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ORIGINAL ARTICLE

MATERNAL RISK FACTORS FOR LOW BIRTH WEIGHT NEONATES: A HOSPITAL BASED CASE-CONTROL STUDY IN RURAL AREA OF WESTERN MAHARASHTRA, INDIA

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ABSTRACT

Low birth weight (LBW) is a major determinant of infant mortality and morbidity. It is generally recognized that the etiology of LBW is multifactorial. Present case control study was conducted with the objective of studying maternal risk factors associated with full term LBW neonates. A total of 200 cases and 200 controls of age 18–35 years who delivered a live-born singleton baby were enrolled. The data information was gathered from the maternal health records and interviewing the mothers of these neonates. All the data were entered into the SPSS package (version 17). Association of the risk factors under study was assessed by applying chi –square test. To assess the strength of association the odds ratio and 95% confidence interval of odds ratio was calculated. Majority of the cases and controls belongs to 20-29 years age group. The proportion of low income, illiterate/primary educated, farm labourer mothers, primiparas, and women with Spacing < 2 years were higher among the LBW newborns. LBW was strongly associated with anaemia [$\chi 2=17.33$, $p<0.0001$]. Significant risk factors identified in univariate analysis included pregnancy-induced hypertension [OR=4.09(1.49-11.19)], pre pregnancy maternal weight <45 kgs [OR=4.41(2.30-8.46)], maternal height <145 cms [OR=2.34(1.17-4.66)] and Inadequate antenatal care ($\chi 2=24.81$, $p<0.0001$). Large number of mothers from rural area were not utilizing or inadequately utilizing antenatal care services. Many risks for LBW can be identified before pregnancy occurs. Health education, socio-economic development, maternal nutrition, and increasing the use of health services during pregnancy, are all important for reducing LBW.

Key words: Low birth weight, risk factors, case control study

INTRODUCTION

Low birth weight (LBW) is an important indicator of reproductive health and general health status of population. LBW is considered the single most important predictor of infant mortality, especially of deaths within the first month of life. [1] It continues to remain a major public health problem worldwide especially in the developing countries. The prevalence of low birth weight in India was found to be 26%. As per the WHO estimation about 25 million low birth weight babies are born each year, nearly 95% of them in developing countries. [2] Across the world, neonatal mortality is 20 times more likely for LBW babies compared to heavier babies (≤ 2.5 kg). [3, 4] LBW is a result of preterm birth, intrauterine growth restriction, or a

combination of both pathophysiologic conditions. There are numerous factors contributing to LBW both maternal and fetal. Weight at birth is directly influenced by general level of health status of the mother. Maternal environment is the most important determinant of birth weight, and factors that prevent normal circulation across the placenta cause poor nutrient and oxygen supply to the fetus, restricting growth. The maternal risk factors are biologically and socially interrelated; most are, however, modifiable. Krammer has identified 43 potential factors for low birth weight.[4] Not that all the factors, should be present in a given area. The factors vary from one area to another, depending upon geographic, socioeconomic and cultural factors. The mortality of low birth weight can be reduced if the maternal risk factors are detected early and managed by simple techniques. Thus it is necessary to identify factors prevailing in a particular area responsible for low birth weight. With this background in mind the objective of the present study was to identify the maternal risk factors associated with LBW in rural area of western Maharashtra.

MATERIAL AND METHOD

Present case control study was conducted in a tertiary care teaching hospital in rural area of western Maharashtra. The study data were collected between March 2010-August 2010 by interviews with the mothers, abstraction of medical records and anthropometry. The World Health Organization (WHO) definition of LBW was used, i.e., birth weight less than 2500g. [5] Eligibility criteria for cases were: to deliver a live newborn weighing less than 2,500 g. To be eligible as a control, mothers should have delivered a single newborn weighing more than 2,499g. Mother of babies with birth weights of > 2,499 g who were born consecutively after each case, constituted the control group. Controls were identified from birth records as the next eligible delivery of a non-LBW baby after a woman delivered an LBW baby. A total of 200 cases (vaginal delivery or caesarean section) and 200 controls of age 18–35 years who delivered a live-born singleton baby through without congenital malformation and with gestational age 37–42 weeks were enrolled within one day of delivery. Mothers who had multiple births were excluded. All babies were weighed within one hour after birth. The data were entered into a standardized questionnaire after verbal consent was obtained form the mother. The data information was gathered from the maternal health records and interviewing the mothers of these infants.

Study variables: Study variables were maternal age, height, pre-pregnancy weight, education, occupation, socioeconomic status, type of family, parity, interval between birth of the newborn baby and the previous delivery, Antenatal care (ANC) during current pregnancy, iron and folic acid tablets consumed and strenuous physical activity during pregnancy. History was asked regarding consumption of tobacco in any form regularly. History of abortion was classified as ever/never had abortion. Birth interval between the current and last pregnancy was taken as a continuous variable. Total numbers of ANC visits for the current pregnancy were categorized as ≥ 4 visits and < 4 visits, based on the WHO and United Nations International Children's Emergency Fund (UNICEF) criteria that women should have ≥ 4 ANC visits with an appropriate health care provider . Adequate antenatal care was considered when the pregnant women was registered at any time, had at least four antenatal checkups, had adequately vaccinated against tetanus, had consumed at least 100 tablets of iron and folic acid. Gestational age was calculated from the first day of the last menstrual period reported by the mother. [6] Illness developed during pregnancy was also recorded; these include pregnancy-induced hypertension (PIH), eclampsia / preeclampsia, Rhesus problem, infections and others. Baby characteristics included sex and the birth weight. Physical examination was undertaken after the interview was over. The available health records were also reviewed. The investigations such as haemoglobin, Blood group, VDRL and urine sugar and albumin were recorded from the case sheets. Socioeconomic status as suggested by B.G.Prasad was adopted and modified as per all India consumer price index. [7]

Statistical analysis: All the data were entered into the SPSS package (version 17). Association of the risk factors under study was assessed by applying chi –square test taking a level of significance of $P < 0.05$. To assess the strength of association the odds ratio and 95% confidence interval of odds ratio (O.R.) was calculated.

RESULTS

The main maternal characteristics of the study population are shown in Table 1. The mean age of mothers in case group was 22.7±2.92 and in control group 22.28±2.74. Majority of the cases and controls belongs to 20-29 years age group.

Table 1: Comparison of basic variables of mothers between cases and controls

Variable	Cases	Control
Mean age (years)	22.7 ± 2.92	22.28 ±2.74
Height (cm)	152.06±6.26	153.62±5.31
Pre-pregnancy weight (kg)	48.58±7.91	52.35±6.3
Mean weight gain in pregnancy (kg)	4.9±1.2	6.9±1.5
Birth spacing (months)	22.3±5.1	30.2±6.2
Mean weight of newborn(gram)	1864.97±465.06	2848.35±298.53

The mean birth weight in LBW group babies was 1864.97±465.06 g and in the control group was 2848.355±298.53 g. Table 2 shows the distribution of various factors among cases and controls.

Table 2: Maternal risk factors for low birth weight

Variable	Cases (%) (n=200)	Control (%) (n=200)	Odds ratio (95% CI)	p value
Age(years) <20/>30 years	31(15.5)	19(9.5)	1.74(0.95-3.91)	0.09
Height <145cm	28(14)	13(6.5)	2.34(1.17-4.66)	0.021
Lower socio-economic status (Class IV+V)	54(27)	36(18)	1.68(1.04-2.71)	0.04
Maternal occupation farm labourer	49(24.5)	19(9.5)	3.09(1.74-5.47)	0.0001
Maternal education-illiterate/primary	71(35.5)	49(24.5)	1.69(1.1-2.61)	0.02
Nuclear family	103(51.5)	97(48.5)	1.12(0.76-1.66)	0.61
Pre pregnancy weight< 45 kg	47(23.5)	13(6.5)	4.41(2.30-8.46)	<0.0001
Spacing < 2years	111(55.5)	83(42.5)	1.75(1.18-2.61)	0.006
Primigravida	71(35.5)	55(27.5)	1.45(0.94-2.21)	0.1064
No ANC registration/late ANC registration	83(41.5)	49(24.5)	2.18(1.42-3.35)	0.0004
Inadequate ANC	107(53.5)	57(28.5)	2.88(1.90-4.36)	<0.0001
Bad obstetrics history	33(16.5)	18(9)	1.99(1.08-3.68)	0.03
Maternal Infections	9(4.5)	7(3.5)	1.29(0.47-3.5)	0.79
History of infertility	11(5.5)	9(4.5)	1.23(0.50-3.05)	0.8185
Tobacco consumption	23(11.5)	4(2)	6.36(2.15-18.77)	0.0003
Heavy physical activity	15(7.5)	5(2.5)	3.16(1.12-8.87)	0.03
PIH	19(9.5)	5(2.5)	4.09(1.49-11.19)	0.0062
Anaemia	85(42.5)	45(22.5)	2.54(1.64-3.93)	<0.0001
Caesarean section delivery	59(29.5)	61(30.5)	0.95(0.61-1.46)	0.91

The proportion of low income, illiterate/primary educated and farm labourer mothers were significantly higher among the LBW newborns. Amongst the LBW there were greater proportion of primiparas, mothers below the age of 20 years and women with Spacing < 2 years. The ANC experience of the mothers in the control group was significantly better than that of cases. LBW was strongly associated with inadequate antenatal care. [$\chi 2=24.81$, $p<0.0001$]. The haemoglobin status and daily intake of iron supplements was better among the control group. Mothers who had bad obstetric history showed poor outcome in their present pregnancy also. A significant association was found between bad obstetric history and birth weight of baby. Anaemia, nonpregnant weight below 45 kg, height less than 145 cm was significantly more common amongst the mothers of LBW babies. A significantly higher proportion of mothers of LBW neonates had PIH and eclampsia during the current pregnancy than controls [O.R. = 4.09 (1.49-11.19)]. Furthermore, a significantly higher proportion of mothers of LBW infants were having history

of tobacco consumption than controls (p=0.0003).

DISCUSSION

Factors associated with low birth weight, often termed as ''risk factors'' and their presence in an individual woman indicates an increased chance, or risk, of bearing a low birth weight infant. Globally, LBW as indicator is a good summary measure of a multifaceted public health problem that includes long-term maternal malnutrition, ill health, hard work and poor pregnancy health care.

In present case control study from rural area, lower socioeconomic status, maternal education, maternal occupation farm labourer and having heavy physical activity during antenatal period were significantly associated with low birth weight. However maternal age, having nuclear family and parity has not identified as significant risk factors for LBW babies. Krammer [4], Hirve and Ganatra [8] Deshmukh et *al* [9] also found significant association between socioeconomic status and birth weight of baby. The percentage of illiterate and primary education was more in cases (35.5%) as compared to control group (24.5%). Hirve and Ganatra [8] found that the adjusted odds ratio for delivering LBW decreases significantly with increasing education status of the mother. In rural area women from lower socioeconomic status often continue strenuous physical work through pregnancy. In our study, maternal age had no significant association with LBW. Our findings on maternal age as a risk factor is consistent with studies conducted by Mavalankar *et al*[10] in India and Fikree *et al* [11] in Pakistan. Anand and Garg [12] also found no significant relationship between maternal age and LBW. Proportion of primigravida was high among cases as compared to control but the difference was not statistically significant. In contrast, previous studies have revealed that primiparity is significantly associated with LBW. [9, 13]

This study has shown that low birth weight was significantly associated with inadequate antenatal care, pre-delivery weight ≤45 kg, height ≤145 cm, bad obstetrics history, tobacco consumption, PIH and anemia. These findings are consistent with Kramer's meta-analysis. [4] Malik *et al* [14] found a strong correlation between birth weight and maternal height. Maternal height < 145 cm contributed significantly to a high rate of L.B.W. Effects of pre pregnancy maternal weight; bad obstetrics history (previous abortions) and anaemia were consistent with another study in Ahmadabad. [10] In a hospital-based study in Calcutta Pahari *et al* [15] reported abortion as one of the main-causes of adverse pregnancy outcomes in addition to anaemia and hypertensive disorder. Anemia was one of the common problems in the present study from rural area. Almost 42.5% of mothers who delivered LBW babies were anaemic. Deshmukh *et al* [9] also found that anaemia was significantly associated with LBW. Similarly, Mavlankar *et al* [10] observed that pre pregnancy maternal weight, and anaemia was important determinant of low birth weight. The association of tobacco consumption with low birth weight observed in this study has also been reported by Deshmukh *et al*. [9] and Gupta *et al*. [16] Antenatal care had a strong influence on birth weight. In present study it was found that most of mothers from rural area start attending ANC clinics in their sixth to seventh months of gestation. Deswal *et al* [17] also reported that low maternal weight, under nutrition, lack of antenatal care, short inter-pregnancy interval, toxemia of pregnancy were independent factors increasing the risk of low birth weight significantly. Rural women from lower socio-economic status are more susceptible to poor diet and infection and more likely to undertake physically demanding work during pregnancy. Large number of mothers from rural area are not utilizing or inadequately utilizing antenatal care services. Antenatal care for pregnant mothers is an established factor to improve pregnancy outcome, appropriate nutritional education and food supplements must be given to the mothers with poor weight gain**.** Access to quality antenatal care should be viewed as potentially important since it also offers opportunities for counseling and risk detection apart from its necessity for maternal health**.** It is generally recognized that the etiology of LBW is multifactorial. Special attention of health care professionals is necessary for identification of these risk factors for low birth weight. Various factors are clearly and consistently linked to low birth weight. Numerous opportunities exist before pregnancy to reduce the incidence of low birth weight, yet these are often overlooked in favor of interventions during pregnancy.

CONCLUSION

Many risks for LBW can be identified before pregnancy occurs. Health education, socio-economic development, maternal nutrition, and increasing the use of health services during pregnancy, are all important for reducing LBW.

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REFERENCES

1. Ryan CA, Ryan F, Keane E, Hegarty H. Trend analysis and socio-economic differentials in infant mortality in the Southern Health Board, Ireland. Ir Med J 2000; 93:204-6.
2. Park K. Park's Text book of preventive and social medicine. 18th Edition. Jabalpur: M/s Banarsidas Bhanot, 2005: 395-396.
3. UNICEF: Low Birth Weight, Country Regional and Global estimates. [http://www.unicef.org/publications/index_24840.html]. Accessed August12, 2011
4. Kramer MS. Determinant of low birth weight: Methodological assessment and Meta analysis. Bull WHO 1987; 65(5): 663-737.
5. World Health Organization. International Classification of Diseases, Ninth revision,Vol. 1 Geneva, World Health Organization, 1977.
6. Smith GC, Pell JP, Dobbie R: Caesarean section and risk of unexplained stillbirth in subsequent pregnancy. Lancet 2003, 362(9398):1779-1784
7. Kumar P. Social classification – Need for constant updating. Indian J Commun Med 1993; 18:60-61.
8. Hirve SS, Ganatra BR. Determinants of low birth weight: a community based prospective cohort study. Indian Pediatr 1994; 31:1221-5.
9. Deshmukh JS, Motghare DD, Zodpey SP, Wadhva SK. Low birth weight and associated maternal factors in an urban area. Indian Pediatr. 1998; 35:33-6
10. Mavlankar DV, Gray Ronald H, Trivedi CR. Risk factors for preterm and term low birth weight in Ahmedabad, India. Int J Epidemiol 1992; 21:263-72.
11. Fikree FF, Berenes HW. Risk factors for term intrauterine growth retardation Community based study in Karachi. Bull WHO 1994; 72:581-87.
12. Anand K,Garg BS. A study of factors affecting low birth weight. Ind j com med 2000;25:57-62
13. Nurul A, Abel R, Sampathkumar V. Maternal risk factors associated with low birth weight. Indian J Pediatr 1993; 60:269-274.
14. Malik S,Ghidiyal RG,Udani R, Waingankar R. Maternal Biosocial factors affecting low birth weight.Indian Journal of Paediatrics 1994;33:1222-25
15. Pahari K, Ghosh A: Study of pregnancy outcome over a period of five years in a postgraduate institute of west Bengal. J Indian Med Assoc 1997; 95:172-4.
16. Gupta PC, Sreevidya S. Smokeless tobacco use, birth weight, and gestational age: population based prospective cohort study of 1217 women in Mumbai, India. BMJ. 2004; 328:1538.
17. Deswal BS, Singh JV, Kumar D. A Study of Risk Factors for Low Birth Weight. Indian J Community Med.1999 ;24 : 127-131.