

ORIGINAL RESEARCH**A hospital based study for comparison of morbidity and mortality in vlbw and elbw babies**

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Abstract

Background: Hence this study was conducted to study the morbidity and mortality rates in in born babies weighing less than 1500gm (ELBW and VLBW) admitted in NICU and to define the associated maternal risk factors. Mortality in both VLBW and ELBW group is still high. There is much variation in survival between developed countries and low income countries like India. Maximum numbers of deaths occur in the early neonatal period in this sub group. If they do not receive proper treatment than it negatively affects their families and their countries economically and mentally for the rest of their lives.

Methodology: This Hospital based prospective study was conducted on very low birth weight newborns, born at S.P. Medical College and P.B.M. Associated Group of Hospitals during period of 6 months after analyzing inclusion and exclusion criteria and with the help of consecutive sampling, the questionnaire was administered for the study objects by the researcher.

Results: In our present study we found that neonatal morbidities such as RDS, NEC, ICH and pulmonary haemorrhage were more frequent with ELBW than VLBW babies ($p < 0.05$) whereas PVL and sepsis had higher incidence in VLBW babies as compared to ELBW babies ($p < 0.05$)

Keywords: very low birth weight newborns, neonatal morbidities, association

Introduction

The fourth Millennium Development Goal is to reduce the mortality of children under the age of 5 years by two thirds, before the year 2015. Neonatal mortality accounts for 37% of deaths below the age of 5 years and "improved neonatal and maternal care could save the lives of countless newborns" [1]. In the Perinatal Problem Identification Program (PPIP) a self reporting data base that covers about 40% of births in Asian countries, the early neonatal mortality rate has been static over the past few years at about 9.5 per 1000 live births [2]. However, the majority of neonatal deaths remain unaudited and the national figure is thus probably higher. Very low birth weight (VLBW) infants represent a vulnerable group of newborns with a high mortality rate. There are many reports of factors affecting early survival of VLBW infants; these are summarized in [3]. The survival rate of VLBW infants

worldwide ranges between 43% in developing countries [4] to more than 90% in developed countries,[5].

Two most important factors to predict the short and long term quality of life of newborns are birth weight and gestational age. The survival rate of VLBW infants has been reported to be constantly increasing but at the same time due to the increase of maternal age from late marriage and development of assisted reproductive technology leads to increase in the births of low birth weight newborns, premature newborns and multiple births .⁶They represent a small percentage of Neonatal Intensive Care Unit admissions and overall births, generally most critically ill and at the highest risk of mortality and morbidity.⁷

Preterm babies mainly when born at <34 weeks of gestation need to remain in newborn intensive care unit (NICU) for sufficient multi-organ maturation resulting in prolonged hospital stay for both mother and babies. The consequences of preterm birth often continue beyond the neonatal period result in significant direct and indirect costs. Therefore, understanding of maternal antenatal factors that lead to preterm birth and need for improvement of perinatal care are important to increase the neonatal survival.⁸

Mortality in both VLBW and ELBW group is still high. There is much variation in survival between developed countries and low income countries like India. Maximum numbers of deaths occur in the early neonatal period in this sub group.⁹

If they do not receive proper treatment than it negatively affects their families and their countries economically and mentally for the rest of their lives.²¹Certain countries like India have recognized the importance of intensive care for infants from early on and are collecting data by organizing a network centered approach on neonatal intensive care units (NICU). They are attempting to achieve quality improvement by sharing network data obtained from such processes. Hence this study was conducted to study the morbidity and mortality rates in in born babies weighing less than 1500gm (ELBW and VLBW)admitted in NICU and to define the associated maternal risk factors.

Methodology

After obtaining permission from Ethical committee and informed verbal consent from the parents of the study population selected through analyzing inclusion and exclusion criteria and with the help of consecutive sampling, the questionnaire was administered for the study objects by the researcher. All relevant information related to the study subjects, sociodemographic details, anthropometry, clinical profile and biochemical parameters were recorded on a proforma.

Very low birth weight newborns, born at S.P. Medical College and P.B.M. Associated Group of Hospitals during period of 6 months were prospectively enrolled in the study. The demographic profile and relevant information of individual patient was collected using structural proforma by interviewing mothers and an informed consent was obtained. Neonatal morbidity,mortality andassociated maternal risk factorswere studied.

This study was done on all inborn babies with birth weights in the range of 500 to 1499gmwho were admitted to the neonatal intensive care unit (NICU) at P.B.M hospital, Bikaner during the course of the study. Thestudy subjectsfurther divided in2 subgroups, ELBW(<1000gm) and VLBW(1000-1499gm)and boththe subgroups comparedin terms of neonatal morbidity, mortality and associated maternal risk factors. Demographic data included maternal history, maternal age, parity,maternal risk factors(PROM, anemia, UTI, abruptio placentae, eclampsia, preclampsia, polyhydroamnios, oligohydroamnios, gestational diabetes mellitus, any chronic illness, multiple gestation etc.), use of antenatal steroids, gestational age, birth weight, sex, mode of delivery, Apgar score, need for surfactant administration ,resuscitation and mechanical ventilation.

Gestational age was determined from the date of the mother's last menstrual period and/or from details of earliest available ultrasound scans (at least before 20weeks). Gestational age was assessed by new Ballard score.¹⁴

Diagnosis of various morbidities was done on the basis of accessible ,convenient laboratory investigation and their clinical presentation. Relevant investigation such as complete blood counts, blood glucose, sepsis screen, serum electrolytes, serum bilirubin, chest x ray, echocardiography, USG cranium and MRI brain were done as needed.

Respiratory distress syndrome was suspected in babies with gestational ageless than 34 weeks with sign of respiratory distress include tachypnea, retractions, flaring of the nasal alae, cyanosis and grunting.¹⁵ Scoring was done according to Silverman Anderson and Downe's score and classified into mild(<5), moderate (5-7) and severe (>7). Intraventricular haemorrhage (IVH) was diagnosed by clinical examination and USG cranium . Necrotizing enterocolitis (NEC) was suspected clinically and radiologically. Patent ductus arteriosus (PDA) was clinically suspected and confirmedby echocardiography.

Periventricular leukomalaciawas diagnosed byimaging (USG and MRI Brain).

Sepsis was clinically suspected and confirmed by sepsis screen and blood cultures.The length of stay was calculated as the total number days spent in the hospital while the mortality data included all deathsthat occurred before discharge from the hospital.

Data analysis

All obtained data were tabulated and important statistical analysis was done with the help of SPSS software (version 23). Microsoft excel and Microsoft word were used to obtain various types of graphs such as bar diagram and pie diagram. Chi-squared test and fishers exact test were used as test of significance for qualitative data. p value (Probability that the result is true) of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

Observations

Table 1: Association Between Birth Weight and Pulmonary Haemorrhage

Pulmonary Haemorrhage	Birth Weight			Fisher's Exact Test	
	<1000gm	1000-1499gm	Total	χ^2	P Value
Present	12 (26.7%)	6 (4.4%)	18 (10.0%)	18.519	<0.001
Absent	33 (73.3%)	129 (95.6%)	162 (90.0%)		
Total	45 (100.0%)	135 (100.0%)	180 (100.0%)		

This table shows that out of 180 neonates, 18(10.0%) had pulmonary haemorrhage in which 12(26.7%) were ELBW and 6(4.4%) were VLBW babies. This difference was statistically significant. (p<0.001)

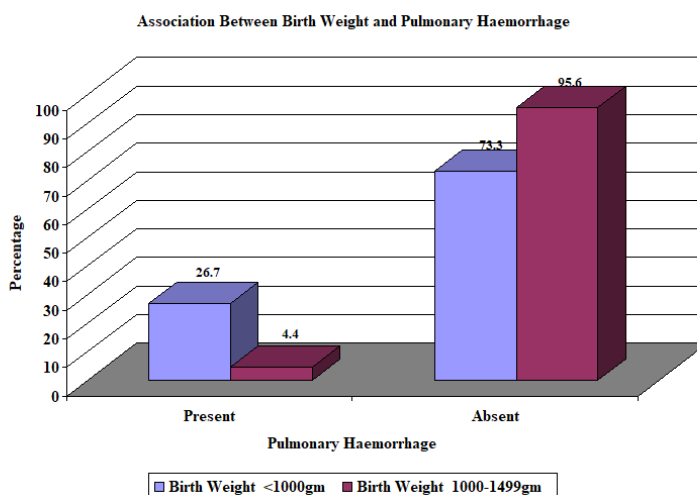


Table 2: Association Between Birth Weight and Respiratory Distress Syndrome(RDS)

Respiratory Distress Syndrome	Birth Weight			Chi Squared Test	
	<1000gm	1000-1499gm	Total	χ^2	P Value
Present	44 (97.8%)	101 (74.8%)	145 (80.5%)	9.943	0.002
Absent	1 (2.2%)	34 (25.2%)	35 (19.5%)		
Total	45 (100.0%)	135 (100.0%)	180 (100.0%)		

Out of 180,171 (95%) babies had RDS .There was statistically significant difference between the incidence of RDS between ELBW (97.8%) and VLBW babies(74.8%).(p=0.002). Out of 145 babies with RDS 87 (60%) babies received surfactant.

Association Between Birth Weight and Respiratory Distress Syndrome (RDS)

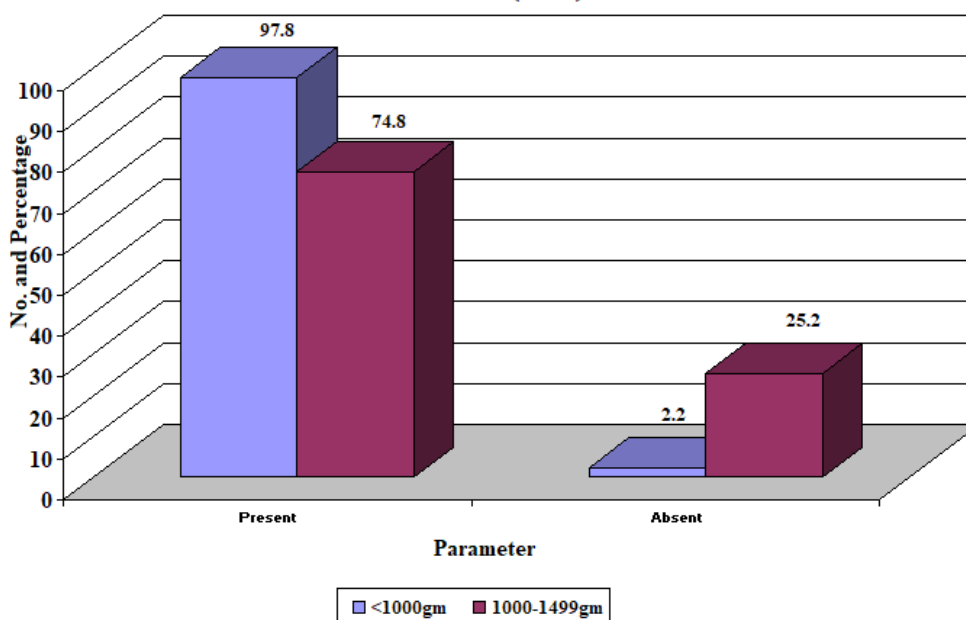


Chart Area

Table 3: Association Between Birth Weight and Sepsis

Sepsis	Birth Weight			Chi-Squared Test	
	<1000gm	1000-1499gm	Total	χ^2	P Value
Present	27 (60.0%)	113 (83.7%)	140 (77.8%)	10.971	<0.001
Absent	18 (40.0%)	22 (16.3%)	40 (22.2%)		
Total	45 (100.0%)	135 (100.0%)	180 (100.0%)		

Sepsis was present in 27 (60%) babies in ELBW group and 113 (83.7%) babies of VLBW group. The incidence of sepsis was higher in VLBW babies as compared to ELBW babies. This difference was statistically significant. ($p < 0.001$)

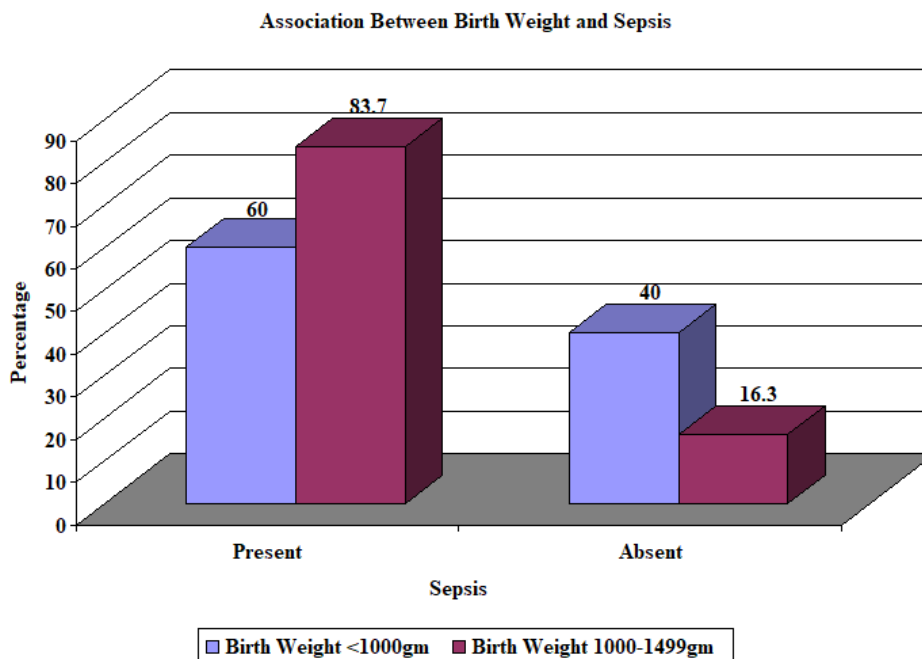


Table 4: Association Between Birth Weight and Jaundice

Jaundice	Birth Weight			Chi-Squared Test	
	<1000gm	1000-1499gm	Total	χ^2	P Value
Present	22 (48.9%)	56 (41.5%)	78 (43.3%)	0.754	0.385
Absent	23 (51.1%)	79 (58.5%)	102 (56.7%)		
Total	45 (100.0%)	135 (100.0%)	180 (100.0%)		

Out of 180, 78 (43.3%) neonates had jaundice. There was no statistically significant difference between the incidence of jaundice between ELBW (48.9%) and 56 (41.5%) VLBW (41.5%) babies. (p=0.385).

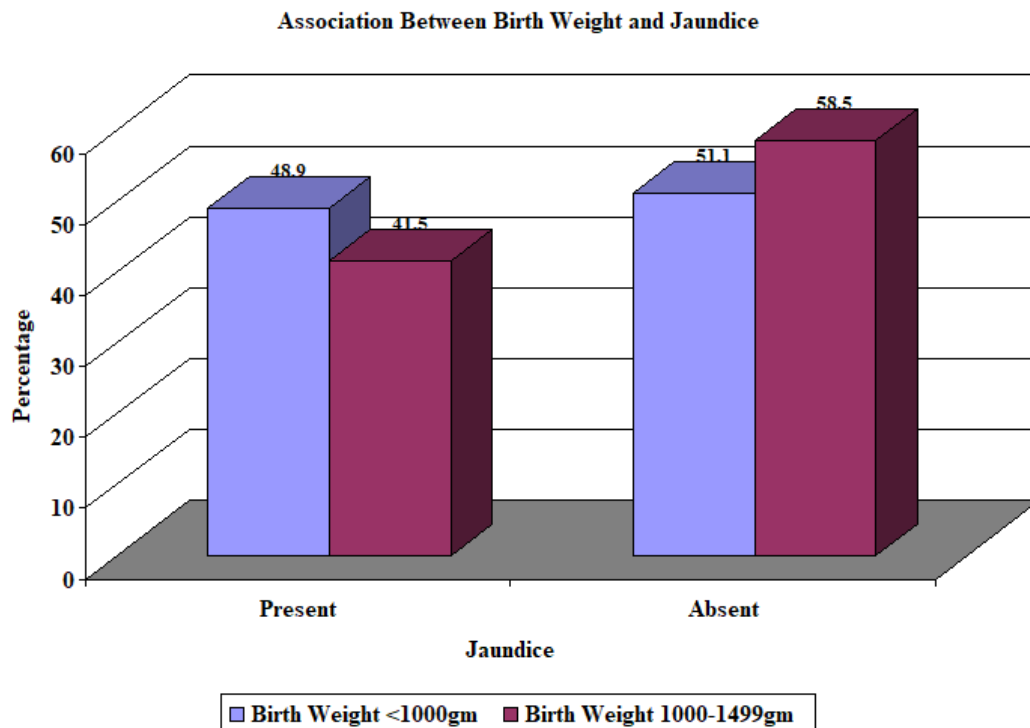


Table 5: Association Between Birth Weight and NEC

NEC	Birth Weight			Chi-Squared Test	
	<1000gm	1000-1499gm	Total	χ^2	P Value
Present	12 (26.7%)	14 (10.4%)	26 (14.4%)	7.253	0.007
Absent	33 (73.3%)	121 (89.6%)	154 (85.6%)		
Total	45 (100.0%)	135 (100.0%)	180 (100.0%)		

Out of 180 neonates, 26 (14.4%) babies had NEC in which, 14(10.4%) were from VLBW group and 12(26.7%) were from ELBW group. ELBW babies had higher chances of getting NEC than the VLBW babies. This difference was statistically significant .(p=0.007)

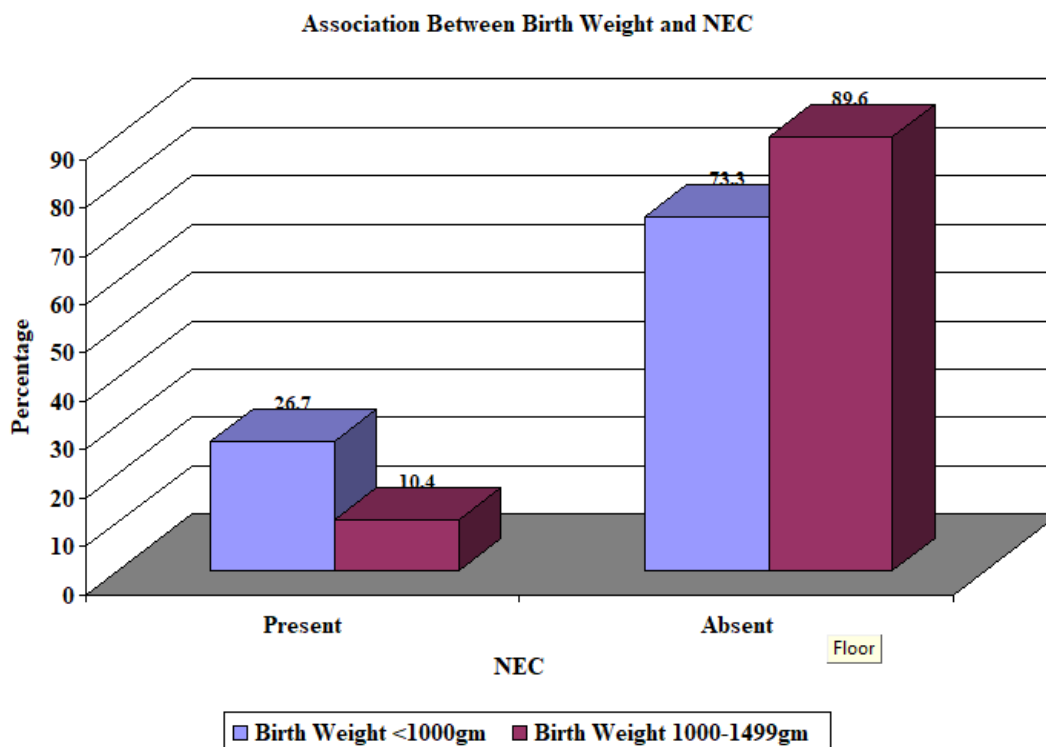


Table 6: Association Between Birth Weight and Intraventricular Haemorrhage (IVH)

Intraventricular Haemorrhage	Birth Weight			Fisher's Exact Test	
	<1000gm	1000-1499gm	Total	χ^2	P Value
Present	10 (22.2%)	9 (6.7%)	19 (10.6%)	8.650	0.009
Absent	35 (77.8%)	126 (93.3%)	161 (89.4%)		
Total	45 (100.0%)	135 (100.0%)	180 (100.0%)		

This table shows that out of 180 neonates 19(0.6%) had IVH in which 9(6.7%) belonged to VLBW group and 10(22.2%) belonged to ELBW group ,depicting higher incidence of IVH in ELBW babies.(p=0.009)

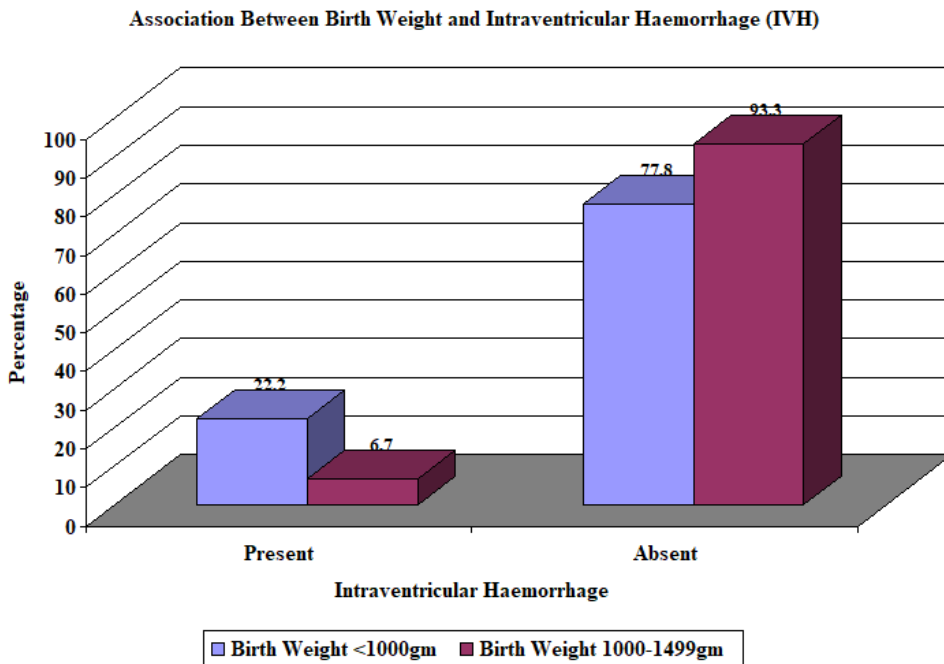


Table 7: Association Between Birth Weight and PDA

PDA	Birth Weight			Chi-Squared Test	
	<1000gm	1000-1499gm	Total	χ^2	P Value
Present	16 (35.6%)	31 (23.0%)	47 (26.1%)	2.774	0.096
Absent	29 (64.4%)	104 (77.0%)	133 (73.9%)		
Total	45 (100.0%)	135 (100.0%)	180 (100.0%)		

This table shows that 47 babies out of 180 of the study population had PDA,16(35.6%) were ELBW and 31(23%) were VLBW babies. This difference was not statistically significant. (p=0.096)

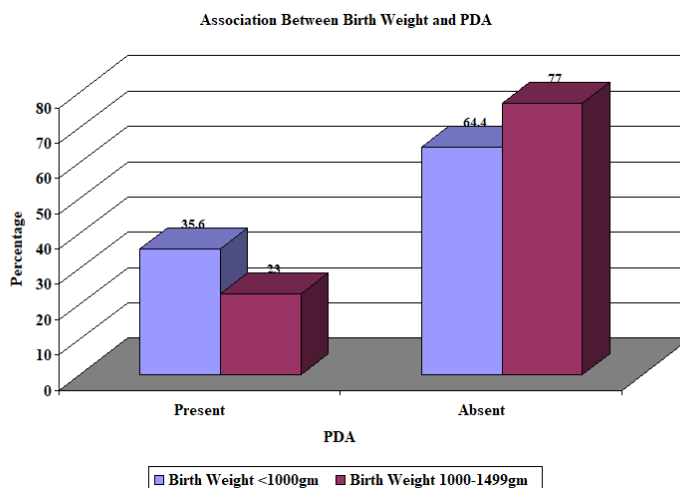
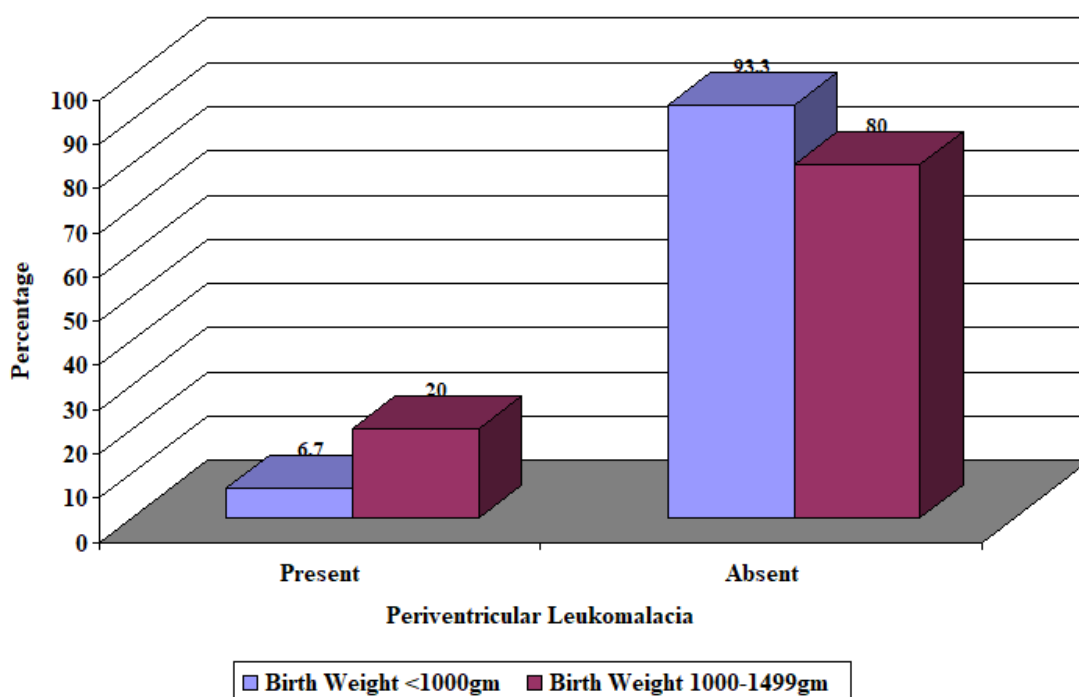
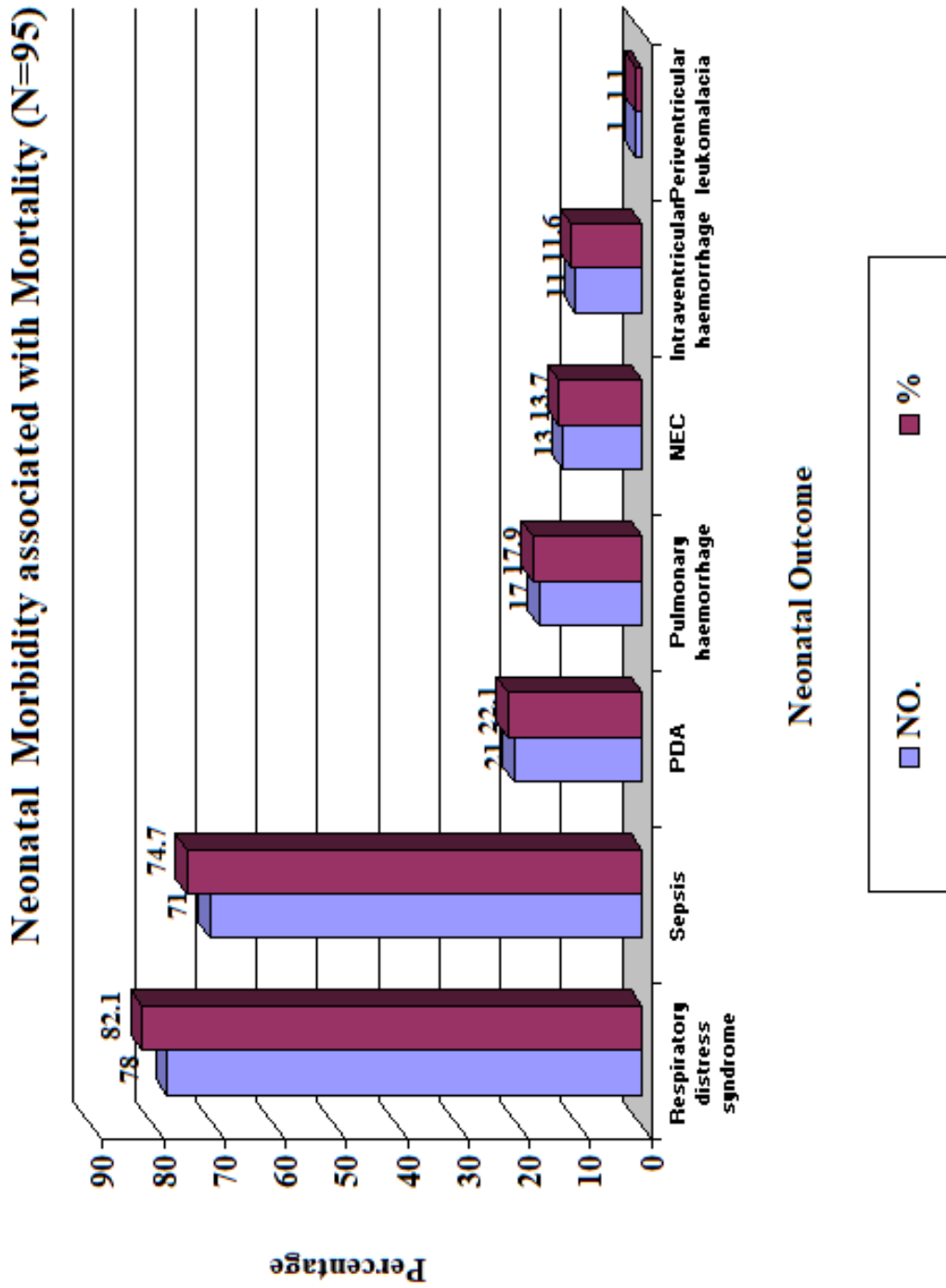


Table 8: Association Between Birth Weight and Periventricular Leukomalacia

Periventricular Leukomalacia	Birth Weight			Chi-Squared Test	
	<1000gm	1000-1499gm	Total	χ^2	P Value
Present	3 (6.7%)	27 (20.0%)	30 (16.7%)	4.320	0.038
Absent	42 (93.3%)	108 (80.0%)	150 (83.3%)		
Total	45 (100.0%)	135 (100.0%)	180 (100.0%)		

This table shows the association between birth weight and PVL. Out of study population of 180 babies, 30(16.7%) babies had PVL, out of which 27(20%) belonged to VLBW group and 3(6.7%) belonged to ELBW group .This result was statistically significant.(p=0.038)

Association Between Birth Weight and Periventricular Leukomalacia



Discussion

In present study 135(75%) babies were VLBW and 45 (25%) were ELBW babies. Comparing the prevalence of different morbidities amongst the VLBW and ELBW babies following observations were made-

- Respiratory distress syndrome – overall, this was the most common complication observed and was present in 74.8% of VLBW and 97.8% of ELBW babies, this difference was statistically significant. This result was corresponding to the study done by Tripathy SK et al¹⁰ in which RDS was common in ELBW babies as compared to VLBW babies.
- Sepsis-Sepsis was found to be more prevalent amongst the VLBW (84%) than the ELBW (67%) (p=0.001). This result was in contradictory to the study done by Atalay et al¹¹ in which there was no difference in terms of sepsis between ELBW and VLBW babies. In our study difference of higher frequency of sepsis in VLBW babies could be explained on the basis of their longer duration of stay.
- Neonatal jaundice – NNJ was present in 41.5% of VLBW and 48.9% of ELBW babies. There was no statistically significant difference between the 2 subgroups on the basis of jaundice. Similar results were also reported in the studies done by Atalay et al¹¹ and Tripathy SK et al.¹⁰
- Patent ductus arteriosus -Incidence of PDA was 23% and 35.6% in VLBW and ELBW babies, respectively which was not statistically significant. In the study conducted by Jakuskiene et al¹³, showed that PDA incidence was 42% and 19% in gestational age of 22 to 27 weeks and 28 to 32 weeks, respectively.
- Periventricular leukomalacia - This was found to be more frequent in VLBW babies (20%) than ELBW (6.7%). This difference was statistically significant (p value=0.038)[Table 15]. On the contrary in the study done by Atalay et al¹¹, PVL was present in both VLBW and ELBW groups which was not statistically significant. In our study difference of higher frequency of PVL in VLBW babies could be explained on the basis of more number of babies in VLBW group as compared to ELBW group.
- Necrotizing enterocolitis – This was more frequently observed in ELBW babies, as more than one fourth (26.7%) of these had NEC in comparison to only 10.4% in VLBW babies (p value=0.007). Comparable results were also seen in the study done by Khan et al¹² in which higher incidence of NEC was seen in ELBW babies (15% as compared to 7.8%).
- Intraventricular haemorrhage -owing to more fragile blood vessels in the ELBW, IVH was found to be more common (22.2%) in them than VLBW babies who had only 6.7% cases with the same (p value =0.009) [Table 13]. These results of our study resembling to the study done by Atalay et al.¹¹
- Pulmonary haemorrhage- similar to IVH, pulmonary haemorrhage was found more in ELBW babies (26.7%) than VLBW (4.4%) (p value<0.001). These results did not correlate with study done by Atalay et al¹¹ in which there were no statistically significant difference between VLBW and ELBW babies.

Hence, in our study we found that there was statistically significant difference in the frequency of RDS, sepsis, NEC, PVL, ICH and pulmonary haemorrhage, between the 2 subgroups. While there was no significant difference between the 2 subgroups in terms of jaundice and PDA.

In study done by Tripathy SK. et al¹⁰ incidence of RDS, HIE and shock was higher in the ELBW babies. A similar study done by K.K. Roy et al¹⁴ also found that RDS, sepsis, NNJ, PDA, IVH and ROP were more frequently associated with ELBW babies.

Conclusion

In our present study we found that neonatal morbidities such as RDS, NEC, ICH and pulmonary haemorrhage were more frequent with ELBW than VLBW babies ($p < 0.05$) whereas PVL and sepsis had higher incidence in VLBW babies as compared to ELBW babies ($p < 0.05$). Neonatal morbidity and mortality can be reduced by improving healthcare management strategies by training staff involved in NICU care.

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