Original Article

Maternal Factors for Low Birth Weight Babies

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Abstract

Background: Low birth weight is defined as the live births with less than 2.5 kg weight. It is a key determinant of infant survival, health and development. Low birth weight infants are at a greater risk of having a disability and for diseases such as cerebral palsy, visual problems, learning disabilities and respiratory problems. To reduce the low birth weight deliveries, we studied the maternal factors which adversely affect the fetus in utero and their impact on fetus.

Methods: A retrospective study was carried out on 40 low birth weight pregnancies out of 650 deliveries from July 2005 to Jun 2006. Maternal factors like age, parity, pre pregnancy body mass index, hemoglobin levels, bad obstetric history (history of stillbirth/ neonatal death in previous pregnancies, three or more spontaneous consecutive abortions), pre eclampsia, fetal distress, mode of deliveries were studied. These results were compared with a random sample of 300 pregnant ladies taken from rest of the deliveries. Cases of multiple pregnancies and stillbirths were excluded.

Result: We found that prepregnancy maternal body mass index ($p<0.01$ for BMI <20), unbooked status ($p<0.01$), pre eclampsia ($p<0.01$) and bad obstetric history ($p<0.01$) were the maternal factors which resulted in low birth weight babies in most of the cases. However in 10 (25%) cases, no contributory maternal factor was found.

Conclusion: Prepregnancy maternal body mass index, unbooked status, pre eclampsia and bad obstetric history are significant maternal factors resulting in low birth weight babies.

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Key Words : Prepregnancy maternal body mass index; Unbooked status; Pre eclampsia; Bad obstetric history

Introduction

Low birth weight (LBW) is the dominating risk factor for infant morbidity and mortality, (36% of all mortality in children <5 years of age), constituting about 4 million deaths per year. Some term and preterm small babies are healthy, with weight and length according to their genetic potential, while others are smaller due to factors impeding growth during fetal life. This phenomenon is called intrauterine growth restriction (IUGR) and is the second leading cause of perinatal morbidity and mortality, after prematurity.

Low birth weight lower than that expected from the genetic potential might be caused by fetal, maternal or placental factors or a combination of risk factors, resulting in an impaired placental transport of nutrients or reduced growth potential of the fetus. Constitutional, gender and hereditary factors explain up to 40% of the variability of birth weight. Maternal age (<20 or >35 yrs), ethnicity, marital status, birth interval, educational level and socio-economic conditions are other explanatory factors. Common fetal factors are genetic and/or chromosomal aberrations. Medical risk factors for LBW before pregnancy are chronic conditions like hypertension, renal insufficiency, cardio-respiratory, autoimmune, endocrine or infectious disorders. The risk factors for LBW during pregnancy are hypertensive disorders, diabetes, malnutrition, bleeding, anemia, infection, placental or fetal anomalies and multiple pregnancies. The morbidities of term and moderately preterm (>32 weeks) LBW are mainly related to utero-placental insufficiency and poor energy substrate transfer, resulting in neonatal complications like birth asphyxia, hypothermia, meconium aspiration, polycythaemia, hypoglycemia, hypocalcaemia and thrombocythaemia.

LBW infants are forty times more likely to die within their first four weeks of life than normal birth weight infants. LBW infants are also three times more likely than normal birth weight infants to have neurodevelopmental complications and congenital abnormalities [1].The neonatal course in LBW infants born preterm (<32 weeks) is dominated by complications caused by anatomic and physiological immaturity e.g. birth asphyxia, hypothermia, respiratory distress due to delayed alveolar clearance of water and surfactant deficiency, delayed postnatal circulatory adaptation with pulmonary hypertension, systemic hypotension and delayed closure of fetal shunts. Immaturity and reduced substrate stores explain high prevalence of hypo/ hyperglycemia, jaundice and coagulopathy. Immature

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intestinal function makes enteral feeding problematic and nutrition insufficient. Immature vascular development in the central nervous system and in the retina predisposes for serious intraventricular bleeding and retinopathy. Immature skin and mucosa barrier and immaturity of cellular and humeral immune function, predisposes for early neonatal sepsis and increased prevalence of nosocomial infections. LBW infants are at risk of developing complications that impose risks for permanent sequelae. The risk increases both by lower gestational age and weight. Preterm small for gestational age (SGA) are more susceptible than preterm infants with adequate intrauterine growth.

Material and Methods

A retrospective study of all newborns weighing less than 2.5 kg born between July 2005 to Jun 2006 was carried out in 650 deliveries which occurred during this period. Multiple pregnancies and stillbirths were excluded. Maternal factors like age, parity, pre-pregnancy body mass index (BMI), hemoglobin levels, bad obstetric history (history of stillbirth/ neonatal death in previous pregnancies, three or more spontaneous consecutive abortions), pre eclampsia, fetal distress, mode of deliveries were studied. These results were compared with a random sample of 300 pregnant ladies. Statistical analysis was done using Fisher Exact test.

Results

During the study period, 40 (6.16%) pregnancies resulted in LBW neonates out of total 650 singleton pregnancies. There were no significant difference in the maternal age, race or parity between the LBW and control groups. The mean age of the mothers in both groups was 24.68 years and 25.15 years respectively. Table 1 shows comparison between LBW group and control for varying levels of prepregnant BMI. As the BMI increase from < 20 to >25, there is a fall in risk levels for LBW neonates. Fisher exact test was applied and difference in incidence of LBW neonates for BMI <20 & >25 was statistically highly significant (p< 0.01).

Table 2 shows fetal outcome in LBW group and control group. There was higher association of preterm delivery (15% vs 6.33%), malpresentation (5% vs 2.33%), caesarean section (27.5 % vs 22.67 %), tuberculosis (2.5% vs 0.67%), anemia (20% vs 18%) in LBW group, but none of them were statistically significant. However unbooked status (12.5% vs 2%, p<0.01), bad obstetric history (17.5% vs 4%, p< 0.01), and pre eclampsia (32.5% vs 5.33%, p<0.01) were highly significant in this study.

Discussion

The frequency of LBW found in this study was 6.16%, the reported incidence of which varies from 6-18% [1-3]. Maternal nutritional status both before and during pregnancy is a well-recognized determinant of birth outcomes [4]. BMI is a simple, useful index for evaluating prepregnancy nutritional status. Although prepregnancy BMI has a genetic as well as nutritional component, a low prepregnancy BMI is considered a marker for minimal tissue nutrient reserves [5]. Women with low prepregnancy weight for height or BMI are at increased risk for a number of adverse pregnancy

Table 1

Comparison between low birth weight (LBW) and control group in prepregnancy body mass index (BMI)

Pre pregnancy BMI Weight (kg)/Height (m)^2	LBW group n=40	Control group n=300	p value (Fisher exact test)	Odds ratio (95%CI)	Odds ratio (baseline strata BMI >25 as one)
<20	14 (35%)	50 (16.67%)	0.009**	2.692 (1.328-5.470)	32.829
20-25	24 (60%)	133 (44.33%)	0.066	1.883 (0.970-3.656)	22.963
>25	2 (5%)	117 (39.00%)	0.000**	0.082 (0.022-0.315)	1.000

**significant, # confidence interval

Table 2

Comparison between low birth weight (LBW) and control group in pregnancy complications

	LBW group n=40	Control group n=300	p value (Fisher exact test)	Odds ratio (95% CI)
Unbooked*	5 (12.5%)	6 (2%)	0.005**	7.000 (2.152-22.84)
Bad obstetric history##	7 (17.5%)	12 (4%)	0.003**	5.091 (1.931-13.488)
Anemia (Hb <11gm%)	5 (12.5%)	54 (18%)	0.507	0.651 (0.252-1.687)
Pre eclampsia	13 (32.5%)	16 (5.33%)	0.000**	8.546 (3.771-19.418)
Preterm delivery	6 (15%)	19 (6.33%)	0.097	2.610 (1.006-6.813)
Tuberculosis on treatment	1 (2.5%)	2 (0.67%)	0.314	3.821 (0.491-30.015)
PROM***	3 (7.5%)	31 (10.33%)	0.781	0.704 (0.219-2.280)
Malpresentation	2 (5%)	7 (2.33%)	0.286	2.203 (0.504-9.756)
Fetal distress###	2 (5%)	26 (8.67%)	0.554	0.555 (0.141-2.202)
LSCS	11 (27.5%)	68 (22.67%)	0.550	1.294 (0.623-2.696)

* less than three antenatal visits,** significant, *** premature rupture of membranes, # confidence interval, ## history of recurrent abortions, stillbirth, neonatal death in last pregnancy, ### as manifested by fetal bradycardia, variable or late decelerations

outcomes, including preterm birth and IUGR [6]. In this study, high percentage of LBW (35 %) newborns were born to women with BMI <20 as compared to 16.67% of normal birth weight newborns in control group. The mechanisms of association between prepregnancy BMI and IUGR and preterm delivery are not clear, but probably the relationship between a low prepregnancy BMI and adverse pregnancy outcomes is mediated by protein energy availability. One explanation for the lower mean neonate birth weight in women with low prepregnancy weight may be that the fetus was prevented from receiving an adequate supply of nutrients from the mother because of changes in maternal hemodynamic status [7]. These studies suggested that in malnourished underweight women, lower volume expansion related to decreased micronutrient status might be associated with reduced fetal growth.

Unbooked status of mother is a significant independent risk factor for LBW babies [8,9]. In this study, 12.5 % of LBW neonates were born to unbooked mothers as compared to 2% in control. Unbooked status contributes to maternal undernourishment and inadequate care during pregnancy, thus compromising both baby and the mother. In this study, bad obstetric history was a significant contributory factor towards LBW babies (17.5% vs 4%, p<0.01). Mothers with bad obstetric history were 4 times likely to deliver a LBW baby [9]. Perhaps genetic factors and socioeconomic factors were the reasons for this phenomenon leading to repeat adverse obstetric outcome.

In this study, anemia was not a significant factor (18% vs 20%, p>0.05) but contribution of anemia leading to LBW babies is controversial [7,9]. However, substantial iron deficiency anemia (usually <80g/L) is associated with an increased incidence of LBW. The mechanism by which anemia could produce this effect is unknown, but other nutrient deficiencies are important contributing factors [10]. One study even reported harmful effects of iron supplementation [11]. In this study women with pre eclampsia were six times more likely to have LBW babies as compared to control (p<0.01). Pre eclampsia by reducing plasma volume reduces the supply of nutrient to the fetus thus affecting fetal growth [12,13].

Higher incidence of preterm delivery was seen in LBW babies (15% vs 6.33%, p>0.05), which was not statistically significant. In literature, two-thirds of infants born weighing less than 2,500 grams are preterm [14]. Low incidence of preterm in this study may be due to exclusion of multiple births. The incidence of tuberculosis, malpresentation, fetal distress and cesarean section rates were higher in LBW group, but statistically insignificant.

We conclude that prepregnancy maternal BMI, unbooked pregnancy, pre eclampsia and bad obstetric history are significant factors resulting in LBW babies.

Conflicts of Interest

None identified

Intellectual Contribution of Authors

Study Concept : Lt Col G Singh
Drafting & Manuscript Revision : Lt Col G Singh
Statistical Analysis : Lt Col G Singh
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