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Maternal Socio-demographic Factors Associated with the Birth Weight of the Newborns in a Rural Area of North Karnataka, India: A Cross Sectional Study

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ABSTRACT

Introduction: Low birth weight (LBW) is associated with infant mortality and is a challenging multifaceted global health concern especially for developing countries. It is also a common health indicator to assess the health conditions of neonates. In terms of short and long term consequences, LBW plays an important role in inferring infant and childhood morbidities such as mental retardation, learning disabilities, inhibited growth, and cognitive delays. To estimate the prevalence of LBW infants and determine the maternal socio-demographic factors associated with them.

Methods: A community-based cross-sectional study was done among postnatal mothers with singleton live births in a rural area of North Karnataka, India from January 2016 to December 2016. Based on the sample size, data was collected from 337 participants via interviewing them either in the hospital or at home by using a predesigned and pretested semi-structured questionnaire. Weight of the infant was recorded from the mother's medical records and other variables were also assessed. Percentages were used for descriptive statistics and the chi square test was used to determine association.

Results: Low birth weight prevalence was 21.1%. Various factors like teenage pregnancy, maternal occupation, type of family, amount of sleep at night, maternal substance abuse, and exposure of the mother to passive smoking were significantly linked to LBW, while association with other factors such as maternal education and socio-economic status were not statistically significant.

Conclusion: Although the prevalence of LBW is lower than some of the studies done earlier in other parts of the country, it is still more than the national average of 18.6%. Interventions are needed to reduce the socio-demographic risk factors by improving the literacy status of women, delaying marriage, and providing good family support and care to the expectant mothers. Also, there is a need to encourage the utilization of health services to ensure total antenatal care registration and institutional deliveries.

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Introduction

Today's children are tomorrow's future. Thus, the sound health and development of children takes on an important function in the prosperity of a country. Low birth weight (LBW) is a serious concern because it is a leading cause of neonatal and infant mortality, as well as childhood morbidity and is associated with an increased risk of developing diabetes mellitus, hypertension and other cardiovascular diseases

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in adulthood (1-3). The extend of LBW differs worldwide, but globally one in seven infants is born with LBW (4)and annually more than 20 million infants (15.5% of all live births) are born with LBW (5). More than 95% of LBW infants are born in developing countries (5-7); hence, LBW is significantly less prevalent in developed countries (7.0%) than in developing countries (16.5%) (5). India has recorded LBW neonates as 30-35%, with over half of them being born full term (8). Infants born in India alone constitute 40% of LBW infants in the overall developing countries and over 50% of those born in Asia (9).

Low birth weight has been determined to be less than 2500 grams by the World Health Organization (WHO). According to epidemiological investigations, neonate mortality is about 20 times more in those weighing less than 2500 grams (10) Most studies conducted on the factors associated with birth weight in India are hospital based and hospital data are generally associated with various kinds of uncertainties and biases. Also, Indian mothers in rural areas are considered to be deprived of current knowledge and still follow outdated superstitions and traditions. Hence this community-based study was conducted to assess the magnitude of LBW and the factors contributing to it.

To estimate the prevalence of LBW infants and determine the maternal socio-demographic factors associated with them.

Materials and Method

This community based cross-sectional study was conducted in the rural field practice area of a medical college in North Karnataka, India from January 2016 to December 2016.

Sample Size calculation

Based on the study done by Metgud et al.[11], where the prevalence of LBW was 22.9%, the sample size was calculated by using the formula $n=4pq/l^2$ where p=prevalence of LBW, q=100-p, and l is the allowable error for p.

Desired sample size (N) was obtained by the following formula: $N=4PQ/l^2$, where P is the prevalence of LBW (22.9%), Q=100-P, l is the allowable error (20% of P), $=4x22.9 \times 77.1/(4.58)^2 =336.78=337$.

Hence, 337 subjects were enrolled into the study after receiving consent.

Inclusion criteria

Postnatal mothers with singleton live births residing in the rural field practice.

Exclusion criteria

Mothers unwilling to partake in the study.

1. Mothers who were not assessable after three successive attempts.

Study protocol

This consisted of the following four phases:

1. **Preparatory phase:** It included taking administrative approval from relevant authorities and institutional ethical committee approval. During this phase the construction of the data collection tool was also done.
2. **Data collection phase:** After obtaining informed consent, data was collected through the pre-designed and pretested semi-structured questionnaire. Infants' birth weight was obtained from their mothers' medical records and all available medical records were also evaluated for other variables. Health education was given when necessary.
3. **Data analysis phase:** Data was compiled and tabulated using the software MS Excel 2007 and was analyzed using SPSS and Open Epi software. Percentage and proportions were used for descriptive statistics. The chi square test was used to find association. If the expected value was less than 5 in more than 20% of cells in a table, the Fisher's exact test was used. P value of <0.05 was considered statistically significant and <0.001 as highly significant.
4. **Documentation phase:** The analysed data is depicted in the form of text, tables, and graphs. The results are interpreted and compared with other previously conducted studies.

Results

Out of 337 live births, 71 had LBW, making the prevalence of LBW infants 21.1%.

Table 1 shows that the prevalence of LBW infants was higher in both extremes of the age group. In the category 15-19 year olds, the prevalence was 33.3% and in the >35 year old category it was 62.5%. Furthermore, as the age increased from 20 years to the older age group, the prevalence of LBW increased, so both the teenage and oldest mothers had an increased prevalence of LBW and this was found to be statistically significant (p<0.001).

Table 2 shows that the prevalence of LBW newborns was almost the same in various levels of education and the association was not statistically significant (p=0.905).

Table 3 shows that the prevalence of LBW was highest (50%) in farmers and those self–employed, followed by laborers (43.6%), and those in service (40%), while it was least in

Table 1: Association of maternal age with birth weight of the infant

Mother's age (in completed years)	Birth Weight of the Infant				Total	
	Low Birth Weight		Normal Birth Weight			
	No.	%	No.	%	No.	%
15-19	3	33.3%	6	66.7%	9	2.7%
20-24	18	12.3%	128	87.7%	146	43.3%
25-29	29	21.5%	106	78.5%	135	40%
30-34	16	41.0%	23	59.0%	39	11.6%
>35	5	**62.5%**	3	37.5%	8	2.4%
Total	71	21.1%	266	78.9%	337	100%

x^2 value=25.133, df=4, p<0.001

housewives (11.4%). So, the prevalence was more when the mothers were involved in hard physical work and this was found to be statistically significant (p > 0.001).

Table 4 shows that the prevalence of LBW was higher in nuclear families (40%) as compared to joint families (14.2%), and the three-generation family (21.1%), and this was found to be statistically significant (p <0.001).

Table 5 shows that the prevalence of LBW was found to be higher in class V (24%), as compared to class III (16.7%) and class IV (18.6%). So, the prevalence is more in the poor socio-economic class than the better socio-economic class. Although it was not statistically significant (p=0.449).

Table 6 shows that the prevalence of LBW babies in mothers having less than eight hours of sleep at night was found to be higher (27.1%) as compared to the ones having more than or equal to eight hours of sleep (14.4%) and this difference was found to be statistically significant (p=0.004).

Figure 1 shows that the prevalence of LBW newborns was higher among mothers with substance abuse (44.4%) as compared to those without any substance abuse problems (19.7%), which was statistically significant (p=0.012).

The above figure shows, that the prevalence of LBW was found to be higher in mothers exposed to passive smoking (30.5%), as compared to the ones not exposed to passive smoking (17.4%). This was found to be statistically significant (p=0.008).

Table 2: Association of maternal education with birth weight of the infant

Mother's Education	Birth Weight of the Infant				Total	
	Low Birth Weight		Normal Birth Weight			
	No.	%	No.	%	No.	%
Illiterate	18	22.5%	62	77.5%	80	23.7%
Primary	33	20.6%	127	79.4%	160	47.5%
Middle	10	22.7%	34	77.3%	44	13%
Secondary	4	13.8%	25	86.2%	29	8.6%
Higher secondary/PUC	4	28.6%	10	71.4%	14	4.1%
Graduate	2	20.0%	8	80.0%	10	2.9%
Total	71	21.1%	266	78.9%	337	100%

x^2 value=1.594, df=5, p=0.905

Table 3: Association of maternal occupation with birth weight of the infant

Mother's Occupation	Birth Weight of the Infant				Total	
	Low Birth Weight		Normal Birth Weight			
	.No	%	.No	%	.No	%
Housewife	28	11.4%	217	88.6%	245	72.7%
Farmer	12	50.0%	12	50.0%	24	7.1%
Labor worker	17	43.6%	22	56.4%	39	11.6%
Self-employed	12	50.0%	12	50.0%	24	7.1%
Service	2	40.0%	3	60.0%	5	1.5%
Total	71	21.1%	266	78.9%	337	100%

x^2 value=50.824, df=4, p<0.001

Table 4: Association of type of family with birth weight of the infant

Type of Family	Birth Weight of the Infant				Total	
	Low Birth Weight		Normal Birth Weight			
	No.	%	No.	%	No.	%
Nuclear	32	40.0%	48	60.0%	80	23.7%
Joint	31	14.2%	187	85.8%	218	64.7%
Three generations	8	20.5%	31	79.5%	39	11.6%
Total	71	21.1%	266	78.9%	337	100%

x^2 value=23.397, df=2, p<0.001

Table 5: Association of socioeconomic status with birth weight of the infant

Socioeconomic Status	Birth Weight of the Infant				Total	
	Low Birth Weight		Normal Birth Weight			
	No.	%	No.	%	No.	%
III	1	16.7%	5	83.3%	6	1.8%
IV	33	18.6%	144	81.4%	177	52.5%
V	37	24.0%	117	76.0%	154	45.7%
Total	71	21.1%	266	78.9%	337	100%

Fisher's Exact p=0.449

Table 6: Association of number of hours of sleep at night with birth weight of the infant

Sleep at night (hours)	Birth Weight of the Infant				Total	
	Low Birth Weight		Normal Birth Weight			
	No.	%	No.	%	No.	%
<8	48	27.1%	129	72.9%	177	52.5%
≥8	23	14.4%	137	85.6%	160	47.5%
Total	71	21.1%	266	78.9%	337	100%

x^2 value=8.207, df=1, p=0.004

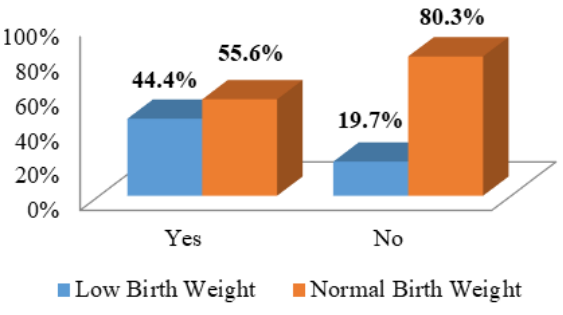

Figure 1: Bar chart showing distribution of maternal substance abuse with birth weight of the infant

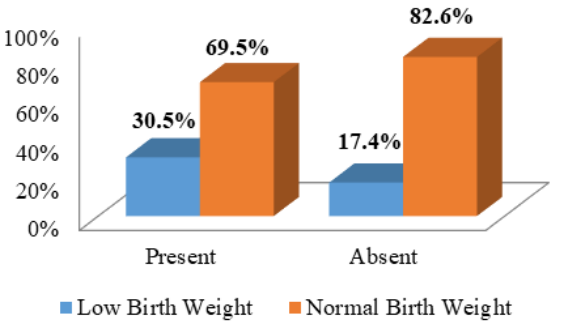

Figure 2: Bar chart showing distribution of passive smoking with birth weight of the infant

Discussion

Worldwide, LBW is a reasonable indicator to measure the state of the health of expected mothers who face challenges such as maternal malnutrition, poor health, laborious work, and unsuitable maternal healthcare. The percentage of deaths due to LBW can be decreased if these maternal risk factors are detected early and managed (12). In the light of the above background, this study was conducted to estimate the prevalence of LBW infants and determine the socio-demographic factors influencing it.

In this study, 71 live neonates out of 337 had LBW, hence, LBW infant prevalence was 21.1%, making it higher than the national average (18.6%) (13). Low birth weight prevalence in this study was similar to Metgud et al.'s study (11) that was also done in rural north Karnataka. Moreover, the prevalence was lower than several other community-based studies, such as those done by Manna et al. (14), Jha et al.(15), Biswas et al.(16), Negi et al.(17), and Rao et al.(18) in rural areas and compared to studies done in urban areas by Choudhary et al.(19) and Chhabra et al.(20).

The prevalence of LBW was higher in both

extremes of the two age groups (i.e., in teenage mothers aged 15-19 and in mothers aged >35) which was statistically significant (p<0.001). Manna et al. also reported that the proportion of LBW infants was greater than those with normal birth weights in both the mothers aged less than or equal to 19 years and more than or equal to 40 years (14). Jain et al. indicated that higher prevalence of LBW infants was associated to higher maternal age (21).

The prevalence of LBW newborns was almost the same in the various levels of education in the present study. However, Jain et al. found that most of the illiterate mothers gave birth to LBW infants (21). A community-based cohort study done in an urban slum of Bhopal also indicated that the proportion of LBW was more in illiterate and primary education mothers as compared to those with higher levels of education (19).

This study demonstrates that the prevalence of LBW was more in farmers and those self–employed, followed by laborers, while it was the least in housewives, which was statistically significant based on the chi-square test. Similar findings were observed by Choudhary et al, in which 71.4% of LBW infants belonged to mothers engaged as laborers as compared to housewives (19). A study carried out in Uttar Pradesh observed that the association between the physical work of the mother and LBW was statistically significant and the proportion of LBW in mothers doing heavy amounts of physical work was more as compared to those who only did mild and moderate work (22).

In this study, the prevalence of LBW was statistically significantly higher in nuclear families as compared to joint families and three-generation families. In addition, Manna et al. found that mothers with a nuclear family background had significantly more LBW neonates than mothers with a joint family background (14). Archana paliwal et al. presented similar findings, wherein the mothers living in a nuclear family delivered a higher proportion of LBW infants than those living in joint a family (23).

The prevalence of LBW was more in the poor socio-economic class than the better socio-economic class in this study, although it was not statistically significant. Aivalli et al., in the Belgaum district, found similar findings and their association was statistically significant (24).

The proportion of LBW infants belonging to mothers with decreased sleep at night (<8 hours) was higher as compared to those having ≥8 hours of sleep and this difference was found to be statistically significant. Manna et al. also found that the maximum proportion of LBW infants belonged to mothers who reported receiving daily sleep and rest of <8 hours; however, this proportion was reduced when daily sleep and rest was increased to ≥10 hours (14).

In the current study, LBW infant prevalence was found to be greater in mothers with substance abuse issues, which was statistically significant. Also, LBW prevalence was more in mothers exposed to passive smoking as compared to those not exposed and this difference was statistically significant. Manna et al. and Metgud et al. found similar findings for substance abuse and passive smoking (11, 14).

Conclusion

Socio-demographic factors such as maternal age, occupation, type of family, hours of sleep at night, substance abuse, and exposure to passive smoking were found to be significantly associated with infant low birth weight, while association with other factors such as maternal education and socio-economic status were not found to be statistically significant in this study. The challenge of low birth weight can be managed by educating the community about the ill-effects of low birth weight to the newborn and mother, also by reducing socio-demographic risk factors by improving the literacy status of women, delaying marriage age and providing good family support and care to the expectant mothers. Thus, interventional programs should be encouraged not only in the health sectors but in all those sectors concerned with social development and social welfare programs.

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