Original Research Article

Evaluation of the risk factors associated with low birth weight babies: a case control study

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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 VIMS Pawapuri in Bihar, India. **Aim:** to evaluate the risk factors associated with low birth weight babies at VIMS Pawapuri in Bihar, India. **Material and methods:** This case control study was done the Department of Paediatrics, Vardhman Institute of Medical Science, Pawapuri, Nalanda,Bihar, India, for 15 months. Total 100 cases (mothers having LBW singleton babies) and 100 controls (mothers having normal birth weight singleton babies) were include in this study. **Results:** A total of 50 case and 50 matched controls were studied. 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=2.15), height <145 cms (OR=1.193), weight <40 kgs (OR=1.89), birth interval of <24 months (OR=1.82), WHPI d"100 (OR=1.82), Hb level <11 gram% (OR=1.64), BMI <18.5 kg/m^2 (OR=1.55) and presence of any morbid condition during current pregnancy (OR=1.41). 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=2.27), unfavourable outcome of previous pregnancy (AOR=1.96) and presence of any morbid condition during current pregnancy (AOR=1.63) were observed to be significant risk factors when adjusted for all other risk factors. 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. **Conclusion:** This study shows that bio-demographic and prenatal care variables have the strongest influence in determining the birth weight of a baby. However, Socio-economic and demographic factors are significantly associated with prenatal care, which is one of the behavioral factors associated with low birth weight.

Keywords: Low birth weight, Risk factors, Maternal risk factor, Preterm.

Introduction

Low birth weight (LBW) has been defined by WHO as weight at birth of less than 2.5 kg.[1] By international agreement, LBW has been defined as a birth weight of less than 2500 grams, with the measurement being taken preferably within the first hour of life, before significant postnatal weight loss has occurred.[2] It contributes substantially to neonatal, infant, and childhood mortality and morbidity.[3] Across the world, neonatal mortality is 20 times more likely for LBW babies compared to NBW babies (>2.5 kg).[4] It is now a well recognized fact that birth weight is not only a critical determinant of child survival, growth, and development, but also a valuable indicator of maternal health, nutrition, and quality of life.[5] The incidence of LBW is estimated to be 16% worldwide, 19% in the least developed and developing countries, and 7% in the developed countries. The incidence of LBW is 31% in South Asia followed by East and North Africa (15%), Sub-Saharan Africa (14%), and East Asia and Pacific (7%). Asia accounts for 75% of worldwide LBW followed by Africa (20%) and Latin America (5%). Every fourth baby in India is low birth weight baby accounting for a high load of morbidity and mortality. Every year 8 million low birth weight babies, 2.7 million preterm babies and 1 million low birth weight babies are born in India. According to WHO statistics, 25 million low birth weight babies are born each year and 95 percent of them are in developing countries.[2,6] Due to improvement in health facilities and improvement in people's standard of living all over the world, the mortality and morbidity rates of low birth weight infants have been substantially reduced over the past years in developed countries. Now the major concern, lies in reducing the mortality and morbidity rates of low birth weight infants in developing countries. In developed countries because of improvement in health care facilities, and increased funds spent for health, the problem of low birth weight has been reduced. But in developing country like India, where there is lacunae in health care facility and funds, the survival and long-term complications of low birth weight babies still remains the challenge. The high incidence of neonatal morbidity and mortality in our country is due to neglect of nutrition, health and education of female children and poor status and empowerment of

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women in society. Early teenage marriages, inadequate spacing between pregnancies, maternal malnutrition, fewer antenatal consultations, bad obstetric history, medical diseases complicating pregnancy and maternal infections are important contributory factors for the increased incidence of low birth weight. The aim of this study was to evaluate the risk factors associated with low birth weight babies at VIMS Pawapuri in Bihar, India.

Material and methods

This case control study was done the Department of Paediatrics, Vardhman Institute of Medical Science, Pawapuri, Nalanda,Bihar, India, for 15 months. after taking the approval of the protocol review committee and institutional ethics committee. Mothers delivering live born singleton term baby with birth weight less than 2500 gm were taken as cases, while mothers delivering live born singleton term baby with birth weight 2500 gm or more were taken as controls. The mothers delivering babies of more than 4 kilograms or babies with congenital anomalies or twins or preterm babies were excluded from the study. One hundred cases and the same number of controls were included in the study. The questionnaire contained the variables on maternal factors (age, weight, height, BMI, parity, ANC check-up, iron (60 mg daily) and calcium (500 mg) supplementation, and interpregnancy interval), sociodemographic factors (religion, ethnicity, occupation, socioeconomic status, educational status of parents, type of family, geographical area, and sex of baby), and diseases during pregnancy (anaemia, night blindness, hypertension, heart diseases, tuberculosis, and eclampsia).

Results

A total of 50 case and 50 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 62 (65%) matched pairs of mothers were in the age group of 20-25 years, 64 (64%) matched pairs of mothers were primipara and 14 (28%) matched pairs of mothers delivered at 39 completed weeks of gestation while 13(26%) mothers delivered at 40 completed weeks of gestation. Almost two third of mothers were Hindus, little less than half had secondary education, more than 80% were housewives and were involved in light physical activity during pregnancy, nearly 2/3rd had 8-10 hours of sleep per day and more than half were married between the age of below 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 (50% v/s 30%) were significantly different between case and control group.

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

Matched variable	Cases (n=50)		Controls (n=50)	
	No	%	No	%
Age of mother				
Below 20	3	6	3	6
20-25	31	62	31	62
25-30	13	26	13	26
30-35	2	4	2	4
Above 35	1	2	1	2
Parity of mother				
Primipara	32	64	32	64
Second para	17	34	17	34
Third para	1	2	1	2
Completed gestational weeks at birth				
34	1	2	1	2
35	1	2	1	2
36	3	6	3	6
37	5	10	5	10
38	10	20	10	20
39	14	28	14	28
40	13	26	13	26
41	2	4	2	4
42	1	2	1	2

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=2.15), height <145 cms (OR=1.193), weight <40 kgs (OR=1.89), birth interval of <24 months (OR=1.82), WHPI d"100 (OR=1.82), Hb level <11 gram% (OR=1.64), BMI <18.5 kg/m^2 (OR=1.55) and presence of any morbid condition during current pregnancy (OR=1.41).

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

Risk factors	z^2 (p value)	OR (95% C.I.)	ARP
Unfavourable outcome of previous pregnancy	19.88 (p<0.05)	2.47(1.71-3.81)	0.68
Place of residence (rural)	25.36 (p<0.05)	2.15(1.59-2.57)	0.59
Height (< 145 cm)	6.15 (p<0.05)	1.93(1.14-3.32)	0.45
Weight (< 40kg)	11.19 (p<0.05)	1.89(1.32-2.92)	0.43
Birth interval < 24 Months	5.42(p<0.05)	1.82(1.15-2.93)	0.47
WHPI < 100	16.36 (p<0.05)	1.82 (1.32-2.35)	0.37
Hb < 11gm%	10.23 (p<0.05)	1.64 (1.23-2.17)	0.39

BMI < 18.5 kg/m2	6.27 (p<0.05)	1.55 (1.14-2.11)	0.32
Presence of any morbid condition during current Pregnancy	4.97 (p<0.05)	1.41 (1.16-1.93)	0.29

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=2.27), unfavourable outcome of previous pregnancy (AOR=1.96) and presence of any morbid condition during current pregnancy (AOR=1.63) were observed to be significant risk factors when adjusted for all other risk factors.

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

Maternal risk factors of birth weight	Adjusted OR	95% C.I.	p value
Place of residence (rural)	2.27	1.67-2.79	0.00
Unfavourble outcome of previous pregnancy	1.96	1.57-2.77	0.00
Presence of any morbid condition during current pregnancy	1.63	1.21-1.97	0.13

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

Risk Factor	z^2	**d.f.**	**p value**
Socio-economic factors			
Mothers education	7.77	4	0.68
Fathers education	3.93	4	0.87
Socioeconomic status (rural)	5.59	1	>0.05
Socioeconomic status (urban)	0.19	1	>0.05
Mothers occupation	1.13	3	0.7
Mothers sleep & rest duration (< 10hrs Vs >10hrs)	0.33	1	>0.05
Mothers age at marriage (<18yrs Vs > 18yrs)	1.57	1	>0.05
Mothers tobacco consumption	3.55	1	>0.05
ANC Care			
Time of registration (< 12 v/s > 12weeks)	0.09	1	>0.05
ANC Visits (< 3 v/s >3)	1.79	1	>0.05
Tetanus toxoid immunization (complete v/s incomplete)	0.70	1	>0.05
Days of Iron Folic Acid supplementation (<100 v/s > 100)	2.57	1	>0.05
Days of Calcium supplementation (<100 v/s > 100)	1.19	1	>0.05

Discussion

In this study 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=2.15), height <145 cms (OR=1.193), weight <40 kgs (OR=1.89), birth interval of <24 months (OR=1.82), WHPI d"100 (OR=1.82), Hb level <11 gram% (OR=1.64), BMI <18.5 kg/m² (OR=1.55) and presence of any morbid condition during current pregnancy (OR=1.41). Shows the distribution of various maternal risk factors which were found to be significantly associated with LBW by using Multiple Logistic Regression (MLR) Analysis. 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.

In this study, maternal age had no significant association with LBW which is consistent with studies conducted by Mavalankar et al.[7] in India and Fikree and Berenes.[8]in Pakistan. But, in contrast, Yadav et al.[9] and Joshi et al.[10] found more risk of delivering LBW babies by teenage mothers. 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)[11] 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)[12] 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 (z^2=15.56, df=4, p<0.005), in primipara as well as among grand multipara (z^2=8.44, df=2, p<0.02), in those with a interpregnancy interval of <1½ years or >5 years (z^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 (z^2=11.49, df=2, p<0.005). JS Deshmukh et al (1996) [13] 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) [14] 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)[15] found that teenage pregnancy ($r=0.97$; $p<0.001$), high parity ($z^2=49.53$; $p<0.001$), low SES ($r=0.77$; $p<0.05$),illiteracy, early marriage ($z^2=10.23$; $p<0.01$) 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

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.

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