira, White, and Neilson, 2005).

Up to date, most stillbirths and early neonatal deaths remain uncounted. Malawi had no national documented data on the number of perinatal deaths until 2000. The previous Demographic Health Surveys before 2000 did not have any information on stillbirths, early neonatal deaths and perinatal mortality rates. The first estimated perinatal mortality rate was 46 perinatal deaths per 1000 births in 2000 (National Statistical Office and ORC Macro, 2001). There was a decrease from 46 perinatal deaths per 1000 births in 2000 to 34 per 1000 in 2004. However, the latest Malawi Demographic Health Survey of 2010 has shown an increase in perinatal mortality again, up to 40 per 1000 births (National Statistical Office (NSO) and ICF Macro., 2011). Measuring perinatal deaths from demographic and health surveys (DHS), are usually limited to prevalence estimates. In addition, the DHS does not include the risk factors and causes of perinatal mortality. Use of household surveys to measure perinatal deaths may also encounter problems. This is in making a distinction between early neonatal deaths and stillbirths with deliveries that occurred at home with no skilled attendants. It is therefore likely that some early neonatal deaths could be misclassified as stillbirths (Lawn et al., 2009b).

Some studies done in Malawi had a perinatal mortality rate ranging from as high as 79 per 1000 births in a central referral hospital to 30 per 1000 births in a rural population based survey (Kulmala et al., 2000; McDermott, Steketee, and Wirima, 1996; Metaferia and Muula, 2009; van den Broek et al., 2003). There are very few studies done on perinatal mortality in Malawi even if these data are essential to effectively plan how to reduce perinatal mortality. In order to inform public health interventions designed to reduce stillbirths and early neonatal deaths in groups at risk more knowledge about these issues are needed. Hence, the aim of the current study was to identify factors contributing to perinatal deaths and to provide estimates of stillbirths and early neonatal mortality rates, using systematic information from a district hospital.

METHODS

The study was implemented performing a prospective review of health cards (passports) and delivery records of all mothers who presented in labour at Chiradzulu District Hospital in southern region of Malawi. The hospital's main responsibility is to provide secondary level of health care. However, majority of patients treated here come straight from home and have normal deliveries. In the year 2010, the hospital had 2447 deliveries, out of these, 1752 (72%) were normal deliveries. In addition, the hospital provides care to referred obstetric patients from 10 of its health centres that provide maternity services (antenatal, labour and delivery and postnatal care) and refer women with complications during perinatal period to the hospital. We therefore consider our study representative of the population of Chiradzulu. However, the data may not be representative of the population at large as it targeted only those who delivered at this health facility.

The mothers received antenatal care at the district hospital or any other facility. Records of mothers, who did not receive antenatal care, or delivered outside this health facility, were not included in the study. Mothers who did not attend antenatal care were about 12%. This was slightly lower than predicted, because antenatal care attendance in Malawi is at 95% (National Statistical Office (NSO) and ICF Macro., 2011). In addition, records of women, who delivered before and after the study, were not reviewed. The data were collected during a three months period from 20th December 2010 to 12th March 2011. Records of mothers who received antenatal care and delivered at this hospital from 28 weeks up to term were reviewed. Only 92 (14.7%) mothers had their last menstrual period documented. Thus, calculation of gestational age was based on fundal height measured during labour as well the delivery attendants' classification of the neonates as preterm or term.

The mothers' health passports were reviewed before delivery after admission to labour ward. The labour and delivery records were reviewed after delivery and the last section about the neonates' condition was done in the postnatal ward after discharge. A data record form was used to collect information on maternal and neonatal health as follows: demographic data; maternal infections, medical and obstetric complications in pregnancy, labour and delivery, attendant conducting the delivery, type of delivery, complications of the neonate at delivery and during postpartum before discharge. Anaemia was categorised as: mild (9-9.9 g/dl), moderate (7-8.9 g/dl), and severe (below 7 g/dl). Foetal distress was defined as foetal heart above 160 beats per minute and /or below 100, and meconium stained liquour. Labour and delivery complications included pre-eclampsia, eclampsia, preterm labour, rupture of membranes more than 24 hours before delivery, foetal distress and cephalo pelvic disproportion, obstructed labour and prolonged second stage of labour (more than one hour).

Stillbirth was defined as uterine death before delivery from 28 completed weeks of gestation. Fresh stillbirth was fetal death less than 12 hours before delivery, presenting without any skin changes. Macerated stillbirth was fetal death probably occurring more than 12 hours before delivery presenting with disintegration of the skin. Early neonatal death was death of a neonate during the first week of life (Miller, 2009). Only live neonates that died in hospital were captured as no follow up of the neonates were done after discharge at 7 days of birth. Mothers who deliver normally with no complications to them and or the babies are discharged within 24 hours with others spending even less than 10 hours at the facility.

The standard rates according to World Health Organization, (2006) were followed

Perinatal mortality rate = (Early neonatal deaths + Stillbirths/ Total births) x 1000

Early neonatal mortality rate = (Early neonatal deaths/ Live births) x 1000

Stillbirth rate = Stillbirths/ Total births) x 1000

The Statistical Package for Social sciences (SPSS) version 18.0 (SPSS Inc. Oslo, Norway) was used for data entry and Stata version 11.0 (Stata Corporation, Texas, USA) was used to analyze the data. Descriptive statistics was calculated to determine the frequencies and percentages of fresh stillbirths, macerated stillbirths and early neonatal deaths. Univariate analysis was computed to determine the association between outcome (perinatal death) and independent variables. The independent variables were maternal characteristics: age, number of antenatal visits and parity, medical and obstetric conditions in pregnancy: HIV, syphilis, anaemia, malaria, preeclampsia and antepartum haemorrhage. During labour and delivery: gestation, anaemia, preeclampsia, eclampsia, labour and delivery complications, preterm labour, rupture of membranes more than 24 hours, foetal distress, cephalo pelvic disproportion, obstructed labour, presentation, prolonged second stage of labour, delivery type and skilled attendant. Postpartum the following variables were registered: asphyxia, meconium aspiration, Apgar score, preterm, birthweight, hypothermia and sepsis.

Multivariable analyses are not reported because the model estimates were not reliable presumably due to the small sample size in this sub-group (n=41). Risk factors that had p-value of less than or equal to 0.2 were investigated using logistic regression for their potential confounding. However, the models were not producing reliable estimates.

Approval for the study was granted by the Norway Regional Committee for Medical Research Ethics as well as College of Medicine Research and Ethics Committee (COMREC) in Malawi for ethical approval in order to ensure that participants were protected. Written permission to conduct the study was obtained from the District Health Officer of Chiradzulu District Hospital (DHO).

Limitations

Hospital based studies cannot be generalised because of selection bias. The data are not representative of the population at large as data collection was biased in favour of women who delivered at the health facility. Use of fundal height as an estimate of pregnancy gestation might have included pregnancies that were below 28 weeks by dates. Neonates were not followed up at 7 days after delivery. Consequently, if any early neonatal deaths occurred at home after the babies were discharged they were missed. Measurement of Apgar score is subjectively done. This might not reflect the true status of the neonates. Some information was missing from the records due to lack of proper documentation and this might have affected cross tabulation of the results, as well as the possibility to make a proper multivaraite analysis. Missing information was not included in the analysis. Inadequate information may make it more difficult to detect adverse effects and may thus be associated with lower rates of adverse effects. The fact that we did not do any multivariate analysis means it was not possible to examine whether the association was affected by other factors.

FINDINGS

Out of the 606 records reviewed 419 (69%) were spontaneous vertex deliveries, followed by caesarean sections 165 (27.2%). There were 42 (6.9%) twin deliveries and the rest 564 (93.1%) were singleton. 581 (95.9%) of the deliveries were conducted by skilled birth attendants. The remaining 25 (4%) were self-deliveries. The majority, 534 (89%), of the babies were delivered at term gestation. The mean birthweight was 2856.6 g; 20% of the neonates had low birthweight (< 2500 g); and 3% were very low birthweight (< 1500 g). Among these very low birthweight neonates, there were two with birthweight of 700 g and 800 g at 28 weeks and 34 weeks gestation by fundal height, respectively. Eight (44.4%) of fresh stillbirths and 10 (66.7%) early neonatal deaths were or above 2.5 kg (Table 1).

Out of the 685 deliveries over the study period, fresh stillbirths were the highest, 18 (2.6%), of all perinatal deaths that occurred. The ratio of fresh to macerated stillbirths was 2.5:1 (Table 2). Fresh stillbirths, macerated stillbirths and early neonatal deaths represented 44%, 17% and 39% of the perinatal deaths, respectively. This number of early neonatal deaths (ENDs) includes one neonate who was brought back by the mother after being ill at home. The mother brought the neonate back three days after delivery and this neonate died same day of readmission.

The mothers' stay in the hospital after delivery ranged from less than a day to 26 days. The average number of days of stay after delivery was 3.2 days. The median stay was one day.

Slightly below two-thirds, 10 (63%), of the early neonatal deaths occurred within 24 hours after birth and three (19%) within the next 48 hours (Figure 1). The majority, 12 (75%),

Table 1. Characteristics of perinatal deaths

Categories	Birth weight, g (%)				Type of delivery (%)				Sex (%)	
	Mean ± SD	700 – 1499	1500 - 2499	≥ 2500	SVD*	Caesarean	VE*/Breech*	Face to pubis	Female	Male
All deliveries	2856.6 ± 572.2	18 (3)	102 (16.9)	483 (80.1)	419 (69.1)	165 (27.2)	21 (3.5)	1 (0.2)	280 (46.7)	320 (53.3)
Stillbirths	2204 ± 959.3	7 (28)	8 (32)	10 (40)	14 (56)	8 (32)	3 (12)	0	11 (45.8)	13 (54.2)
Fresh	2255.5 ± 1073.8	6 (33.3)	4 (22.2)	8 (44.4)	7 (38.9)	8 (44.4)	3 (16.7)	0	7 (41.2)	10 (58.8)
Macerated	2071.4 ± 621.1	1 (14.3)	4 (57.1)	2 (28.6)	7 (100)	0	0	0	4 (57.1)	3 (42.9)
END▪	2386.6 ± 775.3	4 (26.7)	1 (6.7)	10 (66.7)	9 (56.3)	5 (31.3)	2 (12.5)	0	5 (31.3)	11 (68.8)

▪Early neonatal death
Spontaneous* vertex delivery
*Vacuum extraction

Table 2. Frequency of deliveries and deaths

	N (%)
Total Deliveries	685
Total number of fresh stillbirths	18 (2.6%)
Total number of macerated stillbirths	7 (1%)
Total number of early neonatal deaths	16 (2.4%)
Perinatal deaths (stillbirths and early neonatal deaths)	41 (5.9%)
	Rate
Perinatal mortality rate	59.9/1000 births
Stillbirths rate	36/1000 births
Early neonatal death rate	24/1000 live births

of the deaths were from birth asphyxia. This was mostly subsequent to prolonged second stage of labour that ranged from two to six hours, foetal distress in severe preterm babies (28- 30 weeks gestation) and one with congenital abnormalities. Severe prematurity was attributed to 4 (25%). This includes two (12.5%) preterm babies who also had birth asphyxia and sepsis. One of the babies, who developed sepsis, was born from a mother who was in second stage of labour for five hours before caesarean section was done. Out of the ten deaths in the first 24 hours, six (60%) babies had birth asphyxia, two (20%) were very preterm with birth asphyxia and two (20%) very preterm.

The univariate analysis in Table 3 illustrates factors related to the mother, such as maternal age, parity, medical and obstetric conditions that were not associated with perinatal deaths (p >0.05). Age categories of the mothers and number of perinatal deaths varied slightly and it was not significant. Only the number of antenatal visits showed a significant relationship with perinatal deaths (p≤0.001), with highest level (29.4%) of deaths occurring in mothers who had only one antenatal visit. The univariate analysis with maternal and foetal variables during labour and delivery show that most (47%) perinatal deaths occurred in babies that were delivered at or before 31 weeks gestation, (p≤0.001). A significant number of perinatal deaths occurred in abnormal presentations, breech and compound at 21% and 33%, respectively (p ≤0.001). Prolonged second stage of labour and presence of labour and delivery

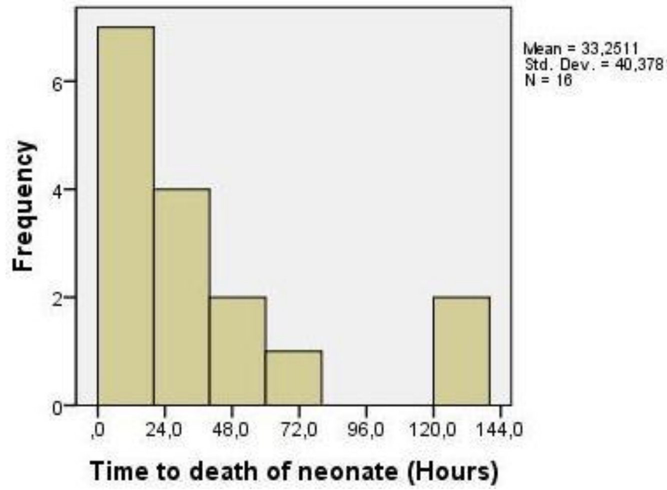

Figure I. Time of Early Neonatal Deaths (Mean 33.3; SD 40.4; N= 16)

Table 3. Variables associated with perinatal deaths during pregnancy (univariate analysis) n = 606

	Perinatal death?				
	No (n = 565)		Yes (n = 41)		
Characteristic	**N**	**%**	**N**	**%**	**P-value †**
Maternal age group					0.873
14-18	106	92	9	8	
19-25	227	93	16	7	
26-35	182	94	12	6	
36-46	49	92	4	8	
Number of antenatal visits					<0.001
1	24	70.6	10	29.4	
2	110	92	9	8	
3	197	97	6	3	
4	177	95	9	5	
≥5	51	88	7	12	
Parity					0.596
1	195	92	16	8	
2-4	290	94	20	6	
5-7	67	94	4	6	
≥8	13	93	1	7	
HIV infection					0.401
no	442	94	30	6	
yes	98	92	9	8	
Syphilis					1.000
no	292	95	15	5	
yes	9	100	0	0	
Preeclampsia					0.384
no	542	93	38	7	
yes	6	86	1	14	
Anaemia					0.496
no	315	95	17	5	
yes	113	93	8	7	
Malaria					0.299
no	16	100	0	0	
yes	32	89	4	11	
Antepartum haemorrhage					1.000
no	43	91	4	9	
yes	5	100	0	0	

† Fisher's Exact Test

Table 4. Variables associated with perinatal deaths during labour and delivery (univariate analysis) n = 606

	Perinatal death?				
	no (n = 565)		yes (n = 41)		
Characteristic	**N**	**%**	**N**	**%**	**P-value †**
Gestation					<0.001
≤31	10	53	9	47	
32-36	140	93	11	7	
≥37	405	95	21	5	
Anaemia					1.000
No	495	94	34	6	
Yes	17	94	1	6	
Preeclampsia					0.075
No	550	94	38	6	
Yes	12	80	3	20	
Eclampsia					1.000
No	559	93	41	7	
Yes	6	100	0	0	
Labour and delivery complications					<0.001
No	351	97	10	3	
Yes	206	88	27	12	
Preterm labour					0.029
No	165	90	19	10	
Yes	11	69	5	31	
Rupture of membranes > 24 hours					0.610
No	511	94	35	6	
Yes	13	93	1	7	
Foetal distress					1.000
No	148	88	21	12	
Yes	28	90.3	3	9.7	
Cephalo pelvic disproportion					1.000
No	160	88	22	12	
Yes	16	89	2	11	
Obstructed labour					0.470
No	536	93	38	6.6	
Yes	29	91	3	9	
Presentation					<0.001
Cephalic	533	94	33	6	
Breech	23	79	6	21	
Compound	4	67	2	33	
Prolonged 2^{nd} stage of labour					<0.001
No	525	95	30	5	
Yes	39	78	11	22	
Delivery type					0.012
SVD	396	95	23	5	
C/S	152	92	13	7.8	
VE/Breech/Breech extraction	16	76	5	24	
Skilled attendant					0.403
No	25	100	0	0	
Yes	540	93	41	7	

† Fisher's Exact Test

Table 5. Variables associated with perinatal deaths during postpartum (univariate analysis) n = 606

	Perinatal death?				
	no (n = 565)		yes (n = 41)		
Characteristic	**N**	**%**	**N**	**%**	**P-value †**
Asphyxia					<0.001
No	502	99	5	1	
Yes	63	85	11	15	
Meconium aspiration					1.000
No	558	97	16	3	
Yes	7	100	0	0	
Apgar score					<0.001
1-3	7	54	6	46	
4-6	60	91	6	9	
7-10	498	99.2	4	0.8	
Preterm					<0.001
No	514	96	20	4	
Yes	50	76	16	24	
Birthweight					<0.001
700g-1499g	7	39	11	61	
1500g-2499g	93	91	9	9	
≥2500g	463	96	20	4	
Hypothermia					1.000
No	430	99	4	1	
Yes	25	100	0	0	
Sepsis					0.009
No	444	99.6	2	0.4	
Yes	17	89.5	2	10.5	

† Fisher's Exact Test

complication were associated with 22% and 12% of perinatal deaths, respectively (p≤0.001). The duration in second stage ranged from two to 11 hours before delivery. Out of the 11 (27%) mothers who had prolonged second stage of labour, seven were delivered by caesarean section. The client who stayed the longest was returned from theatre after it was recognized that the foetal heart had ceased before the operation.

However, she was still later delivered by caesarean section after failed vacuum extraction. Vacuum extraction and breech delivery experienced 24% of perinatal deaths compared to 7.8% for caesarean section and 5% for spontaneous vertex delivery, p=0.01 (Table 4).

Most, (61%), perinatal deaths happened in preterm babies with very low birthweight of 1499 grams and below (p≤0.001) and in severely asphyxiated babies (46%), p≤0.001. Sepsis was associated with 10.5% of the perinatal deaths (p = <0.01) (Table 5).

DISCUSSION

The main findings of our study are that fresh stillbirths were the highest and slightly below two thirds of early neonatal deaths occurred within 24 hours after birth. The important causes of early neonatal death in our study were birth asphyxia and prematurity. A high perinatal mortality was expected at the facility because it receives referred patients with complications from health centres. However, a good number of deaths happened in babies with a birth weight of or above 2500 g that possibly could have been prevented.

A caesarean rate of 27.2% was unexpectedly high compared to the Emergency Obstetric and Newborn Care (EmONC) indicator in Malawi (The expected range is between 5% and 15%) (Ministry of Health, 2011). Nevertheless, what is of paramount significance is the indication for the caesarean section. A vital factor is the ‘decision to delivery interval’. A late decision to do an emergency caesarean section or taking too long after the decision, usually results in poor perinatal outcomes defeating its purpose. In this study, 44.4% of fresh stillbirths and 31.3% of early neonatal deaths were delivered by caesarean section respectively. Although the number of caesarean section was high, it seems probable that many caesarean sections were done too late. Shah et al. found that emergency caesarean sections are often performed too late to reduce perinatal deaths (Shah et al., 2009). An EmONC assessment report in Malawi found that although the recommended international standard time lapse is less than 30 minutes for caesarean section, only 8% were done within 30 minutes or less, 21% in 31 minutes to one hour, 28% in one hour to three hours, 7% in three hours or more and 35% had no information on the duration (Ministry of Health, 2011). However, our study did not include data on decision to delivery interval. The delay may also be attributed to the referral system if the women come from a health centre or to the women themselves if they come from home. When the women arrive at the district hospital they need to be quickly diagnosed, and treated (Kongnyuy, Mlava, and van den Broek, 2009b). Acute emergency care is crucial in preventing perinatal deaths in obstetric emergencies (Hofmeyr et al., 2009). Pregnant women and communities should be informed about obstetric complications and the significance of seeking health care. This may increase communities demand for obstetric care through birth preparedness, recognition of danger signs and obstetric care seeking (Lawn et al., 2009c). There is a need to strengthen women's access to emergency obstetric care once complications are diagnosed at the health facility.

A vast majority of intrapartum related deaths occur early in the first 48 hours and mostly all within the first week (Lawn et al., 2009d). In our study, 82% deaths occurred in the first 48 hours, with 63% dying the same day. Once labour complications cause severe intrapartum problems for the baby it may result in a perinatal death on the same day of delivery. Even the best resuscitation performed will not save the baby's life. This is why proper monitoring of labour and early identification of complications with provision of timely comprehensive emergency obstetric and newborn care are crucial. Labour complications are predictive for perinatal deaths. Therefore identification and management of the complications may significantly improve perinatal outcomes (Lawn et al., 2009d). In our study labour and delivery complications and, specifically, preterm labour prolonged second stage of labour and presentation had an association with perinatal deaths. Provision of care by skilled attendants, availability and utilisation of comprehensive emergency obstetric and newborn care are keys to reducing stillbirths and intrapartum neonatal deaths (Lawn et al., 2009c; Lee et al., 2011a; Yakoob et al., 2011).

Consequently, there is a need to reinforce and improve health workers' abilities to properly monitor women in labour at all levels of care for early identification and management of complications. This includes referral if a woman is at a health centre. There is also a need for in-service education, supportive supervision and availability of adequate resources to possibly improve health workers' performance related to perinatal outcomes.

The documented association between antenatal care and perinatal deaths is consistent with other studies (Engmann et al., 2009; Jammeh, Vangen, and Sundby, 2010; Majeed, Memon, Majeed, Shaikh, and Rajar, 2007; Matendo et al., 2011). Good quality antenatal care is a tool to prevent or reduce risk factors. It may also be a confounder that poor, illiterate women use antenatal care less and are more at risk anyway. Consequently lack of or inadequate antenatal care results in increased risk of perinatal deaths. There is a need to encourage women to start antenatal care early for them to adhere to the four recommended antenatal visits.

The most important causes of early neonatal death in our study, birth asphyxia and prematurity supports the findings of many previous studies (Chowdhury et al., 2010; Edmond et al., 2008; Ersdal, Mduma, Svensen, and Perlman, 2012; Kidanto, Massawe, Nystrom, and Lindmark, 2006). However, at 28 days after birth, infection became the leading cause in one study (Edmond et al., 2008). This shows that more neonatal deaths due to infection may occur after the first week. Unfortunately, we do not have that type of follow up data. Birth asphyxia was the highest cause of early neonatal death while infection was the leading cause of late neonatal deaths in a study in rural Bangladesh (Chowdhury et al., 2010). Turnbull et al. had infections as the leading cause of neonatal death, followed by prematurity, then asphyxia at 28 days of birth (Turnbull et al., 2011).

The number of deaths caused by birth asphyxia indicates that substandard quality of intrapartum care is provided, as most intrapartum related deaths occur in early neonatal period. This is reflected in the high perinatal mortality rate in this study compared to the national mortality rate. It also reveals the inability of health workers to properly resuscitate the babies at birth. Morbidity and mortality related to birth asphyxia and complications of prematurity can be reduced by provision of appropriate care with focus on early recognition of complications and timely comprehensive emergency obstetric and newborn care (Ishaque et al., 2011; McClure, Saleem, Pasha, and Goldenberg, 2009; Menezes et al., 2009; Wall et al., 2010; Yakoob et al., 2011). Furthermore, there is a need to establish a perinatal audit committee to systematically assess care provided during perinatal period. This will present an opportunity to evaluate care that is actually provided as a way of identifying deficiencies in the care (Richardus, Graafmans, Verloove-Vanhorick, and Mackenbach, 2003). Perinatal audits are done with an aim to find solution for identified gaps or problems to improve quality of care (Pattinson et al., 2009). This helps to improve care through identification of substandard care and deficiencies (Bhutta, Darmstadt, Haws, Yakoob, and Lawn, 2009). Studies done in Malawi and elsewhere show that it is possible to improve quality of care through audits. This is when solutions are identified and implemented (Kongnyuy, Mlava, and Broek, 2008; Kongnyuy, Mlava, and van den Broek, 2009a; Nyamtema, de Jong, Urassa, and van Roosmalen 2011; Strand, de Campos, Paulsson, de Oliveira, and Bergström, 2009; van den Akker, Mwagomba, Irlam and van Roosmalen, 2009; van den Akker et al., 2011).

Preterm babies, particularly the very low birth weight babies, born at or before 31 weeks gestation were most vulnerable. As the gestational age increased, the perinatal deaths decreased. Similarly, in another study in Malawi, preterm babies born between 24 to 32 weeks were 22 times more likely to die (risk ratio 21.8 95% CI 11.8, 40.2) compared to babies delivered at term. Those babies born between 33 weeks and before 37 weeks were twice likely to die compared to babies born at term (van den Broek et al., 2005). This finding is significant because lack of neonatal intensive care creates an increasing mortality risk because of breathing and feeding problems. The babies require specialised care, currently not available at the hospital. Therefore, prevention of preterm labour and delivery is essential in reducing perinatal deaths. Furthermore, use of antenatal corticosteroids to accelerate foetal lung maturation in women at risk of preterm delivery is useful in reducing neonatal death from respiratory distress syndrome (Roberts and Dalziel, 2006). The very preterm babies need special care especially with breathing, warmth and feeding. Currently provision of warmth is possible at the facility through Kangaroo Mother Care, but maintaining breathing remains a major challenge. Because of the limited resources, babies who are dependent of supplementary oxygen are removed when another baby also needs oxygen. Lack of electricity can cause a stop in the oxygen production because the oxygen concentrator stops working. Lack of supplementary oxygen or ventilatory support when the baby has respiratory failure contributes to death (Ballot, Chirwa, and Cooper, 2010).

However, the women need to be informed and encouraged to report early with preterm labour for appropriate intrapartum care. When efforts to stop the labour are not working, the best option is to transfer women with very preterm labour (28 to 32 weeks) to deliver in a facility with neonatal intensive care. There is need to promote provision of appropriate essential newborn care to preterm babies at the facility, in addition to Kangaroo Mother Care.

It was noted during the data collection that the labour ward did not have any neonatal facemasks but paediatric sized facemasks for basic resuscitation. Health workers must be knowledgeable and skilled to perform basic neonatal resuscitation through in-service education to update their skills. It is vital that health workers are competent in basic resuscitation, as this would significantly reduce intrapartum related deaths (Wall et al., 2009). Neonatal resuscitation training in facilities with high mortality has been associated with a decrease of 30% to 43% in intrapartum related neonatal mortality (Lee et al., 2011b). Appropriate and adequate resources must be available for resuscitation to be effectively done. Lack of equipment and standard protocols about newborn resuscitation were identified as barriers for resuscitation at a referral central hospital in Malawi (Bream, Gennaro, Kafulafula, Mbweza, and Hehir, 2005).

Associations between medical and obstetric complications in pregnancy have been shown in different studies (Kalanda, Verhoeff, Chimsuku, Harper, and Brabin, 2006; McCormack, Doherty, Magann, Hutchinson, and Newnham, 2008; Schmiegelow et al., 2012; Villar et al., 2006; Watson-Jones et al., 2007). The lack of associations in the present study may be related to the small proportion of women who were HIV positive, had anaemia, malaria, preeclampsia or antepartum haemorrhage. Furthermore women who were anaemic, had malaria or syphilis were treated antepartum.

One mother who delivered at this health facility during the study came back with the baby ill three days after delivery and the baby died on the same day of readmission. This indicates that there may be a number of early neonatal deaths occurring in the communities but never registered. This would have been the case if this mother had not brought back her baby to the health facility. Most perinatal (70%) deaths occur in community settings, often at home (Baqui et al., 2006; Engmann et al., 2011). Further studies are needed in the community to capture community based perinatal deaths.

CONCLUSIONS

There is a need to strengthen monitoring of women in labour for early identification of complications and timely comprehensive emergency obstetric and newborn care at all levels of care. This includes improving health workers' resuscitation skills through facility based training, provision of appropriate essential newborn care to preterm babies at birth and subsequently and availability of adequate resources. Pregnant women and communities should have sufficient information on obstetric complications to seek health care in time.

REFERENCES

Åhman E, Zupan J (2007). Neonatal and perinatal mortality: country, regional and global estimates 2004. Geneva 27, Switzerland: World Health Organisation, Department of Making Pregnancy Safer.www.searo.who.int/LinkFiles/Publications_Ne

onatal_ and_Perinatal_
Ballot DE, Chirwa TF, Cooper PA (2010). Determinants of survival in very low birth weight neonates in a public sector hospital in Johannesburg. BMC Pediatr. 10:30.
Baqui AH, Choi Y, Williams EK, Arifeen SE, Mannan I, Darmstadt GL (2011). Levels, timing, and etiology of stillbirths in Sylhet district of Bangladesh. BMC Pregnancy Childbirth. 11: 25.
Baqui AH, Darmstadt GL, Williams EK, Kumar V, Kiran TU, Panwar D (2006). Rates, timing and causes of neonatal deaths in rural India: implications for neonatal health programmes. Bull.World Health Organ. 84: 706-713.
Beck D, Ganges F, Goldman S, Long P (2004). Care of the Newborn Reference Manual Washington DC: Kinetic.
Bhutta Z, Darmstadt G, Haws R, Yakoob M, Lawn J (2009). Delivering interventions to reduce the global burden of stillbirths: improving service supply and community demand. BMC Pregnancy and Childbirth. 9:S7.
Bream KD, Gennaro S, Kafulafula U, Mbweza E, Hehir D (2005). Barriers to and facilitators for newborn resuscitation in Malawi, Africa. J.Midwifery Womens Health. 50:329-334.
Chowdhury HR, Thompson S, Ali M, Alam N, Yunus M, Streatfield PK (2010). Causes of neonatal deaths in a rural subdistrict of Bangladesh: implications for intervention. J. Health Popul. Nutr. 28: 375-382.
Edmond KM, Quigley MA, Zandoh C, Danso S, Hurt C, Owusu AS (2008). Aetiology of stillbirths and neonatal deaths in rural Ghana: implications for health programming in developing countries. Paediatr.Perinat.Epidemiol. 22:430-437.
Engmann C, Garces A, Jehan I, Ditekemena J, Phiri M, Mazariegos M (2012). Causes of community stillbirths and early neonatal deaths in low-income countries using verbal autopsy: an International, Multicenter Study. J.Perinatol. 32: 585-592.
Engmann C, Matendo R, Kinoshita R, Ditekemena J, Moore J, Goldenberg RL (2009). Stillbirth and early neonatal mortality in rural Central Africa. Int. J. Gynaecol. Obstet. 105: 112-117.
Ersdal HL, Mduma E, Svensen E, Perlman J (2012). Birth asphyxia: a major cause of early neonatal mortality in a Tanzanian rural hospital. Pediatrics. 129: e1238-e1243.
Hofmeyr GJ, Haws RA, Bergstrom S, Lee AC, Okong P, Darmstadt GL (2009). Obstetric care in low-resource settings: what, who, and how to overcome challenges to scale up? Int.J.Gynaecol.Obstet. 107: Suppl 1, S21-S25.
Ishaque S, Yakoob MY, Imdad A, Goldenberg RL, Eisele TP, Bhutta ZA (2011). Effectiveness of interventions to screen and manage infections during pregnancy on reducing stillbirths: a review. BMC Public Health. 11: Suppl 3:S3.
Jammeh A, Vangen S, Sundby J (2010). Stillbirths in rural hospitals in the gambia: a cross-sectional retrospective study. Obstet. Gynecol. Int. 2010: Article ID 86867.
Kalanda BF, Verhoeff FH, Chimsuku L, Harper G, Brabin BJ (2006). Adverse birth outcomes in a malarious area. Epidemiol. Infect. 134:659-666.
Kidanto HL, Massawe SN, Nystrom L, Lindmark G (2006). Analysis of perinatal mortality at a teaching hospital in Dar es Salaam, Tanzania, 1999-2003. Afr. J. Reprod. Health. 10:72-80.
Kongnyuy EJ, Mlava G, van den Broek N (2008). Criteria-based audit to improve a district referral system in Malawi: A pilot study. BMC Health Serv. Res. 8:190.
Kongnyuy EJ, Mlava G, van den Broek N (2009a). A criterion based audit of the management of obstructed labour in Malawi. Arch. Gynecol. Obstet. 279: 649-654.
Kongnyuy EJ, Mlava G, van den Broek N (2009b). Facility-based maternal death review in three districts in the central region of Malawi: an analysis of causes and characteristics of maternal deaths. Womens Health Issues. 19:14-20.
Kulmala T, Vaahtera M, Ndekha M, Koivisto AM, Cullinan T, Salin ML (2000). The importance of preterm births for peri- and neonatal mortality in rural Malawi. Paediatr.Perinat.Epidemiol. 14:219-226.
Lawn JE, Blencowe H, Pattinson R, Cousens S, Kumar R, Ibiebele I (2011). Stillbirths: Where? When? Why? How to make the data count? Lancet, 377: 1448-1463.
Lawn JE, Cousens S, Zupan J (2005). 4 million neonatal deaths: when? Where? Why? Lancet: 365. 891-900.
Lawn JE, Kerber K, Enweronu-Laryea C, Massee BO (2009a). Newborn survival in low resource settings--are we delivering? BJOG. 116: Suppl 1, 49-59.
Lawn JE, Kinney M, Lee AC, Chopra M, Donnay F, Paul VK (2009c). Reducing intrapartum-related deaths and disability: can the health system deliver? Int.J.Gynaecol.Obstet., 107 Suppl 1, S123-2.
Lawn JE, Lee AC, Kinney M, Sibley L, Carlo WA, Paul VK (2009d). Two million intrapartum-related stillbirths and neonatal deaths: where, why, and what can be done? Int. J. Gynaecol. Obstet., 107 Suppl 1:S5-18, S19.
Lawn JE, Yakoob MY, Haws RA, Soomro T, Darmstadt GL, Bhutta ZA (2009b). 3.2 million stillbirths: epidemiology and overview of the evidence review. BMC Pregnancy Childbirth, 9 Suppl 1:S2.
Lee AC, Cousens S, Darmstadt GL, Blencowe H, Pattinson R, Moran NF (2011a). Care during labor and birth for the prevention of intrapartum-related neonatal deaths: a systematic review and Delphi estimation of mortality effect. BMC Public Health. 11: Suppl 3:S10.
Lee AC, Cousens S, Wall SN, Niermeyer S, Darmstadt GL, Carlo WA (2011b). Neonatal resuscitation and immediate newborn assessment and stimulation for the prevention of neonatal deaths: a systematic review, meta-analysis and Delphi estimation of mortality effect. BMC Public Health. 11: Suppl 3, S12.
Majeed R, Memon Y, Majeed F, Shaikh NP, Rajar UD (2007). Risk factors of birth asphyxia. J.Ayub.Med.Coll.Abbottabad. 19: 67-71.
Matendo RM, Engmann CM, Ditekemena JD, Gado J, Tshefu A, McClure EM (2011). Challenge of reducing perinatal mortality in rural Congo: findings of a prospective, population-based study. J. Health Popul. Nutr. 29:532-540.
McClure EM, Saleem S, Pasha O, Goldenberg RL (2009). Stillbirth in developing countries: a review of causes, risk factors and prevention strategies. J. Matern. Fetal Neonatal Med. 22: 183-190.
McCormack RA, Doherty DA, Magann EF, Hutchinson M, Newnham JP (2008). Antepartum bleeding of unknown origin in the second half of pregnancy and pregnancy outcomes. BJOG. 115: 1451-1457.
McDermott J, Steketee R, Wirima J (1996). Perinatal mortality in rural Malawi. Bull.World Health Organ. 74:165-171.
Menezes E, Yakoob M, Soomro T, Haws R, Darmstadt G, Bhutta Z (2009). Reducing stillbirths: prevention and management of medical disorders and infections during pregnancy. BMC Pregnancy and Childbirth. 9: S4.
Metaferia AM, Muula AS (2009). Stillbirths and hospital early neonatal deaths at Queen Elizabeth Central Hospital, Blantyre-Malawi. Int.Arch.Med. 2: 25.
Miller A (2009). Myles Textbook for Midwives. (15 ed.) Editors: Fraser, DM and Cooper, MA Edinburgh: Churchhill Livingstone, Elsevier.
Ministry of Health (2011). Malawi 2010 EmONC needs assessment final report Lilongwe: Ministry of Health.
Mortality_ update.pdf
National Statistical Office (NSO) and ICF Macro (2011). Malawi Demographic and Health Survey 2010. Zomba, Malawi and Calverton, Maryland USA: NSO and ICF Macro.
National Statistical Office and ORC Macro (2001). Malawi Demographic and Health Survey 2000. Zomba, Malawi and Calverton, Maryland USA: National Statistical Office and ORC Macro.
Nyamtema AS, de Jong AB, Urassa DP, van Roosmalen J (2011). Using audit to enhance quality of maternity care in resource limited

countries: lessons learnt from rural Tanzania. BMC Pregnancy Childbirth. 11:94.
Pattinson R, Kerber K, Waiswa P, Day LT, Mussell F, Asiruddin SK (2009). Perinatal mortality audit: counting, accountability, and overcoming challenges in scaling up in low- and middle-income countries. Int. J. Gynaecol. Obstet. 107: Suppl 1:S113-2.
Richardus JH, Graafmans WC, Verloove-Vanhorick SP, Mackenbach JP (2003). Differences in perinatal mortality and suboptimal care between 10 European regions: results of an international audit. BJOG. 110: 97-105.
Roberts D, Dalziel S (2006). Antenatal corticosteroids for accelerating fetal lung maturation for women at risk of preterm birth. Cochrane.Database.Syst. Rev. CD004454.
Schmiegelow C, Minja D, Oesterholt M, Pehrson C, Suhrs HE, Bostrom S (2012). Factors associated with and causes of perinatal mortality in northeastern Tanzania. Acta Obstet.Gynecol.Scand. 91: 1061–1068.
Shah A, Fawole B, M'imunya JM, Amokrane F, Nafiou I, Wolomby JJ (2009). Cesarean delivery outcomes from the WHO global survey on maternal and perinatal health in Africa. Int.J.Gynaecol.Obstet. 107:191-197.
Strand RT, de Campos PA, Paulsson G, de Oliveira J, Bergström S (2009). Audit of referral of obstetric emergencies in Angola: a tool for assessing quality of care. Afr. J. Reprod. Health. 13: 75-85.
Turnbull E, Lembalemba MK, Brad GM, Bolton-Moore C, Mubiana-Mbewe M, Chintu N (2011). Causes of stillbirth, neonatal death and early childhood death in rural Zambia by verbal autopsy assessments. Trop.Med.Int.Health. 16: 894–901.
van den Akker T, Mwagomba B, Irlam J, Van Roosmalen J (2009). Using audits to reduce the incidence of uterine rupture in a Malawian district hospital. Int. J. Gynaecol. Obstet. 107: 289-294.
van den Akker T, van Rhenen J, Mwagomba B, Lommerse K, Vinkhumbo S, Van Roosmalen J (2011). Reduction of severe acute maternal morbidity and maternal mortality in Thyolo District, Malawi: the impact of obstetric audit. PLoS.One. 6: e20776.
van den Broek N, Ntonya C, Kayira E, White S, Neilson JP (2005). Preterm birth in rural Malawi: high incidence in ultrasound-dated population. Hum. Reprod. 20: 3235-3237.
van den Broek NR, White SA, Ntonya C, Ngwale M, Cullinan TR, Molyneux ME (2003). Reproductive health in rural Malawi: a population-based survey. BJOG. 110:902-908.
Villar J, Abdel-Aleem H, Merialdi M, Mathai M, Ali MM, Zavaleta N (2006). World Health Organization randomized trial of calcium supplementation among low calcium intake pregnant women. Am.J.Obstet.Gynecol. 194: 639-649.
Wall SN, Lee AC, Carlo W, Goldenberg R, Niermeyer S, Darmstadt GL (2010). Reducing intrapartum-related neonatal deaths in low- and middle-income countries-what works? Semin.Perinatol. 34:395-407.
Wall SN, Lee AC, Niermeyer S, English M, Keenan WJ, Carlo W. et al. (2009). Neonatal resuscitation in low-resource settings: what, who, and how to overcome challenges to scale up? Int. J. Gynaecol. Obstet. 107: Suppl 1:S47-4.
Watson-Jones D, Weiss HA, Changalucha JM, Todd J, Gumodoka B, Bulmer J (2007) . Adverse birth outcomes in United Republic of Tanzania--impact and prevention of maternal risk factors. Bull.World Health Organ. 85: 9-18.
World Health Organization (2006). Neonatal and Perinatal Mortality: Country, Regional and Global Estimates. Geneva: WHO.
Yakoob MY, Ali MA, Ali MU, Imdad A, Lawn JE, van den Broek N. (2011). The effect of providing skilled birth attendance and emergency obstetric care in preventing stillbirths. BMC Public Health. 11: Suppl 3:S7.
Yinger NV, Ransom EI (2003). Why Invest in Newborn Health? Save the Children Population Reference Bureau. www.savethechildren.org; www.prb.org