

ASSESSMENT OF MATERNAL RISK FACTORS FOR LOW-BIRTH-WEIGHT NEONATES: A CASE CONTROL STUDY IN TEACHING HOSPITAL

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ABSTRACT

Purpose: A major factors contributing to infant deaths and morbidity is low birth weight (LBW). Low birth weight (LBW) is a significant marker for the population's general health condition and reproductive health. Maternal risk factors are controllable and vary from one region to another depending on geographic, socioeconomic, and cultural factors and are biologically, socially interrelated.

Subjects and Methods: The study was conducted in a tertiary care hospital in kalaburagi. A total of 85 cases and 85 controls with normal birth weight. Mothers of aged 18-35 years who delivered a live-born singleton baby without any congenital abnormalities and gestational age 37-42 weeks were enrolled on the same day as delivery are eligible. Mothers who had multiple pregnancies were not eligible. Data was collected from Pre-tested survey.

Results: The mean age of mothers in case and control group was 23.73 years and 5.04 years. Mean weight gain during pregnancy of mothers in case and control was 4.2 kg and 6.5 kg. Mean weight of the newborn of cases and controls was 2012 grams and 3065 grams respectively. Maternal education, tobacco exposure, maternal anaemia, lower socioeconomic status (class IV+V), maternal occupation (laborer), heavy physical activity, pre term birth of baby, history of UTI were identified as significant risk factors for LBW neonates. Significant association was found between age of mother, height of mother <145 cm, pre pregnancy weight <45 kg, mean weight gain (<6.5kg), prior infant death, inadequate ANC visits, and LBW.

Conclusions: Health education, socio-economic development, maternal nutrition, and increasing the use of health services during pregnancy, are all important for reducing LBW.

INTRODUCTION

Among the WHO slogans, Children's health is tomorrow's wealth or healthy children are our wealth of the country. When the mother gives birth, we will have a healthy child; the health of the child is closely related to the mother's health. Low birth weight (LBW) is one of the major problems in developing nations, including India. It is defined by WHO as LBW <2,500 g at birth, regardless of body weight gestation period (WHO, 2011). Low birth weight (LBW) is an important indicator of reproductive health and population health. LBW is regarded as

the single most important predictor of infant mortality, particularly deaths occurring within the first month of life (Ryan et al., 2000). It is still a major public health issue around the world, particularly in developing countries. In India, the prevalence of low birth weight was found to be 26%. According to the WHO, approximately 25 million low birth weight babies are born each year, with nearly 95% of them occurring in developing countries (Park, 2005). All LBW babies have an infant mortality rate that is almost 20 times higher than that of other babies (WHO, 2019).

Low birth weight is either a sign of premature delivery (before 37 weeks of gestation) or of restricted intrauterine growth (Unicef, 2004). Only 6.7% of LBW newborns are born prematurely in developing nations, including India, where the bulk of LBW infants are born small at term (> 37 weeks of gestation) (Muthayya, 2009). Low birth weight is linked to foetal and neonatal mortality, as well as morbidities such as growth retardation, cognitive development, and chronic diseases later on in life. Many factors influence the gestational duration and foetal growth and thus birth weight.

Those factors will have the infant, the mother, or the physical environment. Birth weight is heavily influenced by the mother's own fetal growth and nutrition from birth to pregnancy, as well as her overall health at conception. Mothers of low socioeconomic status frequently have LBW infants as a result of poor nutrition and health during pregnancy, a high prevalence of specific and non-specific infections, or pregnancy complications caused by poverty. Strenuous activity during pregnancy also contributes to poor foetal growth. As a result, LBW has a very complex etiology, and a case-control study was planned to determine the maternal risk factors of Low birth weight neonates (Unicef, 2004). The General Objective of the study is to assess the maternal risk factors for low birth weight neonates.

METHODOLOGY

The Present case control study was conducted in a Sangameshwar teaching & general hospital Kalaburagi, Karnataka, India. Mothers were questioned for the study between March 2021 and August 2021, and anthropometry and the data were gathered from medical records of medical record department. The World Health Organization's (WHO) criterion of LBW birth weight less than 2500g was applied (WHO, 1978). The cases were mothers with live singleton infant weighing less than 2,500 grams at term. The controls were Mothers who had given birth to a single new born weighing more than 2,499g to qualify as a control. A total of 85 cases (vaginal delivery or caesarean section) and 85 controls aged 18-35 years who delivered a live-born singleton baby without any congenital abnormalities and gestational age 37-42 weeks were enrolled on the same day as delivery are eligible. Mothers who had multiple pregnancies were not eligible. Within one hour of birth, all babies were weighed. Following verbal consent from the mother, the data was entered into a standardized questionnaire. The data was gathered through maternal health records and interviews with the mothers of these infants.

Study Variables

Mothers' age, height, pre-pregnancy weight, education, occupation, socioeconomic status, type of family, parity, duration between the new baby's birth and the previous delivery, antenatal care (ANC) received during the current pregnancy, iron and folic acid supplements taken, and strenuous exercise during pregnancy were study variables. Regarding the frequent use of tobacco of whichever form, history was questioned. Abortion history was divided into ever and never categories. The birth interval was treated as a continuous variable between the present and previous pregnancies.

According to the United Nations International Children's Emergency Fund (UNICEF) and World Health Organization (WHO) recommendations, women should have at least four

prenatal care (ANC) visits with a qualified healthcare provider; the total number of ANC visits for the current pregnancy was classified as ≥ 4 and < 4 visits respectively. A pregnant woman was considered to have been given adequate antenatal care if she was registered at all times, had at least four prenatal checks, had received an adequate dose of tetanus vaccination, and had taken at least 100 iron and folic acid supplements. The mother's reported beginning day of the most recent menstrual cycle served as the basis for calculating gestational age (Deshpande et al., 2011).

Pregnancy-related illnesses, such as eclampsia, preeclampsia, infections, and others, were also noted. These included pregnancy-induced hypertension (PIH), eclampsia and preeclampsia. We also looked over the accessible medical records. From the case sheets, the results of the studies, including the haemoglobin, blood group, VDRL, urine sugar, and albumin, were recorded. B.G. Prasad's suggested socioeconomic status was adopted and modified based on the all-India consumer price index (Malhotra et al., 1999).

Statistical Analysis

All the data were entered into the SPSS software for statistical analysis (version 17). Application of the chi-square test with a significance level of $P < 0.05$ was used to evaluate the relationship between the risk factors under consideration. The odds ratio and 95% confidence interval of the odds ratio (O.R.) were calculated to determine the strength of the risk factor.

RESULTS AND DISCUSSION

The study was conducted among 170 postnatal mothers and their new borns in a Sangameshwar teaching & general hospital Kalaburagi, Karnataka, India. Out of 170 new borns 85 new born with Low Birth Weight (below 2500grams) irrespective of gestational age (cases), and 85 new born with Normal Birth Weight (controls). The predominant maternal features of the study population are represented in Table 1. The mean age of mothers in case was 23.73 ± 3.364 and in control group 25.04 ± 3.76 . Majority of the cases and controls fall under 21-31 years age group. The mean weight again during pregnancy of mothers in case was 5.2 ± 1.2 and control was 6.5 ± 1.5 . The mean birth weight of the new born of cases and controls was 2120.97 ± 340.06 and 3065.35 ± 280.02 . Table 2 summarize the distribution of various socioeconomic and maternal risk factors among cases and controls. The proportion of Maternal occupation, pregnancy induced hypertension history infertility, ANC visits of mothers were significantly higher among the LBW new borns. ANC visits, Primigravida, Primiparity in the control group were significantly better than that of cases. Nuclear family, caesarean section were not associated to the risk factors in this study Maternal risk factors of LBW was strongly associated with Lower socio-economic status (Class IV+V), Maternal Occupation, Maternal Education, Maternal Anaemia, Strenuous activity, Preterm baby, History of UTI, General morbidity episodic illness, Tobacco consumption. Figure 3 shows the significant risk factors of LBW. Consumption of Iron, Folic acid and multi vitamin tablets were better among control group. Mothers who had history of abortion, history of infertility and prior infant death showed no poor outcome in their present pregnancy.

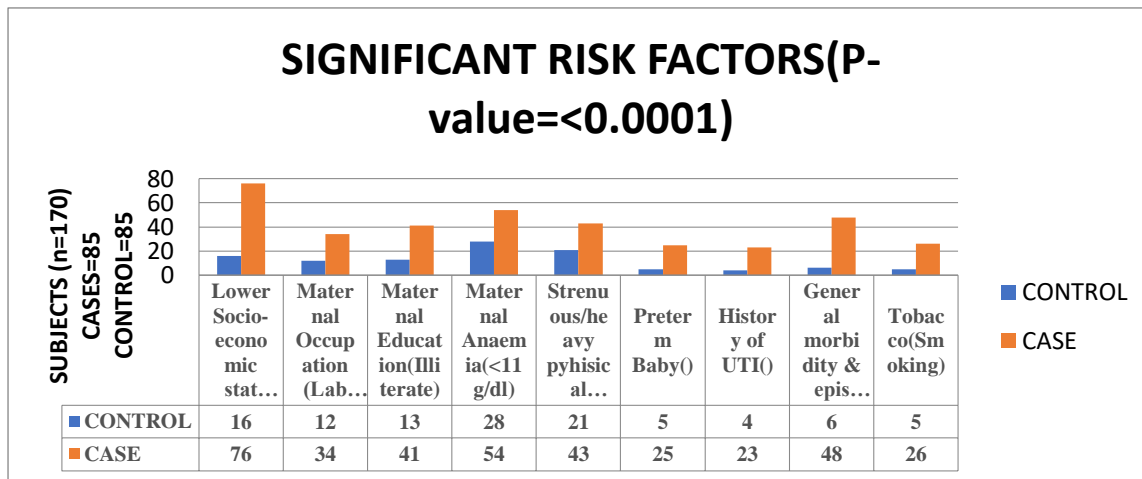
Table 1: Comparison of Basic Maternal Determinants of Low Birth Weight Neonates between Cases and Controls

Variable	Cases	Controls
Mean Age (Years)	23.73 ± 3.364	25.04 ± 3.76
Height (Cm)	147.06 ± 6.26	152.62 ± 5.31
Pre-Pregnancy Weight (Kg)	44.58 ± 7.91	52.35 ± 6.3
Mean Weight Gain in Pregnancy (Kg)	5.2 ± 1.2	6.5 ± 1.5
Birth Spacing (Months)	24.3 ± 5.1	26.2 ± 6.2

Table 2: Shows the Maternal Risk Factors of Low Birth Weight Neonates in Both Case and Control

Variable	Case (%) (N=85)	Control (%) (N=85)	Odds Ratio	P Value
Height Of Mother(<145CM)	42 (49.4)	24 (28.2)	0.819 (0.318-2.111)	0.005
Lower Socio-economic status (Class IV+V)	76 (89.4)	16 (18.8)	0.413 (0.091-1.866)	<0.0001
Maternal Occupation (Laborer)	34 (40)	12 (14.1)	2.385 (0.689-8.260)	<0.0001
Maternal Education (Illiterate)	41 (48.2)	13 (15.2)	1.304 (0.399-4.263)	<0.0001
Pre-pregnancy Weight(<45KG)	43 (50.2)	24 (28.2)	0.606 (0.233-1.575)	0.003
Mean Weight Gain(<6.5KG)	47 (55.2)	30 (35.2)	0.719 (0.294-1.757)	0.009
Maternal Anemia(<11g/dl)	54 (63.5)	28 (32.9)	1.327 (0.510-3.541)	<0.0001
Strenuous/heavy physical activity	43 (50.5)	21 (24.7)	1.848 (0.672-5.048)	<0.0001
Nuclear Family	45 (52.9)	47 (55.2)	0.574 (0.241-1.366)	0.758
Gravida (Primi)	31 (36.4)	31 (36.4)	0.365 (0.134-0.990)	1
Parity (Primi)	38 (44.7)	38 (44.7)	0.373 (0.153-0.911)	1
Birth Spacing (>2 Years)	30 (35.2)	37 (43.5)	0.646 (0.259-1.607)	0.272
Caesarian Section	57 (67.0)	50 (58.8)	1.379 (0.553-3.440)	0.266
PIH(Hypertension)	35 (41.1)	16 (18.8)	2.126 (0.707-6.396)	0.001
History of infertility	10 (11.7)	04 (4.7)	2.667 (0.250-28.438)	0.094
History of abortion	31 (36.4)	22 (25.8)	0.758 (0.270-2.127)	0.136
Preterm Baby	25 (29.4)	05 (5.8)	1.091 (1.011-1.177)	<0.0001
Prior infant death	18 (21.1)	06 (7.0)	0.729 (0.080-6.670)	0.008
ANC visits (>= 4 visits)	26 (30.3)	28 (32.9)	1.115 (0.420-2.955)	0.742
Iron, Folic acid intake	82 (96.4)	83 (97.6)	0.976 (0.943-1.010)	0.65
Multivitamin Tablets	77 (90.5)	84 (98.8)	0.987 (0.962-1.013)	0.016
History of UTI	23 (27.0)	04 (4.7)	0.894 (0.088-9.056)	<0.0001
General morbidity & episodic illness	48 (56.4)	06 (7.0)	0.756 (0.143-3.978)	<0.0001
Tobacco(consumption)	26 (30.5)	05 (5.88)	1.556 (0.244-9.913)	<0.0001
Tea, Coffee	17 (20)	17 (20)	1.607 (0.552-4.675)	0.001

Figure 1: Significant risk factors associated to LBW in this study



Discussion

The study was conducted among 170 postnatal mothers and their new borns in a Sangameshwar teaching & general hospital Kalaburagi, Karnataka, India. Various authors had found many different maternal risk factors to be associated with low birth weight (Nagargoje et al., 2011). In response to the question regarding the height of the mother, the percentage of the mothers whose height was less than 145 CMS was (49.4%) in cases as compared to control groups (28.2%). Our findings are similar to the studies carried out by (Malik et al., 1997) whose findings were having a significant association between birth weight and mothers' height. In our study, the percentage of mothers whose pre-pregnancy weight was less than 45kgs was more in cases (50.6 %) as compared to the control group (28.2%). Our findings are similar to studies carried out by (Mavalankar et al., 1992; Pahari et al., 1997) whose findings were having a significant association between birth weight and pre-pregnancy weight of the mother. For the question on Maternal Anaemic status, the percentage of mothers whose Hb count was less than 11g/dL was more in cases (63.5%) as compared to control groups (32.9%). Our findings are similar to studies carried out by (WHO, 1978) who also found out that anaemia is significantly associated with LBW. The percentage of Maternal Age whose age is less than 20 years was more in cases (9.4%) as compared to the control group (5.9%) but the overall difference was not statistically significant, which is consistent with the studies conducted by (Mavalankar et al., 1992) whose findings were also not having any significant association between birth weight and maternal age.

In our study, the percentage of mothers who were asked the question regarding the educational status, the percentage of illiterate was more in response to the question regarding Family income the percentage of mothers who belonged to the class iv & v of Socioeconomic status suggested by (Malhotra et al., 1999) was more in cases (89.4%) as compared to the control group (18.8%). Our findings are similar to the studies carried out by (Deshmukh et al., 1998) whose findings were also having a significant association between birth weight and low socioeconomic status. The percentage of mothers whose occupation was farm labour/labour was more in cases (40%) as compared to the control group (14.1%) which is similar to the studies carried out by (Deshmukh et al., 1998a; Deshmukh et al., 1998b), whose findings were also having a significant association between birth weight and maternal occupation. In response to the question regarding Heavy Physical activity during pregnancy, the percentage of the mother who said yes was more in cases (50.6%) as compared to the control group (24.7%). In our study, the response to the question of having a Nuclear Family the mothers who said NO was slightly more in cases (47.1%) as compared to the control group (44.7%). Our findings are consistent with previous studies where having Nuclear

Family has not been identified as a significant risk factor for LBW babies. In response to the question regarding Birth spacing, the percentage of mothers who responded to, spacing of fewer than 2 years between the two pregnancies was less in cases (35.3%) as compared to control groups (43.5%). Our findings are not consistent with the previous studies which have identified birth spacing of fewer than 2 years as a significant association between birth weight and birth spacing. In response to the question regarding caesarean section delivery the percentage of mothers who responded as yes was more in cases (67.1%) as compared to the control group (58.8%). In cases (48.2%) as compared to the control group (15.3%). Our findings are similar to the studies carried out by (Deshmukh et al., 1998a; Deshmukh et al., 1998b), whose findings were also having a significant association between birth weight and maternal age.

In response to the question regarding pregnancy-induced hypertension, the percentage of mothers who were having hypertension due to pregnancy was more in cases (41.2%) as compared to control groups (18.8%). In response to the question regarding abortion, the percentage of mothers who have had abortions were more in cases (36.5%) as compared to control groups (25.9%). Our findings are similar to the studies carried out by (Pahari & Ghosh, 1997). whose findings were also having a significant association between birth weight and abortion. In response to the question regarding pre-term babies, the percentage of mothers who have had a pre-term baby was more in cases (29.4%) as compared to control groups (5.9%). Our findings are similar to the studies carried out by (Deshmukh et al., 1998) whose findings were also having a significant association between birth weight and pre-term birth of the baby. In response to the question regarding prior infant death, the percentage of mothers who have had prior infant death was more in cases (21.2%) as compared to control groups (7.1%). In response to the question regarding the number of ANC visits, the percentage of mothers who have had less than 4 visits was more in cases (69.4%) as compared to control groups (67.1%). Our findings are similar to the studies carried out by (Krammer, 1987) whose findings were also having a significant association between birth weight and the number of ANC visits by mothers. In response to the question regarding the history of UTI, the percentage of mothers who said yes was more in cases (27.1%) as compared to control groups (4.7%). In response to the question regarding history of general morbidity and episodic illness, the percentage of mothers who said yes was more in cases (56.5%) as compared to control groups (7.1%).

CONCLUSION

Many risk factors for LBW can be identified before Pregnancy occurs, such as low socio-economic status, obstetric and medical and behavioural health related determinants of low birth weight is quite common or prevalent in Kalaburagi, Karnataka, India, as revealed by this study. Majority of which could be prevented or modified, especially Women's education which likely to reduce the young marriage and lead healthy and productive life style, and spacing between two children > 2 years. In this year (2020-21) due to covid-19 pandemic, many mothers did not get proper nutrition (food), antenatal care because of lockdown there was fear of going hospitals and some mothers were not affordable the hospital charges for monthly check-up. In rural area main risk factor associated with LBW is lower socio-economic status and illiteracy of the family. The government has done Anganwadis to educate the pregnant and lactating women and also provide ration to them to overcome the malnutrition and low birth weight. The government of India is doing many programs to reduce the low birth weight, such as Integrated child development scheme [ICDS] for pregnant and lactating mothers, Indira Gandhi matritva sahayog yojana [IGMSY]. National rural health mission [NRHM], Janani suraksha yojana [JSY]. New born care corner [NBCC]. New born stabilization unit [NBSU].

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare that are relevant to the content of this article.

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AVAILABILITY OF DATA AND MATERIAL

The authors confirm that the data supporting the findings of this study are available upon request.

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