ORIGINAL ARTICLE

Association of Neonatal Mortality with Low Birth Weight

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ABSTRACT

Aim: To determine infant mortality of low birth weight infants and their relationship to low birth weight and gestational age.
Study Design: Prospective study.
Place and duration of study: Paediatric Department of Sharif Medical City Hospital, Lahore for one year duration from March 2018 to March 2019.
Methods: The study covered all children with low birth weight (LBW), single live births in this hospital. Information about neonates was collected in a pre-designed form. Newborns with LBW were observed / treated in the neonatal ward of this hospital and were observed in various ways (such as follow-up visits, hospital records and telephone interviews) up to the age of 28 days.
Results: There were 360(13.4%) LBW newborns in 2000 births and only 350 cases that could observe throughout the entire neonatal period. Ten cases were lost because they could not complete the follow-up due to logistical problems. That is why we analyzed the results of 350 children. The ratio of men to women was 1: 1.07. Gestational age analysis was born at 11(3.14%) <28 weeks and 134(38.29%) after 37 weeks of full pregnancy. Among the different types of LBW, 53.6% of premature babies have AGA and 7.8% SGA, and the term LBW is 38.4%. A detailed breakdown of the mass parameter showed that the majority of newborns 228(6.14%) were between 2.00-2.499 kg and only 15(4.29%) were less than 1kg. Early neonatal mortality was significantly higher than late neonatal mortality (p-value <0.005). When weight was used as the independent variable, the mortality rate was 90% for 1000 gm, 55.88% for 1000-1499 gm and 10.73% for 2000-2499 gm (p value <0.005).
Conclusion: Neonatal mortality is inversely proportional to birth weight. The neonatal mortality rate of infants with low birth weight is about four times higher than our national infant mortality rate. Most neonatal deaths occurred in the early neonatal period.
Keywords: Low birth weight, Neonatal mortality, Pakistan, Premature neonatal mortality

INTRODUCTION

Neonatal mortality is a sensitive indicator of the effectiveness of the national system of perinatal and neonatal care[1]. The neonatal period is the most susceptible period of human life to diseases and most can be prevented. The probability of a newborn baby's death on the first day of life is 500 times higher than at month. It is estimated that 130 million newborns are born each year, and out of these 4 million died in the first 28 days of life. In the neonatal period, 50% of all deaths occur in the first 24 hours and 75% in the first 7 days of life. An average of 10.6 million children under the age of five are estimated to have died in 2000. This disappearance fell to 8.8 million in 2013 and to 7.1 million in 2013. Children under the age of 5 deserve the care and attention of Health professionals who make the necessary decisions, strategies and interventions to reduce this hostile situation[2].

According to UNICEF statistics 2008-2012, low birth weight (BPN) is 32% and neonatal mortality (NMR) is 42/1000 live births. In Pakistan, NMR is 49/1000 live births, and our share of global neonatal death is 7%. Two-thirds of neonatal deaths worldwide occur in 10 countries, mainly in Asia. Pakistan ranks third among countries with 298,000 newborn deaths per year[3]. The death of our babies is even greater than neighbouring developing countries.

In low-income developing countries such as Pakistan, the main causes of neonatal death (NNM) are prematurity and sepsis, while prematurity and malformations are major causes of neonatal death in developed countries[4-5].

Birth weight is a sensitive determinant and an important factor in neonatal mortality. Birth weight <2.5 kg is indirectly related to neonatal mortality, and the infant mortality rate is around 15%. The mortality rate of newborns with LBW is inversely proportional to their birth weight. Briggs reported that 25% of children under 1,500 gm died in neonatal period. Singh G et al. It has been reported that babies born with low birth weight are 40 times more likely to die in than babies born with full-term[6-7].

Low birth weight contributes to 6% of neonatal deaths in high-income countries and 30% in low-income countries, and its main etiology is complications and premature babies[8].

For socio-economic and political reasons, we have not been able to significantly reduce infant mortality in Pakistan over the past decade[9]. In our country/ configuration it is difficult to get community-based data. Therefore, a study was conducted to obtain hospital data to assess the low birth load neonatal mortality.

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PATIENTS AND METHODS

This prospective hospital study was conducted in the Paediatric department of Sharif Medical City Hospital, Lahore for one year duration from March 2018 to March 2019. A total of 360 patients were selected for the study but ten patients left the study and final sample size was 350. Most high-risk cases for mother and fetus were referred here. The neonatal intensive care unit is equipped with all supportive devices, including the use of surfactants for mechanical ventilation and respiratory distress syndrome (RDS). Babies delivered to the hospital, less than 2,500 gm and single birth were included. Stillbirths, very dysmorphic children and weight of 2500 gm and more were excluded. The cohort was recruited at this hospital by a sequential non-random method during delivery. All low birth weight children in this hospital during the above-mentioned period constituted the study population. Information on newborns was collected daily in a form designed by a student apprentice. Parental written consent was obtained before the child was included in the study. Informed consent concerns the inclusion and publication of the child in the study. Each registrar was examined by a registrar (FCPS intern) and then by a newborn/pediatrician. Gestational age was assessed based on existing mother records/Ballard scoring system. The difference between the Ballard scoring system and the gestational age of the mother was resolved by means of ultrasound reports (serial ultrasound examinations) and finally determined on the basis of maternal dates. If the mother is unsure of dates, Ballard's scoring system was preferred.

Low birth weight was defined as less than 2500 g birth weight regardless of gestational age. Very low birth weight (VLBW) means less than 1,500 gm, and extremely low birth weight (ELBW) less than 1,000 gm. Low for gestational age was defined as birth weight less than the 10th percentile for gestational age. Suitable for gestational age (AGA) means a weight between 10 and 90 percentile (CDC and specific fetal growth charts). According to WHO, the early period is defined as live children born before 37 weeks of gestation. There are subcategories of premature delivery by gestational age: (A) Extremely early (<28 weeks) (B) Very preterm (28 to <32 weeks) (C) Medium to late premature (32 to <37 weeks). The gestational period is defined as 37-42 completed gestational weeks. NMR was defined as the number of deaths per thousand live births of low birth weight newborns during the first 28 days after birth. Newborns with LBW were observed / treated in the neonatal ward of this hospital, with all relevant examinations and supporting equipment. Children with LBW were observed in various ways, such as hospital follow-up visits, hospital records or phone calls to assess neonatal deaths at 28 days. Each newborn baby was followed for the first 28 days. Hospital deaths were confirmed in hospital records. Deaths were registered at home after an interview with parents. Our goal was to determine whether the newborn lived or died in the neonatal period, and the cause of neonatal deaths was not one of our goals. Neonatal variables such as weight, gender, gestational age and postpartum age were used to define the data. All data was analyzed using SPSS 20. The level of significance was assumed as $p < 0.05$.

RESULTS

There were 360 (13.4%) LBW newborns in 2000 births and only 350 cases that could observe throughout the entire neonatal period. Ten cases were lost because they could not complete the follow-up due to logistical problems. That is why we analyzed the results of 350 children. The ratio of men to women was 1: 1.07. Gestational age analysis was born at 11(3.14%) <28 weeks and 134(38.29%) after 37 weeks of full pregnancy. A detailed breakdown of the mass parameter showed that the majority of newborns 228(6.14%) were between 2.00-2.499 kg and only 15(4.29%) were less than 1 kg (Table 1).

Seventy eight (22.3%) children died in the neonatal period, giving 23.1% (231.5 / 1000 LBW) of infant mortality. The mortality rate for men and women was 1: 1.04, but there was no statistically significant difference. Early neonatal mortality was significantly higher than late neonatal mortality (p-value <0.005). When weight was used as the independent variable, the mortality rate was 90% for 1000 gm, 55.88% for 1000-1499 gm and 10.73% for 2000-2499 gm (p value <0.005) (Table 2). Regarding the relationship between weight and gestational age and mortality, the analysis showed that the majority of deceased newborns appeared with early AGA (32.32% from the same category), followed by early SGA (23.08% from the same category) [P<0.005] (Table 2).The distribution of premature AGA and premature SGA by gestational age showed that the majority of newborns in both categories were between 32-37 weeks (Table 3).

Table 1: Demographic parameters of LBW neonates (2000)

Variable	**No.**	**%**
Low birth weight		
Proportion of total cases	360/2000	18.00
Proportion followed up cases	350/360	97.22
Gender		
Male	159	45.43
Female	191	54.57
Gestational age (weeks)		
<28 *(extremely preterm)*	11	3.14
28-<32 *(very preterm)*	79	22.57
32-<37 *(late preterm)*	126	36.0
>37 *(term)*	134	38.29
Birth-Weight		
2499 – 2000	228	65.14
1999 - 1500	68	19.43
1499 - 1000	39	11.14
<1000	15	4.29
Preterm infant group (n=225) and weight appropriateness		
	Preterm AGA (200)	**Preterm SGA (25)**
<28 Weeks	39(19.5%)	5(20%)
28-<32 Weeks	62(31%)	7(28%)
32-<37 Weeks	99(49.5%)	13(52%)
Mean weight of preterm infant group		
<28 weeks gestation (n=40)	750gm	(n=5)600gm
28 - <32 Weeks	1500gm	(n=7)1000gm
32 - <37 Weeks	2200gm	(n=13)1900gm

Table 2: Mortality parameters

Deaths per total followed up cases		88/350
Mortality/case fatality of LBW followedup		23.10%
Category	**Total Death/Alive**	**P value**
GENDER		
Male		0.188
Died	30/159 (18.90%)	
Alive	129/159 (81.10%)	
Female		
Died	42/191 (22.00%)	
Alive	149/191 (78.00%)	
TIME OF DEATH		
Early neonatal death	79/88 (89.8%)	< 0.001
Late neonatal death	9/88 (10.2%)	
GESTATIONAL AGE DISTRIBUTION		
<28 weeks (extremely preterm)		<0.05
Died	7/11 (63.64%)	
Alive	4/11 (36.36%)	
28-<32 weeks (very preterm)		
Died	55/79 (69.62%)	
Alive	55/79 (69.62%)	
32-<37 weeks (late preterm)		
Died	35/126 (27.78%)	
Alive	91/126 (72.22%)	
>37 weeks (term)		
Died	11/134 (8.21%)	
Alive	123/134 (91.79%)	
WEIGHT CATEGORY		
2499 - 2000 gm		< 0.001
Died	25/233 (10.73%)	
Alive	208/233 (89.27%)	
1999 - 1500gm		
Died	21/73 (28.77%)	
Alive	52/73 (71.23%)	
1499 - 1000gm		
Died	19/34 (55.88%)	
Alive	15/34 (44.12%)	
<1000		
Died	1/10 (90.00%)	
Alive	9/10 (10.00%)	
Preterm AGA vs SGA (n=224)		
Preterm AGA		0.158
Died	64/198 (32.32%)	
Alive	134/198 (67.68%)	
Preterm SGA		
Died	6/26 (23.08%)	
Alive	20/26 (76.92%)	

Table 3: Early and late mortality according to birth weight

Weight (gm)	<1000	1000-1499	1500-1999	2000-2499	Total
Total neonates	10	34	73	232	3850
Survival (n)	1	18	54	204	277
Early neonatal mortality(n)	9	19	19	21	68
Late neonatal mortality (n)	-	1	2	2	5
Total mortality	9 (90%)	20 (58.8%)	21 (28.8%)	23 (9.9%)	73 (20.9%)

DISCUSSION

To the best of our knowledge, this is the first study in which neonatal mortality was recorded in newborn babies with low birth weight in Pakistan. In a multi-center study from Iran reported specific NMR (187/1000 live new born with LBW) while normal NMR was 24/1000 live births. Reported early NMR and late NMR are consistent with results reported from Iran (93% and 07%) and Bangladesh (84% and 16%) in low birth weight newborns. Jehan et al., Pakistan, reported that NMR had 47.3 / 1000 live births and 75% of total NMR had early NMR, but this study included not only low birth weight infants but the entire neonatal population[10-11]. In our study, there was a statistically insignificant difference between male and female mortality, and the results reported by Yasmin et al., Golestan et al and Kumar et al. (11.5% vs. 30.5%).'

Comparing LBW between two gestational age groups, premature babies with LBW (32%) had significantly higher mortality (8.9%). Similar results have been published by Yasminet al indicate that 75% of total mortality can be attributed to premature births of LBW. Birth weight is considered a significant newborn survival factor, and our study shows that as the birth weight decreases, the survival probability of a newborn baby decreases. Efthekar et al reported that ENMR was 24 times higher and LNMR. Golestan et al. Iran gave similar results to our study[11-12]. Mathews et al calculated that the risk of premature death of children born from 1500–2499 g is 5 times higher than heavier children, and the risk of children under 1500 g (MBPN)> 100 times higher. In the United States, children with LBW account for 50% of neonatal deaths and increase the risk of neonatal deaths by 200 times. Also in the United States, ELBW children account for <1% of all births, but about a third of total infant mortality[13]. According to Rehman et al, 77% of neonatal deaths related to low birth weight infants. Yasmin et al reported that NMR for <1500 g, 1500-1999 g and 2000-2499 g was 780/1000, 204/1000 and 50/1000, respectively[14]. Dawodu et al reported that the NMR from the United Arab Emirates (UAE) was 57/100, 200/1000 and 500/1000, respectively, for newborns LBW, VLBW and ELBW. Corchia et al reported that NMR was 196/1000 in newborns with LBW from Italy. Jehan et al., Municipal Karachi population in Pakistan, reported that NMR for <2,000 g of newborns is 110.06 / 100015. All these differences in mortality are partly due to the nature of the sample, size, methodology used to collect data, and level of care provided to patients newborns. But one common feature of all these studies is that the survival of the newborn in the neonatal period is directly related to birth weights.

CONCLUSION

Low birth weight increased neonatal mortality approximately four-fold compared to our national neonatal mortality rate. Most neonatal deaths occur in the early neonatal period. Neonatal mortality is inversely proportional to birth weight and gestational age. There is a statistically

insignificant effect of sex on infant mortality. In addition, the consequences of LBW in the neonatal period cannot be completely eliminated due to the intensive care of newborns. Local/Community and national policies/protocols should be implemented to reduce the incidence of LBW and thus decreasing the high neonatal mortality. This policy should be multi-faceted and include both prevention / reduction of preterm delivery and LBW. In Pakistan, this LBW prevention / reduction policy will be more effective in reducing infant mortality because our country cannot afford to establish and manage an increasing number of neonatal intensive care units for socio-economic reasons.

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