ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

FACTORS ASSOCIATED WITH MORTALITY AMONG LOW BIRTH WEIGHT NEONATES ADMITTED TO THE NBU OF THE MOI TEACHING AND REFERRAL HOSPITAL IN ELDORET, KENYA

Paul Kiptoon [1*], Festus M. Njuguna [2], Winstone Nyandiko[1]

1- Department of Paediatrics, Moi University, P.O. Box 4606 - 30100, Eldoret, Kenya.

2- Division of Paediatrics, Moi Teaching and Referral Hospital, P.O. Box 4606 - 30100, Eldoret, Kenya.

Manuscript Info

Manuscript History:

Received: 15 May 2014
Final Accepted: 22 June 2014
Published Online: July 2014

Key words:
Mortality, Low Birth Weight, Neonates, New Birth Unit, Moi Teaching, Referral Hospital, Kenya

Corresponding Author

Paul Kiptoon

Abstract

Neonatal mortality is a very significant contributor of infant mortality in Kenya and also in the entire world. It accounts for 43% of the infant mortality in Kenya and has been shown to account for about 50% of the infant mortality in the developing world. This paper sought to determine the factors associated with mortality among the low birth weight neonates admitted to the NBU of MTRH. Across-sectional hospital based descriptive study was conducted at the newborn unit of the Moi Teaching and Referral Hospital (MTRH) among the neonates with a birth weight of less than 2500 grams and admitted to the newborn unit of MTRH. The data was analyzed using SAS institute version 9.1. A p-value of less than 0.05 was considered significant in all analyses. Descriptive statistics such as mean, standard deviation, median, range were used for the continuous variables while frequency listings were used for categorical variables. The most common diagnosis among the neonates was clinically diagnosed sepsis and respiratory distress syndrome. Other common diagnoses were jaundice, birth asphyxia, anaemia and apnoeic attacks. All the common morbidities were associated with very high mortalities. The place of delivery had a significant effect on the outcome of the neonates. The gender of the neonate had no effect on the survival of the neonate. There was a significant association between the diagnosis of respiratory distress syndrome and the gestational age and the birth weight. The study established that the major predictors of mortality in low birth weight neonates in MTRH include a low apgar score at 5 minutes, gestational age less than 28 weeks, birth weight < 1000gms, a diagnosis of respiratory distress syndrome, birth asphyxia and suspected sepsis. The hospital needs to put more emphasis on the care of the VLBW and ELBW neonates. This is the group that was associated with very high mortality rates in this study.

..

INTRODUCTION

A birth weight less than 2500 grams has been defined by the WHO to be low birth weight. This is further sub-classified as low birth weight (1501-2499 grams), very low birth weight (1001-1500 grams) and extremely low birth weight (501-1000 grams) (WHO, 2005).

Low birth weight is associated with high mortality and morbidity. According to WHO, infants who weigh less than 2500 grams are 20 times more likely to die than the ones with normal birth weight (WHO, 2005). However, the morbidity and mortality patterns vary greatly between the developed and the developing countries. The mortality is significantly higher in the developing countries as compared to the developed countries. Research in the developed countries is mainly directed towards the very low birth weight and extremely low birth weight neonates. This could be due to the fact that the survival rate for their neonates in the low birth weight sub-category has been very high (SAHIMS, 2004; Joy & Simon, 2005).

The common causes of morbidity identified in these studies are chronic lung disease, severe intraventricular haemorrhage and necrotizing enterocolitis (Lemons et al., 2001). In Finland, a developed country in the years 1996-1997, there was a survival rate of 62% in the ELBW group. The common morbidities were respiratory distress syndrome, intraventricular hemorrhage, septicaemia and necrotizing enterocolitis. The factors associated with increased mortality were a low 5 minute apgar score, birth weight less than 600 grams and a gestation less than 25 weeks (Tommiska et al., 2001).

In Turkey, in the years 1997-2000, the neonatal survival of the very low birth weight neonates was 83.5%. The common causes of morbidity were necrotizing enterocolitis (26.3%), nosocomisal infection (25.5%), chronic lung disease (12.6%) and retinopathy of prematurity (8.1%) (Begun et al., 2003).

In South Africa between the years 2000 and 2002 a survey in a large public hospital, a survival rate of 84% was noted among neonates who were between 1000 -1499 grams. 32% of those who were below 1000 grams survived. Better neonatal survival was fond in those whose mothers attended antenatal care services. Caesarean section delivery, female gender and an Apgar greater than 5 at 5 minutes were associated with better survival (Velaphi et al., 2005).

The survival rates are quite low in the developing countries. In Nigeria in the early 1990s the survival rates were 10.3% (ELBW), 46.5% (VLBW) and 89.2% (LBW) (Velaphi et al., 2005). In another study in Nigeria the common causes of morbidity among the premature neonates were birth asphyxia jaundice, anaemia and hemorrhagic disease of the newborn (Oguchukwu et al., 2002).

High mortality was found in patients with respiratory distress syndrome (40%), severe birth asphyxia (33.4%), neonatal sepsis (13.3%) and severe neonatal jaundice. Referred cases accounted for 75% of the mortality (Ezeaka et al., 2004).

The leading causes of morbidity in Kenya (10) were respiratory distress (69%); apnoeic attacks (42.4%) suspected sepsis (37.1%) and jaundice (37.1%). Other morbidities were hypothermia (27.2%), anaemia (17%), dehydration (14.6%), confirmed sepsis (13.9%) and birth asphyxia (11.4%). The highest mortalities were found in patients with apnoeic attacks (97%), hypothermia (84.8%), birth asphyxia (82%) and suspected sepsis (76.8%). Other leading causes of mortality were dehydration (70.5%), respiratory distress (66.5%) and jaundice (61.1%) (Simiyu, 2004).

In MTRH low birth weight is a significant cause of admission to the newborn unit accounting for about 37% of the total admissions (Ayaya et al., 2001; Ayaya et al., 2004) Prematurity has also been correlated with poor outcome in the unit. The commonest morbidities have been birth asphyxia and respiratory distress syndrome. These would be expected to rank high also in relation to low birth weight neonates (Ayaya et al., 2001; Ayaya et al., 2004).

Problem Statement

Neonatal mortality is a very significant contributor of infant mortality in Kenya and also in the entire world. It accounts for 43% of the infant mortality in Kenya and has been shown to account for about 50% of the infant mortality in the developing world (Tommiska et al., 2001; WHO, 2005). Low birth weight is one of the three main causes of neonatal mortality in the developing world the others being neonatal infections and birth asphyxia. It accounts for 28% of the deaths (Joy & Simon, 2005).

The mortality of low birth weight neonates has been found to be 20 times more than the mortality of neonates with a birth weight of 2500 grams or more. Overall the mortality is higher in the developing countries than in the developed countries (WHO, 2005). In Kenya Low birth weight neonates' account for 11% of all deliveries

(Stevenson et al., 1993). They account for 60% of the admissions at Kenyatta National hospital and 37% of the admissions at Moi Teaching and referral Hospital. The Low birth weight neonates accounted for 93.5% of the deaths in the new born unit of Kenyatta national hospital (Ayaya et al., 2001; Kasirye-Bainda & Musoke, 1992; Simiyu, 2004).

Limitations of the Study

Lack of constant and adequate supply of blood culture bottles during the time of study contributed to having many patients with a diagnosis of clinically diagnosed sepsis. There was no follow-up for the neonates who were discharged before the end of the neonatal period. Some of the morbidities and mortalities that could have occurred after discharge but before the end of the neonatal period were missed out.

MATERIALS AND METHODS

The study was conducted at the newborn unit of the Moi Teaching and Referral Hospital (MTRH). The hospital is located in Eldoret town in the Rift valley province of Kenya. The town is about 300 kilometers Northwest of Nairobi the capital city of Kenya. The hospital serves as a teaching hospital for Moi University School of Medicine and other medical training institutions around Eldoret. It also serves as a referral hospital for the western part of Kenya, with a catchment population of about 13 million people. The unit mainly serves the neonates born within the hospital. The neonates born outside the hospital are usually admitted in the general paediatric wards unless they are less than 1500 grams and not more than 24 hours of age. The unit has a capacity of 20 neonates. The staff in the unit includes two neonatologists, paediatric registrars, medical officer interns, nurses and other paramedical staff. It does not have the capacity to provide mechanical ventilation and has no incubators.

This was a cross-sectional hospital based descriptive study. The study was carried out among the neonates with a birth weight of less than 2500 grams and admitted to the newborn unit of MTRH. All consecutive neonates admitted to the unit with a birth weight less than 2500 grams between 1st may 2006 and 30th November 2006 (six months) were included in the study.

The inclusion criteria targeted newborns who had: admission to the newborn unit; birth weight less than 2500 grams, and consent from the parents of the neonate. The exclusion criteria targeted those with birth weight greater than 2499 grams. The low birth weight neonates who were already admitted in the unit before the study commenced.

The data was collected between 1st may 2006 and 31st November 2006. All neonates admitted to the unit had their weights taken and those whose weight was less than 2500 grams were identified. The mothers of the neonates were identified in the post-natal ward and consent was sought from them. After obtaining the consent, a complete history and physical examination were done on the neonate. From the history and physical examination appropriate diagnoses were assigned and the appropriate investigations were commenced. A gestational assessment was done using the new Ballard's score by the investigator or by the doctor on duty and recorded in the data collection form. The doctors working in the unit during the period of the study had been trained on gestational assessment to ensure consistency. All of the neonates who were below the 10th percentile of weight for gestational age were classified as being small for gestational age while those above the 10th percentile were classified as appropriate for gestational age. All this information was recorded in the data collection form.

Data regarding the mothers' age, marital status, place of delivery, mode of delivery and presence of any illnesses during the pregnancy was obtained from the mothers medical records. In cases where this information was missing the mother was interviewed and this was also recorded in the data collection form. Daily follow-up was done on the neonates till the time of discharge or death. Physical examination was done daily and the results of any laboratory and radiological investigations were interpreted. New diagnoses were assigned as they arose. All the patients were put on the standard care given to all the neonates in the unit.

All the neonates who were discharged were booked for follow-up in the neonatology clinic in the hospital. The outcome of death was assigned to those neonates who were found to have no cardiac and respiratory activity and also dilated and non-reactive pupils on physical examination. The outcomes and the time of death were also recorded in the data collection form. The data was analyzed using SAS institute version 9.1. A p-value of less than 0.05 was considered significant in all analyses. Descriptive statistics such as mean, standard deviation, median, range were used for the continuous variables while frequency listings were used for categorical variables. The Chi-

square test was used to assess any association between a categorical variable and each of the independent variables. The Fishers exact was used where the cell count was less than 10. The odds ratio was analyzed at 95% confidence level. The multivariate logistic regression model was used to assess the association between a binary outcome and a set of variables both continuous and categorical in the same model.

RESULTS

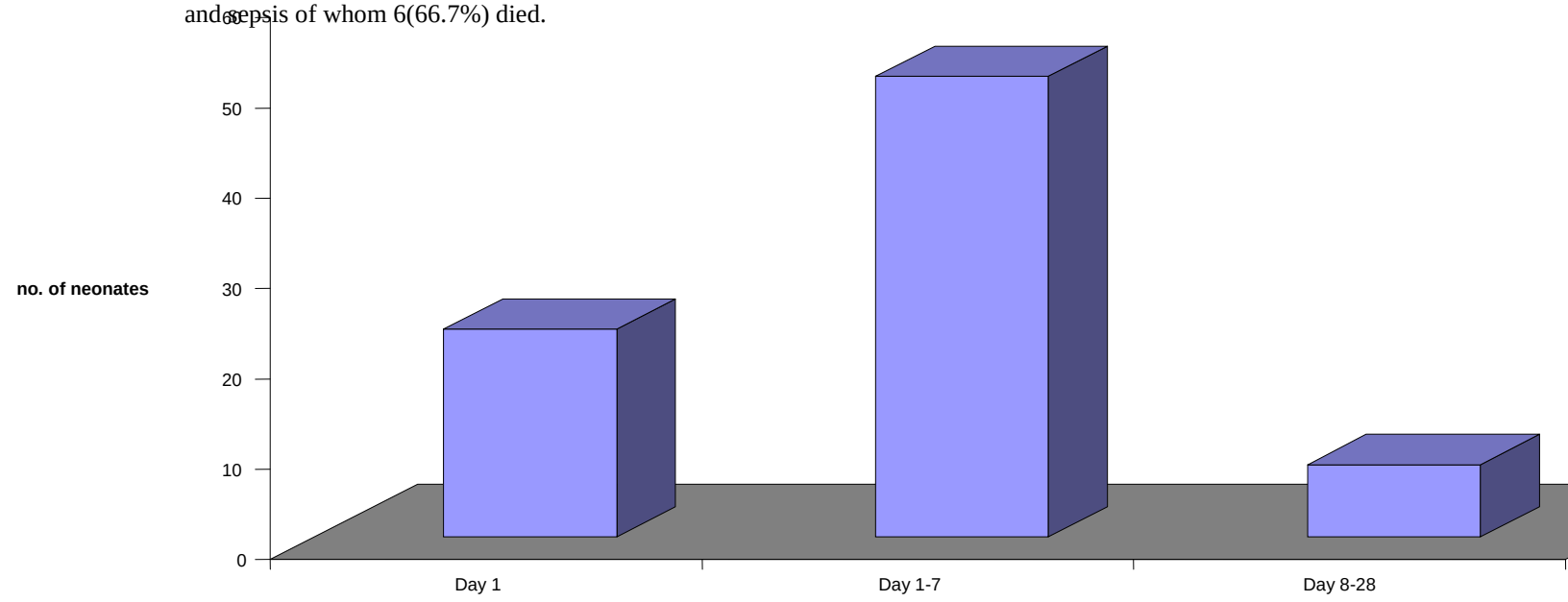
Morbidity among the Neonates

The most common diagnosis among the neonates was clinically diagnosed sepsis (67) and respiratory distress syndrome (59). Other common diagnoses were jaundice, birth asphyxia, anaemia and apnoeic attacks. There were 7 cases of confirmed sepsis; 19.5% of the neonate did not have any other established morbidity apart from having low birth weight (Table 1).

Table 1: Causes of morbidity among the neonates

Diagnosis	No.	% of the total neonates
Clinically diagnosed sepsis	67	42.1%
Respiratory distress syndrome	59	37.1%
Jaundice	35	22.0%
Birth asphyxia	27	17.0%
Anaemia	13	8.2%
Apnoeic attacks	13	8.2%
Confirmed sepsis	7	4.4%
Necrotizing enterocolitis	6	3.8%
Others	16	10.1%

All the common morbidities were associated with very high mortalities: 50(84.7%) of those diagnosed to have respiratory distress syndrome did not survive while 21(77.8%) of those diagnosed with birth asphyxia died. Of those with clinically diagnosed sepsis, 43(63.5%) died while 20(57.1%) of those with jaundice died. There were 34 neonates with both respiratory distress syndrome and clinically diagnosed sepsis of whom 26(76%) died. The neonates who had both jaundice and sepsis were 32 of whom 17(53%) died while 9 neonates had both birth asphyxia and sepsis of whom 6(66.7%) died.



Effect of Delivery and Maternal Variables on the Outcome

The place of delivery had a significant effect on the outcome of the neonates. The neonates who were born within the Moi Teaching and Referral Hospital had a significantly higher survival rate as compared to those who were delivered in the hospital (p=0.0405) (O.R. 2.6154 C.I 1.1089-6.7163). The neonates delivered via caesarean section were more likely to survive compared to those delivered through spontaneous vertex delivery and breech delivery (p<0.0001). There was no statistically significant difference in the mortality of the neonates from single pregnancies and those from multiple pregnancies (p=0.1208) (Table 3).

The outcome of the neonates delivered via caesarean section was better than those delivered vaginally irrespective of whether the neonates' birth weight was small (p=0.0138) or appropriate for gestational age (p=0.0002).

There was no difference in the outcome of the babies who were delivered by mothers in the extremes of age (<20 years and >35 years) compared to those who were between 20 and 35 years (p=0.3859).

Neonates born of mothers who had either pregnancy induced hypertension or had HIV/AIDS had better outcome than those whose mothers did not have either of these conditions (Table 3).

Table 3: Delivery and Maternal Variables versus the Outcome

Variables		Dead	Alive	P value	Odds ratio
Place of delivery	MTRH	65(79.27%)	70(90.91%)	0.0405	2.6154(1.1089-6.7163)
	Outside MTRH	17(20.73%)	7(9.09%)		
Mode of delivery	SVD	64(78.05%)	36(46.75%)	<0.0001	
	C/S	9(10.98%)	35(45.46%)		
	Breech delivery	8(9.76%)	6(7.79%)		
Single/multiple pregnancy	Single	14(17.07%)	21(27.27%)	0.1208	1.8214(0.8491-3.9070)
	Multiple	68(82.98%)	56(72.73%)		
Mothers age	<20 or >35 yrs	23(28.05%)	17(22.08%)	0.3859	1.3759(0.6680-2.8339)
	20-35 yrs	59(71.95%)	60(77.92%)		
Mother HIV +ve	No	78(95.12%)	64(83.12%)	0.0144	0.2525(0.0785-0.8121)
	Yes	4(4.88%)	13(16.88%)		
Mother had hypertension	No	80(97.56%)	68(88.31%)	0.0216	0.1889(0.0395-0.9042)
	Yes	2(2.44%)	9(11.69%)		

Effect of the Neonates Variables on the Outcome

The gender of the neonate had no effect on the survival of the neonate (p=0.8083, O.R=0.9250 C.I. 0.4927-1.7367). The gestation at birth was a significant predictor of outcome. The lower the gestation, the higher the mortality (p<0.0001).

The birth weight and its appropriateness were both significant predictors of outcome. A lower birth weight was associated with higher mortality (p<0.0001). The neonates whose weight was appropriate for their gestational age had a higher mortality than those who were small for gestational age (p<0.0001). There was a significant association between the birth weight and the outcome irrespective of whether the neonates were AGA (p=0.0001) or SGA (p=0.0003). It is important to note that those neonates who were small for gestational age were more likely to be from a multiple pregnancy than those whose weight was appropriate for gestational age (p=0.0055). In all the three birth weight categories the AGA neonates made the larger percentage, 95.8% in the <1000gms category, 57.9% in 1000-1499gms category and 60.8% in the 1500-2499gms category.

The Apgar score was also significantly associated with the outcome (p<0.0001). A low Apgar score conferred a higher risk of death as compared to a high Apgar score. On a logistic regression model controlling for other delivery and neonatal variables, those neonates who had an Apgar score of less than 3 were 48 times more likely to die when compared to those who scored between 8 and 10 (Table 4).

Table 4: Neonates Variables versus the Outcome

Variables		Dead	Alive	P value
Sex	Male	39(50.00%)	37(48.05%)	

	Female	39(50.00%)	40(51.95%)	0.8083
Gestation	<28 weeks	32(39.02%)	2(2.60%)	<0.0001
	28-34 weeks	45(54.88%)	45(58.44%)	
	35-37 weeks	5(6.10%)	23(29.87%)	
	>35 weeks	0(0.00%)	7(9.09%)	
Birth weight	<1000gms	24(29.27%)	0(0.00%)	<0.0001
	1000-1499gms	29(35.37%)	9(11.69%)	
	1500-2499gms	29(35.37%)	68(88.31%)	
Birth weight	SGA	18(21.95%)	37(48.05%)	<0.0001
appropriateness	AGA	64(78.05%)	40(51.95%)	
Apgar	1-3	9(14.06%)	1(1.43%)	<0.0001
Score at 5 minutes	4-5	21(32.82%)	7(10%)	
	6-7	23(35.94%)	24(34.28%)	
	8-10	11(17.19%)	38(54.28%)	

Morbidity in relation to Birth Weight and Gestational Age

There was a significant association between the diagnosis of respiratory distress sydrome and the gestational age ($p<0.0001$) and the birth weight ($p<0.0001$). The diagnosis was more common among the neonates who were either less than 28 weeks of gestation or had a birth weight less than 1000 grams. There was also a significant association between suspected sepsis and the gestational age ($p=0.0017$) and the birth weight ($p=0.0005$). Suspected sepsis was more common in those neonates who were either between 28-34 weeks of gestation or in the VLBW category. There was no statistically significant association between birth weights/gestational age and birth asphyxia.

The higher the number of diagnosis in a neonate the higher was the chance of death ($p<0.0001$). Majority of the neonates had one diagnosis (52.8%) while 44(27.7%) had two diagnoses. Those with three diagnoses were 22(13.8%) while 9(5.2%) had four diagnoses (Table 5 and 6).

Table 5: Birth Weight versus Diagnosis

Variable	0-1000 gms	1001-1499 gms	1500-2499 gms	p-value
Respiratory distress				
Yes	20(83.33%)	21(55.26%)	18(18.56%)	
No	4(16.67%)	17(44.74%)	79(81.44%)	<0.0001
Clinically diagnosed sepsis				
Yes	8(33.33%)	28(73.68%)	38(39.18%)	
No	16(66.67%)	10(26.32%)	59(60.82%)	0.0005
Jaundice				
Yes	2(8.33%)	16(42.11%)	17(17.53%)	
No	22(91.67%)	22(57.89%)	80(82.47%)	0.0018
Birth asphyxia				
Yes	4(16.67%)	3(7.89%)	20(20.62%)	
No	20(83.33%)	35(92.11%)	77(79.38%)	0.2083

Table 6: Gestational Age versus Diagnosis

Variables	Less than 28 weeks	28-34 weeks	More than 35 weeks	p-value
Respiratory distress				
Yes	24(70.59%)	34(37.78%)	1(2.86%)	<0.0001
No	10(29.41%)	56(62.22%)	34(97.14%)	

Clinically diagnosed sepsis				
Yes	18(52.94%)	49(54.44%)	7(20.00%)	0.0017
No	16(47.06%)	41(45.56%)	28(80.00%)	
Jaundice				
Yes	6(17.65%)	27(30.00%)	2 (5.71%)	0.0104
No	28(82.35%)	63(70.00%)	33(94.29%)	
Birth asphyxia				
Yes	6(17.65%)	17(18.89%)	4(11.43%)	0.6040
No	28(82.35%)	73(81.11%)	31(88.57%)	

Effect of various Morbidities on the Outcome of the Neonates

Birth asphyxia (p=0.0028), suspected sepsis (p=0.0049) and respiratory distress syndrome (p<0.0001) were all significantly associated with death. The association between anaemia, jaundice, necrotizing enterocolitis and the neonatal outcome was not statistically significant. There was an association between the number of diagnosis and the outcome of the neonates (p<0.0001) (Table 7).

Table 7: Diagnosis versus Outcome

Variable		Dead	Alive	p-value	Odds ratio 95% C.I.
Birth asphyxia	No	61(74.39%)	71(92.21%)		
	yes	21(25.61%)	6(7.79%)	0.0028	4.0738(1.5448-10.7428)
Respiratory distress	No	32(39.02%)	68(88.31%)		
syndrome	Yes	50(60.98%)	9(11.69%)	<0.0001	11.8056(5.1750-26.9319)
Clinically diagnosed	No	35(42.68%)	50(64.94%)		
sepsis	Yes	47(57.32%)	27(35.06%)	0.0049	2.4868(1.3102-4.718)
Anaemia	No	74(90.24%)	72(93.51%)		
	Yes	8(9.76%)	5(6.49%)	0.4530	1.5568(0.4863-4.9834)
Jaundice	No	62(75.61%)	62(80.52%)		
	Yes	20(24.39%)	15(19.48%)	0.4522	1.3333(0.6258-2.8407)
Necrotizing	No	80(97.56%)	7394.81%)		
enterocolitis	Yes	2(2.44%)	4(5.19%)	0.3621	0.4563(0.0811-2.5652)

DISCUSSION

Neonatal mortality continues to be a major cause of childhood deaths with low birth weight contributing about 30% of the neonatal deaths. The lack of available resources to take care of the extremely premature neonates contributes largely to the high mortality in this study. There was a very high incidence of respiratory distress syndrome among the ELBW and LBW neonates. These are neonates who require surfactant therapy and also mechanical ventilation both of which are unavailable in the institution. The lack of resources to provide for the proper care required for these neonates, including parenteral nutrition, proper temperature control and others could also have contributed to the high mortality.

A low 5 minute apgar score is predictive of a poor outcome (Velaphi et al., 2005). A low apgar score usually denotes fetal compromise during or before the process of delivery. In this study a low apgar score was one a major factor that was used to make a diagnosis of birth asphyxia. Other factors that were considered in the diagnosis of birth asphyxia included clinical features like neurological changes, respiratory distress and intolerance to feeds. To make the diagnosis ideally requires measurement of blood pH at birth which is not done in MTRH. Proper antenatal care and also proper management of labour reduces the incidence of birth asphyxia. Birth asphyxia leads to multiorgan failure leading to death (Behrman, 2004).

The commonest mode of delivery was spontaneous vertex delivery. This represents the general trend in Kenya as well as other developing countries. In KNH in the year 2000 spontaneous vertex delivery was the leading mode of delivery among the low birth weight neonates. Caesarean section is associated with better outcome as compared to vaginal delivery among the low birth weight neonates (Simiyu, 2004; Munz et al., 2005). However, other studies have demonstrated no differences in the outcome between the two modes of delivery (Ezeaka et al., 2004). Vaginal delivery has been associated with high incidence of central nervous system morbidities including peri/intraventricular haemmorhage and periventricular leukomalacia (Deulofeut, 2005; Bauer et al., 2003). These are

not routinely assessed in this unit and could have contributed to the high mortality. In majority of the cases where a premature neonate is delivered through a caesarean section, a paediatrics registrar with training on neonatal resuscitation was usually present to attend to the neonate. This could have contributed to the lower mortality among the neonates delivered through caesarean section.

Neonates born out of the admitting hospital have been known to have poor outcomes compared to inborn neonates. Many of these neonates are delivered at home where the circumstances of delivery are far from the ideal. The neonates get exposed to conditions that lead to sepsis, hypothermia, hypogycaemia and other morbidities that increase the chances of poor outcome. Poor transfer facilities from the peripheral health facilities also contribute to this mortality.

Small for gestation age neonates have a higher mortality as compared to neonates whose weight is appropriate for gestation (Kambarani, 2002; Ho, 2001). However, this study showed reduced mortality among the small for gestation age neonates. The differences in mortality has been mostly demonstrated when neonates of the same gestational age are compared among the two groups.

The male to female ratio in this study was approximately 1:1. This agrees with other studies which have been done in this country (Simiyu, 2004). The sex of the neonate had no effect on the outcome .this has been reported in studies done elsewhere (Ezeaka et al., 2004; Kambarani, 2002). However, some studies have reported better survival with female neonates (Evans et al., 2007; Fanaroff et al., 2007).

The commonest diagnoses in this study were respiratory distress syndrome, suspected sepsis, jaundice and birth asphyxia. Simiyu, in his KNH study, shows that respiratory distress syndrome, apnoeic attacks, suspected sepsis, jaundice and hypothermia as the commonest diagnosis. Birth asphyxia, Jaundice and sepsis were also reported to be the commonest diagnosis in Nigeria (Kambarani, 2002).

The diagnosis of respiratory distress syndrome was quite common among the neonates in this study. This was expected given the pathogenesis of this condition. Lack of surfactant in the alveoli of the lungs causes respiratory distress syndrome and this is common among premature neonates. High mortality was noted in neonates with a diagnosis of respiratory distress syndrome (84.7%).

This could be attributed to the fact surfactant therapy is not available in this facility and ventilator support is also not routinely provided. The diagnosis was mainly clinical without much laboratory and radiological investigation done to either confirm or rule out the diagnosis. This could have contributed to missed diagnosis in some of the neonates leading to lack of proper treatment and hence poor outcome.

Neonates were treated for clinically diagnosed sepsis on the basis of clinical signs and symptoms. Doing blood cultures would have been useful to confirm sepsis. This would have influenced the choice of antibiotics depending on the sensitivity patters and probably improve the outcome. Among those with positive blood cultures Klebsiella spp. and enterococci spp. were the only organisms isolated

Premature neonates are known to have a high risk for infections. This is because they have a state of immunodeficiency due to immaturity of their immune system. Gram negative organisms are a predominant cause of neonatal sepsis in the developing world (Behrman, 2004).

Jaundice was common among the neonates in this study as has been reported in other studies (Simiyu, 2004; Kambarani, 2002). Physiological jaundice and jaundice as a result of sepsis could have been the commonest causes of jaundice among these neonates although specific screening for the aetiology of jaundice was not done.

CONCLUSION

The major predictors of mortality in low birth weight neonates in MTRH include a low apgar score at 5 minutes, gestational age less than 28 weeks, birth weight < 1000gms, a diagnosis of respiratory distress syndrome, birth asphyxia and suspected sepsis. The hospital needs to put more emphasis on the care of the VLBW and ELBW neonates. This is the group that was associated with very high mortality rates in this study. Possible interventions would include use of antenatal steroids in mothers with anticipated premature delivery. The use of surfactant in the

premature neonates would reduce the mortality of the premature neonates with respiratory distress syndrome. Respiratory support by way of mechanical ventilation should also be put in place.

REFERENCES

Ayaya, S.O., Esamai F.O., Rotich J., and Sidle J. (2001): Perinatal morbidity at Moi Teaching and Referral Hospital, Eldoret. East Afr. Med. J. 78 (10): 544-549.

Ayaya, S.O.,Esamai, F.O., Rotich, J., Liechty, E. (2004): Perinatal mortality in the special care nursery of Moi Teaching and Referral Hospital, Eldoret, Kenya. East Afr. Med.J., 81(11): 555-561.

Bauer, J., Heutschel, R., Zahradnik, H., Karck, U., and Linderkamp, O. (2003, May): Vaginal delivery and neonatal outcome in extremely low birth weight infants below 26 weeks of gestational age. Am. J. Perinatol., 20(4): 181-8

Begun, A., Geunlenez, A., Unal, S., and Arsan, S. (2003): Outcomes of low birth weight infants in a newborn tertiary center in Turkey 1997-2000. Turkish J. of Paed., 45(4): 283-289.

Behrman, R. E. (2004): Nelsons Textbook of Paediatrics (17th ed.). W.B. Saunders 2004

Central Bureau of Statistics (2003): Ministry of health, Kenya medical research institute, Kenya. Kenya Demographic health survey.

Deulofeut, R. (2005, March): Impact of vaginal dellivery in infanfs weighing less than 1251 grams. Obst. Gynecol., 105(3): 525-31

Evans, N. Hutchinson, J. Simpson, J.M. et al. (2007 Jan.); Prenatal predictors of mortality in very preterm infants cared for in the Australian and New Zealand neonatal network. Arch. Dis. Child fetal neonatal Ed., 92(1):34-40

Ezeaka, V. C., Ekure, E.N., Iroha, E.O., and Egri-Okwanji, M.T. (2004 Dec): Outcome of low birth weight neonates in a tertiary health care centre in Lagos Nigeria Afri. J. Med. Sci., 33(4): 209-303 .

Fanaroff, A.A., Stoll, B.J., Wright, L.L, et al. (2007, Feb): Trends in neonatal morbidity and mortality for very low birth weight infants. Am. J. Obstet. Gynaecol., 196(2):147-8

Ho, J. (2001, Aug): Malaysian VLBW study group Singapore Med. J. 2001 Aug; 42(8): 355-9

Joy, E.L., and Simon, C. (2005): Neonatal survival 1:4 million neonatal deaths. Lancet.2005

Kambarani, R. A. (2002, Nov-Dec): Levels and risk factors for mortality in infants with birth weight between 500-1800 gms. In a developing country: A hospital based study. Cent. Afri. J. Med., 48(11-12): 133-136

Kambarani, R. A. (2002, Nov-Dec): Levels and risk factors for mortality in infants with birth weight between 500-1800 gms. In a developing country: A hospital based study. Cent. Afri. J. Med., 48(11-12): 133-136

Kasirye-Bainda, and Musoke, R. N. (1992): Neonatal morbidity and mortality at Kenyatta National Hospital. East Afr. med. J., 69:360-365.

Lemons, J. A., Baeur, C. R., Oh, W. et al. (2001, Jan): Very low birth weight outcomes of the national Institute of child health and human development neonatal research network Jan1995-Dec1996. Paediatrics, 107.

Munz, W., Seufert, R., Schimdt, W. et al. (2005): Perinatal outcomes of infants weighing less than 1500 g. Z Geburtshilfe Neonatol, 209(1): 29-33

Oguchukwu et al. (2002): Preterm admissions in a special care baby unit: The Nnewi experience, 29(3): 75-79.

SAHIMS (2004): Reducing maternal and newborn mortality. A United Nations report.

Simiyu, D.E. (2004): morbidity and mortality of low birth weight infants in the NBU, Kenyatta National Hospital. East Afr. Med. J., 81(7): 367-374.

Stevenson et al. (1993, Dec.): Very low birth weight outcomes of the national institute of child health and human development neonatal research network Jan1993-Dec1994. American J. of Ob. and Gyn., 179 1632-9.

Tommiska, V., Heinonen, K., Ikonen, S. et.al. (2001, Jan): A national short follow-up study of ELBW born in Finland in 1996-1997. Paediatrician, 107.

Velaphi, S. C., Mokhachane, M., Mphalele, R.M. et.al. (2005 July): Survival of very very low birth weight infants according to birth weight and gestational age in a public hospital. S. Afri. Med. J., 95(7): 504-9

WHO (2005): Low birth weight: country regional and global estimates 2005. WHO publication