Original Research Article

Maternal Risk Factors affecting Low Birth Weight babies: A case control study from tertiary care teaching hospital in rural Southern India

Joseph Johnson[1], Binu Abraham[*2], Baburaj Stephenson[3] and Jehangir HM[4]

[1]*Assistant Professor, Department of Pediatrics, Dr SMCSI Medical College, Trivandrum, Kerala, India*
[2]*Associate Professor, Department of Pediatrics, Government Medical College Kollam, Kerala, India*
[3]*Professor of Pediatrics, Dr SMCSI Medical College, Trivandrum, Kerala, India*
[4]*Professor of Pediatrics, Aarupadai Veedu Medical College, Puducherry, India*

*Correspondence Info:
Dr. Binu Abraham
Associate Professor,
Department of Pediatrics,
Government Medical College Kollam, Kerala, India
E-mail: abramb@gmail.com

Abstract

Background: Low birth weight which is below 2.5 kg is a major factor affecting the 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.
Aim and objectives: 1) To study the maternal risk factors affecting the low birth weight babies. 2) To compare the incidence of low birth weight babies in a rural medical college population.
Methodology: A prospective case control study was carried out on low birth weight pregnancies deliveries during a one year period in a tertiary care hospital. Maternal factors like age, parity, pre pregnancy weight, height, bad obstetric history, sex of the child, birth interval, literacy, income, maternal diseases, and family structure were compared with same number of controls. Cases of multiple pregnancies and stillbirths were excluded.
Result: Frequency of low birth weight babies had significant association with mother's weight and age, primi, birth interval, bad obstetric history, percapita income and illiteracy. Factors which failed to show a significant relation with low birth weight were mother's height, sex of child, number of antenatal visits, family structure and maternal diseases complicating pregnancy.
Conclusion: To reduce the incidence of low birth weight babies action is called for not only in obstetrical field but also in the wider sphere of maternal welfare.
Keywords: neonate, primi, rural, maternal, literacy.

1. Introduction

The incidence of low birth weight in a given population reflects its socio-economic development and it can also be used as a good indicator of mother's nutritional status. The measure to reduce the incidence of low birth weight becomes most fruitful during the first year of life as it is most important factor affecting the infant mortality and morbidity. [1]

Weight of the newborn is a universal undisputed predictor of healthy infancy and childhood. The risks of perinatal and infant mortality rates are greater among the low birth weight infants. In addition to increasing risk of mortality, low birth weight is also found to be associated with morbidity and long term developmental problems among those babies who survive.

The World Health Organization has defined low birth weight as babies weighing less than 2500 gm's at birth, irrespective of their gestational age[1].In developed countries the incidence of low birth weight is less than 10% whereas in developing countries it is in the range of 15-40% of the total birth. In India about 30% of babies born are of low birth weight. Out of this 30%, 10% is due to preterm deliveries and the remaining is due to Intrauterine Growth Retardation.[2] WHO in 1995 estimated that 142 million babies were born in the world, out of which 25 million are low birth weight and 19 million of these babies were born in the developing countries.[3] 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]

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 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.

2. Materials and Methods

The present study was a prospective case control study conducted in a tertiary care teaching hospital in the rural area of southern Tamil Nadu where poverty, illiteracy, poor sanitation and low socio economic conditions were the major problems. The study period was from June 2013 to May 2014..For definition of LBW (low birth weight), World Health Organisation criteria was used that is birth weight less than 2500gramsOnly mothers of live born singleton babies with birth weight less than 2500 gms (low birth weight) irrespective of gestational age were included in the study which constituted the cases. The exclusion criteria included still birth, multiple births, newborn with congenital anomalies and syndromes. An equal number of newborns of weight more than or equal to 2500 gm and their mothers with age 18 to 35 years were selected by simple randomized technique on the very same day of the selection of study group, irrespective of gestational age constituted the controls. A total of 302 controls and 302 cases were enrolled in the study who fulfilled the inclusion and exclusion criteria.

The maternal study variables were Age, Parity ,Birth interval, Height of the mother, Weight of the mother, Mid arm circumference, Literacy of the mother ,Per capita income per month, Family structure(nuclear/joint),Mother's occupation, Antenatal care(no visits/< 5 visits/>5 visits),Maternal disease during the antenatal period (anemia, pregnancy induced hypertension, antepartum haemorrhage, Heart disease complicating pregnancy, diabetics mellitus, oligohydramnios, UTI and chronic renal disease, viral hepatitis, structural anomalies of uterus and cervix, Hydramnios, Malaria and Bronchial Asthma.) and Bad Obstetric History (Previous miscarriage, Previous Intra uterine deaths, Still births, Previous low birth weight babies and preterm births, Previous neonatal deaths).

Newborn study variables were weight of newborn, gestational age of newborn and sex of the baby. In this study, the gestational age of newborn was confirmed by using modified. Dubowitz (Ballard) examination for newborns. After knowing the gestational age of the newborn, they are classified into three groups namely Preterm Average for Gestational Age (preterm AGA), Term, Small for Gestational Age (term SGA) and Preterm Small for Gestational Age (preterm SGA)

By using the graph relating the gestational age and its appropriate weight the baby is considered small for gestation, if its weight lies below the 10th percentile line in the graph.

2.1 Statistical analysis

For analysing the data collected, the software SPSS 20.0 was used. Mean, standard deviation and Student t test were used continuous variables. Chi Square test was used for nominal variables. A p value below or equal to0.05 was regarded to be statistically significant with the confidence interval set at 95%.

3. Results

A total number of 314 newborns with birth weight less than 2500 grams were born in the hospital out of 1580 live births. Among them 302 mothers whose babies weighing less than 2,500gms were selected for cases. Another set of 302 mothers whose babies weighing more than 2500 gms were selected for controls. The baseline variables of both groups are given in table 1

Table1: Baseline characteristics of mothers between cases and controls

Variable	Cases	Controls
Mean age (years)	22.5±2.32	22.12±2.93
Height (cm)	153.11±5.32	153.97±4.89
Birth spacing (months)	21.34±4.8	32.34±5.5
Mean weight of newborn	1812±345.08	2756±301.34

During the study period, the overall prevalence of low birth weight was found to be 19.87%. The most common cause of low birth weight was preterm delivery which was around 83.77%. In that 74.17% is constituted

by preterm, average for gestational age (preterm AGA) and 9.61% by preterm, small for gestational age (preterm SGA). The remaining 16.22% was constituted by term, small for gestational age (term SGA).

Figure 1: Etiological factors for low birth weight according to gestational maturity
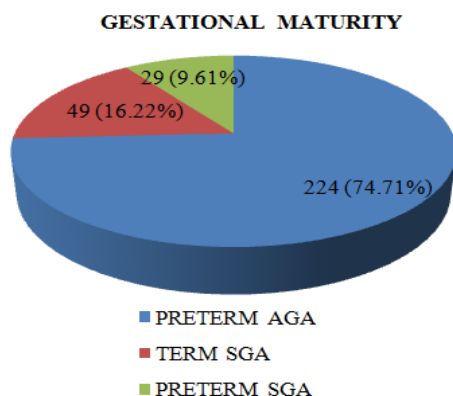

Table 2 shows the comparison of bio social and etiological risk factors between the mothers of low birth weight (cases) and normal birth weight babies (controls),

In this study the mother's age has been strongly related to the incidence of low birth weight. The, incidence of low birth weight is more in mother's age of < 20 years. The incidence of low birth weight is found to be high in mothers with birth interval of less than 2 years. The incidence of low birth weight was very high in mothers who had any one of the bad obstetric history in the previous pregnancies. Another most important factor was mother's weight which was significantly related to birth weight of infants. Mother who weighed less than 45 kg are more prone to give birth to lighter babies. Per capita income was also significantly related to low birth weight. The incidence of low birth weight increases when the percapita income is less than 500 per month. The incidence of low birth weight was very high in primigravida than multi gravida. Another notable finding was that the proportions of low birth weight babies were high in mothers who were illiterate.

The major factors which did not show any significant relation with low birth weight infants were maternal height, family structure, number of antenatal visits and sex of the baby.

4. Discussion

The incidence of low birth weight was considerably decreasing in world over the past years due to increased standard of living of the people, and increased fund allocation for health care by the government. But in India the values are unchanged It may be due to various factions like sociodemographic factors, maternal obstetric factors, anthropometric factors, fetal factors, genetic factors and idiopathic. In a country like India where there is economic constraints the present study was done to find the relationship between socio demographic factors, obstetric &anthropometric factors with low birth weight so that appropriate measures can be taken to reduce the incidence.

The various factors which had significant impact for low birth weight babies in current case control study were birth interval below 2 years, mother's weight, percapita income, mother's age, primi mother and illiteracy. However maternal height, family structure, number of antenatal visits and sex of baby had no significant association with low birth weight incidence.

In this study the risk of low birth weight was significantly higher in young mothers (<20 years) which was supported by other studies done by Roth *et al*. [4] Another study done by Dickute *et al*[5] reported that young mothers less than 20 yrs and older (35 years and above) were related to low birth weight. This relation was not supported by another study done by Yoder *et al*.[6] Sambath Kumar *et al* also had also done a study to find the association between maternal age & low birth weight.[7] When compared with the control group the incidence of low birth weight increased as the mother's age decreased.

There is a significant association of primiparity& low birth weight in this study. This was supported by various other studies like Sampath Kumar *et al*[7], Mallik *et al*[8] and Nayer *et al*.[9] Another study done by Dhar *et al* had found that multigravida mother's had more low birth weight babies than primigravida which was against this study.[10]

In this study there was a cent percent association between the birth interval &low birth weight. The incidence of low birth weight was high when birth interval was lessthan 2 years when compared to birth interval more than 2 years. This may be due to aminimum period of 2-3 yrs for the mother's nutrition and general condition to attain the prepregnancy level. This was supported by Dhar *et al*.[10] This association was also supported by studies done by Deshmukh *et al*[11] and Singh *et al*[12].

Mother's height had no relation to the birth weight of the child in this study. This is supported by previous studies done by Chhabra *et al*.[13] The results of previous studies from Malik *et al* [14] and Deshmukh *et al* [11] were against this study. In this study mother's weight also showed a significant association with low birth weight. This incidence of low birth weight is higher in women weighing less than 40kg when compared to women weighing more than 40 kg. This was supported by studies done by Amin *et al* [7] and Chhabra *et al*[13].

Mother's literacy had a strong relation with low birth weight in this study. The incidence of low birth

weight was more in mothers who were illiterate than in literate mothers. This was supported by previous studies by Dickute *et al*[5] and by Mondal *et al*.[15] To implies significance of the literary with low birth weight further studies are required which involves the father's education, which was not considered in this study dueto reduced feasibility.

There was a strong relation between per capita income and low birth weight. The incidence of low birth weight was more when the percapita income was less than500 per month. This is because nutrition of the mother mainly depends on the percapitain come and education. This was supported by Dhar *et al* [10] and Deshmukh *et al*.[11] But this was not in favour of the studies done by Amin *et al*.[7] In this study Family Structure had relation to low birth weight. Further studies are required to confirm this association including factors like food taboos, family atmosphere, environmental factors, customs and family cultures etc.,

In this study there was no relation between maternal occupation and very low birth weight infants. This was supported by a previous study done by Chia *et al* where mothers occupation had no role in the causation of low birth weight.[16] Instead fathers occupation had a significant relationship with low birth weight. Further studies with large study group is needed to confirm this data, since in this study mother's; in heavy work category were less in number. This was not supported by previous studies like Dickute *et al*[5] and by Dhar *et al*.[10]

In this study there was no relation between number of Antenatal visits and incidence of low birth weight. This was may be due to non-consideration of the quality of Antenatal care. This was not supported by previous study done by Nair *et al*.[17]

In this study there was no relation between the incidence of low birth weight and any of the maternal diseases. This may be due to associated fetal or genetic factors operating both in case and control group. This was not supported by a study done by Arif *et al* in which there was a strong association existed between Pregnancy Induced Hypertension and Ante Partum Hemorrhage with low birth weight babies.[18] Another study conducted by Deshmukh *et al* had found a strong association between Anemia and low birth weight.[9] Yet another study done by Lin *et al* had found a relation between placenta and uterine problems and Pregnancy Induced Hypertension with low birth weight.[19] Even though the percentage of low birth weight babies was more in mothers with uterine and cervical anomalies, when compared to control group, the significance ratio cannot be attributed because of reduced number of women in both groups. In this study there was a cent percent relation between Bad Obstetric History in previous pregnancies with low birth weight.

The incidence of low birth weight was more in mother's who had any one of the Bad Obstetric History mentioned than that for the control group. This was supported by previous studies done by Maruoka *et al*[20] and Arif *et al*.[18]

There was no relation between the sex of the child and low birth weight in this study. But in the study done by Mondal *et al* had found a relation between sex of the child and low birth weight.[15]

5. Conclusion

Birth weight of an infant is determined by a multitude of biological and socioeconomic factors. Some of them are determined even before conception. A well-nourished multiparous mother between 20 to 30 years with birth interval of more than 2years with good literacy and without any bad obstetric history has the best chance of producing a good weight baby. To achieve the above goal, concentration should be diverted on female literacy, girl child and adolescent nutrition, health education, genetic counselling, improving the standard of living, easy availability of health care and early detection and prompt treatment of obstetrical factors. Thus to reduce the incidence of low birth weight babies action is called for not only in obstetrical field but also in the wider sphere of maternal welfare. And for the law makers, the solution of social problem should become the priority of state health policy.

Acknowledgements

References

[1] Gagan A, Sartaj A, Kapil G, Vijaykumar. , Northern India. Maternal risk factors associated with low birth weight neonates in tertiary care hospital, Northern India. *J Community Med Health Educ,* 2012; 2: 711-715.

[2] Deshpande J, Phalke D, Bangal V, Peeyusha D. Maternal risk factors for low birth weight neonates: A hospital based case control study in rural area of, western Maharashtra, India. *National Journal of Community Medicine*, 2011;2(3):394-98.

[3] Nadiaye O, Diallo D, B MG Diagne I, Moreau JC, Diadhiou F, Kuakuvi N. Maternal risk factors and low birth weight in Senegalese teenagers: the example of a hospital centre in Dakar. *Sante,* 2001; 11(4): 241-4.

[4] Roth J, Hendrickson J, Schilling M, Stowell DW. The risk of teen mothers having low birth weight babies: implications of recent medical research for school health personnel. *J Sch Health*, 1998; 68(7): 271-5.

[5] Dickute J. Padaiga Z, Grabauskas V, Gaizauskiene A, Basys V, Obelenis V. Maternal social factors, health behavior and work conditions during pregnancy increase the risk of low birth weight in Lithuania. *Medicina (Kaynas)*; 2002; 38 (3): 321-32

[6] Yoder BA, Young MK. Neonatal Outcomes of teenage pregnancy in a military population. *Obstet Gynecol,* 1997; 90(4): 500-6

[7] Amin N, Abel R, Sampathkumar V. Maternal risk factors associated with low birth weight. *Indian J Pediatr,* 1993; 60 (2): 269 -74.

[8] Malik S, Ghidiyal RG, Udani R, Waingankar P. Maternal biosocial factors affecting low birth weight. *Indian J Pediatr*, 1997; 64(3): 373-7.

[9] Nair NS, Rao RS, Chandrashekar S, Acharya D. Socio-demographic and maternal determinants of low birth weight: a multivariate approach. *Indian J Pediatr*, 2000; 67(1):9-14.

[10] Dhar GM, Shah GN, Bhat TA, Butt N. Low birth weight: an outcome of poor socioobstetric interaction: *Indian J Matern Child Health*, 1991; 2(1): 10-3.

[11] Deshmukh JS, Motghare DD, zodpey SP, Washva SK.: Low Birth weight and associated maternal factors in an urban area. *Indian Pediatr*, 1998; 35 (1): 33-6.

[12] Lt Col G Singh, Capt R Chouhan, Maj K Sidhu.A study of Maternal Factors for Low Birth Weight Babies in a Military Hospital. *MJAFI* 2013; 65: 10-12.

[13] Chhabra P, Sharma AK, Grover VL. Prevalence of low birth weight and its deteminants in an urban resettlement area of Delhi. *Asia Pac J Public Health*, 2004; 16(2): 95-8.

[14] Malik S, Ghidiyal RG, Udani R, Waingankar P. Maternal biosocial factors affecting low birth weight. *Indian J Pediatr*, 1997; 64(3) : 373-7

[15] Mondal.B. Risk factors for low birth weight in Nepali infants. *Indian J Pediatr*, 2000; 67(7):477-82.

[16] Chia SE, Lee J, Chia KS. Low birth weight in relation to parental occupations a population -based registry in Singapore (1994 -1998). *Neurotoxicol Teratol*, 2004:26(2): 285-90.

[17] Nair NS, Nayar V, Thankam, M. A study of birth weight of term infants at Calicut. *Journal of Obstetrics and Gynaecology of India*, 1963; 13:488-94.

[18] Arif MA, Qurreshi AH, Jafarey SN, Alam SE, Arif K. Maternal sociocultural status: a novel assessment of risk for the birth of small for gestational age, low birth weight infants: *J Obstet Gynaecol Research,* 2012;24(3):215-22.

[19] Lin RX. Maternal, medical and obstetric complications are major risk factors for low birth weight infant. *Zhonghua Fu Chan KeZaZhi*, 1993 ; 28 (1):24-6

[20] Maruoka K, Yagi M, Akazawa K, Kinukawa N, Ueda K, Nose Y. Risk factors for low birth weight in Japanese infants. *Actapaediatr,* 1998; 87 (3):304-9.