Original Article

MATERNAL RISK FACTORS AFFECTING BIRTH WEIGHT OF NEWBORN

Yasmeen Memon, Salma Sheikh and Aslam Memon

ABSTRACT

OBJECTIVE: To determine the association of maternal biosocial, medical and obstetric risk factors with low birth weight (LBW).
DESIGN: A case control study.
SETTING: Department of neonatology and paediatrics, Liaquat University Hospital, Hyderabad - Sindh from 1st September to 31st December 2001.
METHODS: One hundred live born LBW babies were selected against 65 normal birth weight babies as control for this study. Information regarding maternal biosocial, medical and obstetric problems during pregnancy was recorded on a specified proforma and data analysis was done through SPSS 10.0 version and results were interpreted in terms of P-values.
RESULTS: The mean birth weight of LBW babies was 1.96 kg as compared to 3.2 kg in control group. Sixty-nine percent of cases were preterm with male predominance. Main factors identified were poverty, maternal malnutrition, short birth interval, teenage mother, lack of antenatal care, anemia, toxemia, antepartum hemorrhage, renal disease and malaria.
CONCLUSION: Maternal biosocial, medical and obstetric factors have strong association with LBW. To overcome this problem, health education of mothers and strengthening of the health care facilities for mother and children in the community are required.

KEY WORDS: Low birth weight. Risk factor. Mother. Baby. Prevention.

INTRODUCTION

Birth weight is a reliable index of intrauterine growth and is one of the major factors that determine child survival and his physical and mental development.[1] It is an indicator of health and nutritional status of mothers as well as predictor of infant health and development. The size of baby at birth has an important bearing on survival so, birth weight is commonly used as the yardstick of the maturity.[2] Low birth weight (LBW) is the most important challenge confronting those responsible for new born care specially in a developing country like Pakistan because the greater proportion of mortality and morbidity falls in this group. Death of very LBW babies accounts for about 50% of neonates and 50% of handicapped infants.[3] In addition to its impact on infant mortality, LBW has been associated with higher possibilities of infection, malnutrition and handicapping condition during childhood including cerebral palsy, mental retardation and problems related to learning and behavior during childhood.[4,5] There is evidence that LBW or its determinant factors are associated with a predisposition to higher rate of diabetes mellitus, cardiac disease and other future chronic health problems.[6,7] The worldwide incidence of LBW is 17% per year making it an important health problem in many populations.[8] The incidence of LBW varies among countries ranging from 4% to 6% in western countries like Sweden, France, United States and Canada and much higher in developing countries[9], which is a strong indicator that the etiology is different in different regions. In developing countries, the majority of LBW cases is caused by intrauterine growth retardation (IUGR) as opposed to prematurity.[10] In Pakistan, LBW constitutes about half of the perinatal deaths[11] and high incidence of LBW is constantly reported to be 25%.[12] This high incidence may be due to variety of factors such as maternal malnutrition, multiple gestations, short birth interval, premature delivery, the common complications of pregnancy such as pre eclamptic toxemia, antepartum hemorrhage (APH), urinary tract infection (UTI) together with external influences such as lack of educational and medical facilities as well as antenatal supervision.

Hence, the aim of present study was to determine the association of various maternal biosocial, medical and obstetric factors with LBW in our set up.

SUBJECTS AND METHODS

This case control study was carried out during

September to December 2001 in the department of neonatology, Liaquat University Hospital (LUH), Hyderabad that is a referral center for sick neonates requiring tertiary care. One hundred and sixty-five live born babies with gestational age of > 28 weeks were enrolled for the study. Newborn babies with malformation and multiple births were excluded from the study. The babies were categorized into two groups; cases and controls. The group one (cases) included 100 LBW babies weighing 2.5 kg or less while group two (control) included 65 normal birth weight (NBW) babies weighing >2.5kg. All the relevant information was collected from mother, attendant and hospital record and noted on a specified proforma. This included the details of maternal education, birth spacing, maternal anthropometry, socioeconomic and nutritional status, obstetrical history, medical problems complicating pregnancy and the obstetric complications. Pediatrician conducting the study examined each LBW baby. Weight of the babies was measured without clothes. Gestational age was assessed by Dubowitz Scoring System, which is based on neurological and external criteria and is accurate to +/- 2 weeks.[13] For the maternal education; five categories were identified; i) illiterate ii) primary iii) middle iv) matric v) intermediate and having professional education. Social class was categorized on the basis of father's occupation and monthly income of the family. Nutrition of mother was assessed by calculating the body mass index as weight kg/height^2 and age was grouped as <19,19-28 and > 28 years[14]. Antenatal care was assessed by number of visits to maternity clinic before delivery. Inter pregnancy interval referred to the number of months between conception for index pregnancy and the preceding abortion, stillbirth and delivery. Medical problems complicating the pregnancy like anemia (Hb<11gm%), hypertension, diabetes mellitus, renal, cardiac or pulmonary diseases, APH, toxemia, high fever (malaria) were considered as additional risk factors for LBW. Data analysis was done using SPSS 10.0 version and results were compared by keeping the P-value of < 0.01 as significant.

RESULTS

This study included 100 LBW cases and 65 normal birth weight controls admitted in neonatal unit of Liaquat University Hospital. These babies were either delivered in obstetric unit of LUH or referred to our unit within 24 hours. During study period,1269 babies were delivered in obstetric unit. Out of these, 273 (21.5%) were admitted in neonatal unit and among these, 117(42.8%) were LBW. **Table I** shows the basic characteristics of cases and controls. LBW was more common in males than females. Sixty-nine percent of babies in LBW group were preterm, born before 37 weeks of gestation. Out of these, 48% were AGA and 21% were SGA while term SGA were 31%. In control group, 15.38% babies were preterm. The main risk factors were both social and medical. **Table II** shows the analysis of maternal socioeconomic and biological factors in both groups. Mothers from lower social class produced more LBW babies as compared to those from middle and upper middle classes. Illiteracy in mother was found significantly associated with increased risk of LBW. Teenage mothers and those above 30 years were at more risk of giving birth to LBW babies. Maternal malnutrition expressed as body mass index<19 was associated significantly with LBW. Similarly, maternal height and weight also affected the weight of new born. The analyses of maternal medical and obstetric factors are shown in **Table III**. Grand multiparity, lack of antenatal care, birth interval of <12 months, anemia, antepartum hemorrhage, toxemia and renal disease (UTI) were also significantly associated with increased risk of LBW. Factors like primiparity, multiparity, pregnancy induced hypertention, hepatitis, pulmonary disorder and genital infection did not affect the birth weight significantly.

TABLE I:

BASIC CHARACTERISTICS OF CASES AND CONTROL GROUPS

Risk factor	LBW (n=100)	NBW (n=65)	P-value
Sex			
Male	69%	52.30%	0.000001
Female	31%	47.69%	1.0
Weight (kg)			
Mean	1.96kg	3.2kg	
Range	1-2.5kg	2.6-4kg	
Gestational age			
Preterm (37 weeks)	69%	15.38%	0.00000001
Term (37-42 weeks)	31%	84.61%	0.00025

TABLE II:
MATERNAL SOCIOECONOMIC AND BIOLOGICAL FACTORS ASSOCIATED WITH LBW

Risk factor	LBW (n=100)	NBW (n=65)	P - value
Social class			
Lower	69 (69%)	35 (53.84%)	0.000002
Middle	21 (21%)	16 (24.61%)	0.2
Upper middle	10 (10%)	14 (21.53%)	0.2
Maternal education			
Illiterate	73 (73%)	46 (70%)	0.0004
Primary	14 (14%)	8 (12.30%)	0.07
Secondary	11 (11%)	5 (7.69%)	0.03
>Secondary	2 (2%)	6 (9.23%)	0.04
Maternal age			
<20 years	40 (40%)	5 (7.69%)	0.0000000000
20 to 30 years	37 (37%)	48 (73%)	0.001
>30 years	23 (23%)	12 (18.46%)	0.008
Body mass index			
< 19	66 (66%)	24 (36.92%)	0.000000278
19 to 28	33 (33%)	41 (63%)	0.18844
>28	1 (1%)	0 (0%)	0.15729
Maternal weight			
< 45 kg	60 (60%)	9 (13.84%)	0.0000000000
45 to 55 kg	39 (39%)	21 (32.30%)	0.001
> 55 kg	1 (1%)	35 (53.84%)	0.0000000000
Maternal height			
<5 ft	34 (34%)	5 (7.69%)	0.0000001
5 ft	19 (19%)	18 (27.69%)	0.816153
>5 ft	47 (47%)	32 (49.23%)	0.017

TABLE III:
ASSOCIATION OF OBSTETRIC AND MEDICAL FACTORS WITH LBW

Risk factor	LBW (n= 100)	NBW (n=65)	P-value
Parity			
Primi	35 (35%)	25 (38.46%)	0.06
Multi	38 (38%)	27 (41.53%)	0.05
Grand multi	27 (27%)	12 (18.46%)	0.0006
Birth interval			
<12 months	39 (39%)	0 (0%)	0.00000000
>12months <24 months	20 (20%)	16 (24.61%)	0.3
>24 months	41 (41%)	24 (36.92%)	0.002
Antenatal visit			
Nil	37 (37%)	2 (3%)	0.0000000000
One	35 (35%)	2 (3%)	0.000000
2 to 4	13 (13%)	29 (44.61%)	0.00004
> 4	15 (15%)	32 (49.23%)	0.0004
Maternal disease(s)			
Anemia	65 (65%)	21 (32.30%)	0.00000000
Toxemia	19 (19%)	3 (4.61%)	0.000000
Antepartum hemorrhage	12 (12%)	1 (1.53%)	0.00001
Malaria	19 (19%)	4 (6.15%)	0.00000
Renal disease (UTI)	9 (9%)	2 (3%)	0.002
Hypertension	7 (7%)	6 (9.23%)	0.6
Pulmonary disease	5 (5%)	1 (1.53%)	0.02
Hepatitis	2 (2%)	0 (0%)	0.04
Genital infection	2 (2%)	0 (0%)	0.04

DISCUSSION

Birth weight not only affects the perinatal mortality but also provides information about the quality of health care provided to the mother during pregnancy. In United States, premature birth accounts for approximately 70% of perinatal mortality and 50% of long-term morbidity.[15,16] Approximately 30% of LBW infants in United States have IUGR and are born preterm.[3] Most of LBW babies born each year are concentrated in the developing countries, where approximately 70% of infants have IUGR.[3] The vast burden of LBW and early infant mortality is found in South Asia where 30-50% of babies are born with LBW each year. This high incidence of LBW is a strong indicator that the etiology is different from that commonly described in more developed countries. A large number of maternal risk factors for LBW infants have been reported.[17-23] Knowledge about risk factors for occurrence of LBW babies specific to Pakistani population is of critical importance because it is a major factor responsible for neonatal death as it has been reported in 40.02% cases from Karachi.[11] The present study was an attempt to investigate the relationship between maternal biological, nutritional and sociodemographic variables as they relate to LBW from this area. In this study, we took the reported monthly income and father's occupation as index of social status that showed a significant association of low social status with birth of LBW babies. Various

studies have shown that lower social class is associated with an increased risk of various adverse pregnancy outcomes including perinatal mortality, premature birth and LBW.[9,20] This increased incidence is largely explained by associated adverse factors like lack of education, repeated pregnancies, hard physical work, inadequate antenatal care, multiparity, early marriages and inadequate dietary intake during pregnancy along with low income.[24-26] The height and weight being a representative of maternal nutritional status have a positive influence on birth weight. Weight gain in pregnancy is the most important determinant of birth weight and is considered a significant test[27]. Under nutrition in pregnant women of low socioeconomic status is associated with delivery of LBW infant[28]. An improvement in nutritional status and maternal weight may have a positive effect on birth outcome.[29] In our study, the nutrition of the mother, which is expressed as BMI affected the birth weight of new born significantly. Our results are similar to other studies.[3,30] Maternal education affects birth weight through social status but it was not found as an independent factor in this study because >70% mothers were illiterate. Mothers under 17 years and over 35 years are more likely to have premature delivery and other complications of pregnancy like anemia, hypertension and diabetes especially in primigravida over 40 years of age.[31-33] Our study also favors these findings. Studies show that first born and those born at higher parities i.e. five or more tend to have lower birth weight and higher rate of IUGR.[31,33,34] Our study showed a significant association of grand-multiparity with LBW babies. Both short and long birth intervals have been associated with higher incidence of IUGR.[35] A short birth interval does not allow the mother to recover the optimal nutritional status for initiating new pregnancy increasing the chance of LBW and prematurity. This study showed the independent effect of short birth interval (<12 months) on LBW while the effect of long birth interval (>24 months) was not seen significantly. The importance of antenatal care cannot be ignored as high-risk mothers can be identified and managed accordingly. A systemic review of controlled trials among low-risk pregnancies from developed and developing countries has shown that moderate reduction in number of antenatal visits to 4 with increased emphasis on content could be implemented without any adverse effect on perinatal outcome.[36] Our study showed significant association of lack of regular antenatal visit with LBW babies. Maternal diseases during pregnancy affect the birth weight negatively. Multiple studies have reported association of maternal anemia with LBW and prematurity.[37,38] A study in Nepal documented increase in mean birth weight by 37gm after supplementation with iron and folate resulting in reduced incidence of LBW by 16%.[39] A study in rural Malawi has confirmed that iron deficiency was the most common nutritional deficiency in pregnant women and fetal anemia and LBW has increased the mortality significantly as compared to either LBW infant or normal weight and non-anemic infants.[40,41] The promotion of low cost fortified food and mineral multivitamin supplementation for women of reproductive age in developing countries have been recommended[42], but due to lack of education and antenatal care in majority of our patients these become ineffective. In this study, anemia with Hb% of <11 gm was found significantly associated with LBW babies and similar results are also shown by Ayesha[43]. Bleeding per vagina and toxemia leading to spontaneous or intentional interruption of pregnancy add the compounding complication of prematurity.[44-46] In this study, APH and toxemia were found to affect the birth weight significantly. Malaria due to *plasmodium falciparum* is an important cause of reduction in birth weight by infecting the placenta resulting in IUGR and preterm delivery[47]. Urinary tract infection in pregnancy has been associated with LBW due to prematurity[48]. Many factors like hepatitis, cardiorespiratory disease and genital infection were not found significantly associated with LBW babies.

CONCLUSION

It is concluded that the rate of LBW babies is high in our set up like other developing countries. The most important factor influencing the birth weight of new born is the socioeconomic environment that has the direct influence on maternal nutrition, height, weight and Hb%. Meanwhile, young maternal age, high parity, lack of birth spacing, lack of education, APH, toxemia, UTI and malaria are additional factors responsible for LBW babies in this set up. So, there is need of interventions to solve this problem and the interventions include education, poverty reduction by income generating plans, discouragement of early marriage, promotion of family planning services, nutritional supplementation of mothers during pregnancy for women belonging to lower social class, promotion of health education by medical, paramedical or community health workers to create awareness about the care of pregnant lady, providing good maternal care services and facilities for high risk mother to be referred to tertiary care hospital.

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AUTHOR AFFILIATION:

Dr. Yasmeen Memon *(Corresponding Author)*
Senior Medical Officer
Department of Paediatrics
Liaquat University Hospital, Hyderabad - Sindh.

Prof. Salma Sheikh
Department of Paediatrics
Liaquat University of Medical and Health Sciences (LUMHS) Jamshoro - Sindh.

Dr. Aslam Memon
Assistant Professor, Department of Paediatrics
LUMHS Jamshoro - Sindh.