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Original Research Article

Proportion of Low Birth Weight (LBW) and Associated Risk Factors in the Rural Field Practice Area of M S Ramaiah Medical College, Bangalore

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ABSTRACT

Introduction: Birth weight of newborn is one of the single most important determinants of its chances of survival and development as it is influenced by the health and nutritional status of the mother.
Objectives: To study the proportion of low birth weight and the associated risk factors among antenatal mothers in rural area.
Methods: A community based longitudinal study was carried out in the 36 villages of Kaiwara (rural field practice area) from Jan-Dec 2011. Antenatal mothers were traced through anganwadi records maintained at different villages and were visited at three different points at their residence (i.e. First visit before delivery, second one within 7th day of delivery and third at 42nd postnatal day). Pre-tested questionnaire was administered to collect information pertaining to socio-demographic details, birth weight and risk factors. Statistical analysis was performed using SPSS software version 16.0.
Results: The present study revealed that, the proportion of LBW in the study area was 31.9% (95% CI=25.74-38.06). The multiple logistic regression analysis showed that, among all the risk factors of LBW, tobacco use [OR=2.75, 95%CI=0.83-0.09, p=0.09] and consumption of iron tablets less than 100 [OR: 2.85, 95%CI: 1.45-5.59, p=0.002] were the most important predictors of LBW.
Conclusion: The present study revealed that the proportion of low birth weight is higher among the women in the study area. Among all the risk factors, consumption of less than 100 iron tablets and tobacco use were the important predictors of low birth weight.

Key words: *low birth weight, pregnant, risk factors.*

INTRODUCTION

Low birth weight has been defined by the World Health Organization as weight at birth of less than 2,500 grams (5.5 pounds). This is based on epidemiological observations that infants weighing less than 2,500 g are approximately 20 times more likely to die than heavier babies. More common in developing than developed countries, a birth weight below 2,500 g contributes to a range of poor health outcomes.[1]

More than 96 per cent of low birth weight occurs in the developing world, reflecting the higher likelihood of these babies being born in poor socio-economic conditions, where women are more susceptible to infection and more likely to consume poor diet and undertake physically demanding work during pregnancy. India is home to nearly 40 per cent of all low-birth weight babies in the developing world.[2]

As birth weight is conditioned by the health and nutritional status of the mother, the percentage of infants born with low birth weight closely reflects the health status of the communities in which they are born. Thus, birth weight of an infant can be considered as the single most important determinant of its chances of survival, healthy growth and development.

Hence, this study was undertaken with a dual objective to study the proportion of low birth weight and the associated risk factors among antenatal mothers in rural area.

MATERIALS AND METHODS

This longitudinal study was conducted in the administrative limits of primary health centre, Kaiwara under Chintamani Taluk, Chikkaballapur District. Kaiwara is a small township situated about 75kms from Bangalore city.

The Kaiwara Primary Health Centre caters to a population of 35,290 people as per 2001 census (PHC data) living in 36 surrounding villages. This community based longitudinal study was carried out in all the 36 villages of Kaiwara.

All the antenatal mothers who were residing in the study area and had registered at anganwadi between June 1st 2010 to December 31st 2010 and who were expected to deliver after January 31st 2011 were included for the present study. Mothers who would be available for follow up till 42 days after delivery were only included.

According to UNICEFF[3] the proportion of low birth weight in India is 28%. Considering the above finding, the sample size for the present study was calculated with a relative precision of 20% and confidence level of 95%. The sample size worked out to be 257. As per 2001 census, population of Kaiwara PHC is 35,290. Considering the birth rate of India, which is 21/1000 population,[4] it is expected that 741 live births would occur in one year in Kaiwara. Hence 6 months period (i.e. June 2010 to December 2010) was considered for recruiting the mothers to meet the required sample size.

The study was carried out from January 2011 to December 2011. A predesigned semi structured questionnaire was developed and a pilot study was carried out during the month of February to field test the instrument for data collection and later standardized, which was used for the main study.

The mothers were traced through Anganwadi records maintained at different villages. Antenatal mothers who met the inclusion criteria were prospectively enrolled for the study. After establishing a good rapport, an informed consent was taken from the study participants. They were contacted at their residence and the questionnaire was administered in their local language.

The questionnaire was administered during three different visits. The first visit was made before delivery. The second and third visits were made within 7 days and after 42nd day of delivery respectively. Maternal and child protection cards and discharge summary (where available) were used to validate the collected information.

Data on birth weight was based on the history given by the mother and was counter checked with maternal and child protection card.

Presence of following risk factors were considered to classify the pregnancy as high risk pregnancy, elderly primi, short statured primi, malpresentation, pre-eclampsia, anaemia, twins, previous still births/abortions, prolonged pregnancy, history of previous caesarean delivery, grand multipara.

Assessment of socioeconomic status of family was done based on Modified B G Prasad's classification by considering per capita monthly income of the family.

Per month Per capita income of 1961 as suggested by B G Prasad x CF	Per month per capita income for year 2010	Socio economic class	
Rs 100 & above x 27.21	Rs. 2721 & above	Class I	Upper high
Rs 99 to 50 x 27.21	Rs. 2720- Rs. 1361	Class II	High
Rs 49 to 30 x 27.21	Rs. 1360- Rs. 816	Class III	Upper middle
Rs 29 to 15 x 27.21	Rs. 815- Rs. 408	Class IV	Lower middle
< Rs 15 x 22.21	<Rs. 407	Class V	Poor

Education was classified as per census of India 2011, i.e., Graduate, Intermediate/diploma, High school, Middle school, Primary school, Not literate.

The following classification was used classify the occupations of the study population.

1-Professional

1-Doctor, 2-Engineer, 3-Principal, 4-Lawyer, 5-Military officer, 6-Senior executive, 7-Business proprietor, 8-Writer, 9-Scientist, 10-Large employer, 11-Director, 12-University professor, 13-Police officer, 14-Others (Horse rider)

2-Semi-professional

1-Teacher, 2-Pharmacist, 3-Social Worker, 4-Owner of small business and manager, 5-Farmer, 6-Others (Computer Programmer, Constructor, Govt. Employee, Nurse)

3-Skilled worker

1-Artisian, 2-Clerk, 3-Foreman, 4-Supervisor, 5-Carpenter, 6-Tailor, 7-Mechanic, 8-Electrician, 9-Railway guard, 10-Painter, 11-Modeller, 12-Smiths, 13-Baker, 14-Driver, 15-Shop assistant, 16-Petty trader, 17-Constable, 18-Soilder, 19-Linesman, 20-Pointsman, 21-Potter, 22-Barber, 23-Others (Tinkering, Printer, Receptionist, Salesman, Welder, Gardner, Cook, Mason, Postman, Plumber, Agarbatti worker)

4-Semi-skilled worker

1-Factory operator, 2-Agriculture labourer, 3-Shoe maker, 4-Potters, 5-Others (Security guard, Shop helper, Canteen helper)

5-Unskilled worker

1-Labourer, 2-Domestic servants, 3-Casual worker, 4-Peon, 5-Sweeper, 6-Porter, 7-Washer-man, 8-Others (Vegetable vendor)

6-Unemployed

7-Retired

8-Housewives

9-Students

10-Others/Not classified

Statistical analysis: The data was tabulated in SPSS sheet (SPSS version 16.0). The Proportion of low birth weight per 1000 live births was estimated based on the results of the present study, along with 95% confidence interval. Chi-square test of significance was employed to evaluate the association between the low birth weight and the risk factors. All the cases of underweight were considered as cases and rest as controls. Employing case control approach uni variate and multivariate odds ratios were computed. Multiple- logistic regression technique was employed to evaluate the independent predictors of low birth weight.

RESULTS AND DISCUSSION

A total of 239 mothers were available for complete follow up till 42 days of delivery (Loss to follow up rate was 8%) and were included for study analysis.

It was observed from the present study that the mean age of antenatal mothers was 22.5± 2.97 years. The literacy rate among the antenatal mothers and their husbands was 161(67.4%) and 195(81.6%) respectively. According to the Provisional census report 2011, the total literacy rate in rural population of Karnataka is estimated to be 68.86% with male literacy rate being 77.92% and females being 59.60% .[5] It was observed that, 177(74.1%) of the antenatal mothers were unemployed (house wives) and only 7(2.9%) were unemployed among their husbands. And majority of their husbands belonged to semi-skilled 147(61.5%) and unskilled group 35(14.6%). As per B G Prasad classification, 133(56%) of the study population belonged to poor socio economic status followed by 49(20%) to lower middle class and 26(11%) to upper middle class. Thus, the study population mainly comprised of lower middle and poor income category which is one of the important determinants of health (Table 1).

Table 1. Distribution of study participants according to socio-demographic details.

Education	Antenatal mother No. (%)	Husband No.(%)
Graduate	9(3.8)	17(7.1)
Intermediate/diploma	81(33.9)	98(41.0)
High school	40(16.7)	43(18.0)
Middle school	18(7.5)	26(10.9)
Primary school	13(5.4)	11(4.6)
Not literate	78(32.6)	44(18.4)
Total	239(100.0)	239(100.0)
Occupation	Antenatal mother No. (%)	Husband No.(%)
Semi-professional	0	5(2.1)
Clerical/shop/farm	1(0.4)	3(1.3)
Skilled worker	1(0.4)	42(17.6)
Semi-skilled worker	15(6.3)	147(61.5)
Unskilled worker	45(18.8)	35(14.6)
Unemployed	177(74.1)	7(2.9)
Total	239(100.0)	239(100.0)

Socio-economic status	No. (%)
Upper high	7(2.9)
High	24(10.0)
Upper middle	26(10.9)
Lower middle	49(20.5)
Poor	133(55.6)
Total	239(100.0)

The present study revealed that the proportion of low birth weight was 31.9% (95% CI=25.74-38.06) which is higher when compared to national average but the difference was not found to be statistically significant.

In the present study, the association between high risk factors and low birth weight was studied by calculating odds ratio. For some of the factors like elderly primi, preeclampsia and eclampsia, twins and hydramnios and prolonged pregnancy, odds ratio could not be calculated as the frequency of the variables were found to be less (‘zero’ frequency in one of the cells). And the factors like, short statured primi, malpresentation, anaemia, previous still births/abortions, previous caesarean delivery and grand multipara did not attain statistical significance at 0.05 level (Table 2).

Table 2. Association between risk factors and low birth weight.

Risk factors	Level	Low birth weight		Total No. (%)	OR(95%CI)
		Present No. (%)	Absent No. (%)		
Elderly primi	< 35years	154(98.7)	2(1.3)	156(100.0)	*
	≥35yrs	0.0(.0)	73(100.0)	73(100.0)	
Short statured primi	≤145cms	1(33.3)	2(66.7)	3(100.0)	1.07
	>145cms	72(31.9)	154(68.1)	228(100.0)	(0.09-11.98)
Malpresentation**	Yes	2(40.0)	3(60.0)	5(100.0)	0.5
	No	7(26.9)	19(73.1)	26(100.0)	(0.07-4.03)
Pre-eclampsia	Yes	1(100.0)	0(.0)	1(100.0)	*
	No	72(31.6)	156(68.4)	228(100.0)	
Anaemia	Yes	50(33.8)	98(66.2)	148(100.0)	1.19
	No	18(30.0)	42(70.0)	60(100.0)	(0.62-2.27)
Twins	Yes	2(100.0)	0(.0)	2(100.0)	*
	No	71(31.3)	156(68.7)	227(100.0)	
Previous still births/abortions	Yes	5(21.7)	18(78.3)	23(100.0)	0.39
	No	36(41.4)	51(58.6)	87(100.0)	(0.13-1.15)
Prolonged pregnancy	Yes	0(0.0)	4(100.0)	4(100.0)	*
	No	73(32.4)	152(67.6)	225(100.0)	
History of previous caesarean delivery	Yes	3(25.0)	9(75.0)	12(100.0)	0.52
	No	38(38.8)	60(61.2)	98(100.0)	(0.13-2.06)
Grand multipara	Yes	2(40.0)	3(60.0)	5(100.0)	1.43
	No	71(31.7)	153(68.3)	224(100.0)	(0.23-8.78)

*Odds ratio could not be calculated as the frequency of the variables were found to be '0'
**Third trimester ultrasonography results were available for only 31 subjects

Velankar et al[6] in their study showed that, the prevalence of low birth weight among mothers with height less than 145 cms was higher (60.6%) compared to mothers with height more than 145cms (39.8%) and the difference was statistically significant (P<0.01). It was also observed that, 37.9% and 37.7% of the women of 1st and 2nd order pregnancy, gave birth to low birth weight babies which is significantly lesser as compared to 51.7%, 75% and 67% of 3rd , 4th and 5th order respectively and the difference was statistically significant (P <0.01).

In a study conducted by Singh et al[7] to evaluate the maternal factors contributing to low birth weight the following observations were made,

(1)The proportion of bad obstetric history was 17.5% among the low birth weight group (n=40), where as it was 4% in the control group and the difference was statistically significant OR=5.097 [95%CI=1.931-13.488, P=0.003]. (2)The proportion of pre-eclampsia was 32.5% and 5.33% in the low birth weight group and control group respectively and the difference was statistically significant OR= 8.546 [95% CI= 3.771-19.418, P=0.000]. (3)The proportion of malpresentation was 5% and 2.33% among the low birth weight group and control group respectively and the difference was not statistically significant, OR=2.20 [95%CI=0.50-9.76, P=0.286]. (4)It was also noted that, history of lower caesarean section was 27.5% among the low birth weight group and 22.67% among the control group and the difference was not statistically significant OR=1.29 [95% CI=0.62-2.69, P=0.55].

Thus, the clinical significance between associations of the high risk factors with low birth weight cannot be ruled out based on the findings of the present study: possibly statistical significance would have attained by relatively larger sample size.

The proportion of anemia was 19.8% among study population who consumed more than 100 iron & folic acid tablets, where as it was 39% and 40.8% among

those who consumed less than 50 and 50-99 tablets respectively. And the difference was found to be statistically significant (*P*=0.01) (Table 3). Therefore, there is a need to promote, educate and increase the awareness regarding iron and folic acid supplementation which is a part of National Nutritional Anemia Prophylaxis Program. Under this program, the antenatal mothers are given 100 mg of elemental iron and 500 µg of folic acid daily for a period of 100 days. Now, it is a part of Reproductive and Child Health Program.[8]

Table 3 Association between consumption of iron & folic acid tablets andLBW

Number of iron & folic acid Tablets	Low birth weight Yes No. (%)	No No. (%)	Total
<50	23(39.0)	36(61.0)	59(100.0)
50 to 99	29(40.8)	42(59.2)	71(100.0)
≥100	16(19.8)	65(80.2)	81(100.0)
Total	68	143	211

χ^2=9.418, d f=2, *P*=0.01

(n=211, of all the antenatal mothers, 220 of them had consumed iron tablets and birth weight was available for 211 mothers)

Table 4. Association between chewable tobacco use by antenatal mothers and low birth weight.

Tobacco use	Low birth weight Yes No. (%)	No No. (%)	Total
Yes	8(57.1)	6(42.9)	14
No	65(30.2)	150(69.8)	215
Total	73	156	229

χ^2 = 4.38, d f=1, *P*=0.04, OR=3.08 (95% CI=1.03-9.23)

A randomized controlled trial conducted by Cogs well et al,[9] included 117 pregnant women who were given iron supplement during pregnancy and 96 women in the placebo group. Mean birth weight in the placebo group was low for an American population, i.e., only 3072 g, and there was a relatively high proportion of LBW (16.7%).

In the present study antenatal mothers who consumed tobacco regularly (Minimum three times a week) in the past six months were considered as tobacco users.

It was observed that, proportion of low birth weight was 57.1% among those who consumed tobacco, where as the proportion was 30.2% among those who had not consumed tobacco. Thus, the present study showed that consumption of tobacco is associated with one of the major pregnancy outcomes, i.e., low birth weight, and the difference was found to be statistically significant OR=3.08 [95% CI=1.03-9.23, *P*=0.04] (Table 4).

A study conducted by Gupta et al[10] enrolled 1217 women who had used a smokeless tobacco product at least once a day for the past six months. It was revealed that, the proportion of low birth weight babies was 28.6% (48/168) among tobacco users and 19.9% (160/806) among non-users with an adjusted odds ratio of 1.6 (95%CI=1.1 to 2.4) and the difference was

statistically significant (P<0.05). A cohort study carried out by Deshmukh et al,[11] in the urban field practice area attached to the Department of Preventive and Social Medicine, Government Medical College, Nagpur, from January to May 1994 showed tobacco exposure (passive smoking and tobacco chewing) is associated with low birth weight OR: 3.14 [95%CI: 2.08-4.88] .It was observed that, smokeless tobacco use in pregnant women reduces birth weight and increases the number of low birth weight babies. The adverse outcomes are dose dependent and similar to those associated with maternal smoking. The findings were similar to the present study; however the dose dependency was not assessed in the present study.

Thus, consumption of smokeless tobacco (chewable tobacco) can be considered as one of the important risk factors for low birth weight based on the findings of the present study.

Univariate and multiple logistic regression analysis were done to identify the predictors of low birth weight among study participants.

Table 5. Univariate and multiple logistic regression analysis of predictors of low birth weight among study participants.

Variable	Level	LBW(-)	LBW(+)	Uni variate		Multiple-logistic	
		(n=156)	(n=73)	OR (95% CI)	*P* value	OR (95% CI)	*P* value
Tobacco use	No	150(96.2)	65(89.0)	1	0.04*	2.75	0.09**
	Yes	6(3.8)	8(11.0)	3.07 (1.02-9.22)		(0.83-9.09)	
Minimum three antenatal visits	Yes	117(75.0)	59(80.8)	1	0.33	0.52	0.09
	No	39(25.0)	14(19.2)	0.71 (0.35-1.41)		(0.24-1.09)	
Iron & folic acid tablets	>100	65(41.7)	16(21.9)	1	0.004*	2.85	0.002*
	<100	91(58.3)	57(78.1)	2.54 (1.34-4.82)		(1.45-5.59)	
Education of husband	Literate	131(84.0)	56(76.7)	1	0.18	1.48	0.33
	Not-literate	25(16.0)	17(23.3)	1.59 (0.79-3.17)		(0.66-3.30)	
Education of mother	Literate	109(69.9)	45(61.6)	1	0.21	1.32	0.37
	Not-literate	47(30.1)	28(38.4)	1.44 (0.80-2.58)		(0.70-2.49)	
Occupation of mother	Employed	43(27.6)	16(21.9)	1	0.36	1.35	0.41
	unemployed	113(72.4)	57(78.1)	1.35 (0.70-2.61)		(0.65-2.79)	
Occupation of husband	Employed	150(96.2)	72(98.6)	1	0.31	0.45	0.48
	Unemployed	6(3.8)	1(1.4)	0.35 (0.04-2.94)		(0.05-4.19)	
Socio-economic status	No BPL	66(42.3)	34(46.6)	1	0.54	0.84	0.59
	BPL	90(57.7)	39(53.4)	0.84 (0.48-1.47)		(0.46-1.58)	

*significant at 0.05 level, **significant at 0.1 level

Those variables which were found to be statistically significant in the uni-variate analysis (P<0.05) or thought to be clinically/sociologically important were also included for multiple logistic regression analysis.

The multiple logistic regression analysis revealed consumption of less than 100 iron & folic acid tablets during the antenatal period as statistically significant factor for low birth weight OR: 2.85[95%CI: 1.45-5.59, P=0.002] (Table 5).

However, the other variable which attained significance in the range of 0.05 to 0.10 was tobacco use possibly would have attained statistical significance at 5% level with larger sample size. Hence these two variables (tobacco use and consumption of

less than 100 iron & folic acid tablets) can be taken as most important predictors of low birth weight.

The other factors such as education, occupation, minimum three antenatal checkups and socio-economic status did not attain statistical significance in the multiple logistic regression analysis. However, the clinical significance cannot be ruled out based on the findings of the present study.

CONCLUSION

The present study revealed that the proportion of low birth weight was 31.9% (95% CI=25.74-38.06) which is higher when compared to national average but the difference was not found to be statistically significant. Among all the risk factors, consumption of less than 100 iron & folic acid tablets and tobacco use were the important predictors of low birth weight.

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