

Analysis of Perinatal mortality at a teaching hospital in Dar es Salaam, Tanzania, 1999-2003

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ABSTRACT

We conducted a retrospective analysis of perinatal mortality at Muhimbili National Hospital (MNH), Dar es Salaam, Tanzania 1999-2003 in order to categorise/classify perinatal deaths as well as to identify key factors in perinatal care that could be improved.

Data were retrieved from the MNH obstetric database and causes of early neonatal deaths were traced from the neonatal ward register. The study includes all foetuses weighing ≥ 500 g. A modified Nordic-Baltic classification was used for classification of perinatal deaths. Over a 5-year period there were 77,815 babies born with a perinatal mortality rate of 124 per 1000 births, 78% of which was labour related stillbirth.

The PMR was 913/1000 for singleton births and 723/1000 for multiple births for babies weighing less than 1500 grams and 65/1000 for singleton births and 116/1000 for multiple births for babies weighing 2500 grams or more. Babies weighing less than 1500 grams contributed 26% of PMR, whereas 41% occurred in babies weighing 2500 grams or more.

The majority (79%) of neonatal deaths had Apgar score < 7 at 5 minutes and the most common causes of neonatal mortality were birth asphyxia (37%) and prematurity (29%). Labour related deaths were more common in multiple pregnancies.

The majority of the perinatal deaths should be essentially avoidable through improved quality of intrapartum care. Establishment of perinatal audit at MNH can help identify key actions for improved care. (*Afr J Reprod Health* 2006; 10[2]:72-80)

RÉSUMÉ

Mortalité périnatale dans un Centre Hospitalier Universitaire à Dar-Es-Salam, Tanzanie (1999 – 2003). Nous avons mené une analyse retrospective de la mortalité périnatale dans l'Hôpital National de Muhimbi (HNM) à Dar Es Salam, Tanzanie (1999 – 2003) afin de catégoriser/classifier les décès périnatals ainsi que pour identifier les facteurs clés dans le soin périnatal qui peuvent être améliorés. Nous avons collecté les données à partir de base de données obstétriques de HNM et causes du décès précoce néonatal ont été tracés à partir de registre de la salle d'hôpital néonatal. L'étude comprenait tous les foetus qui pesaient ≥ 500 kg. Une classification des décès périnatals a été réalisé à l'aide d'une Nordic Baltic modifié. Au cours d'une période de cinq ans 77,815 enfants ont été nés avec un taux de mortalité périnatale de 124 pour 1000 naissances dont 78% étaient des naissances mortes liées au travail. Le TMP était 913/1000 pour les accouchements simples et 723/1000 pour les accouchements multiples pour les bébés qui pesaient moins de 1500 grammes et 65/1000 pour les accouchements simples et 116/1000 pour les accouchements multiples pour les bébés qui pesaient 2,500 grammes ou plus. Les bébés qui pesaient moins de 1500 grammes ont contribué 26% du TMP alors que 41% se sont produits chez les bébés qui pesaient 2500 grammes ou plus. La majorité (79%) des décès néonataux avaient l'indice d'Apgar < 7 à 5 minutes et les causes les plus communes de la mortalité néonatale étaient les mort apparante du nouveau-né (37%) et la prématurité (29%). Les décès liés au travail étaient plus communs dans les grossesses multiples. La majorité des décès périnatals doivent être essentiellement évitables grâce à une qualité améliorée de soin intrapartum. L'établissement d'un audit périnatal à HNM pourra aider à identifier le actions clé pour les soins améliorés. (*Rev Afr Santé Reprod* 2006; 10[2]:72-80)

KEY WORDS: *Perinatal mortality, Tanzania, low-birth weight, stillbirth, and neonatal deaths*

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Introduction

The perinatal mortality rate (PMR) is not only related to maternal health status but also a sensitive indicator of quality of maternal and neonatal health-care.^{1,2} PMR in developing countries is more than 10 times higher than in developed countries. The proportion of potentially avoidable perinatal deaths is also higher in resource poor countries with higher PMR and it is likely that a significant reduction can be achieved by minor improvements in the organisation and quality of health care.^{3,4}

Mortality rates among under-5-year-old children have decreased substantially over the past 20 years in developing countries, but PMR has not followed the same trend and continues to represent a huge burden.⁵ In 1995, WHO estimated the number of perinatal deaths worldwide to be greater than 7.6 million, with 98% of these deaths occurring in developing countries.⁶ The highest levels of PMR are reported from sub-Saharan Africa (about 80 per 1000 births). Tanzania, like other countries in the region has a high PMR ranging from 90 to 100 per 1000 births.⁷⁻¹⁰

Since 1999 routine data on perinatal outcome are recorded at Muhimbili National Hospital (MNH), Dar es Salaam. Perinatal morbidity and mortality statistics, despite their inherent limitations, provide an important base for audit.^{10,11} Analysis and monitoring of data collected on a regular basis in audit meetings avails both the neonatal and obstetric staff the opportunity to examine and critically evaluate patient management and to take appropriate action wherever possible.¹² At a higher level, such data help to shape policy and change resource allocation. At MNH regular maternal and perinatal audit meetings are held since 2005, whereby data analysed from the data base are the basis for the discussion. We have analysed the perinatal mortality in MNH to document the magnitude of the problem and the relative contribution to perinatal mortality of major factors such as birth

weight and labour complications in order to identify areas of perinatal care that merit priority for resource allocation and improved provision of care. Subsequent papers will report on the experiences with the clinical audit.

Methods

The study was conducted at Muhimbili National Hospital (MNH), Dar es Salaam, Tanzania, a tertiary care hospital. The hospital provides primary and secondary care mainly for Dar es Salaam and the coastal region, but occasionally receives patients from upcountry. In addition, it serves as a referral centre for surrounding districts and primary health-care clinics and as a teaching hospital for the Muhimbili University College of Health Sciences of the University of Dar es Salaam.

The MNH labour ward is meant for high risk and complicated deliveries, however, due to poor function of the referral system, 80% of patients come directly from home and often have an essentially normal pregnancy. This leads to overcrowding, an imbalanced staff patient ratio, especially the midwives and overuse, of the scarce supplies available. There are three shifts for nurses, each with six midwives. One specialist obstetrician, one consultant obstetrician and one resident (house officer) are on call every day. There is only one obstetric theatre for both emergency and elective surgeries, so there is often waiting time even for emergencies. The caesarean section (C/S) rate has increased from 12% in 1999 to 29% in 2003, while only 2% of deliveries are vacuum extraction. After a normal uneventful vaginal delivery patients are often only observed in hospital for 6-10 hours before being discharged. Babies delivered by C/S and those with low Apgar score (<7) are admitted to the neonatal ward, which is just one floor up from the labour ward. The unit also admits sick babies from other hospitals as well.

The MNH obstetric database was established in 1998 and since that time data have been

prospectively entered. The main source of data is the midwifery book in the labour ward. All patients admitted to the MNH labour ward bring their antenatal cards. Information from the cards is transferred to the midwifery book. Delivery data on the progress of labour, maternal and neonatal outcome are also recorded. Causes of early neonatal deaths were traced from the neonatal unit records based on clinical diagnosis. The neonatal register keeps summaries of the case notes of each neonate. A quality check program is run weekly to ensure the quality of the data. Maternal and neonatal diagnosis is based on doctor's records in the case notes.

Data for this paper were retrieved from the MNH obstetric database 1999-2003 and counterchecked in the neonatal ward admission register. Neonatal deaths reflect only babies born at MNH and admitted to the neonatal unit. Deaths that occurred at home after discharge from the hospital could not be included. All perinatal deaths among women delivered at MNH labour ward between January 1999 and December 2003 were included. The analysis included all foetuses weighing ≥ 500 g and deaths of live born infants occurring in the first week in the hospital.

Various methods of classifying perinatal deaths have been suggested, however, in this study a modified Nordic-Baltic classification¹² has been applied for simplicity. Since it was difficult to ascertain the gestational age, birth weights were used instead. Congenital malformations could not be classified since they were not properly recorded. Thus the variables used for classification were time of death (pre-labour-, labour- or post-delivery), Apgar score at 5 minutes, singleton or multiple gestation, and birth weight.

Statistical methods

The software Epi Info and PEPI were used for data entry and statistical analysis. Chi-square test was used to test whether there was a trend in low birth weight. The 95% confidence intervals

for the rate ratio were based on the Chi-square distribution.

Results

There were 7497 stillbirths (SB) and 2135 early neonatal deaths (END) making a total of 9632 perinatal deaths among 77,815 babies delivered during the 5-year period. Thus SB, END and perinatal mortality rates were 96, 27 and 124 respectively (Table 2).

A large proportion of the intrauterine deaths occurred during labour after arrival to the labour ward. The majority of the neonatal deaths were asphyxiated at delivery. There was a significant decrease in the LBW rate during the study period from 19.0% in 1999 to 16.5% in 2003 ($p < 0.001$), but that was not followed by a similar trend in PMR.

The PMR for multiples and singletons were 269 and 118 respectively resulting in a rate ratio of 2.3 (95% CI: 2.1-2.4) (Table 3). The corresponding figures for labour related deaths were 105 and 35.7 respectively resulting in a rate ratio of 2.9 (95% CI: 2.6-3.3). The PMR was 913/1000 for singleton births and 723/1000 for multiple births for babies weighing less than 1500 grams and 65/1000 for singleton births and 116/1000 for multiple births for babies weighing 2500 grams or more.

About 41% of all perinatal deaths weighed 2500 grams or more with almost equal numbers of pre-labour and labour-related intrauterine deaths (Table 4). The majority (1611/2135) of the neonatal deaths had Apgar score < 7 at 5 minutes. Among the multiple births there were 60 labour-related deaths in babies weighing > 2500 grams.

There were 1668 breech deliveries during the study period, out of which 485 (28%) and 125 (7.5%) were stillbirths and early neonatal deaths respectively. Breech deliveries were 2.1% of the total deliveries but their relative contribution to the total perinatal mortality was only 6.3%

The major causes of neonatal mortality were birth asphyxia (37%), preterm deliveries (29%), sepsis (16%) and respiratory distress syndrome (6.4%) (Table 5).

Discussion

The motive for this study was to identify areas of priority for improved quality of care in the largest and tertiary delivery ward in Tanzania with extremely high perinatal mortality. We used a modified Nordic Baltic classification^{12,13} to classify perinatal mortality as according to the relative contribution from different birth weight categories and the relation to labour and delivery, in order to guide on possible actions to be taken.

In most statistics from developing countries not all stillbirths are included in official statistics due to logistical difficulties. In Tanzania only 44% of deliveries occur at health facilities and therefore stillbirths and early neonatal deaths occurring outside the health system are not included in health statistics. Further, some severely asphyxiated babies, especially with very low birth weight or with malformations, are often misclassified as stillbirths, since resuscitation is considered as not meaningful and the babies never leave the labour ward.

The high PMR reported here is still an underestimation due to the short observation time for babies without initial problems. Mothers delivered normally are only observed for six to twelve hours before discharge, and thus some early neonatal deaths are missing, however, in term babies without initial problems, only a small part of the neonatal mortality occurs after the first 24 hours.

During the study period the number of deliveries at the tertiary hospital declined, due to the upgrading of the delivery facilities at the three district hospitals in Dar es Salaam in 2001 (Mwananyamala, Amana, Temeke). However these hospitals are small, understaffed and do not provide 24 hours theatre services, and therefore most complications are referred to MNH, hence

increasing the relative proportion of complicated deliveries. These referrals sometimes are made late and therefore they will not always increase the possibilities to save the baby.

The PMR was estimated to be 124 per 1000 births, which is higher than the national average (99 per 1000).⁸ Some smaller community-based studies have reported lower figures (73/1000).^{9,10}

In this study infants weighing 2500 or more contributed about 41% of the total perinatal deaths with labour related asphyxia accounting for 17% of all perinatal deaths. Likewise, 89% of early neonatal deaths among infants weighing 2500 or more had an Apgar score of less than 7 at 5 minutes. This indicates suboptimal care during labour and delivery and the majority of these term stillbirths and neonatal deaths could be avoidable.¹¹ Labour complications have been reported as the most important causative factor for perinatal mortality.¹⁴ Improved monitoring of the foetal heart rate using intermittent auscultation, preferably with Doppler, and improved facilities for immediate delivery when indicated should make a difference. Increased use of vaginal assisted delivery in the second stage should also be encouraged. At present there are too few vacuum sets and they are often not in working order. Increasing the current low rate for vacuum extraction at MNH as well as establishing 24 hours EMOC at the three district hospital which has been lacking during the study period could certainly reduce the current C/S rate at MNH but also reduce perinatal mortality. The rapid increase of C/S rate without any improvement in perinatal outcome illustrates that in settings such as this, even when the C/S is done on a foetal indication, it is not possible to perform it within the short-time interval necessary to save the baby.

The high risk of labour related perinatal death in multiple pregnancies found in this study raises questions on the competence and skills of delivery care providers to conduct these deliveries. There is also an increased risk of perinatal death in babies born in breech presentation, but 80% of them

also were low birth weight, with associated higher mortality. Regular in-service training on the management of multiple as well as breech deliveries, especially among midwives and junior doctors might reduce these labour-related deaths as well as the risk of asphyxia and neonatal death.

Birth asphyxia and pre-term delivery were the leading cause of neonatal deaths. To meet the millennium goal number four that calls for reduction of mortality in children under five by two thirds, a more rapid reduction is required particularly in the risk of early neonatal deaths, the group that has shown the least decline globally.¹⁵ Sepsis seemed to contribute less to neonatal mortality in this study, probably due to under recording. Previous studies have indicated high perinatal morbidity and mortality of neonates due to cord sepsis.^{13,14} This is again a preventable complication related to the standard of delivery care.

The low birth weight rate in this material is 18%, and is similar to other countries in the region. Studies in Tanzania have showed a high incidence of LBW (10-16%).¹⁶ The mean birth weight in Tanzania is 2978 grams (UNICEF) and is low compared to developed countries (Denmark 3375g and France 3335 g respectively). PMR among LBW babies was extremely high. The high PMR reported in this study concurs with previous studies, which reported a fourfold increase in mortality¹⁶. This is partially explained by the inability to take care of very pre-term babies at the MNH neonatal unit. Previous studies done at MNH have indicated that factors significantly associated with increased neonatal morbidity and mortality were prematurity, birth asphyxia, sepsis, respiratory distress syndrome, hypothermia and hypoglycaemia and majority of the deaths (83%) occurred within the first week of life.¹⁶ Infections such as syphilis, HIV and chorioamnionitis and malaria have been associated with pre-term deliveries and therefore low birth weight.¹⁶⁻¹⁸ These infections may also contribute to pre-labour deaths.^{19,20}

Muhimbili National Hospital (MNH) is overwhelmed by a large number of patients. It is the only government owned referral hospital in the city. The population of Dar es Salaam is currently over 3 millions, but the health care structure has not changed since when the population was less than 1 million. This has created an imbalance between the numbers of health care providers, resources and patients. Quality of care in such situation is uncertain.^{21,22} About 80% of patients admitted for delivery at MNH are coming directly from home and most of them have essentially normal deliveries. The referral system must be streamlined, easy and quick. Only patients requiring tertiary level care should be accepted in the tertiary centre. However this can only be achieved if the existing district hospitals (three) are expanded to cater for more patients since they are small and overcrowded as well.

Although the limitations of hospital based data for correct assessment of the magnitude of a problem in the general population is known, the absence of nationally collected vital statistics in most developing countries makes a community based survey impracticable. Hence most studies in developing countries are hospital based. Still, for the purpose of improving the quality of care in the health-care sector, subgroup analysis such as this study and further case-based in depth audit is an appropriate and useful method.

Conclusions and recommendations

A major part of the perinatal deaths should be essentially avoidable through improved quality of intrapartum care in a tertiary hospital such as MNH. Pre-labour intrauterine death must be addressed through improved antenatal care, with special attention to common causes in this region such as syphilis and malaria. Establishment of perinatal audit at MNH can help identify key actions for improved care. Case-based audits of perinatal deaths should be a regular event for more detailed recommendations for a positive change.

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Table 1 Definitions and abbreviations

	Abbreviation	In plain text
Assisted breech delivery	ABD	
Booked		Initial attendance at an antenatal clinic
Caesarean section	C/S	
Early neonatal death	END	Death of live-born infant weighing <500 grams at birth that dies during the first seven completed days of life
Low birth weight	LBW	A baby with a birth weight of <2500 grams
Very low birth weight		A baby with a birth weight of 1000-1499 grams
Extremely low birth weight		A baby with a birth weight of <1000 grams
Intrauterine foetal death	IUFD	Death in utero after 28 weeks
Low cavity vacuum extraction	LCVE	
Muhimbili National Hospital	MNH	
Perinatal mortality rate	PMR	Number of stillbirths and early neonatal deaths/1000 births
Premature rupture of membranes	PROM	Rupture of membranes before the onset of labour
Stillbirth	SB	The complete expulsion from the mother of a foetus weighing <500 grams which shows no sign of life at or after birth
Spontaneous vertex delivery	SVD	

Table 2 Number of pre-labour and labour related deaths, number of early neonatal deaths and perinatal mortality rate per 1000 live birth 1999–2003

	Year					Total
	1999	2000	2001	2002	2003	
<i>Number of babies born:</i>						
Singleton	18,160	18,114	15,434	13,865	12,242	77,815
Multiples	716	663	524	486	450	2839
<i>Number of stillbirths:</i>	2050	1594	1367	1338	1148	7497
Pre-labour	1016	937	939	875	758	4525
Labour related	1034	657	428	463	390	2972
Number of early neonatal deaths	452	476	514	400	293	2135
<i>Rates / 1000 live births:</i>						
Low birth weight (<2500 g)	19.0	18.4	17.6	17.5	16.5	18.5
Stillbirth	113	88	89	97	94	96
Early neonatal death	25	26	33	29	24	27
Perinatal mortality	138	114	122	125	118	124

Table 3 Number and rate of singleton and multiple stillbirths and early neonatal deaths by birth weight categorized according to a modified Nordic-Baltic classification

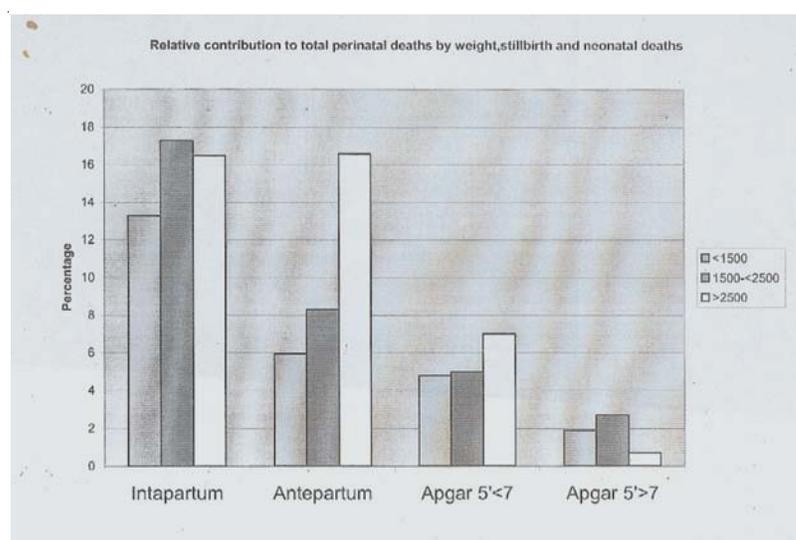
	Birth weight (grams)			Total
	<1500	1500-2499	≥2500	
Number of singleton births:				
Number of stillbirths:	2374	14,441	58,161	74,976
Pre-labour deaths	1665	2225	3114	7004
Labour related deaths	1189	1567	1574	4330
	476	658	1540	2674
Number of early neonatal deaths:				
Apgar <7 at 5'	503	654	708	1865
	361	424	645	1430
Rate/1000 singleton births:				
Stillbirth	701	154	53	93
Early neonatal death	212	45	12	25
Perinatal mortality	913	199	65	118
Number of multiple births:				
Number of stillbirths:	454	1442	979	2839
Pre-labour deaths	190	235	68	493
Labour related deaths	94	93	8	195
	96	142	60	298
Number of early neonatal deaths:				
Apgar <7 at 5'	138	86	46	270
	99	56	26	181
Rate/1000 multiple births:				
Stillbirth	419	163	69	174
Early neonatal death	304	60	47	95
Perinatal mortality	723	223	116	269

Table 4 Relative contribution by birth weight of total perinatal mortality for intrauterine foetal deaths and early neonatal deaths

	Birth weight (gram)			Total
	<1500	1500-2499	≥2500	
Intrauterine foetal deaths:				
Pre-labour	13.3	17.3	16.5	47.1
Labour	6.0	8.3	16.6	30.9
Early neonatal deaths:				
Apgar <7 at 5'	4.8	5.0	7.0	16.8
Apgar ≥7 at 5'	1.9	2.7	0.7	5.2
Total	26.0	33.2	40.8	100

Table 5 Reported causes of early neonatal deaths 1999–2003

Reported causes	Year					Total	
	1999	2000	2001	2002	2003	No.	%
Birth asphyxia	117	257	183	162	70	799	37.4
Prematurity (<37weeks)	108	126	182	112	90	618	29.0
Sepsis	92	35	38	75	95	335	15.7
Respiratory distress syndrome	53	28	17	21	18	137	6.4
Others	82	30	94	20	20	246	11.5
Total	452	476	514	400	293	2135	100

**Figure 1:** Relative contribution to total perinatal deaths by weight, stillbirth and neonatal deaths