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Original Research Article

An epidemiological study on association of maternal stress, anxiety and depression with low birth weight in a tertiary care hospital of Kolkata, West Bengal

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ABSTRACT

Background: Low birth weight (LBW) is a significant public health problem globally. In India every 3rd newborn is a LBW contributing to about 40% of the global burden. Maternal stress, anxiety and depression have been shown to impact on the progress and outcome of pregnancy, especially those related to LBW. This study was done to find the psychological factors associated with LBW among babies delivered in a tertiary care hospital in Kolkata.
Methods: It was a cross-sectional institution based observational study conducted from November 2016 to October 2018 among 410 postnatal mothers in the postnatal ward of the department of obstetrics and gynaecology, medical college, Kolkata, West Bengal. Data was obtained by interview method along with record analysis (medical and hospital records). Dependent variable was LBW (<2.5 kg). Ethical clearance was obtained from local ethics committee of all India institute of hygiene and public health Kolkata and medical college, Kolkata.
Results: Out of 410 babies, 112 (27.3%) were LBW. Out of 112 LBW babies, 59 (52.7%) were pre-term (<37 weeks); 51 (45.5%) were term (37-42 weeks) and 2 (1.8%) were post-term (>42 weeks). Among the mothers, 22.0% had anxiety, 17.1% had depression and 65.4% had stress during pregnancy.
Conclusions: In this study, association of LBW with anxiety, depression, both anxiety and depression, stress in mothers during pregnancy was not found. However, minimizing stress and having sufficient sleep during pregnancy is recommended.

Keywords: Low birth weight, Preterm baby, Small for date baby, Stress, Anxiety, Depression

INTRODUCTION

Birth weight is a critical determinant of child survival, growth and development. Every year, 1.1 million babies die from complications of preterm birth.[1] There is considerable variation in the prevalence of LBW across regions and within countries; however, the great majority of low-birth-weight births occur in low-and middle-income countries and especially in the most vulnerable population.[2,3] Regional estimates of LBW include 28% in south Asia, 13% in sub-Saharan Africa and 9% in Latin America. LBW is a global concern, as some high-income countries are also faced with high rates for their contexts (e.g., Spain, the United Kingdom of Great Britain and Northern Ireland and the United States of America).[4] As per WHO criteria, the incidence of LBW in China and Canada is 6%, in USA and UK it is 7%, in Iran and Mexico it is 12-14%.

According to world health organization (WHO), a new-born is said to have LBW if it weighs less than 2500 gm within one hour of birth, irrespective of the gestational age.[5]

Very LBW (VLBW) infants weigh 1500 gm or less and extremely LBW (ELBW) infants weigh 1000 gm or less.[6]

LBW is an important determinant of childhood morbidity and mortality.[7,8] In fact it is the most significant cause of undernutrition among children. Child's birth weight is a significant factor which determines vulnerability for risk of childhood illnesses and childhood survival. Consequently, children who are born with weight less than 2.5 kg are more vulnerable to undernutrition, infection and disease and thereby death during their early childhood.[8,9]

Birth weight is determined by two processes: length of pregnancy period (gestation period) and intrauterine growth rate. Accordingly, there are two types of LBW babies: Preterm baby and small for date baby.

Preterm baby is one, born after 28 completed weeks and before 37 completed weeks of gestation regardless of birth weight. The intrauterine growth for that pregnancy period is normal (10^{th} to 90^{th} percentile) but since it is born before 37 completed weeks, it is also called as 'premature baby.' This comprises 30% of all LBWs in India. If care is taken, such a child will catch up the growth and will be normal within 2 years.[10]

Small for date baby (SFD baby) is a new-born with birth weight below the 10^{th} percentile, who is smaller and lighter than what it should have been for that pregnancy period due to failure in the intrauterine growth. The baby may be born preterm, term or after full term. This comprises 70% of all LBWs in India.[11] The cause is intra uterine growth restriction (IUGR) associated with medical conditions that interfere with the circulation and efficiency of the placenta with the development or growth of the foetus or with the general health and nutrition of the mother. IUGR is often classified as reduced growth that is symmetric (head circumference, length and weight equally affected) or asymmetric (with relative sparing of head growth).[12] Symmetric IUGR often has an earlier onset and is associated with diseases that seriously affect foetal cell number e.g., conditions with chromosomal, genetic, malformation, teratogenic, infectious or severe maternal hypertensive etiologies. Asymmetric IUGR is often of late onset, demonstrates preservation of doppler waveform velocity to the carotid vessels and is associated with poor maternal nutrition or with late onset or exacerbation of maternal vascular disease (pre-eclampsia, chronic hypertension).

LBW is the single most important factor determining the survival chances of the child. Even if the LBW baby survives, there are various well established medical issues that may arise even during adulthood. It is an important guide to the level of care needed by individual babies. It also reflects inadequate nutrition and ill-health of the mother. A high percentage of LBW therefore points to deficient health status of pregnant women, inadequate prenatal care and the need for improved care of the new-born. Its public health importance is attributed to numerous factors like its high incidence, its association with mental retardation and a high risk of perinatal and infant mortality and morbidity (half of all perinatal and one-third of all infant deaths are due to LBW), human wastage and suffering, the very high cost of special care and intensive care units and its association with socio-economic underdevelopment.

In Indian situation, as one third of all births fall in the category of LBW which are principally result of various causes prevailing in prenatal days, a sensible approach to this huge problem should be adoption of suitable preventive measures to lower the incidence of LBW babies and thus ensure greater chance for our children to survive. LBW is one of the most serious challenges in maternal and child health in both developed and developing countries.

LBW is a major public health problem, caused by factors that are potentially modifiable. Health of the child is closely related to mother's health; we will get a healthy child only when the mother is healthy. Therefore, identification of maternal risk factors associated with LBW is essential in order to guide program planning and organizing care for mothers and their new-borns. Identification of such factors is important to plan an appropriate intervention towards better child survival. The societal determinants of LBW play a very important role and the scourge of early marriage and child birth, poor female literacy, low empowerment of women at large, many harmful myths especially regarding nutrition during antenatal period all must be taken care of if LBW has to be reduced in this country. The IEC and BCC targeting not only the would-be mothers but also the girl child, all women of reproductive age (WRA women), the family members and of course the community at large are the most important measures for prevention and control of LBW. Normal birth weight baby is predicted to have a healthier future strictly following the WHO slogan "children's health is tomorrow's wealth or healthy child is the wealth of our nation".

With this backdrop a study was planned and undertaken to find out the proportion of LBW among babies delivered in a tertiary care health facility and to identify the predictors of various domains like anxiety, depression, stress of mothers during pregnancy that may influence LBW of new-born. All these findings may be utilized in any IEC/BCC programme for awareness campaign for the mothers and the general mass for reduction of LBW in the country and thus give the best opportunity for good health to all babies from the very start of their life.

METHODS

This was a cross- sectional institution based observational study conducted from November 2016 to October 2018 in the post-natal ward of the department of obstetrics and

gynaecology, medical college, Kolkata, West Bengal. Ethical clearance was obtained from local ethics committee of all India institute of hygiene and public health Kolkata and medical college, Kolkata. Study population included all mothers who delivered babies during the period of data collection from May-2017 to April-2018 (Total=12,337) except sick post-natal mothers and those mothers who did not give their written informed consent to participate excluded from study.

Sample size calculation was based on LBW proportion of 33.6% using standard formula: $N=(Z_{\alpha/2})^2pq/l^2$ as 343.[12] Taking a 20% non-response, the total sample size was 412. Out of 12,337 mothers who delivered during my study period, 412 mothers were selected by 'simple random sampling' with the help of random numbers generated by R-software. Two mothers did not give consent to be included in the study. So, my final sample size was 410.

Patient health questionnaire-4 (PHQ-4) was used to collect data regarding depression and anxiety and perceived stress scale 4 (PSS-4) was used for Stress during pregnancy of the mother by interview method. Record analysis (medical and hospital records) of mothers was also done. The dependent variable in this study was LBW and independent variables were: depression, anxiety and stress.

Table 1: Depression and anxiety during pregnancy: PHQ-4.[13]

Over the past 2 weeks have you been bothered by these problems	Not at all (0)	Several days (1)	More days than not (2)	Nearly every day (3)
(i) Feeling nervous, anxious or on edge				
(ii) Not being able to stop or control worrying				
(iii) Feeling down, depressed or hopeless				
(iv) Little interest or pleasure in doing things				

Anxiety=(i) + (ii)-total score ≥3, depression=(iii) + (iv)-total score ≥3 and anxiety + depression=(i) + (ii) + (iii) + (iv)

Table 2: PHQ-4 grades.

Grade	Total score
Normal	0-2
Mild	3-5
Moderate	6-8
Severe	9-12

Table 3: Stress during pregnancy: PSS-4.[14]

Scale	0	1	2	3	4
(i). In the last month, how often have you felt that you were unable to control the important things in your life?					
(ii). In the last month, how often have you felt confident about your ability to handle your personal problems?					
(iii). In the last month, how often have you felt that things were going your way?					
(iv). In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?					

0=Never, 1=almost never, 2=sometimes, 3=fairly often, 4=very often.

Scoring for the PSS-4: Questions 1 and 4-0=never, 1=almost never, 2=sometimes, 3=fairly often and 4=very often.

Questions 2 and 3-4=never, 3=almost never, 2=sometimes, 1= fairly often and 0=very often.

Lowest score: 0 and highest score: 16 (Higher scores are correlated to more stress).

RESULTS

Present study observed a slightly more male predominance (54.9% vs 45.1%) of newborn babies, 27.3% of which LBW. Most of the LBW babies were (>1.5-2.499) kg i.e. 15.1% followed by very LBW babies (7.8%) and extremely LBW babies (4.4%) respectively. Among mothers, there was anxiety (22.0%), depression (17.1%), severe degree of both anxiety and depression (1.2%) and stress (65.4%) during pregnancy. There was no significant association of LBW with anxiety, depression, both anxiety and depression and stress in mothers during pregnancy.

Table 4: Distribution of new-born babies according to their birth weight (n=410).*

Birth weight (kg)	N	Percentage (%)	Mean, SD, range median and IQR
Normal (≥ 2.5)	298	72.7	2.56, ±0.67, 3.6 (0.7-4.3) 2.70, (2.30-3.00)
(2.5-3.5)	289	70.5	
(3.6-4.6)	9	2.2	
Low (<2.5)	112	27.3	
(>1.5-2.499)	62	15.1	
Very low (1.1-1.5)	32	7.8	
Extremely low (≤1.0)	18	4.4	

*It included two pairs of twins, among which one of each pair survived.

Table 5: Distribution of new-born babies according to their gender, (n=410).

Gender of baby	N	Percentage (%)
Male	225	54.9
Female	185	45.1

Table 6: Distribution of mothers according to anxiety, depression (PHQ-4) and stress during pregnancy as per (PSS-4), (n=410).

Characteristics	N	Percentage (%)
Anxiety		
Present	90	22.0
Absent	320	78.0
Depression		
Present	70	17.1
Absent	340	82.9
Both anxiety and depression		
Normal (0-2)	242	59.0
Mild (3-5)	96	23.4
Moderate (6-8)	67	16.4
Severe (9-12)	5	1.2
Stress		
Yes	268	65.4
No	142	34.6

Table 7: Association between low birth weight of new-born babies and anxiety, depression, both anxiety and depression, stress of mothers, (n=410).

Characteristics	Total	LBW, N (%)	χ^2, df and p value
Anxiety			
Present	90	28 (31.1)	0.83, 1, 0.36
Absent	320	84 (26.2)	
Depression			
Present	70	21 (30.0)	0.30, 1, 0.58
Absent	340	91 (26.8)	
Anxiety and depression			
Present	70	21 (30.0)	1.46, 1, 0.69
Absent	340	91 (26.8)	
Stress			
Present	268	80 (29.9)	2.50, 1, 0.11
Absent	142	32 (22.5)	

DISCUSSION

Our study shows among the mothers, 22.0% had anxiety and 17.1% had depression during pregnancy. Stress was present in 65.4% of mothers during pregnancy. We didn't find any statistical significance between stress, anxiety, depression of mothers and low birth weight of newborn babies. Similar finding was reported by Keenan et al where they found that birth weight was not associated with mothers' depression.[15]

However, a population-based study done in Bangladesh by Nasreen et al found a significant relationship between variables of depression, stress, and anxiety of mothers with birth weight.[16]

Birth weight is the first weight of new-born obtained just after birth. It is the single most important determinant for survival, growth and development of infant. It reflects health status of mother during adolescence and pregnancy and also quality of antenatal care. The proportion of LBW of a country is a surrogate indicator of the health status of the country. LBW is of great concern as the baby may be at increased risk for complications. The baby's tiny body is not as strong and he or she may have a harder time eating, gaining weight and fighting infection. As they have so little body fat, LBW babies often have difficulty staying warm in normal temperatures. Some new variables were studied by the researcher which were not done in earlier studies e.g., anxiety, depression and stress in mothers during pregnancy.

Limitations

The study was cross-sectional in nature, a one-time measurement of exposure and outcome, hence temporal association or cause effect relationship could not be established; Being an institution-based study the results cannot be used for a community. A community-based study would have brought a better representative result; It was susceptible to biases such as responder bias, recall bias, interviewer bias social acceptability bias and selection bias; In this study, only access to data was from a public hospital (medical college, Kolkata) where usually the mothers are from low socioeconomic strata of the society and no information was available from private sector where the better of mothers seek health care service; The study setting being medical college, Kolkata which is a referral hospital, a large proportion of mothers from outreach health care organizations were referred with complications or near death situations. Therefore, the data collected may be biased and may not be the true picture of the LBW and its determinants as operative in community.

CONCLUSION

Tremendous advances have been made in care of sick and premature babies, more and more babies are surviving despite being born early and being born very small. This exercises an extra load on the national exchequer and on the health care system. Therefore, all steps must be taken at mother, family and community level to bring forth a healthy baby from a healthy mother.

Recommendations that were made through this study were first-as LBW is a multi-factorial phenomenon, interventional programs should be encouraged not only in health sectors but also in all those sectors concerned with social development and social welfare programs. It is a significant public health problem and to reduce low birth weight prolonged, effective and well sustained approach is needed. Secondly-minimizing stress and having sufficient sleep during pregnancy.

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