Maternal Factors Associated with the Birth Weight of the Babies in a Rural Area of North Karnataka: A Cross Sectional Study

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Abstract:

Introduction: Birth weight is a reliable indicator of intrauterine growth and is one of the major factors that determine child survival and its physical and mental development. There is no indicator in human biology which tells us so much about the past events and the future life, as the weight of an infant at birth. Low Birth Weight (LBW) is still a major public health problem in developing countries and majority of it is seen in Africa and Asia. The prevalence of LBW in India has although reduced over the past decade, but it still remains high in some of the states of the country. **Objective:** To estimate the prevalence of Low birth weight and to study the maternal factors associated with it. **Method:** A Cross-sectional study was conducted in a village of north Karnataka from December 2015 to May 2017. Sample size calculated was 337. The study participants comprised of postnatal mothers with singleton live born baby. Weight of the newborn was recorded. Chi square test was used to find the association. **Results:** The prevalence of LBW was found to be 21.1%. A number of factors such as mother's age, height, number of hours of rest, tobacco consumption, passive smoking, gravidity, parity, previous history of LBW, time of antenatal care (ANC) registration, haemoglobin, bad obstetric history, type of delivery and gestational age at delivery were found to be significantly associated with LBW. **Conclusion:** Adverse pregnancy outcome is the result of a multiple factors. Prevalence of LBW can be reduced by regular ANC, balanced diet and adequate rest during antenatal period, and avoiding tobacco consumption. Thus, it calls for overall improvement in the ANC.

Keywords: Low Birth weight, Maternal Factors, Rural

Introduction:

For new born health and survival, Low Birth Weight (LBW) is an important predictor. It is associated with high-risk infant and childhood mortality.[1] Low Birth weight is defined as a birth weight of less than 2.5 kg (up to and including 2499 grams), the measurement being taken preferably within the first hour of life, before significant postnatal weight loss has occurred.[2] Birth weight is a good indicator of intra uterine growth and also it determines physical and mental health.[3] It is a prospective marker for new-borns future growth and development and retrospective marker for the mother's health and nutritional status.[4]

In 2015, an estimated 14.6 per cent of all babies born globally suffered from low birthweight.[5] In developing countries, LBW is the most important public health problem. Africa and Asia accounts for most of the LBW babies globally.[6] In India the prevalence of LBW has although declined over the past few years, but the progress is slow and still many states have high prevalence of LBW.[7]

The prevalence of LBW in India ranges from 10% in high socioeconomic class to 56% for the poor slum community. The higher prevalence of LBW was found in rural areas and urban slums.[4] The data for 2014 shows the prevalence of Low birth weight babies in India as 18.6 per cent, while in Karnataka was 17.2 per cent.[8]

LBW increases a child's school-age learning disability. The child born with a LBW also leads huge economic costs, including higher medical expenditures and decreased productivity in adulthood.[9]

The UNICEF (United Nations Children's Fund) and WHO (World Health Organization) in 2015 estimated that one in seven live-births suffered from low birth weight and among that half of them are from Southern Asia. Reducing LBW is recognized as a most important public health priority. The Global Nutrition Targets were adopted in 2012 and now it is a global commitment. In 65th World Health Assembly (WHA), the target of a 30 per cent reduction in Low birth weight globally was set between 2012 and 2025 for the member states.[10]

The factors responsible for Low birth weight differ from one area to another, depending upon geographic, socioeconomic and cultural factors. That is why it is necessary to identify factors responsible for low birth weight, so that the strategy can be planned to tackle this important problem.

In India, majority of the studies done on determinants of birth weight are hospital based. Data from hospitals is generally associated with uncertainties and biases.[11] Hence this study was carried out to estimate the prevalence of Low birth weight babies and study the maternal factors associated with it.

Method:

A Cross-Sectional study was conducted in a rural field practice area of S. N. Medical College, Bagalkot, Karnataka from December 2015 to May 2017 for a period of 18 month. This study was undertaken in the village of Shirur, which is the rural field practice area of S. Nijalingappa Medical College, Bagalkot, Karnataka, it is situated about 17 km to the south east of Bagalkot city. The population covered is 17,512.

Sample size calculation:

Sample size was calculated based on the study done by Metgud C. S. et al[11] where prevalence of LBW was 22.9%, by using the formula $n = 4pq/l^2$ where p = prevalence of LBW (22.9), q = 100-p (77.1) and l is the allowable error for p (20% of p is 4.58). So, the sample size came out to be 337.

Selection of study participants:

The participants' eligible for the study, comprised of all postnatal mothers with singleton live born baby residing in the village "Shirur", within the duration of study till the sample size was achieved.

Inclusion criteria for the study group:

Postnatal mothers with singleton live born baby and resident of the village.

Exclusion criteria for the study group:

1)   Mothers not willing to participate in the study.

2)   Mothers who cannot be reached after three consecutive attempts.

Ethical clearance and Informed consent:

Ethical clearance was obtained from institutional ethical committee and informed consent from study participants.

Study tool and Data collection:

The data was collected by approaching mothers either in hospital or home through pre-designed pre-tested semi-structured questionnaire. Weight of the new-born of mothers registered in the study was recorded from their health records. The available health records were also reviewed for other variables.

Statistical analysis:

Data was entered in Microsoft Excel 2007 spread sheet, and subsequently it was analysed using SPSS (trial version 20) and Open Epi software. Percentage and proportions were used for descriptive statistics and chi square test was used for finding the association. Odds ratio was used for expressing the strength of association. In case if expected value was less than 5 in more than 20% of cells in a table, Fisher's Exact test was used. p value of <0.05 was considered statistically significant and <0.001 as highly significant.

Results:

Out of 337 mothers included in the study, majority of the study participants belonged to 20-29 years of age i.e., 83.3%. Majority of participants (90.8%) were Hindu by religion. Most (47.5%) of the study participants were educated till primary school only. Majority (72.2%) of participants were housewives. 52.5% belonged to class IV followed by class V (45.7%).

Out of total 337 live new-borns, 71 were Low birth weight babies. Thus, the prevalence of LBW babies is 21.1%.

The prevalence of LBW was higher (21%) when the weight gain was less than 9 kg during pregnancy and it was 11.1% in those who gained weight of >11 kg, although it was not found to be statistically significant in this study (Table 1).

Table 2 shows, the prevalence of LBW was highest among fifth para mothers (76.5%), while it

was (11.2%) in primi mothers. The increase in prevalence of LBW with parity was found to be statistically significant.

The prevalence of LBW newborn was highest in preterm babies (86.7%) as compared to term and post-term and this association was found to be statistically significant (Table 3).

Table 4 reflected that the chances of having LBW newborn was high in both young age and elderly mothers, the odds of having LBW newborn was 11.5 times higher in short statured (< 140 cm) mothers. Mothers having less than 8 hours sleep in night were seen to have more chance of LBW newborn as compared to the ones who have more hours of sleep-in night and it was statistically significant. Mothers having some substance abuses were having 3.2 times more chances of having LBW as compared to those who didn't and it was statistically significant, the chances of having LBW newborn was 2.1 times more in mothers exposed to passive smoking than those who were not exposed and it was also found to be statistically significant.

Also shown in table 4, that the chances of having LBW newborn in multi-gravida mothers was found to be higher than primigravida it was statistically significant. The odds of having LBW newborn tend to increase as the time of ANC registration delays. The chances of having LBW newborn are 7 times in hypertensive mothers than normo-tensive and it was statistically significant. The odds of LBW newborn were 17 times in case of severely anaemic mothers and it was highly significant. Mothers with bad obstetric history have 4.2 times higher chances of having LBW newborn as compared to those mothers who didn't and was statistically highly significant.

Discussion:

The maternal risk factors are biologically and socially interlinked and are modifiable. These factors are different from one place to another and depend upon the geographic, socio-economic and cultural

Table 1: Association of maternal weight gain during pregnancy with birth weight of the baby

Weight gained (kgs) during pregnancy	Birth Weight of the Baby				Total	
	Low Birth Weight		Normal Birth Weight			
	No.	%	No.	%	No.	%
<9	42	21.0%	158	79.0%	200	59.3%
9-11	25	24.8%	76	75.2%	101	30%
≥11	4	11.1%	32	88.9%	36	10.7%
Total	71	21.1%	266	78.9%	337	100%
χ^2 value = 2.971, df = 2, p = 0.226						

Table 2: Association of parity with birth weight of the baby

Parity	Birth Weight of the Baby				Total	
	Low Birth Weight		Normal Birth Weight			
	No.	%	No.	%	No.	%
1	10	11.2%	79	88.8%	89	25.8%
2	17	14.9%	99	86.8%	114	34.4%
3	21	26.2%	59	73.8%	80	23.7%
4	11	34.4%	21	65.6%	32	9.5%
5	13	76.5%	4	23.5%	17	5%
>5	0	0.0%	5	100.0%	5	1.5%
Total	71	21.1%	266	78.9%	337	100%
Fisher's exact p <0.001						

Table 3: Association of gestational age at delivery with birth weight of the baby

Gestational age at delivery	Birth Weight of the Baby				Total	
	Low Birth Weight		Normal Birth Weight			
	No.	%	No.	%	No.	%
Term	45	14.9%	257	85.1%	302	89.6%
Preterm	26	86.7%	4	13.3%	30	8.9%
Post-term	0	0.0%	5	100.0%	5	1.5%
Total	71	21.1%	266	78.9%	337	100%
Fisher's exact = 85.872, p <0.001						

Table 4: Results of binary logistic regression analysis of independent risk factors with birth weight of the baby

Risk factors	Odds ratio	95% CI	p value
Mother's age			
15-19 years	3.556	0.817-15.481	0.091
20-24 years	1	-	-
25-29 years	1.945	1.024-3.697	0.042
30-34 years	4.947	2.208-11.082	0.000
≥35 years	11.852	2.608-53.865	0.001
Mother's height			
<140 cm	11.511	3.014-43.965	0.0004
140-144 cm	6.852	2.754-17.048	0.00002
145-154 cm	1.766	0.807-3.860	0.154
>154 cm	1	-	-
No. of hours of sleep-in night			
<8	2.216	1.276-3.850	0.005
≥8	1	-	-
Substance abuse			
Yes	3.251	1.233-8.573	0.017
No	1	-	-
Passive smoking			
Present	2.092	1.208-3.623	0.008
Absent	1	-	-
Gravidity			
Primigravida	1	-	-
Multigravida	2.577	1.256-5.287	0.010
History of Previous LBW			
Yes	2.701	1.331-5.480	0.006
No	1	-	-
Time of ANC registration			
1st trimester	1	-	-
2nd trimester	1.635	0.930-2.874	0.088
3rd trimester	4.512	0.880-23.120	0.071
Blood Pressure			
Normal	1	-	-
Hypertensive	7.164	2.035-25.129	0.002
Haemoglobin (gm/dl)			
<7	17.156	4.276-68.836	0.0001
7-9.9	4.506	1.865-10.886	0.001
10-10.9	1.360	0.587-3.149	0.473
≥11	1	-	-
Bad obstetric history			
Present	4.225	2.300-7.760	0.00002
Absent	1	-	-

factors. If these risk factors are detected early and managed, LBW can be reduced and then mortality.[12]

The prevalence of LBW babies in this study was found to be 21.1% which is more than the national average i.e., 18.6%.[8] Although the prevalence in this study was found to be high, yet it is less than some of the other studies done in India probably because of better ANC registration and institutional delivery than other parts of the country. On the other hand, prevalence of LBW in this study was found to be almost similar to the study done by Metgud et al[11] which was also conducted in rural area, and it was found to be lower than some of the other community-based studies also, such as those done by Manna et al.[13]

Similar to this study, Jain S et al[14] found that the prevalence of LBW babies increased with increase in maternal age, with maximum prevalence in ≥31 year's age group (66.7%).

The odds of having LBW baby were found to be high in mothers of< 140cm height and it showed a decreasing trend as the height increases, this was found to be statistically significant (p <0.001).Manna et al[13] also showed that 39.5% mothers with short height (<145 cm) had LBW babies, which was 23.9% for mothers with height ≥ 145 cm (p=0.0001) which is similar to our study.

Johnson et al[15] found that the history of adequate weight gain during pregnancy was significantly associated with birth weight of baby, where absence of adequate weight gain was associated with higher proportion of LBW. In this study also the proportion of LBW babies reduced as the weight gained during pregnancy improved.

Similar observations were made in the study done by Manna et al[13] wherein maximum proportion of LBW babies were found among mothers who had daily sleep and rest < 8 hours(45.6%),but this came down to22.8% when the sleep & rest was ≥ 10 hours.

The odds of having LBW new-borns were higher among mothers having substance abuse as compared to those not having any substance abuse. This was found to be statistically significant (p = 0.012). Jain S et al[14] in their study, found that mothers having tobacco consumption had more proportion of LBW babies as compared to non-tobacco user.

Metgud et al[11] also observed the similar findings like the present study, that the chances of having LBW babies with exposure of mother to passive smoking is more [crude OR = 2.0, P = 0.002].

The prevalence of LBW was highest among fifth para mothers (76.5%), while it was (11.2%) in primi mothers and as the parity increased the prevalence of LBW increased in the present study. Manna et al[13] also observed similar findings wherein LBW babies were maximum (54.8%) for mothers who had 3 or more children followed by primipara mothers which was also statistically significant.

In this study, the odds of having LBW babies were 2.7, in mothers having previous history of LBW as compared to those who did not have any history of previous LBW baby. This was found to be statistically significant (p = 0.005). Metgud et al[11] also found that the chances of having LBW babies in mothers having previous history of LBW was 4.8 times more as compared to normal.

The odds of having LBW baby were17 times more, in mothers with Hb < 7 gm/dl as compared to those with normal Hb, the odds decreased as the haemoglobin level increased. This was found to be statistically significant (p <0.001). Archana paliwal et al also observed the similar pattern.[16]

Jadhao AR[17] et al found association of bad obstetric history with LBW. The present study also showed to have higher chances of LBW in case of bad obstetric history.

The prevalence of LBW newborn is highest in preterm babies (86.7%) who are followed by term babies (14.9%) while all post-term newborn were of

normal birth weight. This association is found to be statistically significant (p<0.001). Jain S et al[14] found that majority of LBW babies (62.5%) were delivered prematurely and it was found to be statistically significant (p=0.043).

Conclusion:

A number of factors like teenage pregnancy, mother's height, number of hours of sleep-in night, tobacco consumption, passive smoking, gravidity and parity, previous history of LBW, time of ANC registration, mother's blood pressure, haemoglobin, bad obstetric history, type of delivery and gestational age at delivery were found to be significantly associated with low birthweight. So, adverse pregnancy outcome is the result of a multiple factors, which needs to be taken care from an early adolescent age.

Prevalence of LBW can be reduced by regular antenatal check-ups, adequate rest during antenatal period and avoiding the tobacco chewing. Thus, it calls for overall improvement in the antenatal care.

Recommendations:

Grass root level workers may be trained to support and help the pregnant women. The families of the women can also be informed, involved and educated about the proper antenatal care and maintaining good dietary habits and daily practices, so that they can help her and give moral support during this phase.

To promote the utilization of various maternal and child health government schemes, so that mothers or their family members don't face any problems in receiving their rightful benefits such as food supplementation under ICDS and provision of IFA tablets.

A proper health education should be given in order to bring about appreciable change in the knowledge, attitude and practice before and during pregnancy and also after delivery, which should cover

the aspects such as avoiding teenage pregnancy for which the family members should be educated about the risks associated with it related to the birth weight.

Declaration:

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Conflict of Interest: Nil

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