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Weight-specific Morbidity and Mortality Rates among Low Birthweight Infants in Two Developing Countries

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Summary

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Objective: The objective was to compare the morbidity and mortality data among low birthweight (LBW) infants in two developing countries with different medical facilities, and determine where further improvements are possible.

Methods: Data were extracted from the admission records and case notes of neonates with birthweight <2500grams, admitted to Qatif Central Hospital (QCH), Saudi Arabia, from January 1990 to December 1994, and those of corresponding neonates admitted to the Wesley Guild Hospital (WGH), Ilesa, Nigeria from January 1991 to December 1995. The data obtained were analysed retrospectively.

Outcome Measures: Comparison of birthweight-specific and gestational age-specific mortality rates among LBW infants delivered at Wesley Guild Hospital (WGH), Ilesa and Qatif Central Hospital (QCH), Qatif, Saudi Arabia.

Results: When the data on 368 infants from each hospital were compared, the commonest factors found to be associated with mortality rate were respiratory distress syndrome in QCH and birth asphyxia in WGH. The proportions of infants of VLBW (BW <1500gm) and GA < 32 weeks were higher in QCH than WGH ($p<0.001$). The overall mortality rate was higher in WGH than in QCH although the difference was not significant ($p>0.1$). The mortality rate was significantly higher among the VLBW group in WGH than in QCH ($p <0.001$).

Conclusions: The neonatal mortality rates in the LBW infants in both units were still very high. Improvement in access to antenatal care should reduce LBW rates and associated morbidity and mortality in both hospitals, while the introduction of neonatal intensive care facilities in WGH should greatly reduce the high mortality rate among VLBW infants.

Key Words: Low birthweight, very low birthweight, respiratory distress syndrome, morbidity and mortality, neonatal units, developing countries.

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Introduction

NEONATAL mortality rate (NMR) is an important component of infant mortality rate (IMR) data in many third world countries.[1-5] It may account for half to two-thirds of deaths in the first year of life.[1,6] Neonatal mortality rates (NMR) and day-one mortality rates are directly related to health service activity and are useful indices for comparing effectiveness of health services available to children in various countries.[7] High rates of preterm delivery and low birthweight (LBW) infants are major factors in the high neonatal and infant mortality rates in most developing countries.[8-10] One of the major advances of recent, is the evolution of neonatal intensive care.[11] This facility, unfortunately, is not usually available to very ill LBW preterm infants

in most developing countries;[4] limited funds makes it imperative that priorities are given to other less expensive but easily applied preventive measures. With the present emphasis on primary health care (PHC) activities and prevention of many of the vaccine preventable diseases however, it is anticipated that neonatal care will be accorded its rightful priority.

Saudi Arabia and Nigeria are two developing countries[9] with different levels of medical facilities and practice. For example, Qatif Central Hospital (QCH), Saudi Arabia has a neonatal unit (NNU) that provides neonatal intensive care which includes ventilatory support. On the other hand, only special care services are available to very ill babies at Wesley Guild (WGH) in Nigeria. One of the authors (JAO) has had an opportunity to work in these two units. This provided a unique opportunity to compare the outcome of management of LBW infants in the two units. The objective of this study therefore, was to compare the birthweight-specific and gestational age-specific mortality rates among LBW infants in the two neonatal units and suggest measures that can be taken to improve the outcome in such infants. We believe that this information will also be valuable to other developing countries in deciding on whether or not, to start neonatal intensive care units.[10]

Materials and Methods

Data were obtained retrospectively, from the records of all LBW infants (birthweight <2500grams) delivered in the two hospitals and were admitted into the NNUs. The periods covered in the study were January 1990 to December 1994 in QCH and January 1991 to December 1995 in WGH. The data obtained included postnatal age on admission, birthweight, gestational age (GA), sex, major indications for admission and /or the diagnosis, management, duration of stay in the units (at the time of discharge or death) and outcome. It was the policy at QCH to admit only babies delivered in the maternity unit of the hospital into the NNU. All other ill neonates from outside were usually admitted into the paediatric intensive care unit (PICU). In WGH, babies were admitted into the neonatal unit from outside (within the first month of life) and the maternity unit of the hospital. In order to remove the confounding factor of outside delivery, the data analysed only related to those of LBW infants delivered in both hospitals. Determination of gestational age (GA) was based on the first day of the mother's last menstrual flow and clinical assessment using Ballard *et al's* gestational age assessment chart.[12]

Statistical analysis

Babies were stratified into weight and GA range groups. Means and standard deviations were calculated for weights and GAs. The data were compared using chi-square test with Yates correction for proportions and Student's 't' test for means. P values less than 0.05 were regarded as significant.

Results

In WGH and QCH, 379 and 373 records were reviewed, respectively. Of these numbers, 11 and five respectively, were discharged against medical advice ($p>0.5$) leaving 368 infants in each hospital for comparison. There were 57 deaths in WGH and 69 in QCH, resulting in overall mortality rates of 15.5 percent and 18.8 percent ($p>0.1$) respectively (Table I). Table I also shows the male: female ratios, the means and SD of Gas, birthweights, and duration of stay in the units. The means of BW and GA were significantly higher, while the duration of stay was significantly lower in WGH than QCH. ($p<0.001$).

Table I

Comparison of the Main Clinical Parameters

Parameters	*Hospitals*		$X^2\pi$	*df*	*p value*
	WGH, Ilesa	*QCH, Qatif*			
Total no of neonates	379	373			
No discharge against medical advice	11	5	$X^2=0.44$	1	NS
Male: female ratio	1.02: 1	1: 1.08	$X^2=2.2$	1	NS
Gestational age (weeks)*	34.7 ± 4.3	32.3 ± 3.9	t=7.9	¥	< 0.001
Birthweight (grams)*	1787 ± 443	1596 ± 454	t=5.8	¥	<0.001
Duration of admission (days)*	12.3 ± 10.2	23.0 ± 22.4	t=8.3	¥	< 0.001

**Mean ± one standard deviation*
+NS = not statistically significant

Table II

Comparison of the Major Respiratory Problems

Major Respiratory Problems	*WGH, Ilesa*		*QCH, Qatif*				
	No. of Cases	*% of Total*	*No. of Cases*	*% of Total*	X^2	*df*	*p value*
Birth asphyxia	59	73.8	1	0.8	61.0	1	<0.001
RDS	10	12.5	111	90.2	115	1	<0.001
MAS	2	2.5	4	3.3	0.1	1	NS
Apnoea	2	2.5	-	-	-	-	-
Pneumonia	2	2.5	-	-	-	-	-
TTN	2	2.5	3	2.4	0.01	1	NS
URTI	1	1.2	1	0.8	0.1	1	NS
Aspiration	1	1.2	1	0..8	0.1	1	NS
Congenital malformation	1	1.2	2	1.6	0.05	1	NS
Pneumothorax	-	-	1	0.8	-	-	-
Total	80	100	123	100	12.6	1	<0.001

TTN = Transient tachypnoea of the newborn
URTI = Upper respiratory tract infection

Table III

Comparative Distribution of Gestational Ages

GA (Weeks).	*WGH, Ilesa*		*QCH, Qatif*				
	No. of Cases	*% of Total*	*No. of Cases*	*% of Total*	X^2	*df*	*p value*
<27	15	4.1	40	10.9	12.3	1	<0.001
28 – 32	93	25.3	146	39.7	17.4	1	<0.001
33 – 36	144	39.1	148	40.1	0.1	1	NS
37 – 42	116	31.5	34	9.2	56.3	1	<0.001
Total	368		368				

Comparing proportions of babies with GA above 33 weeks: $X^2 = 34.5$; df. =1; p<0.001

The major respiratory problems observed in the babies are compared in Table II. Significant differences were observed in rates of birth asphyxia (BA) and respiratory distress syndrome (RDS). Birth asphyxia was diagnosed in 59 (16.0 percent) babies in WGH and one (0.3 percent) baby in QCH (p<0.001). On the other hand, RDS was recorded in 10 (2.7 percent) and 111 (30.2 percent) cases at WGH and QCH, respectively (p<0.001). There were no significant differences in the prevalence of other conditions diagnosed namely, meconium aspiration syndrome, apnoea, pneumonia, upper respiratory tract infections, transient tachypnoea of the newborn and congenital malformations.

Tables III and IV compare the distributions of GAs and birthweights, respectively. Higher proportions of lower GAs (p<0.001) and BWs (p<0.01) were observed in QCH than WGH. Similarly, the proportions of very low birthweight (VLBW; BW<1500 gm) and infants of GA £ 32 weeks were higher in QCH than WGH (p<0.01 and p<0.001, respectively). Although the overall mortality rate was higher in QCH, the difference was not significant (p>0.1). The gestational age-specific (Table V) and birthweight-specific (Table

Table IV

Comparative Distribution of Birthweights

Birthweight (Grams)	*WGH, Ilesa*		*QCH, Qatif*				
	No. of Cases	*% of Total*	*No. of Cases*	*% of Total*	X^2	*df*	*p value*
<1000	24	6.5	44	12.0	6.5	1	<0.01
1000-1499	61	16.6	95	25.8	9.8	1	<0.01
1500-2499	283	76.9	229	62.2	18.7	1	<0.01
Total	368	100.0	368	100.0			

Comparing proportions of babies heavier than 1500 grams: $X^2 = 18.7$; $df = 1$; $P < 0.001$

Table V

Comparative Gestational Age-specific Mortality Rates (MR %)

GA (Weeks)	*WGH, Ilesa*			*QCH, Qatif*					
	Alive	*Dead*	*MR%*	*Alive*	*Dead*	*MR%*	X^2	*df*	*p value*
< 27	3	12	80	10	30	75.0	0.15	1	NS
28 – 32	59	34	36.6	119	27	18.2	9.8	1	<0.001
33 – 36	136	8	5.6	141	7	4.7	0.10	1	NS
37 – 42	113	3	2.6	29	5	14.7	7.6	1	<0.01
Total	311	57	15.5	299	69	18.8	1.4	1	NS
≥ 32	62	46	42.6	129	57	30.6	4.3	1	<0.05

GA = Gestational age

Table VI

Comparative Birthweight-specific Mortality Rates (MR %)

BW (Grams)	*WGH, Ilesa*			*QCH, Qatif*					
	Alive	*Dead*	*MR%*	*Alive*	*Dead*	*MR%*	X^2	*df*	*p value*
<1000	4	20	83.3	11	33	75.0	0.63	1	NS
1000-1499	37	24	39.3	78	17	17.9	8.8	1	<0.01
1500-2499	270	13	4.6	210	19	8.3	3.0	1	NS
Total	311	57	15.5	299	69	18.8	1.4	1	NS
<1500	41	44	51.8	89	50	36.0	5.4	1	< 0.02

BW = Birthweight.

VI) mortality rates in both hospitals were inversely related to the BW and GA. However, the mortality rates were significantly higher in the VLBW and infants of GA £ 32 weeks in WGH than QGH ($p< 0.02$ and $p<0.05$, respectively). On the other hand, babies with GA and BW above these values survived better in WGH, although the differences were not significant ($p>0.1$ and $p<0.1$, respectively).

Discussion

The neonatal unit in WGH serves at least, six of the 36 states in Nigeria while that in QCH serves Qatif area which is a major local government area in the Eastern Province of Saudi Arabia. Both units therefore, provide medical services to a sizeable proportion of the population of the respective countries. The neonatal mortality rates in LBW infants in these two units were still very high when compared with data from Europe and America where the NNMR is under five percent.[13,14] A recent report from Europe even reported a NNMR of 2.18 percent for LBW infants.[15]

The most common respiratory problems in the two NNUs namely, RDS in QCH and BA in WGH, may have a common basis. The difference is probably a reflection of the differences in the available facilities in the two units. In QCH, neonatal intensive care facilities such as ventilators and a standby portable X-ray machine were available; more detailed evaluation of ill VLBW infants was therefore possible. Consequently, a greater proportion of the VLBW infants lived long enough for a more accurate diagnosis to be made. Birth asphyxia was diagnosed in the two hospitals when APGAR was £7 at five minutes. Similarly, diagnosis of RDS in the two hospitals was based on the clinical features, including blood gas analysis and chest X-ray findings of diffuse, fine granular densities and air bronchograms. Most of the VLBW babies who died in WGH died within 24 hours of life and most of these deaths were attributed to BA, followed by respiratory failure. Chest X-ray was not usually possible during the period of respiratory distress. It was therefore possible that cases of RDS were being under-diagnosed at WGH.

Introduction of neonatal intensive care facilities into WGH could greatly reduce the very high mortality rate among VLBW infants and possibly among heavier LBW infants. Although the question of high cost of providing such facilities is real, it is not a justifiable reason to continue to deny thousands of such babies in Nigeria and other developing countries the chance to live.[16] Advances in neonatal intensive care has greatly contributed to the survival of such VLBW infants in developed countries.[11,15,17] The better survival rate among the VLBW in QCH than WGH was most likely due to better facilities at QCH. Since there are no easy ways of accurately predicting neonatal morbidity in extremely LBW infants (BW <1000 grams at birth),[17] all babies no matter their birthweights, should therefore be given every chance of survival. Other reasons why such facilities are required include the need to train junior doctors, particularly now that access to training abroad is becoming more difficult. Moreover, those who train abroad do not necessarily return to their home countries because of inadequate facilities to practise the knowledge and skills they have acquired. The appropriate utilisation of new technology appears to have contributed to marked reduction of perinatal mortality even among groups of high-risk patients. Recent declines in mortality rates have been attributed more to improved neonatal care than a reduction in prematurity rates which takes a longer time to achieve.[18]

The slightly better mortality data in WGH was due largely to better survival rate in babies weighing ³1500 grams or with GA ³ 33 weeks. The LBW babies in WGH were relatively more mature. The other reason is that lethal congenital anomalies were relatively more common in Saudi Arabia partly as a result of consanguineous marriages.[18] Since autopsy was not usually performed, some of the lethal internal malformations could easily have been missed.

There is room for improvement in both units. Improvement in NMR in advanced countries has been attributed to many factors that include better and more extensive access to antenatal care, a general improvement in standard of living, better nutrition, better obstetric and neonatal care and greater access to high quality medical care through regionalization of perinatal care.[18-20] A critically ill, VLBW infant with moderate to severe respiratory distress syndrome or severe birth asphyxia needs neonatal intensive care facilities such as ventilatory support to survive. Easy access to medical and perinatal care and improvement in neonatal care facilities should reverse the current unfavourable neonatal morbidity and mortality rates among the VLBW infants in Nigeria.

In the present study, we could not control for variables such as maternal, biological, social and cultural factors, because of the retrospective nature of the study. While we appreciate that this constitutes a limitation to the study, we believe that based on the objective of the study, the following overall observations remain valid, to a great extent. Reduction in preterm and LBW rates in both centres should reduce high NNMR among LBW infants. Such reduction would be enhanced by better access to prenatal care in the two countries. Introduction of neonatal intensive care facilities in WGH will most

likely have a great impact in reducing the mortality rate among the VLBW infants and thus, the overall infant mortality rate. In QCH, reduction in the incidence of major congenital malformations is similarly expected to reduce NNMR in the more mature babies.

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