Original Article

A comparison of early neonatal deaths among preterm infants with term neonatal deaths at the University Teaching Hospital, Lusaka, Zambia

*P Kamfwa[1], Y Ahmed[1], B Vwalika[2]

[1]*Department of Obstetrics and Gynaecology, UTH, Lusaka, Zambia*
[2]*Department of Obstetrics and Gynaecology, University of Zambia, School of Medicine*

ABSTRACT

Background: Prematurity is a common complication that contributes significantly to high neonatal mortality. In spite of many efforts by the government and other partners, non-significant decline has been achieved in the recent past. Globally, 15 million babies are born preterm (<37 weeks gestation) each year, and more than 1 million of those do not survive their first month of life. Preterm birth accounts for 75% of all perinatal mortality in some series thus identifying the determinants of preterm deaths is very crucial for policy improvement. This study was aimed at establishing factors associated with preterm deaths at UTH compared to those of term neonatal deaths.

Methods: A case-control study was conducted among 208 neonates that were early neonatal deaths i.e. within 7 days in neonatal intensive care unit (NICU) at UTH in 2015. Antenatal and intrapartum details (parity, multiple pregnancy, birth weight, antenatal steroid exposure, antibiotic exposure, and the indication of admission to NICU) were obtained from 104 neonates that were preterm (between 24-36 completed weeks gestation) and had died and of a further 104 term neonates (>37 weeks gestation) that died around the same time. The data was collected by interviewer-administered structured questionnaire and analyzed by SPSS v21. Bivariate analysis was used to identify variables for multivariate logistic regression model to identify obstetric determinants amongst deaths in neonates that were preterm compared to those born at term.

Results: There were few differences between the two groups. The sex of the neonate significantly influenced the odds of dying. We confirmed that male neonates had a 57.1% higher risk than females (42.9%) of dying during the early neonatal period. More term neonates that died were male (P=0.0031) and had a very poor Apgar score (1-3) (P=0.0048). Both the indications for admission to NICU and cause of death were different in the two groups with preterms (P<0.0001) and terms P=0.0309. On multivariate regression analysis, poor Apgar score was associated with six-fold odds of RDS. More preterm neonates had died despite receiving steroids. None of the other factors reached statistical significance (adjOR 6.0, 95% CI 3.03-11.92, p<0.0001). Poor Apgar score was also the only factor associated with sepsis, though it was a neonate with a good Apgar score that had higher odds of dying due to sepsis. Primiparity was associated with a 2.6-fold odds (95% CI 1.03 to 6.68, p=0.04) of hypoxic ischaemic encephalopathy. On logistic regression, a preterm neonate dying only had a higher odds of being a LBW (<2500g) than any other factor [adjusted OR 132.72 (95% CI 39.49 to 387.66) P<00001]. Considering the main causes of death, hypoxic ischemic encephalopathy in preterm neonates was only associated with poor Apgar score (i.e. <7) [adjusted OR 2.03 (95% CI 1.12 to 3.67) P =

*Corresponding author:
Paul Kamfwa
Department of Obstetrics and Gynaecology, UTH,
Lusaka, Zambia
(email: kamfwap@yahoo.com)

0.02]. Sepsis in term neonates OR 0.2 (95% CI 0.15 to 0.54) P<00001]. Respiratory distress syndrome in preterm neonates dying was only associated with poor Apgar score [adjusted OR 6.01 (3.03 to 11.92) P<00001].

Conclusions: Hypoxic ischemic encephalopathy as a cause of early neonatal death is commoner in term neonates but also common in preterm. Sepsis is commoner in preterm neonates as a cause of early neonatal death. Comparing different causes of death, poor Apgar score featured in all cases calling for improved resuscitation.

INTRODUCTION

Prematurity is a key issue in public health, especially for developing countries like Zambia. Worldwide, it remains a significant perinatal challenge, with pre-term babies accounting for 5-25% of all deliveries and up to 75% of all perinatal mortality in some series (Fuch, 1976).

Globally, 15 million babies are born preterm each year, and more than 1 million of those do not survive their first month of life. Three –quarters of these could be saved with current, cost effective interventions. In lower income countries on the average 12% of the babies are born too early compared with 9%in higher income countries. The situation is especially dire in low and middle-income countries where 98% of all neonatal deaths occur. The highest rates of preterm mortality are in West Africa. In Nigeria, preterm babies account for 40-60% of all perinatal deaths (Njokanma, 1994).

Of all early neonatal deaths not associated with congenital malformations, 28% are due to preterm birth (Lawn, 2006). Factors linked to preterm deaths include medical conditions of the mother or fetus, genetic influences, environmental exposure, infertility treatments, behavioral and socioeconomic factors and iatrogenic prematurity.

Although Zambia has a perinatal mortality rate of 24/1000 live births (ZDH2013), there is not much documentation about the survival rate and determinants of preterm deaths for babies sent to

Neonatal intensive Care Unit (NICU) at University Teaching Hospital (UTH). This study was aimed at establishing the factors and risks associated with preterm deathsat UTH in comparison with term neonates.

METHODS

The study was a case control one with the target population of preterm and term deliveries at UTH. The study population was preterm neonates who died in NICU and comparison group were term neonates who died on the same day in NICU. The sample size of 208 of which 104 were preterm and rest term babies dying within 7days.Any preterm neonate born at UTH was followed up to 7 days from birth. In the event of early neonatal death, pregnancy and delivery details were abstracted. A term neonate that died as an early neonatal death was selected as a comparison and similar pregnancy and delivery details abstracted.

RESULTS

The mean age of the mothers was 27.62 with a median of 28. The minimum age was 15 with the maximum of 44 years. It was observed that 73.2% women were from poor socio-economic class and were from high density areas mostly the compounds in Lusaka .Only 18(8.6%) were from low density and 6(2.9%) were from the rural areas around Lusaka .Most of the mothers 145(69%) had attained secondary schooling 53(25.4%) primary, 7(3.7%) tertiary and only 3 (1.9%) had no formal education with education giving a P-value of 0.814. The married ones were 189(90.9%) and the unmarried were 19(9.1%) with the p-value of 1.000. Marital status was not significantly associated with preterm deaths. Steroid exposure was significantly associated with a P-value 0.001 even after regression the association was high. The birth weight of the neonate was significant with P-value 0.001 even after regression it was still significant. The babies who were reactive were 47(23.3%) and 161(76.7%) were non-reactive giving a P-value 0.241.

In terms of the number of days spent in NICU between the preterm and term babies for less than a day were 41(39.4%),2-2days31(30.8%)and 31(29.8%) compared to the term babies 27(26%),46(44.2%),31(29.8%) not significantly different with the p-value 0.674.

The various factors related to the preterm and term neonates are presented in the table below stratified by the gestation.

Table 1: variable between preterm and term neonates

Associations of factors between preterm and term neonates resulting in Early Neonatal Deaths

Variable	P value (chi square)	
Age	0.2886	No difference between two groups
Parity	0.0879	
Education	0.1394	
Residence	0.8788	
HIV status	0.4701	
Previous preterm birth	0.0504	
PROM	0.2971	
Mode of delivery	> 0.9999	
Breech	0.1362	
Antenatal steroids	< 0.0001	A feature of preterm
Antibiotics	0.0004	
Apgar scores (term less)	0.0048	Less AS in term neonates
bweight	< 0.0001	By definition
sex	0.0031	More term males died
Cause Of Death	0.0309	Different in 2 groups
Days surviving	0.0674	

Fig 1: distribution of gestation by cause of early neonatal death (HIE)

Hypoxic ischemic encephalopathy in preterm was associated with poor Apgar score (<7) than any other factor, adjusted OR 2.03(95% CI 1.12 to 3.67) P = 0.02.Sepsis in term neonates dying was only associated with poor Apgar score (<7) than any other factor, adjusted OR 0.2 (95% CI 0.15 to 0.54) P<00001.As expected, a preterm neonate dying only had a higher odds of being a LBW (<2500g) than any other factor adjusted OR 132.72 (95% CI 39.49 to 387.66) P<000 1.RDS in preterm neonates dying was only associated with poor Apgar score (<7) than any other factor adjusted OR 6.01(3.03to11.92) p <00001

DISCUSSION

The study conducted involved 208 neonates from July 2015 to January 2016.There were 104 preterms and 104term neonates. We examined the factors associated with the risk of preterm death and multivariate analyses showed that mortality was associated with a number of factors including birth weight, sex, lack of steroid exposure , lack of antibiotic exposure and HIE. Various studies have looked at relationship of teenagers and older mothers as being risky and subsequently having a preterm death, however, this particular trend was not shown by our study even after regression. In our study, the majority of women were from lower socioeconomic class.

It was observed that preterm death was directly related to birth weight. . Majority of these deaths can be prevented by reducing the incidence of preterm labour through regular antenatal checkups, screening of high risk cases and use of short term glucocorticoids for improving lung maturity. We found that there was 51% mortality reduction in those with steroid exposure in comparison with other studies where they had found a 53% reduction (Kambafwile, 2010).

During the study, the leading cause of preterm death was sepsis .This observation is similar to what was found in Pakistan at both local hospital and community based studies (Bhutta, 2005). Incidence of deaths due to sepsis was very high and should be
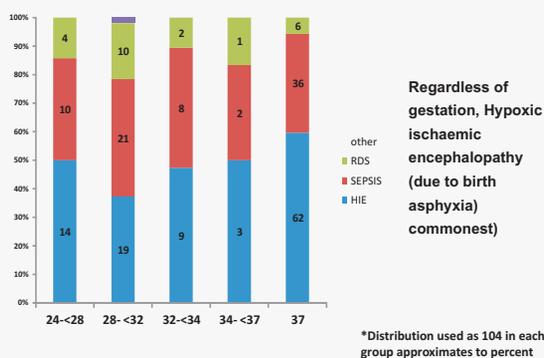
reduced by improving the asepticconditions in the labour ward and in the neonatal care unit and by use of broad spectrum antibiotics in preterm labour especially for those mothers with ruptured membranes. The sex of the neonate significantly influenced the odds of dying, and consistent with other reports we found females had lower odds of mortality than males during the first week of life. This and other studies have shown higher neonatal mortality among males compared to female neonates (Renzo, 2007). We confirmed that male neonates had a 57.1% higher riskthan females (42.9%) of dying during the early neonatal period. Our finding is higher thanin the study conducted in Ethiopia where it was 38% (Mekonnen, 2013). The biological factors that have been implicated with this increased risk of neonatal deaths in male infants include late maturity resulting in a high prevalence of respiratory diseases in males (Alonso and Fuster, 1975)

In our study, the influence of maternal education on preterm death did not change even after controlling for proximate factors probably because most of the mothers had attended secondary education thus increasing their knowledge about child health and healthcare services .

Indicators of socio-economic status were limited to marital status and educational level which were both not significant; hence our analyses could have been affected by other confounders owing to unmeasured socio-economic factors. However, in all of these cases, covariates were related to low birth weights, therefore it is felt that residual confounders did not play a significant role.

Our analysis had other limitations and the results might have been biased in selection, misclassification, or confounding. The target population in our study consisted of all preterm and term newborns admitted to NICU who subsequently died. However, selection bias in this regard wouldbe relatedto the comparison of preterm newborns to "controls – term babies. However, since our controls originated from newborns who were delivered at UTH and sent to NICU, they belong to the same population of "cases, thus reducing the risk of selection bias. Having said that we believe that selection may not have been a considerable source of bias

CONCLUSION

Sepsis is commoner in preterm as a cause of early neonatal death. Hypoxic ischemic encephalopathy as a cause of early neonatal death is commoner in term neonates but also common in preterm .Poor Apgar score featured in all cases calling for improved resuscitation. The study revealed that initial cause of morbidity and certain factors (parity, gestation, bithweight and gender) may influence different causes of death. Reorganization of services and increased funding and human resource allocation to NICU and to provide better clinical support to these preterm babies will be needed since there are several modifiable factors that affect the risk of preterm death.

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