



CLINICAL STUDY OF MATERNAL AND FETAL FACTORS AFFECTING LOW BIRTH WEIGHT NEONATES IN A TERTIARY CARE HOSPITAL-SOUTH INDIA-A CROSS SECTIONAL STUDY.

Paediatrics

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ABSTRACT

Introduction: Low birth weight (LBW) remains a significant public health concern, with a prevalence of 14.6% in 2022. LBW is a major contributor to neonatal morbidity and mortality, often resulting from neglect of maternal nutrition, health, and education. Factors such as early teenage marriages, frequent pregnancies, maternal malnutrition, inadequate antenatal care, and poor obstetric history exacerbate the risk of LBW. **Aims:** To evaluate the prevalence and associational factors of LBW among neonates born at a tertiary care hospital in south India. **Material And Methods:** This cross-sectional study included 208 live neonates born in a tertiary care hospital, Tumkur, South India during the period between December 2022 and January 2024. Neonates born with birth weight <2.5 kg were included and Neonates with major congenital malformations, stillbirths, and those born to critically ill mothers were excluded. Chi-square tests were used for analysis. **Results:** Of the 208 neonates, 71 (34.1%) were LBW. The male-to-female ratio was 1:1.2. Significant associational factors included: Parity, Weight gain during pregnancy, Maternal height, ANC visits, Antepartum hemorrhage, Smoking, Alcohol/toddy consumption, Systemic infections, Iron and Folic acid supplementation. **Conclusion:** This study highlights the complex interplay of maternal factors contributing to LBW, emphasizing the need for multifaceted interventions. Addressing these factors through health education, socioeconomic development, maternal nutrition and improved healthcare utilization during pregnancy is crucial for reducing LBW rates.

KEYWORDS

Anemia during pregnancy, Fetal development, Maternal nutrition, Parity, Risk factors, Systemic diseases.

INTRODUCTION

Regardless of gestational age, the World Health Organization defines low birth weight (LBW) as a birth weight of less than 2,500 grams, inclusive of 2,499 grams [1]. Low birth weight (LBW, <2,500g) is a significant public health concern globally. The World Health Organization (WHO) reports approximately 20.6 million newborns (14.6% of all births) suffer from LBW worldwide (WHO, 2022) [2]. In India, the National Family Health Survey (NFHS-5, 2019-21) reveals a nationwide LBW prevalence of 17.8%, translating to 4.5 million newborns annually. Regional disparities exist, with some states recording LBW rates up to 25.6% [3]. Maternal malnutrition, inadequate antenatal care, teenage pregnancies, and socioeconomic disparities contribute to India's high LBW incidence [1,4,5,6]. Addressing these underlying factors is crucial to reducing LBW's burden and improving newborn health outcomes. Infants born with LBW often experience impaired cognitive development and research indicates they face heightened risks of chronic illnesses in adulthood. These include conditions such as high blood pressure, type 2 diabetes, coronary heart disease and stroke [4].

MATERIALS AND METHODS:

The present cross sectional study was conducted in department of Pediatrics, Sri Siddhartha Medical College and Hospital SSMC, Tumkur for a period of 12 months from December 2022 to January 2024. The study protocol received ethical approval from the institutional ethics committee. Informed verbal consent was obtained from the parents.

Inclusion Criteria: All live birth weight babies weighing <2.5kg

Exclusion Criteria: Still birth babies, Neonates born to Critically ill mothers Neonates with Major congenital malformations, Parents not giving consent.

Study Procedure:

Sample Size Calculation: Taking the 26% prevalence of LBW babies born to mothers in India, and by applying the formula $4pq/r^2$ with 6% allowable error, minimum required sample was 205.

Formula for the same is as follows: $n = Z^2pq/d^2$ Where: Z=level of

Significance (1.96)

p = Prevalence q = 1-p d = allowable error
n = $3.84 \times 26 \times 25 / 6^2$ n = 205

Method Of Data Collection: The study conducted on all live babies born to mothers who delivered at SSMC. Written informed consent obtained from all the parents before their enrolment into the study.

Statistical Analysis: SPSS software 22.0 were used to analyse the data. Categorical data was represented in the form of frequencies and proportions. Association between the categorical variables was tested using Chi-square test. Continuous data was represented as mean and standard deviation. P value < 0.05 was considered statistically significant.

RESULTS

Table 1: Characteristics of study participants (neonates and parents) with p-value

Variable	Category	Birth		Total	Chi-square, P-value
		Low Birth Weight (<2.5Kg)	Normal (>=2.5)		
Age of mother	<19 years	10 (40.0%)	15 (60.0%)	25 (100%)	0.940, 0.625
	19-35 years	59 (33.0%)	120 (67.0%)	179 (100%)	
	>35 years	2 (50.0%)	2 (50.0%)	4 (100%)	
Parity	Primi	21 (30.0%)	49 (70.0%)	70 (100%)	11.552, 0.003
	Multi (2-3)	12 (20.7%)	46 (79.3%)	58 (100%)	
	Grandmulti (4+)	38 (47.5%)	42 (52.5%)	80 (100%)	
Birth spacing	<18 Months	37 (35.9%)	66 (64.1%)	103 (100%)	0.742, 0.690
	18-24 Months	22 (34.9%)	41 (65.1%)	63 (100%)	
	>24 Months	12 (28.6%)	30 (71.4%)	42 (100%)	
Weight gain during pregnancy	<=7 kg	53 (50.0%)	53 (50.0%)	106 (100%)	24.200, <0.001
	>7 kg	18 (17.6%)	84 (82.4%)	102 (100%)	

Height of the mother	<=145cm	48 (52.7%)	43 (47.3%)	91 (100%)	24.928,
	>145cm	23 (19.7%)	94 (80.3%)	117 (100%)	<0.001
Antenatal visits	< 4 visits	59 (65.6%)	31 (34.4%)	90 (100%)	69.664
	>= 4 Visits	12 (10.2%)	106 (89.8%)	118(100%)	<0.001
Obstetric history	No	52 (37.1%)	88 (62.9%)	140(100%)	3.583, 0.310
	Abortion	5 (21.7%)	18 (78.3%)	23 (100%)	
	Neonatal deaths	8 (40.0%)	12 (60.0%)	20 (100%)	
	LBW	6 (24.0%)	19 (76.0%)	25 (100%)	
Mode of delivery	NVD	55 (34.4%)	105 (65.6%)	160(100%)	0.018,
	LSCS	16 (33.3%)	32 (66.7%)	48 (100%)	0.894
Gestation	Pre-term	43 (100%)	0 (0.0%)	43 (100%)	99.52
	Term	28 (17.8%)	129 (82.2%)	157(100%)	5,
	Post-term	0 (0.0%)	8 (100%)	8 (100%)	<0.001
Sex	Male	33 (33.0%)	67 (67.0%)	100(100%)	0.110,
	Female	38 (35.2%)	70 (64.8%)	108(100%)	0.740

Table 2: Characteristics of Maternal factors with p-value

Factors	Birth		Total	Chi-square, P-value
	Low Birth Weight (<2.5Kg)	Normal (>2.5)		
Antepartum hemorrhage	9 (69.2%)	4 (30.8%)	13 (100%)	7.597, 0.006
History strenuous physical activity	59 (46.8%)	67 (53.2%)	126 (100%)	22.894, <0.001
Smoking/tobacco chewing	11 (73.3%)	4 (26.7%)	15 (100%)	11.048, 0.001
Alcohol/toddy	27 (73.0%)	10 (27.0%)	37 (100%)	30.195, <0.001
Maternal infections	35 (34.3%)	67 (65.7%)	102 (100%)	0.003, 0.957
Systemic diseases	17 (25.8%)	49 (74.2%)	66 (100%)	3.018, 0.082
Iron and folic acid supplementation	33 (24.3%)	103 (75.7%)	136 (100%)	17.023, <0.001
Structural anomalies of cord and placenta	0 (0.0%)	2 (100.0%)	2 (100%)	1.047, 0.306

Among the 208 live born babies included in the study, Table 1 and 2 depict the clinical profile and maternal factors affecting low birth weight and their association with low birth weight. There were significant statistical differences found in the following factors: parity (p=0.003), weight gain during pregnancy (<0.001), height of the mother (<0.001), antenatal visits (<0.001) and gestation (<0.001). APH, history of strenuous physical activity, tobacco and alcohol consumption were associated with low birth weight.

DISCUSSION

This is a cross sectional study conducted in a tertiary hospital in Karnataka, India. The study set to find the maternal and fetal factors associated with low birth weight and the study recruited 208 newborns for the assessment.48.07% of newborns were male similar to Rajashree et al^[7] and majority of the newborns were term born (75.48%) followed by pre-term (20.67%). Around 3/4th of the newborns (76.92%) were delivered through normal vaginal delivery.

Prevalence of LBW was 34.13% which was similar to many tertiary hospital-based studies.^(8,9,10) However, it was comparatively higher compared to Mishra et al^[11] with 12% of prevalence. The discrepancy may be due to difference in population, antenatal care and culture. 86.05% of mothers belonged to age range of 19-35 years with a mean age of 24-36 years. However, the group differences between age groups was not statistically significant. The group differences observed in primiparous, multiparous and grand multiparous women in terms of birth weight of the newborn was statistically significant(P=0.003). Among the low birth weight, it was seen that grand multiparous women gave birth to more low birth weight children compared to multiparous and primiparous women. This may be due to the chronic anemia being suffered by these women due to multiple gestations. The present results were similar to study by Devguru et al^[12] and Acharya et al^[13] where 53.6% and 609% of multiparous women had LBW infant. 73.3% of women with less than two years birth interval delivered a LBW baby and this result was statistically significant in the study done by Rajashree et al.^[7] However only 35.5%

of women in that category in our study delivered LBW baby. But these group differences were not statistically significant in the present study.

Among women with less than 7kgs weight gain during pregnancy, newborns were divided equally in low birth weight and normal weight category. However, women with more than 7kgs weight, only 17.6% of newborns came under low-birth-weight category and this was statistically significant(p<0.01). This was on lower side when compared to Rajshree et al^[7] and Devguru et al^[12] where 92.9% and 82.20% of women with less than 6.5kg weight gain fell under LBW category respectively. The discrepancy may be because of comparatively less participants falling under the category of less than 6.5kg weight gain altogether. The present results were parallel to a retrospective study by Shan et al^[4] where women with inadequate weight gain were 2.38 times more at risk of delivering LBW baby.

Among women with less than 145cms height, newborns were divided almost equally in both the categories. However, in women with more than 145cms height, only 19.7% of newborns fell under LBW category and this result was statistically significant. This was less compared to study by Devguru et al^[12] where 83.46% of women under 145cms delivered LBW child. 100% of children born in preterm category belonged to low-birth-weight category, present results are in parallel to results by Shan et al^[4] and Diabelková et al^[1], where mothers with <37 weeks of gestation had around 80 times more risk of delivering a LBW baby when compared to term gestation. 65.6% of women with less than 4 antenatal visits delivered a LBW infant which was similar to study by Devguru et al(59.65%)^[12] and Acharya et al(73.4%)^[13] and was parallel to study by Diabelkova¹ with OR of 1.68, which means mothers with less than 8 visits were 1.68 times more risk of delivering LBW infant. 46.8% of women with strenuous physical activity fell under LBW category which was similar to Devguru et al^[12] and Acharya et al.^[13]

Other factors associated with low birth weight in present study were antepartum hemorrhage, strenuous physical activity, consumption of alcohol and smoking and iron and folic acid supplementation. Among 15 women who smoked or consumed tobacco, 11(73.3%) women gave birth to low birth weight newborns which was similar to study Devguru et al (91.42%)^[12] and among 37 women who consumed alcohol, 27(73%) gave birth to low birth weight infant which was similar to Devguru et al(66.66%).^[12] 75.7% of women who were on iron and folic acid supplementation delivered a normal weight child similar to results by Devguru et al (76.96%)^[12] and Acharya et al(62%).^[13]

CONCLUSION

Several modifiable and perinatal factors are significantly associated with Low Birth Weight (LBW). Targeted interventions addressing these factors, combined with awareness programs conducted by primary health care centers, can substantially reduce LBW prevalence. Future research should prioritize Modifiable risk factors and Awareness-based interventions

Limitations: The present study had several limitations, including its cross-sectional design, single-center setting and limited sample size. Further Longitudinal studies to explore causal relationships, Interventions targeting modifiable risk factors and Multi-center studies are required to generalize findings.

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