

A Study of Determinants of Low Birth Weight in Newborns Delivered at One of the Tertiary Care Hospitals in Saurashtra Region, Gujarat

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Abstract:

Introduction : Birth weight is one of the most important criteria for determining neonatal and infant survival and is considered a sensitive index of the nation's health and development. The World Health Organization (WHO) defines low birth weight (LBW) as "Birth weight less than 2500 grams" regardless of gestational age, the measurement being taken preferably within the first hour of life. **Objectives :** 1) To estimate the prevalence of LBW among sample population at tertiary care hospital. 2) To study the distribution of newborns, according to socio-demographic characteristics of the mother and its association with LBW. **Method:** A hospital based cross-sectional study was carried out among 500 newborns between December 2020 and November 2021. Participants were selected by systematic random sampling technique. The data were collected from the case file and face-to-face interview. Both descriptive and inferential statistics were used in the analysis. **Results:** Prevalence of low birth weight was 29.2%. Majority 271 (54.2%) of newborn mothers' age group was between 21 to 25 years. More than half 272 (54.4%) newborns were from mothers who studied up to primary level education and more than three fourth 389 (77.8%) were from mothers who were housewives. Majority 293 (58.6%) of newborns were from the urban area, around three fourth 382 (76.4%) newborns were Hindu and nearly two fifth 194 (38.8%) newborns belonged to lower middle class. Prevalence of low birth weight was significantly higher in mothers aged >35 years and ≤ 20 years, who were illiterate, doing labour work and belonging to lower socio-economic class. **Conclusion:** The prevalence of Low Birth Weight was 29.2% among sample population. Socio-demographic variables like maternal age >35 years, ≤ 20 years, illiteracy, labour work and lower socio-economic class had shown significant risk for delivering Low Birth Weight babies.


Key Words : Low birth weight, Newborn, Socio-demographic factors, Tertiary care Hospital

Introduction:

Birthweight is the first weight of the new born obtained after birth. For live births, birthweight should preferably be measured within the first hour of life, before significant post-natal weight loss has occurred.^[1] Birth weight is one of the most important criteria for determining neonatal and infant survival

and is considered a sensitive index of the nation's health and development.^[2]

The World Health Organization (WHO) defines low birth weight (LBW) as "Birth weight less than 2500 grams" regardless of gestational age, the measurement being taken preferably within the first hour of life.^[2] LBW includes both appropriately

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grown preterm neonates (<37 completed weeks of gestation), term neonate and also in preterm growth-restricted neonates (<10th centile of weight for gestational age and sex) but remains an important public health indicator, especially in settings where accurate gestational age assessment is not possible.^[3] It is estimated that the risk of neonatal mortality for LBW infants is 20 times more than for infants with birth weight exceeding 2500 grams, and it increases sharply as birth weight decreases.^[4] According to health and family welfare statistics, 48.1% causes of deaths within first 29 days and 35.9% causes of death within 1 year of birth were occurred due to the prematurity & low birth weight.^[5]

According to the National Family Health Survey (NFHS-4), about 18% of Indian children younger than five years are born with LBW in 2015–16.^[6] LBW among infants were highest in the Central region of India (20.73%). The prevalence of LBW cases was 20.64% in the Northern region and 20.43% in the Western region. Comparatively, the rate was approximately 18.15%, 16.40% and 9.87% in the Southern, Eastern, and North-east regions, respectively. The prevalence of LBW cases among the infants born in urban areas was 16.75% while the cases of LBW were 17.72% among the infants born in rural sectors.^[7] Being born with a low birth weight also incurs enormous economic costs, including higher medical expenditures and social service expenses, and decreased productivity in adulthood.^[8]

Socio-demographic characteristics such as socioeconomic status, parent's education, maternal age, and maternal occupation during pregnancy are also found to be associated with LBW. Social factors might also have an impact on the psychology of pregnant women and can thereby affect the pregnancy outcome.^[9] With this background, this research was conducted to estimate the prevalence of LBW among sample population at tertiary care hospital and to study association of various socio-demographic determinants with low birth weight.

Method:

An institutional based cross-sectional study design in which all three Post-natal wards of Gynaecology Department at tertiary care government hospital, Jamnagar were selected. Study duration was 12 months from December 2020 to November 2021. The study population consists of newborns of postnatal mothers delivered at a tertiary care hospital. The sample size estimation was done taking 5% alpha error at 95% CI by using equation $N = Z^2_{(1-\alpha/2)} pq / l^2$ [Where, N = Desired sample size, $Z_{(1-\alpha/2)}$ at 95%CI = 1.96, p = prevalence of LBW in the studied institution in the previous year which was 27% = 0.27, q = (1-p) = 73% = 0.73, l = max. allowable error which is taken as 15% of p which is 0.04]. Now, $N = (1.96)^2 \cdot 0.27 \times 0.73 / (0.04)^2 = 473.12 \approx 474$. Taking 5% as non response rate sample size would be $474 + 24 = 498$. So, the estimated final sample size was 500.

Systematic random sampling technique were employed for selecting participants. By considering total numbers of deliveries in previous 3 months of the study and sample size, the sampling interval (3) was obtained. In gynaecology department each unit was visited on post emergency day and every third mother indoor in postnatal ward was selected as our study participant. If the mother doesn't give consent to participate in the study, mother next to that was selected. Singleton live newborns of Postnatal mothers, Newborns' mothers who were willing to participate, Informant and participants must be free from any severe, debilitating and mental illness were included. Newborns' mothers who were not willing to participate, Twins and Still births were excluded from the study.

For the Data collection a predesigned, pre-tested and semi-structured questionnaire was used. The information regarding the study variables like mothers' and fathers' age, education, occupation, residential area, religion, type of family and socio economic class were collected. For Socio economic class modified BG Prasad classification (revised for

year 2020, CPI-330)^[10] was used. The guardians(mothers) were interviewed by visiting PNC wards and explained in detail about the study. Informed consent was taken before starting data collection. The data was collected from the case file and face-to-face interview. Collected data were compiled in Microsoft excel sheet, after that data was analysed in SPSS software version 26. Both descriptive and inferential statistics were used in the analysis. In descriptive statistics frequency and percentage were computed. Proportion of low birth weight was determined first and LBW proportion associated with each factor was computed by chi-square test. Statistical significance was set at the probability value ($p < 0.05$). Ethical clearance from institutional ethics committee was sought prior to the study. The participant's consent was obtained first after explaining the purpose of the study.

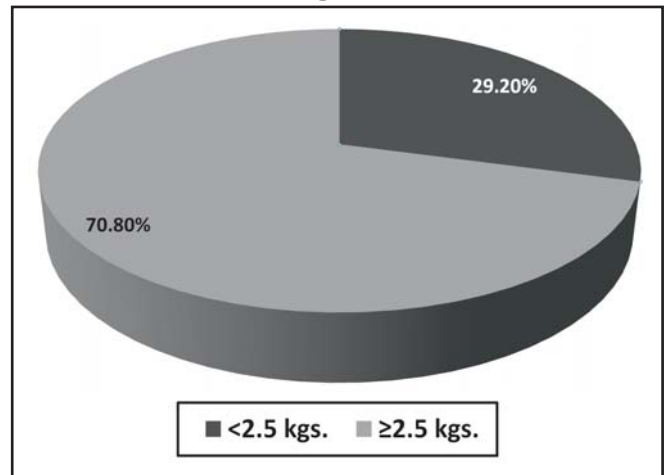
Results:

In present study, prevalence of low birth weight was 29.2% in sample population (N=500) while 70.8% was normal or above normal weight newborns. (Figure 1) Mean birth weight of newborn babies was 2.7 kg.

Mean age of the newborns' mothers in the study was 25.1 year. Table 1 shows, 271 (54.2%) of newborns belonged to mothers age group 21 to 25 years. More than half 272 (54.4%) and 222 (44.4%) of newborns belonged to mothers and fathers respectively, who were studied up to primary level education. More than three fourths 389 (77.8%) newborns mothers were housewives. Majority 314 (62.8%) of newborns' fathers were labourer. Majority 293 (58.6%) of newborns were from the urban area, 382 (76.4%) were Hindu and 244 (48.8%) were from three generation family. Majority newborns belonged to lower middle 194 (38.8%) and middle class 164 (32.8%) according to Modified BG Prasad classification(Revised for year 2020).

Figure 2 shows that the prevalence of LBW was significantly higher in mothers' age group > 35 years and ≤ 20 years. Prevalence of low birth weight was

Figure 1: Distribution of newborns' according to birth weight



significantly higher in mothers who were illiterate, doing labour work and belonging to lower socio-economic class.(Table 2)

Discussion:

In present study prevalence of low birth weight was 29.2% and this finding on prevalence of low birth weight was supported by study of Bhue PK et al^[11] which was 27.7% and also in the study by Paliwal A et al^[12] but in a study by Zaveri A et al^[13] used a sub-sample of the NFHS-4 data where about 17.5% of children are found to be born with LBW. The prevalence rate of LBW is higher and also the mean birth weight of new born is lesser in most of the hospital-based studies. The reason may be most of the high-risk pregnancies deliver in tertiary health care centres.^[14]

Majority of newborns' mothers belong to age group 21 to 30 years which was similar to study conducted by Bhue PK et al^[11] and Metgud CS et al.^[14] In this study 15.4% newborns' mothers were illiterate and this result was similar (15.5 %) in the study conducted by Borah M et al^[15] and Shanti Ramesh S et al^[16] which was 15.5% and 12% respectively while in study by Zaveri A et al^[13] it was 20%. In current study majority (77.8%) newborns were belonged from mothers who were housewife which was followed by 16.8% from labour and 5.4% from service doing in private/govt. sector. A study by

Table 1: Distribution of newborns according to Socio-Demographic characteristics (N=500)

Variables	Category	Frequency (%)
Mother's Age (In completed years)	≤20	49 (9.8)
	21-25	271 (54.2)
	26-30	129 (25.8)
	31-35	26 (5.2)
	>35	25 (5)
Father's Age (In completed years)	≤20	0 (0)
	21-25	256 (51.2)
	26-30	184 (36.8)
	31-35	31 (6.2)
	>35	29 (5.8)
Mother's Education	Illiterate	77(15.4)
	Primary	272(54.4)
	Secondary	81 (16.2)
	higher secondary	48 (9.6)
	Graduate& above	22(4.4)
Father's Education	Illiterate	65 (13)
	Primary	222 (44.4)
	Secondary	111 (22.2)
	higher secondary	71 (14.2)
	Graduate& above	31 (6.2)
Mother's Occupation	Housewife	389(77.8)
	Labour	84(16.8)
	Service (private/Govt.)	27(5.4)
Father's Occupation	Agriculture	41(8.2)
	Labour	314(62.8)
	Business	57(11.4)
	Service (private/Govt.)	73(14.6)
	Unemployed	15(3)
Residential area	Urban	293(58.6)
	Rural	207(41.4)
Religion	Hindu	382(76.4)
	Muslim	118(23.6)
Type of family	Nuclear	69(13.8)
	Joint	187(37.4)
	Three Generation	244(48.8)
Socio economic class*	Upper class (I)	35(7)
	Upper middle class (II)	56(11.2)
	Middle class (III)	164(32.8)
	Lower middle class (IV)	194(38.8)
	Lower class (V)	51(10.2)

*According to modified BG prasad classification

Pal A et al^[17] shows similar kind of distribution of mothers in category of occupation in which majority 85.33 % of mothers were housewife, 10.03% were labourer while 4.6% were doing service. Supportive results also seen in the study of Bhue PK et al^[11] More than three fifth (62.8%) of newborns belonged to father who were doing labour work similar result in a study by Pal A et al^[17] where more than three fifth (65.95%) of fathers were labourer. Majority (76.4%) of mothers were Hindu and this result was supported by the study conducted by Metgud CS et al^[14] and Bhue PK et al^[11] in which it was 85.8% and 96.02% respectively. Nearly half (48.8%) of newborns were from three generation family while in study by Bhue PK et al^[11] half (51.26%) mothers belong to joint family while only 7.57% from three generation family and this is contrast to the present study finding. Socio economic class distribution of study participants in present study supported by Pal A et al^[17] and Bhue PK et al^[11] in which majority of mothers belong to lower/upper lower class which was followed by middle/upper middle class and upper class.

In this study, mothers with pregnancy presented after 35 years and less than equal to 20 years had greater chance of having low birth weight newborns as compared to mothers belonging to other age group categories. In study by Bhue PK et al^[11] the proportion of LBW babies was higher in below 20 years mothers (44.19%) and ≥ 30 years (39.56%) as compared to 20-29 years (25.0%) and the association between maternal age and LBW was found significant ($p < 0.05$). In the study by Metgud CS et al^[14] percentage of LBW babies was 50.0% ($n = 9$) in the ≥ 35 years age group, followed by 33.3% ($n = 20$) in 30-34 years age group. The least percentage (19.9%) of LBW was noted in the age group of 20-24 years ($n = 130$). As the maternal age increased the chances of having LBW baby also increased (crude OR 4.0, 95% CI 1.6-10.3, $p = 0.004$). This result also supported in study by Jayaraj N et al^[9] In prior age group it might be due to primiparous mothers have not experienced childbirth and might have less knowledge about

pregnancy care. Lower maternal age of primiparous mothers might also be another reason which was also evident from the stratified analysis based on the age group. It may be due to the fact that teenage mothers are both physically and mentally less capable for bearing the burden of pregnancy. While in later age group it may due to multiparity and less interpregnancy interval which may lead to nutrition depletion of mothers.

In present study, prevalence of low birth weight was significantly higher in mothers who were illiterate. In a study by Bhue PK et al^[11] the proportion of LBW was high in mothers who were illiterate (53.52%). The LBW proportion decreased as educational standard increased. The association between mothers' education and birth weight of babies was found statistically significant ($p < 0.05$). In a study by Zaveri A et al,^[13] the prevalence of LBW was 6.3% lower among higher educated women as compared to women who had no formal education (13.3% vs. 19.6%). ($p < 0.001$) Education plays an important role in improving health-seeking behaviour, social status, and living standard and health awareness such as maternal health service utilization, proper maternal feeding practices, etc.^[18] Therefore, interventions to improve the education level of women and female children are important to reduce prevalence LBW in India.^[19]

Maximum 42.9% prevalence of low birth weight was seen in labourer mothers which was followed by 27% in housewife and 18.5% in service (private/govt.) doing mothers and this was supported by Bhue PK et al^[11] the proportion of LBW was higher in manual labourer (67.14 %) than housewives (25.10%) and service class mothers (12.50%) and the association was found statistically significant ($p < 0.05$). Similar finding also reported in the studies of Deshpande JD et al^[20] and Bener A et al^[21]

The area of residence was not associated with the LBW and it is supported by Taywade ML et al^[22] Religion of newborn also not shown any association

Figure 2: Association between Mothers' Age and Birth Weight of Newborns (N=500)

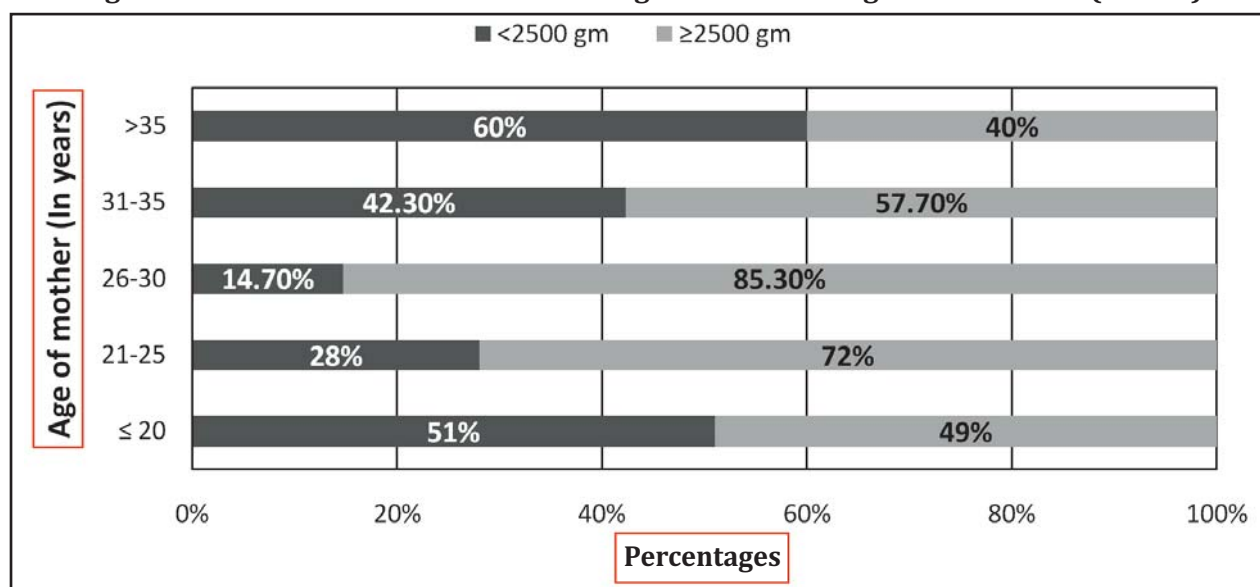


Table 2: Association between Socio-Demographic Characteristics of Newborn Mothers' and Newborns' Birth Weight (N=500)

Variables	Category	Birth weight (in grams)				Total		Chi-Square Value	p-Value
		<2500		≥2500		n	%		
		n	%	n	%				
Mothers' Education status	Illiterate	31	40.3	46	59.7	77	15.4	12.90	0.012*
	Primary	83	30.5	189	69.5	272	54.4		
	Secondary	22	27.2	59	72.8	81	16.2		
	Higher secondary	8	16.7	40	83.3	48	9.6		
	Graduate& above	2	9.1	20	90.9	22	4.4		
Mothers' Occupation	Housewife	105	27	284	73	389	77.8	9.99	0.007*
	Labour	36	42.9	48	57.1	84	16.8		
	Service (private/Govt.)	5	18.5	22	81.5	27	5.4		
Residential area	Urban	78	26.6	215	73.4	293	58.6	2.28	0.13
	Rural	68	32.9	139	67.1	207	41.4		
Religion	Hindu	113	29.6	269	70.4	382	76.4	0.11	0.74
	Muslim	33	28	85	72	118	23.6		
Type of family	Nuclear	19	27.5	50	72.5	69	13.8	3.11	0.21
	Joint	47	25.1	140	74.9	187	37.4		
	Three Generation	80	32.8	164	67.2	244	48.8		
Socio economic class	Higher	5	14.29	30	85.71	35	7	33.82	0.0001*
	Middle	40	18.18	180	81.82	220	44		
	Lower	101	41.22	144	58.78	245	49		

*Statistically Significant

with birth weight and this finding supported by Pal A et al,^[17] Bhue PK et al,^[11] Yadav DK et al^[23] Type of family shown no association with birth weight while in contrast study of Bhue PK et al^[11] shows Prevalence of low birth weight was significantly high among the nuclear family. (p<0.05)

In this study prevalence of low birth weight was significantly higher (41.22%) in lower socioeconomic group, similarly a study by Pal A et al^[17] has shown that the prevalence of low birth weight in lower/upper lower class was 23.69%, in middle/upper middle class was 21.7% and in upper class was 14.65%. This study showed that women from lower socioeconomic families were more prone to deliver LBW babies. (p<0.001) Similar result also seen in study by Bhue PK et al,^[11] Jayaraj N et al^[9] and Ramesh S et al.^[16] Such an association may be related to several potential mechanisms. A poor maternal nutritional intake during pregnancy, which is more likely among low socioeconomic groups and also certain socio cultural practices among them, may contribute to LBW.^[15] So, all above result along with comparisons support that prevalence of low birth weight higher as socioeconomic class moves towards lower.

Limitations:

It is a hospital-based study so the results cannot be generalized. The study did not include obstetric factors, nutrition status of mother, infections and other complications during pregnancy which could have effect on occurrence of LBW.

Conclusion and Recommendation:

Prevalence of LBW newborns was 29.2% in the study population. Socio-demographic variables like mothers age >35 years and ≤ 20 years, illiteracy, labour work and lower socioeconomic status were significantly associated for delivering low birth weight newborns.

Education plays an important role in improving health-seeking behaviour, social status, and living standard and health awareness such as maternal

health service utilization, proper maternal feeding practices, etc. So, the study findings recommend that female literacy status should be improved by enhancing school enrolment and decreasing school dropout rate. Future research is needed to identify the factors responsible for LBW newborns among labourer women. Women should be educated to avoid pregnancy at extremes of the reproductive age. Special attention should be given to women of lower socioeconomic class to decrease LBW newborns among them.

Declaration:

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Conflict of Interest: Nil

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