Original Article

Maternal Risk Factors Associated with Low Birth Weight: A Case Control Study

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Abstract

Introduction: Low birth weight is a common contributor to neonatal and infant mortality and has a known association with childhood morbidity and long term developmental sequelae.

Objective: To evaluate impact of maternal socio-economic, nutritional, medical and obstetric factors on the low birth weights.

Design: Case control study.

Setting and Duration: Department of Obstetrics and Gynaecology Lady Wellingdon and Lady Aitchison Hospitals, Lahore from February to July 2005.

Patients and Methods: One hundred and eighty low birth weight (wt < 2500 gms) live new – born babies were enrolled as cases against same number of good weight babies (wt ≥ 2500 gms) as controls. Information was obtained directly from mothers using a pre-tested structured questionnaire and was analysed using SPSS version 10.

Results: The mean weight of cases and controls was 1760 gms and 3100 gms respectively. Fifty nine percent of cases were preterm. The factors like teenage mothers (p-value 0.007), maternal education (p-value < 0.025, OR – 1.61), antenatal booking (p-value < 0.001, OR – 3.38), less than three antenatal visits (p-value < 0.001), pregnancy induced medical ailments (p-value < 0.001) and maternal anaemia during pregnancy (p-value < 0.001) were significant risk factors causing low birth weight.

Conclusion: It is concluded from this study that teenage, illiteracy, poor antenatal care, maternal anemia, and pregnancy induced medical ailments have strong association with low birth weight. To overcome these problems, the mother and child health care services in the country should receive special attention.

Key Words: Low birth weight, maternal risk factors, Neonatal mortality, Infant mortality.

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Introduction

Each year, about 4 million children die within the first 28 days of life: the newborn period. Knowing that this neonatal mortality account for 54% of all under-five deaths, improving neonatal survival is essential particularly in developing countries like Pakistan.[1] This signifies the need for optimal antenatal care for all expectant mothers.

Birth weight is a major determinant of infant survival, mortality, and health outcomes later in life.[2] Babies weighing less than 2500 grams at birth are termed as low birth weight (LBW), irrespective of their gestational age.[3] LBW may be because of prematurity (gestational age less than 37 weeks) or intra-uterine growth retardation (IUGR) or both.[2] The LBW babies are at a higher risk of morbidity and mortality in the immediate newborn period.[4] WHO reports that countries having high LBW rate have higher rates of infant mortality[5] and malnutrition.[6]

Low birth weight infants have four times greater risk of dying from diarrheal disease and acute respiratory infections.[7] Malnutrition and infections complicate as growth retardation, failure to thrive and cognitive impairment.[8] Low birth weight is also a risk factor for atherosclerosis, renal disease, non-insulin dependent diabetes mellitus, asthma, hypertension, obesity, psychological stress and hepatoblastoma.[9]

According to current available data from 111 countries, Yemen has the highest percentage of LBW (32%); it is lowest in Albania, which also is a developing country. It is 5% in Denmark and 6% in Italy. The figure stands at 19% for Pakistan, 22% for Sri Lanka and 30% for India and Bangladesh. This is in sharp contrast to neighboring China (6%) and Iran (7%).[6]

Maternal risk factors associated with low birth weight have been studied internationally and locally. Gebremariam A[10] and Amin et al[11] found that younger maternal age, maternal short stature, late antenatal visits and complicated pregnancies were significantly associated with low birth weight. Similar observations were made by Valero De Bernabé J.[12] Chumnijarakij T[13] identified antepartum hemorrhage, maternal hypertension, toxemia of pregnancy, less than 4 antenatal visits, coffee or tea intake during pregnancy, and repeated induced abortions as risk factors of LBW. Rizwi et al[14] found maternal anemia as risk factor of LBW. Local data observed the poor socioeconomic status, pre-term labor, premature rupture of membrane and close birth spacing, as risk factors of LBW.[15-17]

The present study was designed to identify association between LBW and maternal age, education, socioeconomic and nutritional status and pregnancy related medical problems. The public health administrators may then use the information as a resource allocation tool.

Patients and Methods

This case control study was conducted at Obstetrics and Gynecology departments of Lady Aitchison and Lady Wellingdon Hospitals, Lahore, from February to July 2005. The neonatal units of these two hospitals are affiliated with the Department of Pediatrics, Mayo Hospital, Lahore. One hundred and eighty newborn singletons, weighing less than 2500 grams, irrespective of their gestational age were included in the study, using non-probability sampling technique. All live born singletons with birth weight ≥ 2500 gms at birth, regardless of gestational age served as the control group. Twins, triplets, stillborn, those with recognizable chromosomal anomalies, congenital malformations and placental complications were excluded.

We selected 180 babies with equal number of controls in order to study the maternal risk factors leading to low birth weight birth as mentioned in objectives. A verbal consent was taken from the mothers. Data was collected by histories taken from the mothers by cross-questioning and their antenatal cards wherever possible. Information was recorded on a pretested structured performa for each subject studied. Data was analysed using statistical package for social sciences (SPSS) version 10.

Results

A total of 360 newborns were included in this study; 180 each of cases and controls. There were no drop outs. Cases and controls matched by age, race and ethnicity. The birth weight ranged 800 – 2450 gm among cases and 2500 – 4600 gm among controls. All controls were full term. One hundred and seven (59.4%) cases were preterm while (Table 1).

Teenage pregnancy (≤ 25 years especially ≤ 20 years) had statistically significant association with low birth weight (p-value = .007). Maternal illiteracy was also found as a significant risk factor. Low family income (p-value = < 0.001, OR = 5.13) was statistically significant as well. Source of income (mother, father or both) when compared between two groups, was also found as a significant risk factor (p-value = < 0.007). Inter birth interval below 24 months was associated with low birth weight (p-value = < 0.001, OR = 3.68). Number of antenatal visits had strong association with low birth weight (p-value = < 0.001, OR = 4.08). One hundred and thirty four (74.44%) cases as compared to seventy five (41.66%) controls had less than 3 antenatal visits (Table 2).

Pregnancy induced medical ailments like gestational diabetes, hypertension, renal disorders, use of drugs, smoking and addiction (P = 0.001, OR = 2.84)

Table 1: Distribution of Background Characteristics among Cases and Controls (n = 360).

Background Characteristics	Cases	Control
	Mean ± SD	Mean ± SD
Gestational age (wk)	34.33 ± 3.16	38.55 ± 1.30
Neonatal weight (kg)	1.87 ± 0.44	3.11 ± 0.37
Maternal age (years)	26.46 ± 6.60	28.42 ± 4.61
Monthly Income (Rs.)	3334.72 ± 1341	4203.33 ± 1387.77
Birth Interval (mo)	9.90 ± 9.30	14.44 ± 10.82
Maternal weight (kg)	61.86 ± 6.19	66.94 ± 5.05

Table 2: Frequency distribution of maternal risk factors for LBW along with their statistical characteristics. (n = 360).

		Controls (n = 180)	Cases (n = 180)	P-value
		Number (%)	Number (%)	
Maternal Education	Illiterate	67 (37.2)	91 (50.6)	< 0.025
	Primary	22 (12.2)	8 (4.4)	
	Middle	40 (22.2)	39 (21.7)	
	Matric	30 (16.7)	27 (15.0)	
	Intermediate and above	21 (11.7)	15 (8.3)	
Source of Income	Father	171 (95.0)	159 (88.3)	< 0.007
	Mother	-	9 (5.0)	
	Both	9 (5.0)	12 (6.66)	
Family Income	< 3000 Rs.	60 (33.3)	16 (8.8)	< .001
	> 3000 Rs	120 (66.7)	164 (91.2)	
Inter birth interval	< 24 months	155 (86.1)	113 (62.8)	< .001
	> 24 months	25 (13.9)	67 (37.2)	
Antenatal Visits	< 3	134 (74.4)	75 (41.7)	< .001
	> 6	46 (25.6)	105 (58.3)	

were significantly associated with LBW. Maternal height, weight and body mass index (BMI) were also associated with low birth weight (Table 3).

Discussion

Low birth weight infants have a higher risk of mortality, especially during neonatal period and infancy. Their organ systems are immature so they need stronger fight for their survival.

Birth weight has long been the subject of clinical

and epidemiological interest and a target for public health intervention.[18] Low birth weight has multiple causes. In fact, birth weight is determined by an interaction of socio-demographic and biological forces. To some extent it is a reflection of maternal health and an indicator of the health status of a given population. It is also the most common determinant of the chances of the newborn – survival and potential for future growth and development.

The findings of our study illustrate that teenage, anemic, illiterate mothers, belonging to poor socio-economic stratum with close birth spacing are more likely to give birth to LBW babies.

Table 3: Effect of pregnancy induced medical ailment on birth weight (n = 360).

		Cases (n = 180)	Controls (n = 180)	P value
Pregnancy induced medical ailments		Number (%)	Number (%)	
	Yes	49 (27.2)	21 (11.7)	< 0.001
	No	131 (72.8)	159 (88.3)	
Edema	Yes	48 (26.7)	23 (12.8)	< 0.001
	No	132 (73.3)	157 (87.2)	
Pallor	Yes	129 (71.7)	45 (25)	< 0.001
	No	51 (28.3)	135 (75)	
Hypertension	Yes	36 (20)	13 (7.2)	< 0.001
	No	144 (80)	167 (92.8)	
Maternal weight	< 60 Kg	66 (36.7)	8 (4.4)	< 0.001
	> 60 Kg	114 (63.3)	172 (95..6)	
Body Mass Index	< 25	109 (60.5)	41 (22.7)	< 0.001
	> 25	71 (31.5)	139 (77.3)	
Maternal Height	< 150 cm	12 (6.6)	2 (1.1)	< 0.006
	> 150 cm	168 (93.4)	178 (98.9)	

- P-value < 0.05 was taken as significant

Table 4: Distribution of number of children among cases and controls (n = 360).

	Numbers	Controls (n = 180)		Cases (n = 180)	
		Number	Percentage	Number	Percentage
Number of children P value = 0.85 (insignificant)	1 – 3	126	70.0	132	73.4
	4 – 6	35	19.4	40	22.2
	7 – 9	16	8.9	7	3.9
	≥ 10	3	1.7	1	0.5

Maternal age is an important risk factor related to birth weight of the neonate. The relationship between maternal age and birth weight was found insignificant when compared for mothers below and above 35 years of age. Mothers less than 25 years of age and espe-

cially those less than 20 years had increased proportion of LBW babies. This result supports previous studies mentioning teenage pregnancy as a risk factor.[19]

We observed in our study that illiterate mothers were more likely to give birth to LBW babies ($p < 0.025$). This result also supports the pervious available data.[20]

Antenatal visits of the pregnant mothers are very important as they provide chances for monitoring the fetal well being and allow timely intervention for feto-maternal protection.

Our study showed less than 3 antenatal visits being significantly related with a LBW. Tasnim and colleagues[21] in their study also reported this variable as a significant risk factor for a LBW birth (OR – 2.66) and prenatal feto-maternal complications. Other studies about LBW births also conclude similarly.[22]

Fifty nine percent of our cases were born preterm. A study from Islamabad by Nusrat Khan on maternal risk factors in LBW babies reports 46% of their cases as preterm.[19]

The age of the mother was obtained by direct interview and crosschecked by using local event calendars. There was no other available tool for validating this information. The errors in assessment of maternal age for both cases and controls were obtained in a similar manner distributed equally between two groups.

Literature review shows that poor socioeconomic conditions are often related to LBW births.[23] Narrow birth spacing is mentioned as a risk factor for LBW babies.[19,24] Family income also affects birth weight. We had more LBW than good weight babies among families having income less than 3000 rupees per month.

Primigravida mothers are more prone to deliver LBW babies. It has been shown that the birth weight increases with parity (up to 4 – 5 births) but declines thereafter. We observed that the chances of delivering a LBW baby are not increased even if parity level increases beyond 4.

Pregnancy related medical ailments and maternal anemia are well known factors affecting birth weight. Our findings support the previous studies in this regard.[20,25] Similarly, diagnostic accuracy and reliability of pallor as a sign of anemis is well established.[26] We used pale conjunctivae as a tool for quick assessment of anemia. N. Meda and colleagues have described this sign as a reliable tool.[27] They concluded that relationship of conjunctival pallor with hemoglobin level has high specificity and sensitivity and is a suitable and affordable screening method for detection of severe anemia during pregnancy.[26]

Only one of our mothers was a smoker, so its relationship with LBW couldn't be proved.

We used maternal weight and height at term to calculate BMI. The studies from neighboring countries[23,28] have shown that BMI, pre pregnancy body weight and weight gain during pregnancy had significant effect on birth weight. We noted only one reading of maternal weight (at term) as most of our mothers had poor antenatal record keeping and majority did not know their pre-pregnancy weight so it was not possible to calculate pre-pregnancy BMI and weight gain during current pregnancy.

Pervious bad obstetric history also affects birth weight but we have not observed this variable in our study.

Our study supports that birth weight of the babies born to healthy mothers is different from birth weight of the babies born to mothers with sub-optimal socio-economic conditions, health and nutritional status.

Conclusion

It is concluded that maternal malnutrition, illiteracy, teenage pregnancies, low family income, poor antenatal visits, close birth spacing and pregnancy induced medical ailments have strong association with low birth weight. To overcome this problem, special attention is required to strengthen the mother and child health care services in the community.

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