

Original Article

## A case control study for risk factors of low birth weight in Nagpur city of Maharashtra

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### ABSTRACT

**Background:** Birth weight is one of the most important determinants of the chance of the newborn to survive & to experience healthy growth & development. So the present case control study was done to find some risk factors associated with low birth weight (LBW) among women delivering at a government medical college of Central India. **Material and Methods:** The study was conducted on 860 women who came for their delivery at Medical College & Hospital of Nagpur in between June 2007 to December 2009. This case-control study had equal number of cases & controls matched for maternal age, parity & completed weeks of gestational age at the time of birth by 1:1 paired matching. **Results:** out of 430, 280 (65.12%) matched pairs of mothers were in age group 20-24 years, 261 (60.70%) were primipara and 112 (26.05%) were delivered at 39 completed weeks of gestation. Some maternal factors which were found to be significantly associated with LBW were unfavourable outcome of previous pregnancy (OR=2.47), place of residence (rural) (OR=2.06), height <145 cms (OR=1.91), weight <40 kgs (OR=1.87), birth interval of <24 months (OR=1.81), WHPI d<sup>2</sup>100 (OR=1.77), Hb level <11 gram% (OR=1.59), BMI <18.5 kg/m<sup>2</sup> (OR=1.48) and presence of any morbid condition during current pregnancy (OR=1.39). After MLR only 3 maternal factors i.e. place of residence (rural) (AOR=2.11), unfavourable outcome of previous pregnancy (AOR=1.96) and presence of any morbid condition during current pregnancy (AOR=1.44) were found to be associated with LBW. **Conclusion:** Women residing in rural areas, women with unfavourable outcome of previous pregnancy and women with any morbid condition during present pregnancy need special attention as these conditions were found to be significantly associated with LBW.

**Key words:** Low birth weight (LBW) baby, case control study, weight height product index (WHPI), unfavourable outcome of previous pregnancy, presence of morbid condition during current pregnancy

### Introduction:

The birth weight of an infant, simple as it is to measure, is highly significant in two important aspects. In the first place it is strongly conditioned by the health and nutritional status of the mother and in the second place it is one of the most important determinants of the chances of the newborn to survive and experience healthy growth and development. World Health Assembly in 1976 defined Low Birth Weight (LBW) as a birth weight of less than 2500 grams (upto & including 2499 grams)<sup>1</sup>. LBW babies are burden to the community, apart from being pregnancy wastage is also a form of a reproductive failure contributing to a major share in perinatal & neonatal mortality & also towards mental, physical & developmental failure. In the present study attempt has been made to identify & quantify those maternal risk factors which have significant association with LBW.

### Material and Methods:

The present study was a case-control study which was carried out at the post natal care (PNC) wards of Indira Gandhi Govt. Medical College & Hospital, Nagpur. The

study population was all mothers who had delivered a baby at the IGGMC, Nagpur between June 2007 to December 2009. A case was defined as mother whose baby had a birth weight of <2500 grams and a control was defined as mother whose baby had a birth weight of 2500 grams or more. These cases & controls were matched for maternal age, parity & completed weeks of gestational age at the time of birth by 1:1 paired matching. Inclusion criteria: mothers delivered at the Medical College Hospital. Exclusion criteria: multiple births / stillbirths, those delivered by Caesarean Section, mothers unable to stand or seriously ill. Approval from Institutional Ethical Committee & from University Ethical Committee of MUHS, Nashik was taken before commencing the study. Data collection was done by using predesigned & pretested proforma. A written informed consent of mother of the newborn baby was taken before starting the interview. A pilot study was done on 100 cases & 100 controls to check the feasibility of the proforma. Sample size was also calculated based on the findings of the pilot study. Formula for sample size was  $n = [(2pq)(Z_{\alpha} + Z_{\beta})] / (p_1 - p_0)^2$ . A sample size of 430 each was estimated for cases & controls for present study. Statistical analysis: Chi square test, Odds Ratio, Attributable Risk

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Proportion, Multiple Logistics Regression analysis were used for data analysis.

**Results:**

A total of 430 case and 430 matched controls were studied. Table 1 shows the distribution of case and controls as per their 3 matched variables. Cases & controls were matched for maternal age, parity & completed weeks of gestational age at the time of birth by 1:1 paired matching. Maximum 280 (65.12%) matched pairs of mothers were in the age group of 20-24 years, 261 (60.70%) matched pairs of mothers were primipara and 112 (26.05%) matched pairs of mothers delivered at 39 completed weeks of gestation while 104 (24.19%) mothers delivered at 40 completed weeks of gestation.

Almost two third of mothers were Hindus, little less than half had secondary education, more than 90% were housewives and were involved in light physical activity during pregnancy, nearly 2/3<sup>rd</sup> had 8-10 hours of sleep per day and more than half were married between the age of 18-20 years. All these factors were having insignificant difference between case and control group. But a birth interval of less than 2 years (30% v/s 20%) and rural area of residence (45% v/s 29%) were significantly different between case and control group.

Table 2 summarizes the maternal risk factors which were found to be significantly associated with LBW. The risk from various maternal factors as determined by Odds Ratio (OR) and Attributable Risk Proportion (ARP) in order of decreasing order was unfavourable outcome of previous pregnancy (OR=2.47), place of residence (rural) (OR=2.06), height <145 cms (OR=1.91), weight <40 kgs (OR=1.87), birth interval of <24 months (OR=1.81), WHPI d<sup>o</sup>100 (OR=1.77), Hb level <11 gram% (OR=1.59), BMI <18.5 kg/m<sup>2</sup> (OR=1.48) and presence of any morbid condition during current pregnancy (OR=1.39).

Table 3 shows the distribution of various maternal risk factors which were found to be significantly associated with LBW by using Multiple Logistic Regression (MLR) Analysis. After MLR only 3 maternal factors i.e. place of residence (rural) (AOR=2.11), unfavourable outcome of previous pregnancy (AOR=1.96) and presence of any morbid condition during current pregnancy (AOR=1.44) were observed to be significant risk factors when adjusted for all other risk factors.

Table 4 summarizes the maternal risk factors which were not found to be significantly associated with LBW. Mother's education, occupation, socio-economic status, physical activity during pregnancy (light, moderate & hard), sleep & rest duration, age at marriage, tobacco consumption, time of registration of pregnancy, number of ANC visits, tetanus

toxoid immunization, days of iron, folic acid & calcium supplementations all were found to be not significantly associated with low birth weight.

**Table 1: Distribution of cases & controls as per matched variables**

Matched variable	Cases (n=430)		Controls (n=430)	
	No	%	No	%
<b>Age of mother</b>				
15-19	22	5.12	22	5.12
20-24	280	65.12	280	65.12
25-29	108	25.12	108	25.12
30-34	13	3.02	13	3.02
?35	7	1.62	7	1.62
<b>Parity of mother</b>				
Primipara	261	60.70	261	60.70
Second para	158	36.74	158	36.74
Third para	11	2.56	11	2.56
<b>Completed gestational weeks at birth</b>				
34	4	0.93	4	0.93
35	11	2.56	11	2.56
36	21	4.88	21	4.88
37	43	10.00	43	10.00
38	99	23.02	99	23.02
39	112	26.05	112	26.05
40	104	24.19	104	24.19
41	29	6.74	29	6.74
42	7	1.63	7	1.63

**Table 2: Distribution of the maternal risk factors found to be significantly associated with LBW**

Risk factors	χ <sup>2</sup> (p value)	OR (95% C.I.)	ARP
Unfavourable outcome of previous pregnancy	19.47 (p <0.05)	2.47 (1.64-3.71)	0.59
Place of residence (rural)	24.96 (p <0.05)	2.06 (1.56-2.73)	0.51
Height (< 145 cm)	6.00 (p <0.05)	1.91 (1.13-3.24)	0.48
Weight (< 40kg)	11.06 (p <0.05)	1.87 (1.29-2.72)	0.46
Birth interval < 24 months	5.59 (p <0.05)	1.81 (1.10-2.98)	0.45
WHPI ? 100	16.23 (p <0.05)	1.77 (1.34-2.35)	0.43
Hb < 11gm%	10.11 (p <0.05)	1.59 (1.19-2.11)	0.37
BMI < 18.5 kg/m <sup>2</sup>	6.25 (p <0.05)	1.48 (1.09-2.02)	0.32
Presence of any morbid condition during current pregnancy	4.78 (p <0.05)	1.39 (1.03-1.87)	0.28

**Table 3: Distribution of maternal risk factors found to be significantly associated with LBW after using Multiple Logistic Regression (MLR) Analysis**

**Table 4: Summary of the maternal risk factors found not to be significantly associated with LBW**

Maternal risk factors of birth weight	Adjusted OR	95% C.I.	p value
Place of residence (rural)	2.11	1.58-2.80	0.00
Unfavourable outcome of previous pregnancy	1.96	1.41-2.72	0.00
Presence of any morbid condition during current pregnancy	1.44	1.06-1.95	0.19

Risk Factor	$\chi^2$	d.f.	p value
<b>Socio-economic factors</b>			
Mothers education	7.57	5	0.67
Fathers education	3.90	5	0.95
Socioeconomic status (rural)	5.55	1	>0.05
Socioeconomic status (urban)	0.17	1	>0.05
Mothers occupation	1.03	2	0.6
Mothers sleep & rest duration (? 10hrs Vs >10hrs)	0.26	1	>0.05
Mothers age at marriage (<18yrs Vs ? 18yrs)	1.58	1	>0.05
Mothers tobacco consumption	3.41	1	>0.05
<b>ANC Care</b>			
Time of registration (? 12 v/s > 12weeks)	0.05	1	>0.05
ANC Visits (?3 v/s <3)	1.74	1	>0.05
Tetanus toxoid immunization (complete v/s incomplete)	0.61	1	>0.05
Days of Iron Folic Acid supplementation (<100 v/s ? 100)	2.55	1	>0.05
Days of Calcium supplementation (<100 v/s ? 100)	1.09	1	>0.05

**Discussion:**

Various authors had found many different maternal risk factors to be associated with the birth of a low weight baby. SS Hirve et al (1994)<sup>2</sup> found that unadjusted relative risks for LBW among women in Pune district were lower socio-economic status (RR=1.71), maternal age <20 years (RR=1.27), primiparity (RR=1.32), last pregnancy interval <6 months (RR=1.48), non-pregnant weight <40 kg (RR=1.3), height <145 cm (RR=1.51), hemoglobin <9 g/dl (RR=1.53) and third trimester bleeding (RR=1.87). MLR analysis showed that LBW decreased with increasing gestational duration (AOR=0.207), non-pregnant weight (AOR=0.711), parity (AOR=0.835) and rising education level of the mother (AOR=0.869). UH Gawande et al (1994)<sup>3</sup> conducted a cross sectional study on 966 women of rural and urban Nagpur and concluded that proportion of LBW was higher in teenage mothers as well among those over 30 years of age ( $\chi^2=15.56$ , df=4, p<0.005), in primipara as well as among grand multipara ( $\chi^2=8.44$ , df=2, p<0.02), in those with a interpregnancy interval of <1½ years or >5 years ( $\chi^2=11.47$ , df=3, p<0.01), among those with a low socio-economic status and

low literacy and among mothers who received inadequate antenatal care ( $\chi^2=11.49$ , df=2, p<0.005). JS Deshmukh et al (1996)<sup>4</sup> found that various maternal factors significantly associated with LBW among women in urban area of Nagpur were anemia (OR-4.81), low socioeconomic status (OR-3.96), short birth interval (OR-3.84), tobacco exposure (OR-3.14), height (OR-2.78), maternal age (OR-2.68), body mass index (OR-2.02) and primiparity (OR 1.58). Kiran Anand et al (2000)<sup>5</sup> found that ANC care during pregnancy (p<0.001), maternal education (p<0.001), maternal occupation (p<0.001), per capita income (p<0.001), parity (p<0.001), bad obstetric history (p<0.001), pre delivery weight (p<0.05) and haemoglobin concentration (p<0.001) were significantly associated with LBW in Wardha district of Maharashtra. Sumedha M Joshi et al (2000)<sup>6</sup> found that teenage pregnancy (r=0.97; p<0.001), high parity ( $\chi^2=49.53$ ; p<0.001), low SES (r=0.77; p<0.05), illiteracy, early marriage ( $\chi^2=10.23$ ; p<0.01) and increased parity (r=0.94; p<0.001) were significantly associated with birth of LBW babies among women of slums of Mumbai.

So, various studies had found almost same factors for LBW exception being maternal education, occupation, their socio-economic status and number of ANC visits which were found to be insignificant in our study. This could be due to the fact that better ANC services are now available and availed by all sections of society regardless of their education, occupation and social status. This do not undermine the importance of ANC visits during antenatal period as any medical illness during current pregnancy is needed to be detected as early as possible to decrease the number of babies with a low birth weight.

**Conclusion:**

Mothers with history of unfavourable outcomes like LBW, abortions, LSCS, still birth, neonatal deaths etc. in previous pregnancy had two and a half times higher risk of delivering a LBW baby. So, the mothers with unfavourable outcome of previous pregnancy should be closely monitored during current pregnancy and appropriate interventions should be taken at the earliest to prevent LBW. Maternal nutrition as assessed by WHPI showed significant association with LBW. This means good nutrition during pregnancy would result in increased birth weight despite the constraint of maternal height. As various morbid conditions during current pregnancy like Anaemia, PIH, Rh iso-immunization, sickle cell disease etc are significantly associated with LBW; women should be educated and encouraged for regular ANC check-ups, which augments the detection of these risk factors at the earliest to improve the weight of a new born. LIMITATIONS: The present study carries all the

limitations of a case-control study. Due precautions are needed while projecting the study results into community as study was conducted in a government hospital which is not used by all sections of society. Nutritional status of the mother was assessed by height, weight, Haemoglobin status & not by actual dietetic history. Despite of all efforts to measure intake of Calcium and Iron-Folic Acid supplementation as accurate as possible, exact quantity of intake may not have been obtained in some cases, amounting to recall bias on the part of the mothers.

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