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ORIGINAL ARTICLE

Risk factors of low birth weight among neonates at A Tertiary Care Hospital Karachi.

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ABSTRACT… Objective: To determine frequency and risk factors of low birth weight (LBW) among neonates at a tertiary care hospital in Karachi, Pakistan. **Study Design:** Cross-sectional study. **Setting:** Neonatal Intensive Care Unit (NICU) of National Institute of Child Health. **Period:** December 2022 to May 2023. **Material & Methods:** Neonates newly admitted in NICU were enrolled into study. In accordance with World Health Organization criteria, LBW was defined as birth weight <2500 grams. Clinical and demographic details of mothers were retrieved. Frequency and risk factors of LBW among neonates were noted. **Results:** In a total of 212 neonates, 117 (55.2%) were boys. Mode of delivery was spontaneous vaginal delivery in 118 (55.7%) cases. The median maternal age was 25.5 (IQR=22-30) years. There were 172 (81.1%) cases that were pre-booked. Median birth weight was 2.8 (IQR=2.5-3.1) grams. The frequency of LBW was noted in 45 (21.2%). On multivariable regression model, maternal age, education, antenatal care visit, birth interval, presence of hypertension and anemia during pregnancy were found to be independent ($p<0.05$) predictors of LBW. **Conclusion:** The frequency of LBW among neonates admitted in NICU was high. Maternal age, educational status, antenatal care, birth interval, hypertension and anemia were independent predictors of LBW.

Key words: Anemia, Antenatal Care, Hypertension, Low Birth Weight, Neonates, Pregnancy.

INTRODUCTION

Regardless of gestational age, low birth weight is defined as less than 2,500 grammes at birth.[1] The burden of LBW is roughly 7% in the industrialised world, but it is more than double that in developing nations, at about 16.5%.[2] More than 20 million babies are born underweight (LBW) in the world, which accounts for 15-20% of all births.[3,4] 95.6% of them are in developing nations.[5] South-central Asia accounts for 50% of low birth weight births, whereas South Asia, Sub-Saharan Africa, and Latin America each reported 28%, 13%, and 9% of low birth weight births.[1,5]

Low birth weight is a significant public health issue since it is linked to newborn mortality and morbidities such cognitive developmental delays, IQ score declines, obesity, asthma, and diabetes mellitus (DM).[1,4] A third of infantile mortality and over half of all prenatal deaths can be directly or indirectly attributed to LBW. Low birth weight and mortality are negatively correlated; an LBW infant has a 20 times greater chance of dying in the neonatal period than a baby with a birth weight of more than 2500 grammes.[2,6]

The most common causes of LBW are infections, maternal malnutrition, smoking, prematurity, multiple pregnancies, high parity, low education, food insufficiency, a lack of antenatal visits, and pregnancy complications like preeclampsia, anaemia, hypothyroidism, and diabetes.[1,7,8]

Understanding the primary modifiable risk factors for LBW is crucial for prevention so that health managers and practitioners can develop strategies and put them into practice to promote health. As previous literature suggested that risk factors of LBW varied from one geographical area to another, so it is important to determine risk factors and outcome in neonates in our local population.

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Therefore, the aim of our study is to find various risk factors of neonates associate with LBW admit in a public sector hospital in Karachi.

MATERIAL & METHODS

This cross-sectional study was carried out at Neonatal Intensive Care Unit (NICU) of National Institute of Child Health during December 2022 to May 2023. The study was commenced with the approval of hospital ethics committee (IERB-41/2022, dated: 9-12-2022). A written informed consent was sought from the mother of the baby. All singleton live birth neonates of both genders were included. Neonates with neurological syndrome or congenital malformations were excluded. Neonates of mothers having intrauterine growth retardation (IUGR) were also excluded. Non-probability consecutive sampling technique was used. Taking anticipated frequency of LBW as 8.9%[9], with 95% confidence level and 4% margin of error, a sample size of 195 was estimated.

The neonate's weight was measured using a balanced Seca scale (Germany) to the nearest 0.01 g within 1 hours of birth. According to "World Health Organization (WHO)" criteria, LBW was defined as birth weight <2500 grams.[10] Maternal demographic and clinical data including age, antenatal visit, presence of gestational diabetes, hypertension, anemia, addiction habit (smoking or tobacco), mode of delivery, birth interval, antepartum hemorrhage (APH), case nature (booked or non-booked) and mode of delivery were noted whereas mothers were interviewed for socio-demographic and medical history.

Data was entered and analyzed using "Statistical Package for Social Sciences (SPSS)" version 26. Categorical variables were expressed as frequency and percentage. Numerical variables were expressed as median with interquartile range (IQR) as they were not normally distributed when assumption was assessed with Shapiro-Wilk test. Binary logistic regression was applied to assess factors associated with low birth weight. Variables with p-values <0.25 in univariate analysis were put in a multivariable regression model. P-value less than or equal to 0.05 was taken as significant.

RESULTS

In a total of 212 neonates, 117 (55.2%) were boys. Mode of delivery was spontaneous vaginal delivery in 118 (55.7%) cases. The median maternal age was 25.5 (IQR=22-30) years. There were 172 (81.1%) cases that were pre-booked. Median birth weight was 2.8 (IQR=2.5-3.1) grams. Table-I displays details of maternal characteristics.

Maternal Features	Groups	Frequency (%)
Maternal age	18-24 years	84 (39.6%)
	25-34 years	113 (53.3%)
	>34 years	15 (7.1%)
Occupation	Housewife	207 (97.6%)
	Working women	5 (2.4%)
Household income (Pakistani Rupees)	<20000	49 (23.1)
	20000-30000	163 (76.9%)
Education	Illiterate	54 (25.5%)
	Primary	73 (34.4%)
	Secondary or above	77+8 (36.3%)
Gestational diabetes		26 (12.3%)
Hypertension		27 (12.7%)
Anemia		76 (35.8%)
Smoking		6 (2.8%)
Chewing tobacco		50 (23.6%)
Antepartum hemorrhage		38 (17.9%)
Mode of Delivery	Spontaneous vaginal delivery	118 (55.7%)
	Cesarean section	94 (44.3%)

Table-I. Maternal Characteristic

The median birth weight was 2.8 (IQR=2.5-3.1) grams. The frequency of LBW was noted in 45 (21.2%). The frequency of LBW was 30.5% in female and 13.7% among males neonates (p=0.003). Table-II displays univariate association of maternal features with birth weight. Risk of lower birth weight was lower among young mother. Lower maternal education, household income ≤20,000 PKR, non-booked case, no antenatal visits, birth interval of one year, presence of gestational diabetes, and hypertension, habit of chewing tobacco and cesarean section deliveries were significantly associated with higher likelihood of LBW.

Table-III shows that multivariate regression analysis found that maternal age, educational status, case booking, antenatal visits, hypertension and anemia were independently associated (p<0.05) with LBW.

Maternal Factors	Groups	Low Birth Weight	Normal Birth Weight	OR (95% CI)	P-Value
Maternal age	18-24 years	13 (15.5%)	71 (84.5%)	0.21(0.1-0.7)	**0.009
	25-34 years	25 (22.1%)	88 (77.9%)	0.3 (0.1-0.9)	0.046
	>34 years	7 (46.7%)	8 (53.3%)	Reference category	
Occupation	Housewife	44 (21.3%)	163 (78.7%)	1.1(0.1-9.9)	0.946
	Working women	1 (20%)	4 (80%)	Reference category	
Education	Illiterate	19 (35.2%)	35 (64.8%)	5.2(2.1-13.1)	**<0.001
	Primary	18 (24.7%)	55 (75.3%)	3.2(1.3-7.7)	*0.013
	Secondary and above	8 (9.4%)	77 (90.6%)	Reference category	
Household income	≤20,000 PKR	21 (42.9%)	28 (57.1%)	4.3 (2.1-8.8)	**<0.001
	>20,000 PKR	24 (14.7%)	139 (85.3%)	Reference category	
Cases booking	Non-booked	21 (52.7%)	19 (47.5%)	6.8(3.2-14.5)	**<0.001
	Booked	24 (14.0%)	148 (86.0%)	Reference category	
Antenatal visit	No visit	21 (77.8%)	6 (22.2%)	40.8 (9.2-180.8)	**<0.001
	1-3 visits	21 (14.3%)	126 (85.7%)	1.9 (0.5-6.8)	0.303
	≥4 visits	3 (7.9%)	35 (92.1%)	Reference category	
Birth interval	1 years	24 (42.9%)	32 (57.1%)	4.8(2.4-9.7)	**<0.001
	2 years	21 (13.5%)	135 (86.5%)	Reference category	
Gestational diabetes		10 (38.5%)	16 (61.5%)	2.7 (1.1-6.4)	0.026
Hypertension		15 (55.6%)	12 (44.4%)	6.5(2.7-15.2)	**<0.001
Anemia		31 (40.8%)	45 (59.2%)	6(2.9-12.3)	**<0.001
Smoking		2 (33.3%)	4 (66.7%)	1.8(0.3-10.7)	0.469
Chewing tobacco		17 (34.0%)	33 (66.0%)	2.4(1.2-5.0)	*0.013
Antepartum hemorrhage		11 (28.9%)	27 (71.1%)	1.6(0.7-3.7)	0.202
Mode of delivery as Cesarean section		29 (30.9%)	65 (69.1%)	2.8(1.4-5.6)	**0.003

Table-II. Univariate analysis of maternal factors associated with low birth weight
CI: Confidence interval, OR: Odds ratio, *Significant at p<0.05, **Significant at p<0.01

Variables	Groups	aOR	95% CI for aOR		P-Value
			Lower	Upper	
Maternal age	18-24 years	0.1	0.0	0.8	*0.034
	25-34 years	0.3	0.1	2.0	0.232
	>34years	Reference category			
Neonate gender	Male	0.8	0.3	2.2	0.661
	Female	Reference category			
Occupation	Housewife	0.6	0.0	8.8	0.717
	Working woman	Reference category			
Education	Illiterate	2.9	0.7	12.3	0.144
	Primary	4.8	1.2	19.0	*0.024
	Secondary	Reference category			
Household income	≤20,000 PKR	1.1	0.243	5.1	0.891
	>20,000PKR	Reference category			
Case booking	Non-booked	7.4	0.420	10.7	0.818
	Booked	Reference category			
Antenatal visit	No visit	22.4	1.3	386.5	*0.032
	1-3 visits	2.0	0.4	9.3	0.372
	≥4 visits	Reference category			
Birth interval	1 year	7.3	2.4	22.1	**<0.001
	2 years	Reference category			
Gestational diabetes		2.4	0.3	19.0	0.421
Hypertension		5.0	1.0	24.7	*0.048
Anemia		5.1	1.8	14.1	**0.002
Chewing tobacco		1.8	0.6	5.6	0.321
Antepartum hemorrhage		1.6	0.5	5.5	0.443
Mode of delivery as Cesarean section		2.3	0.8	6.8	0.147

Table-III. Multivariable association of neonate and maternal features with birth weight
CI: Confidence interval, aOR: Adjusted odds ratio, *Significant at p<0.05, **Significant at p<0.01

DISCUSSION

This study found a frequency of 21.2% LBW among neonates with median birth weight of 2.8 (IQR=2.5-3.1) grams. A recent study from Rawalpindi city reported a lower frequency of 8.9% than our study.[9] Another recent study from Sindh, also reported a lower frequency of LBW (13.4%).[11] A similar LBW frequency is reported from Nepal (21.6%)[12] and Bangladesh (22%).[13] A lower frequency than this study was reported from Iran (8.5%)[14], Sub-Saharan Africa (9.8%)[15], Afghanistan (15.5%)[16] and Sri Lanka (17%).[17] Another study from Pakistan reported a 16.9% LBW frequency among neonates.[17] This discrepancy might be brought about by variations in the research environment, study participants' socioeconomic backgrounds, and demographics.

Male babies often weigh more at birth than female babies. Following a gestation of 28 weeks, this difference begins. The Y chromosome, which contains the genetic information for foetal growth, or androgen activity may be to blame for the variation in birth weight, even though the precise mechanism influencing it is unknown. Male children may therefore experience more intrauterine growth and birth weight than female ones.[18] This study analyzed that females were likely to have LBW than males in univariate analysis but in multivariable analysis this association was not significant. In contrast to our study, female gender was found to be associated with higher odds of LBW even on multivariable regression model in other studies.[19] A limited sample size and strong association of other variables could impact association of gender in final regression model in this study.

Age of the mother is thought to be a significant factor in a successful pregnancy result. In this study we found a significant association of maternal age with lower odds of LBW weight in younger age (18-24 years and 25-34 years) as compared to older age mothers (>34 years). However, in literature, maternal age is consistently reported to be significantly associated to higher odds of LBW.[20,21] In a similar study, a U-shaped association of LBW with young maternal age (<15 years) and advanced maternal age (>40 years) was seen among white race with higher risk than those of age 25-29 years. While for black race, a steep rise was seen in LBW risk with increasing maternal age i.e. younger mothers of age 15-19 years were considerably at lower risk than those of 25-29 years age group.[21]

LBW is caused by a variety of individual and environmental factors in addition to mother age including maternal education, household and household income. In this study, LBW was considerably higher in neonates of females who were illiterate or primary pass than those who had higher education which is consistent findings with exiting literature.[15,16,21] Lower Literacy levels may results in poor nutritional practice and health-seeking behaviors during pregnancies, which could impact birth outcomes. In literature it is reported that working mothers were likely to have LBW neonates[22,23] but this study did not find association of occupation with LBW on final regression model. The association was significant in our study even in univariate analysis. A restricted sample size than other studies could be the reason of this conflicting finding. In this study lower household income was found to be linked to higher odds of LBW on univariate analysis but was no longer significant in multivariable analysis. In contrast, existing literature reports that lower wealth index has positive association with LBW particularly in lower middle income countries.[24,25] In this study we only take household income as surrogate of wealth index. The result could be changed when socioeconomic status and social class were actually evaluated using appropriate method.

The study has a number of limitations. This study was conducted in a single center of Karachi with a limited sample size. Further we did not study gravida and parity as risk factors of LBW. It is important to consider these limitations when interpreting the findings of this study. We recommend to conduct a larger sample size study for validating findings of this study.

CONCLUSION

This study analyzed that a considerable number

of neonates were LBW. A focused maternal and child health programs should be designed and implemented to enhance maternal education and health and promote birth spacing and regular antenatal care visit to prevent LBW.

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2	Arit Parakash	Concept and Designing, Critical revisions.	
3	Mehmood Shaikh	Data analysis, Literature review.	
4	Toqeer Hussain	Data interpretation, Literature reivew.	
5	Wajid Hussain	Literature review, Discussion.	