

STUDY OF LOW BIRTH WEIGHT (LBW) IN AN URBAN PUBLIC TERTIARY HOSPITAL IN DHAKA CITY OF BANGLADESH

Quamrun Nahar¹, Syeda Saliha Saliheen², Rehana Begum², Tasnuva Rahman¹,
MA Mannan³, *M Omar Faruque⁴

¹Department of Biochemistry and Cell Biology, BIRDEM, Dhaka-1000, Bangladesh,

²Department of Food and Nutrition, Home Economics College, Dhaka 1205, Bangladesh,

³Sir Salimullah Medical College, Dhaka 1100, Bangladesh,

⁴Department of Nutrition and Food Engineering, Daffodil International University, Dhaka 1207, Bangladesh.

Abstract: Low birth weight remains a significant public health problem in many developing countries including Bangladesh. According to the report of BBS, 2007, the prevalence of LBW was 36%. The present study aimed to assess the current status of LBW and its determinants among the neonates born in an urban hospital. This cross-sectional study was conducted in BIRDEM hospital, data were collected from Sir Salimullah Medical College & Mitford Hospital, Dhaka, Bangladesh, with a total of 175 subjects who had delivered within 24 hrs. Anthropometric data (height, weight, MUAC) were measured by standard method. History of the patients was collected from the hospital record books and face to face interview of the subjects. The statistical analysis of the data was performed by using statistical package SPSS, version 15. The prevalence of LBW was found to be 39% among the studied subjects. The anthropometric values of mothers who delivered LBW babies and among them who delivered NBW babies were almost similar. We found that maternal age and physical condition were approximately similar between the two groups. It was observed that gestational period was significantly ($p=0.03$) lower among LBW babies compared to NBW babies. The result showed that among the mothers of LBW babies, 44% was at 1st parity, 37% was at 2nd parity and 19% was at 3rd or above. The prevalence of LBW was 39% in an urban public maternity center. Maternal gestational age significantly influenced on low birth weight.

Keywords: LBW, newborn babies, mortality, BIRDEM hospital, Dhaka city

Introduction

The term 'low birth weight (LBW) babies' applies to those newborn babies who weigh less than 2500g at the birth time¹. It is one of the poor outcomes of pregnancy that has caught the attention of the World Health Organization². In Bangladesh, LBW is one of the leading causes of child mortality.

The prevalence of LBW in Bangladesh is 36%³. Among the Asian countries this percentage is 18.3%. The prevalence of LBW in another continent⁴ of the world like in Africa is 14.3%, in Europe 6.4%, in Latin America and Caribbean Region 10%, in North America 7.7%, Oceania 10.5%, in Iran 8% and in Isfahan 9.5%.

LBW is associated with high neonatal and infant mortality. Infants with LBWs are 40 times more likely to die than those with normal birth weight (NBW). It has also a great impact on lower trajectory of growth during childhood and adolescence and increased risk of non-communicable diseases during

*Corresponding Author: Dr Md Omar Faruque, Associate Professor, Department of Nutrition and Food Engineering, Daffodil International University, Dhaka, Bangladesh, Email: omar.nfe@diu.edu.bd

adult life⁵. The rates of cerebral palsy (CP), mental retardation and other sensory and cognitive dysfunctions are higher in LBW infants than in those with a NBW (birth weight of 2,500–4,000 g)⁶.

LBW is a multifactorial phenomenon. Many maternal and fetal factors are found significantly to be associated with the LBW. The findings of different research done on LBW have shown that maternal anthropometric value⁷, age, poor nutritional status, age at pregnancy, shortness of the interval period between the pregnancy^{8,9}, gestational period, antenatal care, bad delivery background¹⁰, number of parity, maternal psychology & life style¹¹, socioeconomic & demographic status, maternal education and occupation¹² all are significantly associated with LBW.

In study on Bangladeshi community it has been stated that inadequate food intake and poor nutrition utilization associated with maternal malnutrition which reduces blood volume expansion and inadequate increase in cardiac output, then decreased blood and nutrient supply to the fetus which results reduced placental size and reduced nutrient transfer and ultimately produces low birth weight babies¹³.

The predominant cause of LBW in the United States is preterm birth, whereas in developing countries, it is more frequently caused by IUGR⁶.

These risk factors have great impact on the increment of LBW babies who survive with suffering from cognitive and neurological impairment. Moreover, a child with LBW has, in later life, a greater risk of illness and premature death from cardiovascular diseases, hypertension and diabetes compared to others with adequate birth weight. Besides this, the mothers of LBW babies become mentally disappointed and consequently they turned to a burden of the nation.

Improved neonatal and maternal care could save the lives of countless newborns¹⁴. A good start in life is important and maternal nutritional status during pregnancy has repeatedly been demonstrated to be associated with pregnancy outcomes for the infant¹⁵. Keeping all these in views, an attempt has been made to carry out a study on LBW babies at the public tertiary care hospital in Dhaka city.

Materials and methods

This was a cross sectional study. The data was collected from Sir Salimullah Medical College & Mitford Hospital, Dhaka using predesigned questionnaire. The study was conducted August 2011 to February 2012.

Inclusion criteria

- Mothers who have new born babies.
- Mothers those are agreed to participate in the study and are not with chronic illness.

Data collection method

The aim of the study was explained to the mothers, agreed volunteers were interviewed face to face and anthropometric indices were measured for both mothers and neonates.

Measurement of length

For measuring the length of the neonate, a wooden length board was used. Two examiners were required to correctly position the neonate to ensure accurate and reliable measurement of length. The neonate was placed face upward, with the head towards the fixed end & the body parallel to the long axis of the board. One examiner applied gentle traction to bring the crown of the neonates head into contact with the fixed head board & position the head so the Frankfurt plane was vertical. The second examiner held the neonates feet, without shoes, toes pointing directly upward and keeping the neonates knees straight, brings the movable footboard to rest firmly against the heels. The reading was taken to the nearest centimeter.

Measurement of neonatal weight

For measuring the weight of neonate, a weighing sling was used. They were weighted with the minimum of clothing. After slipping the neonate into the sling, the weight was recorded as soon as the indicator on the scale had stabilized. Alternatively, a pediatric scale with a pan was also used. When the pan was used it was ensured that the neonate was placed on the pan scale, so the weight was distributed equally about the center of the pan. Once the neonate was quietly, weight was recorded to the nearest 10g.

Measurement of head circumference

For the measurement of the head circumference, a narrow, flexible & no stretch tape made of fiberglass or steel about 0.6 cm wide was used. The tape was placed just above the supra-orbital ridges covering the most prominent part of the frontal bulge, and over the part of the occipital which gives the maximum circumference. Measurements were made to the nearest millimeter.

Measurement of maternal weight

For the measurement of the weight of the mother a beam balance with non-attachable weight was used. The balance was placed on a hard flat surface & checked for zero balance before measurement. The mother was in the center of the platform wearing light cloths but without shoes.

Measurement of mid upper arm circumference

To obtain the mid arm circumference, the mothers & neonates right arms were bent at the elbow at a 90-degree angle, with the upper arm held parallel to the side of the body. Then, using the tape, measure the distance between the acromion (the bony protrusion on the posterior of the upper shoulder) & olecranon process of the elbow (tip the elbow). Mark the midpoint between these two landmarks with indelible ink, the mothers & the neonate's right arms were relaxed and hanging loosely at their side. Position the tape around the upper arm at the previously marked midpoint. The tape is snug, but not so tight as to cause skin indentation or pinching. The circumference was recorded to the nearest millimeter, in case of neonate & centimeter in case of mother.

Statistical analysis

Statistical analysis was performed using SPSS (Statistical Package for Social Science) software for windows version 11.5 (SPSS Inc, Chicago, Illinois, USA). All the data were expressed as mean \pm SD (Standard Deviation); median (range) & percentage (%) as appropriate. The statistical significance of differences between the values was assessed by t-test or chi square test (as appropriate). A two-tailed P-value of <0.05 was considered statistically significant.

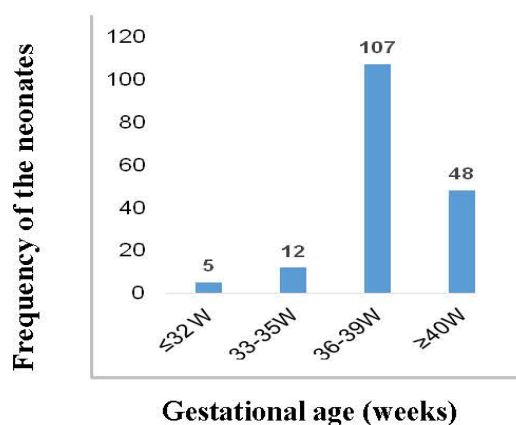
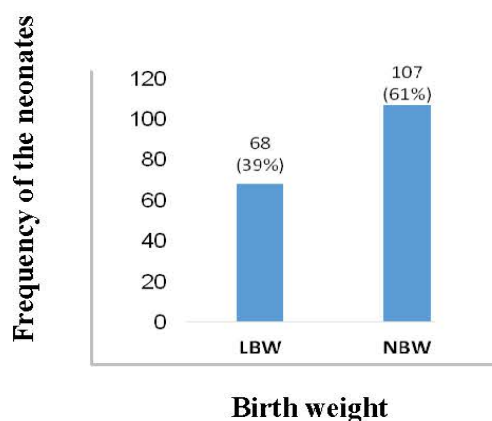
Results

The present study included 175 new born babies from the maternity center of Mitford Hospital of Dhaka city where 81 were male and 94 were female. The mean \pm SD of birth weight (kg), Birth length (cm), birth MUAC (mm) and head circumference of the studied babies were 3.0 ± 0.43 , 47 ± 3 , 98 ± 10 and 34 ± 1 . Age (yrs), weight (kg), height (cm) and MUAC of the mothers were 24 ± 4 , 54 ± 9 , 151 ± 6 , 26 ± 3 . Mother's age (yrs) at marriage was 18 ± 3 and total monthly income (BDT) of family was 12358 ± 11856 (Table 1).

Table 1: Anthropometric indices of mothers and newborn babies, and family income of the studied subjects

Parameters	Mean \pm SD	Minimum	Maximum
Birth weight (kg)	3 \pm 0.43	1.60	3.84
Birth length (cm)	47 \pm 3	38.0	55.5
Birth MUAC (mm)	98 \pm 10	70	122
Head circumference (cm)	34 \pm 1	28.5	38.5
Mother's age (yrs)	24 \pm 4	16	40
Mother's weight (kg)	54 \pm 9	37.0	85.3
Mother's height (cm)	151 \pm 6	135.0	168.0
Mother's MUAC (cm)	26 \pm 3	19.0	35.0
Mother's age at marriage (yrs)	18 \pm 3	12	33
Monthly income of family (Tk.)	12358 \pm 11856	1500	100000

When the babies were categorized according to the gestational age, it has been found that 17 of the neonates were born before 36 weeks of gestational age, 107 were born between 36 and 39 weeks of gestational age and 48 of the babies born at 40 weeks or more than that (Figure 1). When the birth weight were evaluated it has been found that 39% of the neonates born with less than 2.5kg body weight and are classified as low birth weight (LBW) neonates (Figure 2).

**Figure 1: Frequency of the babies according to the gestational age****Figure 2: Frequency (%) of the babies according to the birth weight (LBW, low birth weight; NBW, normal birth weight)**

Birth weight (kg), birth length (cm), MUAC (mm) and head circumference (cm) were evaluated to observe the effects of LBW on these parameters and found that these four parameters were significantly ($p=0.01$) lower in LBW (2 ± 0.24 , 45 ± 3 , 91 ± 8 and 33 ± 1) neonates compared to the NBW (3 ± 0.29 , 49 ± 3 , 102 ± 8 and 35 ± 1) neonates (Table 2).

Table 2: Anthropometric parameters of neonate (M \pm SD) among the study participants

Group no	Birth weight (kg)	Birth length (cm)	Birth MUAC (mm)	Head circumference (cm)
Group 1 (n=68)	2.0 \pm 0.24	45 \pm 3	91 \pm 8	33 \pm 1
Group 2 (n=107)	3.0 \pm 0.29	49 \pm 3	102 \pm 8	35 \pm 1
t/p value	-15.82/0.01	-7.64/0.01	-8.97/0.01	-7.57/0.01

Group 1, BW<2.5kg; Group2, BW>2.5kg. Results are expressed as Mean \pm SD. t/p value was calculated by using unpaired t test.

The Mean \pm SD value of Mother's age (yrs) and age at marriage (yrs) in LBW and NBW group were 24 \pm 5 and 18 \pm 4. Gestational period (weeks) in LBW (36 \pm 3) neonates was significantly ($p<0.05$) lower compared to NBW (38 \pm 2) neonates. Systolic and diastolic blood pressure in mothers of both the LBW and NBW neonates were not significantly different (Table 3).

Table 3: Maternal age (yrs), gestational period (weeks) and blood pressure (mm-hg) among the mothers of LBW and NBW neonates

Group no	Mother's age	Mother's age at marriage	Gestational period	DBP	SBP
Group 1 (n=68)	24 \pm 5	18 \pm 4	36 \pm 3	119 \pm 13	77 \pm 10
Group 2 (n=107)	24 \pm 4	18 \pm 3	38 \pm 2	119 \pm 11	79 \pm 9
t/p value	-0.47/0.64	0.40/0.69	-2.23/0.03	0.08/0.94	-1.16/0.25

Group 1, BW<2.5kg; Group2, BW>2.5kg. DBP, diastolic blood pressure; SBP, systolic blood pressure.

Results are expressed as Mean \pm SD. t/p value was calculated by using unpaired t test.

Mother's weight, height and MUAC of LBW neonates were 53 \pm 10, 151 \pm 7 and 25 \pm 3, the values NBW neonates were 55 \pm 9, 151 \pm 7 and 26 \pm 3. No significant differences were found among the parameters between mothers of LBW and NBW neonates (Table 4).

Table 4: Anthropometric parameters of mother (M \pm SD) among the study participants (n=175)

Group No	Mother's weight(kg)	Mother's height(cm)	Mother's MUAC(cm)
Group 1 (n=68)	53 \pm 10	151 \pm 7	25 \pm 3
Group 2 (n=107)	55 \pm 9	151 \pm 7	26 \pm 3
t/p value			
Group1 vs Group2	-0.28/0.20	-0.33/0.74	-0.37/0.71

Group 1=BW<2.5kg; Group2=BW>2.5kg. Results are expressed as Mean \pm SD. t/p value was calculated by using unpaired t test.

Anemic and edema status were analyzed in both the mothers of LBW and NBW group and no significant association were found when using χ^2 test (Table 5).

Table 5: Presence of anemia and edema among the participating mother (n=175)

Group no	Anaemia		edema	
	Yes N (%)	No N (%)	Yes N (%)	No N (%)
Group 1 (n=68)	16 (23)	52 (77)	8 (12)	60 (88)
Group 2 (n=107)	24 (22)	83 (78)	20 (19)	87 (81)
χ^2 / p	0.03/0.87		1.48/0.22	

Group 1, $BW < 2.5\text{kg}$ (LBW); Group2, $BW > 2.5\text{kg}$ (NBW). Results are expressed as number & percentage. Chi-square was performed as a test of significance.

Mothers of both the LBW and NBW neonates were categorized according to parity (single baby, two baby and more than two babies) and no significant association was found among the groups in chi square test (Table 6).

Table 6: Distribution of parity among the study participants (n=175)

Group	Parity 1 No (%)	Parity 2 No (%)	Parity >2 No (%)
Group 1 (n=68)	30 (44)	25 (37)	13 (19)
Group 2 (n=107)	45 (42)	38 (35)	24 (23)
χ^2 / p	4.46/0.62		

Group1, $BW < 2.5\text{kg}$ (LBW); Group2, $BW > 2.5\text{kg}$ (NBW). Results are expressed as number & percentage. Chi-square was performed as a test of significance.

Discussion

Low Birth Weight (LBW) is a public health problem linked to a wide range of health risk predictors which sometimes difficult to manage and this problem persists in both developing and developed countries¹⁶. It is a leading cause of mortality, morbidity and disability in neonates, infancy and childhood and has long-term impact on health outcomes in adult life. It is a multifaceted public health problem. Low birth weight results in substantial costs to the health sector and imposes a significant burden on the society as a whole.

The LBW rate is a good health indicator of public health problem including long-term maternal malnutrition, ill health and poor health care. Low birth weight is an important predictor of newborn health and survival. Based on epidemiological observations, low birth weight infants are 20 times likely to develop complications compared to heavier babies¹⁷. LBW together with preterm delivery has also been recognized as a strong biological predictor of unfavorable developmental outcomes¹⁸. Among the health disadvantages associated with low birth weight, there were cognitive deficits, motor delays, cerebral palsy, and other behavioral and psychological problems^{19,20}.

Many studies have identified prevalence and risk factors associated with low birth weight worldwide. A recent study done in Pakistan has reported that teenage mother, low maternal education, poor antenatal care, maternal anemia, and pregnancy-induced medical ailments have a strong association

with low birth weight²¹. Extreme maternal age (less than 18 years old and more than 35 years old) and lower parity have shown significant association with low birth weight infants²². A number of studies have shown correlates of antenatal care, parity, inter pregnancy interval, gestational weight and bad obstetric history with occurrence of low birth weight infants²³⁻²⁷.

In this study, 175 new born babies were studied from Sir Salimullah Medical College & Mitford Hospital (a public hospital where economically constrained peoples are usually visited) where 81 were male and 94 were female. We found that the prevalence of LBW was 39% among the studied subjects which was approximately similar to the national data (36%) of BDHS, 2007.

A study on newborn babies in Shaheed Shohrawardy Medical Hospital where relatively economically sound peoples are visited have shown that the percentage of LBW was 23.2%²⁸. The LBW babies in our study have shown significantly less body length, MUAC and head circumference which could affect physical and mental health in future life.

In our study mothers age and anthropometric status were almost similar between the mothers of LBW and NBW babies. A study conducted at UKMMC in Kuala Lumpur, Malaysia have documented that maternal age was significantly associated with low birth weight infants. The younger age group is at risk of having LBW babies compared to older age group and other studies^{22,25} also supported this view. However, there were also studies reported that the older maternal age is at higher risk in getting LBW infants²⁹. The explanation could relate to maternal nutritional depletion that presence normally in teenage pregnancy and older age group because of poor eating pattern. Increased risk of chronic disease such as hypertension, Diabetes Mellitus and heart disease for advanced maternal age required them to deliver preterm or their babies developed intrauterine growth restriction due to poor maternal health.

The relationship between maternal body mass index (BMI) and fetal growth is well known^{25,30}. Lower maternal BMI showed higher risk to have LBW infants. A study in China³¹ have shown that pre-pregnancy underweight may increase the risk of small for gestational age (SGA) and LBW infants while pre-pregnancy overweight and obesity will increases the risk of large for gestational age (LGA), macrosomia, and subsequent offspring overweight/obesity³¹. This finding may suggest the role of genetic influence in having LBW infants thus promoting for further research on possible of genetic involvement.

In our study it has been documented that the mothers of NBW babies had longer gestational period than that of the mothers of LBW. Existing literatures have been suggested that low gestational age is a risk factor contributing to LBW infants^{25,32}. Gestational age plays an important role in determining infants' birth weight. Infants who are delivered prematurely (less than 37 weeks) are at higher risk to have low birth weight infants. The World Health Organization estimated about one third of low birth weight infants is caused by prematurity. With advanced technology, the prevalence of prematurity infants survived are increasing thus increased the number of LBW infants. This is one of the reasons identified why the prevalence of low birth weight infants remain unchanged since years ago. Thus, it is much more important in preventing the birth of premature baby by identifying and managing the associated risk factors.

Conclusion

Although the prevalence of low birth weight is decreasing in Bangladesh but in some section of the community this problem is improving slowly and gestational period may influences the risk of LBW in this section of the population.

References

1. CDC (Center for Disease Control and Prevention), 2011. National Center for Health Statistics Vital Stat 2010. Available from URL: <http://www.cdc.gov/nchs/Vital/Stats.html>. Accessed on April 2.
2. McCromick MC. The contribution of low birth weight to infant mortality and childhood morbidity, *New Engl. J. Med.* 1985; 312: 82-90.
3. Bangladesh Demographic and Health Service (BDHS), 2007.
4. Hassan TM, Ali AG. The relationship between biological, psychological-cognitive and social - cultural characteristics of parents with infant's birth weight in Isfahan province. *Health Sys. Res.* 2010; 6:2.
5. Martin RJ, Fanaroff AA, Walsh MC, 8th ed. Fanaroff and Martin Neonatal-Perinatal Medicine. Disease of the fetus and infant. Philadelphia: Elsevier, 2006:19.
6. Stoll BJ, Adams-Chapman I. The high-risk infant. In: *Textbook of Pediatrics*. 18th ed, Philadelphia: Saunders, 2007: 698-711.
7. Eshraghian MR. The effects of risk factors of pregnancy period on the infant's weight. *The Journal of Qazvin Univ. of Med. Sci.* 2008; 11: 60-65.
8. Kidanto HL, Mogren I, Lindmark G, Massawe S, Nystrom L. Risk for preterm delivery and low birth weight are independently increased by severity of maternal anaemia. *South African Medical Journal* 2009; 99: 235-240.
9. Eghbalian F. Low birth weight causes survey in neonates. *Iran J Pediatr* 2007; 17: 27-33.
10. Velankar DH. Maternal Factors Contributing to Low Birth Weight Babies in an Urban Slum Community of Greater Mumbai. *Bombay Hospital Journal* 2009; 51:1
11. Shah PS. Parity and low birth weight and preterm birth: a systematic review and meta-analysis. *Acta Obstet Gynecol Scand* 2010; 89: 862-75. doi: 10.3109/00016349.2010.486827.
12. Silvestrina S, Homrich da Silvab C, Hirakatac VN, Goldanid AAS, Silveira PP, Goldanie MZ. Maternal education level and low birth weight: a meta-analysis. *J Pediatr (Rio J)*. 2013; 89: 339-345.
13. Annual Report 2009, icddr,b, Dhaka, Bangladesh.
14. The Millennium Development Goals (MDG) Report, 2008.
15. Kramer MS. Determinants of Low Birth Weight Methodological Assessment and Meta-Analysis. *Bulletin of the World Health Organization*.1987; 65: 663-737.
16. Torres-Arreola LP, Constantino-Casas P, Flores-Hernández S, Villa-Barragán JP, Rendón-Macias E.. Socioeconomic factors and low birth weight in Mexico. *BMC Public Health* 2005; 5:20.
17. The United Nations Children's Fund (UNICEF) Low Birth Weight: Country, Regional and Global Estimates. UNICEF, New York, 2004.
18. Taylor HG, Minich NM, Klein N and Hack M. Longitudinal Outcomes of Very Low Birth Weight: Neuropsychological Findings. *Journal of the International Neuropsychological Society* 2004; 10: 149-163. <http://dx.doi.org/10.1017/S1355617704102038>
19. Reichman NE. Low Birth Weight and School Readiness. *Future Child* 2005; 15: 91-116. <http://dx.doi.org/10.1353/foc.2005.0008>
20. Hack M, Klein NK and Taylor HGLong-Term Developmental Outcomes of Low Birth Infants. *Future Child* 1995; 5: 176-196. <http://dx.doi.org/10.2307/1602514>
21. Anjum F, Javed T, Afzal MF, Sheikh GA. Maternal Risk Factors Associated with Low Birth Weight: A Case Control Study. *ANNALS* 2011; 17: 223-228.
22. Rakesh KN, Chandra SM, Maheshwar DM and Vijaya AN. Prevalence of Low Birth Weight at Primary Health Center of North Karnataka. *International Journal of Pharma Medicine & Biological Science* 2013; 2: 1-4.
23. Lopez NB, Choonara I. Can We Reduce the Number of Low-Birth-Weight Babies? The Cuban Experience. *Neonatology* 2009; 95: 193-197. <http://dx.doi.org/10.1159/000155649>
24. Negi KS, Kandpal SD, Kukreti M. Epidemiological Factors Affecting Low Birth Weight. *JK Science* 2006; 8: 31-34.

25. Agarwal K, Agarwal A, Agarwal VK, Agarwal P and Chaudhary V. Prevalence and Determinants of Low Birth Weight among Institutional Deliveries. *Annals of Nigerian Medicine* 2011; 5: 48-52. <http://dx.doi.org/10.4103/0331-3131.92950>
26. Akin Y, Cömert S, Turan C, Ünal O, Piçak A, Ger L and Telatar B. Increasing Low Birth Weight Rates in Istanbul. *Iranian Journal of Pediatrics* 2010; 20: 284-290.
27. Zhu BP. Effect of Inter Pregnancy Interval on Birth Outcomes: Findings from Recent US Studies. *International Journal of Obstetrics and Gynaecology* 2005; 89: 525-533. <http://dx.doi.org/10.1016/j.ijgo.2004.08.002>
28. Khatun S, Rahaman M. Socio-economic determinants of Low birth weight in Bangladesh. *Bangladesh Medical Research council Bull* 2008; 34: 81-86.
29. Yadav H, Lee N. Maternal Factors in Predicting Low Birth Weight Babies. *Medical Journal of Malaysia* 2013; 68: 44-47.
30. Department of Statistics Malaysia. *Vital Statistics Malaysia 2011*. Department of Statistics Malaysia, Putrajaya. 2012.
31. Yu Z, Han S, Zhu J, Sun X, Ji C, Guo X. Pre-Pregnancy Body Mass Index in Relation to Infant Birth Weight and Offspring Overweight/Obesity: A Systematic Review and Meta-Analysis. *PLoS ONE*, 2013; 8, e61627. <http://dx.doi.org/10.1371/journal.pone.0061627>
32. Boo NY, Lim SM, Koh KT and Ravindran, J. Risk Factors Associated with Low Birth Weight Infants in the Malaysian Population. *Medical Journal of Malaysia* 2008; 63: 306-310.