

Low Birth Weight in Omdurman Maternity Hospital

Dr.Somiya Gutbi Salim Mohammed

I. INTRODUCTION

Approximately, thirty million children worldwide are born with low birth weight every year, representing 23.8% of all births (WHO, 2009).

The World Health Organization (WHO) has defined LBW as a weight at birth of less than 2500g (5.5 pounds). This definition of low birth weight (LBW) was endorsed by the first World Health assembly in 1948. This practical cut-off for international comparison is based on epidemiological observation that infants weighing less than 2500g are approximately twenty times more likely to die than heavier babies. LBW is more common in developing than developed countries. A birth weight below 2500g contributes to range of health outcomes. Reducing LBW incidence by at least one third between 2000- 2012 is one of the major goals in 'world fit for children' the declaration and plan of action adopted at the United Nations general assembly especial session on children on 2002. The reduction of low birth weight forms an important contribution to the Millennium Development Goals (MDGs) for reducing the child mortality (UNICEF, 2004).

Low birth weight (LBW) is a risk factor for a variety of adverse health outcomes, particularly among babies with very low birth weight. Such babies face many of the health problems associated with premature births.

Birth weight is one of the most important individual factors influencing the neonatal death rate. Prematurity (born before 37 weeks of gestation) and intrauterine growth retardation (a condition where fetal growth has been constrained) are the two main causes of low birth weight. Both depend on the duration of gestation and on the adequacy of maternal nourishment and other factors in utero (Behrman & Kliegman, 2002).

Low birth weight is associated with impaired immune function, poor cognitive development, and high risks of developing acute diarrhea or pneumonia. It also affects the infant mortality rate, especially in premature babies. Infant mortality rates are 6 times higher if the birth occurs between weeks 34-36 of gestation, and 40 times higher if the birth occurs before week 34 of gestation. Birth weight is also associated with infant and child morbidity. Low birth weight (LBW) represents the third leading cause of death in children in developing countries, and is the most significant predictor of death, health, growth, and development (Institute of Medicine, 1985).

Therefore, LBW may result from short gestation (prematurity) or from intra uterine growth retardation, or a combination of both. Prematurity is more common in industrialized countries, while intrauterine growth retardation is common in developing countries. It is estimated that of the 22 million cases of LBW deliveries that occur every year, 20 million are in developing countries (Mahjub, et. al, 1997).

Infants weighing 2000-2499 g at birth are 4 times more likely to die during their first 28 days of life than infants who weigh 2500-2999 g, and 10 times more likely to die than infants

weighing 3000-3499 g Low birth weight infants are 5 times more likely than normal birth weight infants to die later in the first year and account for 20 percent of post neonatal deaths . (Judith & laura, 2000).

This research is an attempt to assess the problem of low birth weight at Omdurman Maternity Hospital focusing on causes, risk factors, and management of this major health and nutritional problem.

Justification:

Birth weight is a powerful predictor of infant growth and survival. An infant born with a low birth weight begins life immediately at a disadvantage and faces extremely poor survival rates. Approximately, every ten seconds an infant born in developing countries dies from diseases or infections that can be attributed to low birth weight.

Despite that, there is improvement in maternal and child health services in developing countries including Sudan, yet high prevalence of low birth weight has been documented. This draws the researchers' attention to investigate about the risk factors associated with low birth weight and to provide some recommendations to improve the situation.

Objectives:

General objective:

To determine the risk factors of low birth In Omdurman Maternity Hospital in the period From June 2010 to February 2011.

Methodology:

Study Area:

This study was cross sectional study carried out in Omdurman Maternity Hospital. The hospital had been established in the year 1957 as the first specialized hospital in Sudan, for the purpose of providing more care and medical services to mothers and newly born babies. Also, it is considered to be the main training center for the midwives. It is located in South Western area of Omdurman. At the beginning, it started with one building for delivery with 34 beds. Different sections had been then added to the first building, such as nursery of the newly born infants in 1977, the major operation theater in 1979, sterilization room in 1982, and private rooms in 1993.

Study Population:

Population of this study includes all mothers who gave birth to low birth weight infants in the hospital during the study time (June to December). In the process of selection of the mothers, no choice of socioeconomic status, education level, ethnicity, and religion had been made.

Sampling Methods: Purposive sampling was used for sample selection. All mothers of low birth weight infants during the period of the study were included in this research.

Sample Size: One hundred and fifty low birth weight babies were included with their mothers in this study. All the available children who show criteria of admission were included in this study.

Methods of Data Collection: Two methods of data collection were used in this study:

1/ Questionnaire (appendix-1): Interview following structural questions which included:

- A- Information about socio demographic variables.
- B- Medical and obstetric information.
- C- Life style factors.
- D- Food Frequency data.

2/ Anthropometric measurements include:

- A- Height of the mothers.
- B- Weight of the mothers.

C- Weight of the babies.

3.9. Method of Data Analysis:

Statistical analyses were performed using Statistical Package for Social Sciences (SPSS) version 12 program. Descriptive analyses were performed including frequencies of all variables and percentages and chi-square test to determine the relationship between birth outcomes and certain maternal, fetal and socio- demographic factors. A statistical significance was set at P value < 0.05.

II. RESULTS AND DISCUSSION

Table (1) Age of the respondents:

| Maternal age | Frequency | Percentage |
|---------------|------------|---------------|
| < 20 years | 31 | 20.7% |
| 20-30 years | 92 | 61.3% |
| 31 - 40 years | 24 | 16.0% |
| > 40 years | 3 | 2.0% |
| Total | 150 | 100.0% |

Table (2) Weight of new born and maternal age:

| Maternal age | Weigh of new born | | | | | | | |
|---------------|-------------------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|
| | < 1kg | | 1-1.4 kg | | 1.5-1.9kg | | 2-2.4kg | |
| | F | % | F | % | F | % | F | % |
| < 20 years | 3 | 11.5% | 19 | 28.4% | 6 | 17.6% | 3 | 13.0% |
| 20-30 years | 18 | 69.2% | 40 | 59.7% | 20 | 58.8% | 14 | 60.9% |
| 31 - 40 years | 5 | 19.2% | 7 | 10.4% | 7 | 20.6% | 5 | 21.7% |
| > 40 years | 0 | 0.0% | 1 | 1.5% | 1 | 2.9% | 1 | 4.3% |
| Total | 26 | 100.0% | 67 | 100.0% | 34 | 100.0% | 23 | 100.0% |

P value=0.1

Table (1) shows that, the majority of the respondents (61.3%) were in the age group between 20-30 years, and only (2.0%) of them their ages were more than 40 years. No significant correlation was found between weight of new born and maternal age (p=0.1). It was observed that, low birth weight was more prevalent among the mothers of age group between 20-

30 years. The present study is not in line with previous studies which proved that pregnancy of mothers of less than 20 years have increased risk of low birth weight infants. On the other hand, the risk of preterm birth is shown to increase as maternal age increases above 30 years compared to 25-29 years old (Miller, et. al, 1996).

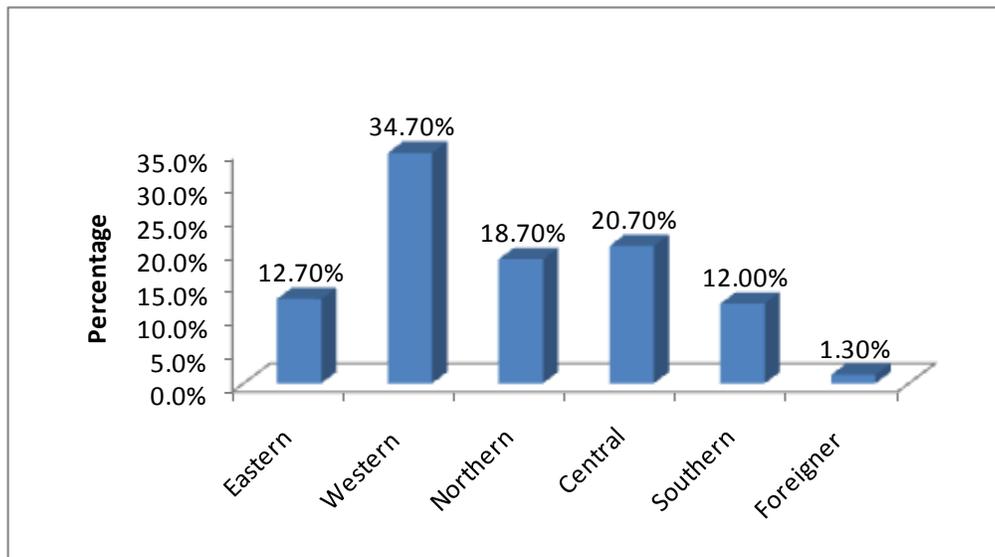


Figure (1) Mothers original place

The above figure shows that, the highest percentage of the mothers came from Western Sudan (34.7%), (20.7%) of the mothers were from Central Sudan, (18.7%) belonged to the Northern regions, (12.7%) came from the Eastern of Sudan, and the others (12.0%) of them came from the Southern part of

Sudan. It was observed that, the lowest percentage of the mothers was found among the foreigners who came from the neighboring countries (1.3%). This result reflected that, LBW problem was common in all parts of Sudan.

Table (3) Occupation of mother and father:

| Occupation | Respondents | frequency | percentage |
|----------------------------|---------------|------------|---------------|
| Mother's occupation | Housewife | 127 | 84.7% |
| | Student | 9 | 6.0% |
| | Professional | 10 | 6.7% |
| | Labor | 4 | 2.7% |
| | Total | 150 | 100.0% |
| Father's occupation | Laborer | 93 | 62.0% |
| | Free business | 40 | 26.7% |
| | Professional | 11 | 7.3% |
| | Merchant | 6 | 4.0% |
| | Total | 150 | 100.0% |

As shown in Table (3), the majority of the studied women were found to be housewives (84.7%), and only (2.0%) of them were laborers. Regarding their husbands, (62.0 %) of them were laborers, while only (4.0%) were merchants. Duration of work, type of work, and workplace activities are important factors related to pregnancy. Many attempts have been made to explain

the effects of work on pregnancy outcomes. Some women continue to hide their pregnancy due to fear of losing their job and even continue to perform hard activities in addition to their domestic responsibilities. Stress associated with prolonged strenuous work may initiate labor (Simpson, 1993).

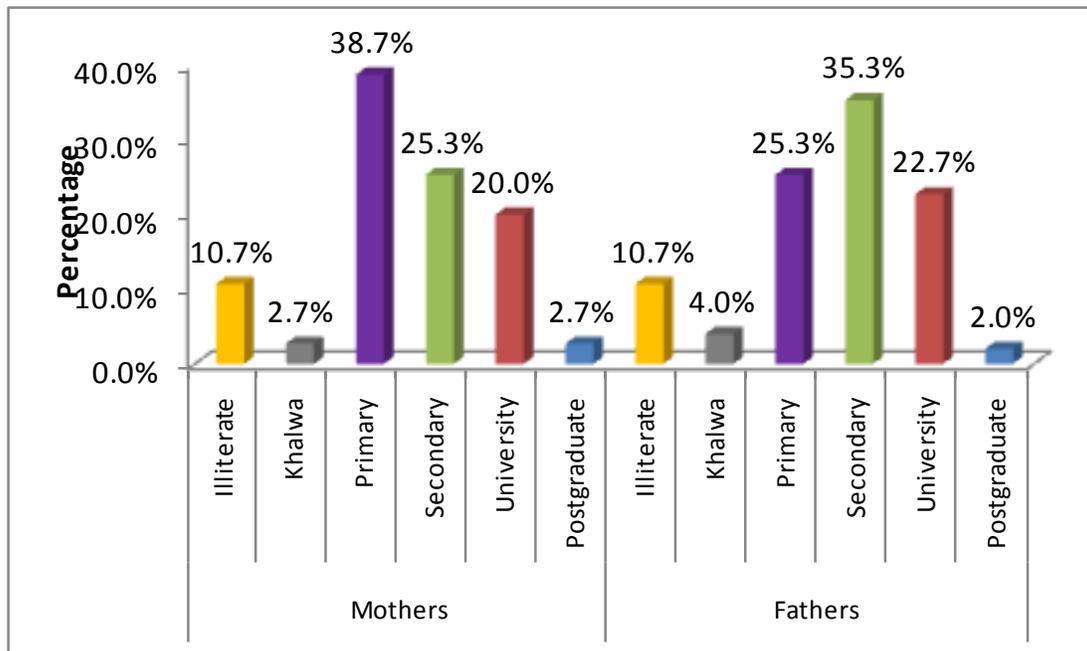


Figure (2) Educational level of mothers and fathers

Figure (2) shows that, (38.7%) and (25.3%) of the mothers and fathers in the present study had primary level of education, only (2.0%) of the fathers had postgraduate studies while (10.7%) of them were illiterate. One of the risk factors for giving birth to a LBW neonate is the mother's level of education. Currie & Moretti, (2003) found that one year of maternal education reduces both the probabilities of low birth weight and premature birth by 1 percentage point. Another study

found that, mother's education had a significant independent effect on birth weight, with literate mothers having bigger babies than the illiterates, on average. However, it is also possible that the effect of education on birth weight is, to some extent, a reflection of other influences such as maternal nutrition which can also be enhanced by better income opportunities for educated mothers or couples (Oni, 1986).

Table (4) Age of menarche:

| Age of Menarche | Frequency | Percentage |
|-----------------|------------|---------------|
| 10-13 years | 72 | 48.0% |
| 14-17 years | 78 | 52.0% |
| Total | 150 | 100.0% |

Regarding age of menarche, table (4.4) shows that (52.0%) of mothers' menarche age ranged between 14- 17 years, while (48.0%) of them ranged between 10- 13 years. In literature, Coall

(2003) found that women who had early menarche were more likely to produce LBW babies.

Table (5) Birth interval:

| Birth interval | Frequency | Percentage |
|--------------------|------------|---------------|
| Less than one year | 79 | 52.7% |
| 1-2 years | 38 | 25.3% |
| 2.1-3 years | 20 | 13.3% |
| More than 3 years | 13 | 8.7% |
| Total | 150 | 100.0% |

Regarding birth interval, table (4.5) reveals that more than half of the infants' mothers had pregnancy intervals of less than one year (52.7%), (25.3%) had pregnancy intervals between 1-2

years, (13.3%) between 2.1-3 years, and (6.7%) of the subject mothers reported for more than 3 years' birth intervals. The small inter-pregnancy interval between the birth of one child and

conception of the next appears to be one of the factors associated with preterm birth (less than 37 weeks), low birth weight (less than 2500 g), and growth restriction (Bujold & Gauthier, 2010). The present study findings are similar to researchers findings which revealed that infants born to women who conceived less than six months after giving birth had a 40% increased risk for

being born prematurely and a 61% increased risk of low birth weight, compared with infants born to mothers who waited 18 months to 2 years between pregnancies. The analysis suggests that better pregnancy spacing could have a dramatic impact on neonatal complications and deaths.

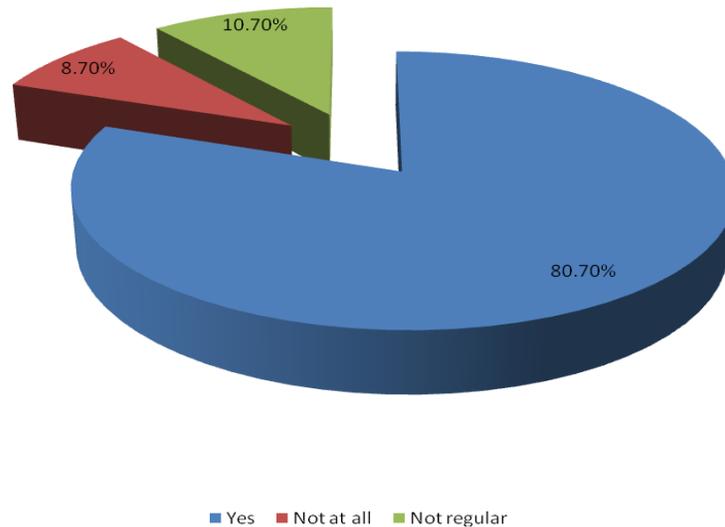


Figure (3) Regular visits to antenatal care unit

Figure (3) shows that, the majority of the women in this study (80.7%) had regularly visited antenatal care units and only (8.6%) did not. The rest (10.7%) of the mothers had irregular visits to the antenatal care during the period of pregnancy. Despite that, the LBW was found to be high among mothers who had been regularly visited the antenatal care units, which means

that they did not receive high quality care. An important reduction in the incidence of low births could be expected if women could attend an adequate number of antenatal care visits. This confirmed by study proved that women with optimal antenatal care and perfect care during their pregnancies have babies with normal birth weights (Mbugbaw & Gofin, 2010).

Table (6) Level of hemoglobin during pregnancy:

| Hemoglobin (Hb) | Frequency | Percentage |
|-----------------|------------|---------------|
| Unknown | 5 | 3.3% |
| < 50% | 14 | 9.3% |
| 50-70% | 48 | 32.0% |
| 71-80% | 71 | 47.3% |
| > 80% | 12 | 8.0% |
| Total | 150 | 100.0% |

Table (6) showed that, (47.3%) of the respondents had hemoglobin level ranged between (71-80%), (32%) had hemoglobin level ranged between (50-70%), (3.3%) their level was less than (50%) while only (8.0%) of the respondents had hemoglobin level of more than (80%). In this study, it seems that the hemoglobin level has no great effect on the maternal

outcomes. Despite that the majority of mothers their blood level is high but still they delivered LBW. This result differs from study demonstrated that, mothers who delivered preterm LBW babies had significantly lower hemoglobin levels at delivery when compared with those who had normal birth weight deliveries (Lawoyin, 1997).

Table (7) Bleeding during current pregnancy:

| Time of bleeding during pregnancy | Frequency | Percentage |
|-----------------------------------|-----------|------------|
| 1st trimester | 6 | 4.0% |

| | | |
|----------------------|------------|---------------|
| 2nd trimester | 10 | 6.7% |
| 3rd trimester | 10 | 6.7% |
| No bleeding | 124 | 82.7% |
| Total | 150 | 100.0% |

Table (8) Correlation of weight of newborn and bleeding during pregnancy:

| Time of bleeding during pregnancy | Weigh of new born | | | | | | | |
|-----------------------------------|-------------------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|
| | < 1kg | | 1-1.4 kg | | 1.5-1.9kg | | 2-2.4kg | |
| | F | % | F | % | F | % | F | % |
| 1st trimester | 0 | 0.0% | 6 | 9.0% | 0 | 0.0% | 0 | 0.0% |
| 2nd trimester | 0 | 0.0% | 8 | 11.9% | 0 | 0.0% | 2 | 8.7% |
| 3rd trimester | 2 | 7.7% | 8 | 11.9% | 0 | 0.0% | 0 | 0.0% |
| No bleeding | 24 | 92.3% | 45 | 67.2% | 34 | 100% | 21 | 91.3% |
| Total | 26 | 100.0% | 67 | 100.0% | 34 | 100.0% | 23 | 100.0% |

P value=0.4

Table (7) explained that, the majority of the respondents did not experience bleeding during pregnancy (82.7%), (6.7%) experienced bleeding both at 2nd or 3rd trimesters while (4.0%) have experienced bleeding during the first semester. In table (4.8), no significant correlation was found between weight of newborn and the occurrence of bleeding during pregnancy (P

value= 0.4). The present study was different from previous studies which revealed that, vaginal bleeding occurs in (20% to 30%) of confirmed pregnancies during the first 20 week of gestation and associated with other adverse pregnancy outcomes such as low birth weight, preterm birth, stillbirth, and prenatal death (Phillip, 2009).

Table (4.9) Uterus diseases:

| Diseases of the uterus cervix | Frequency | Percentage |
|-------------------------------|------------|---------------|
| Yes | 30 | 20.0% |
| No | 120 | 80.0% |
| Total | 150 | 100.0% |

Table (10) Previous preterm labor:

| Previous preterm | Frequency | Percentage |
|------------------|------------|---------------|
| Yes | 42 | 28.0% |
| No | 108 | 72.0% |
| Total | 150 | 100.0% |

The majority of the mothers (80.0%) as shown in table (4.9) had no abnormalities in uterus and cervix, only 20.0% showed uterus and cervix abnormalities. Table (4.10) explained that, previous preterm labor was found among (28.0%) of the

respondents. Pervious study found that diseases in the uterus and cervix were associated with a higher incidence of preterm births (Ramsay & Goldenberg, 2001).

Table (11) Gestational age:

| Gestational age | Frequency | Percent |
|----------------------|------------|-------------|
| < 37 weeks | 90 | 60.0% |
| 37 - 42 weeks | 54 | 36.0% |
| > 42 weeks | 6 | 4.0% |
| Total | 150 | 100% |

Table (11) shows that, most of the infants were born before 37 weeks of gestational age (60%), (36%) of them between 37-42 weeks of gestation while only (4.0%) of them were born after 42 weeks of gestation. Study by Mansour, et. al, (2002) found

that, infants who were born before 37 weeks of gestational age were 16 times at higher risk of having low birth weight than babies who were born at 37-42 weeks of gestation.

Table (12) Diseases associated with low birth weight:

| Diseases associated with low birth weight | Frequency | Percentage |
|---|------------|---------------|
| None | 84 | 56.0% |
| Preeclampsia | 2 | 1.3% |
| Hypertension | 23 | 15.3% |
| Urinary tract infections | 21 | 14.0% |
| Anemia | 8 | 5.3% |
| Malaria | 12 | 8.0% |
| Total | 150 | 100.0% |

Table (13) Weight of newborn and diseases associated with LBW babies:

| Diseases associated with low birth weight | Weigh of new born | | | | | | | |
|---|-------------------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|
| | < 1kg | | 1-1.4 kg | | 1.5-1.9kg | | 2-2.4kg | |
| | F | % | F | % | F | % | F | % |
| None | 16 | 61.5% | 30 | 44.8% | 24 | 70.6% | 14 | 60.9% |
| Preeclampsia | 0 | 0.0% | 2 | 3.0% | 0 | 0.0% | 0 | 0.0% |
| Hypertension | 6 | 23.1% | 12 | 17.9% | 0 | 0.0% | 5 | 21.7% |
| UTIs | 4 | 15.4% | 11 | 16.4% | 6 | 17.6% | 0 | 0.0% |
| Anemia | 0 | 0.0% | 6 | 9% | 0 | 0.0% | 2 | 8.7% |
| Malaria | 0 | 0.0% | 6 | 9% | 4 | 11.8% | 2 | 8.7% |
| Total | 26 | 100.0% | 67 | 100.0% | 34 | 100.0% | 23 | 100.0% |

P value=0.02

In table (12), the most common diseases among the mothers in the present study were hypertension (15.3%), UTIs (14.0%), malaria (8.0%) and anemia (5.3%). Table (4.13) also shows the significant correlation was found between weight of new born and diseases prevalent among their mothers (p value=0.02). These diseases stated in many previous studies as determinants of low birth weight babies. In the present study prevalence of low birth weight were more among hypertensive mothers and mothers with urinary tract infections. The finding is in line with the previous studies which revealed that, pregnant women with urinary tract infections had more low birth weight babies than pregnant women without urinary tract infections (Uncu, et. al, 2002).

High blood pressure during pregnancy is at higher risk of having a low birth weight infant, when compared to normal blood pressure during pregnancy. Moreover, infants who were born to mothers with preeclampsia had weights less than infant were born to the mothers without preeclampsia. This diagnosed when the mother have high blood pressure, positive protein in urine and edema (Mansour, et. al, 2002).

Regarding anemia, as stated in the literature, maternal anemia diagnosed prior to mid pregnancy has been associated with increased risk of preterm delivery (Scholl & Reially, 2000).

For malaria, results of many studies stated that malaria in pregnant women is a major determinant of low birth weight (Onis, 2001).

Table (14) Drugs taken during pregnancy:

| Drugs taken during pregnancy | Frequency | Percentage |
|------------------------------|------------|---------------|
| None | 6 | 4.0% |
| Folic acid | 100 | 66.7% |
| Aspirin | 6 | 4.0% |
| Antibiotics | 19 | 12.7% |
| Vitamins | 19 | 12.7% |
| Total | 150 | 100.0% |

Table (15) Weight of newborn and drugs taken during pregnancy:

| Drugs taken during pregnancy | Weigh of new born | | | | | | | |
|------------------------------|-------------------|-------|----------|-------|-----------|-------|---------|-------|
| | < 1kg | | 1-1.4 kg | | 1.5-1.9kg | | 2-2.4kg | |
| | F | % | F | % | F | % | F | % |
| None | 0 | 0.0% | 2 | 3.0% | 4 | 11.8% | 0 | 0.0% |
| Folic acid | 19 | 73.1% | 47 | 70.1% | 24 | 70.6% | 10 | 43.5% |
| Aspirin | 0 | 0.0% | 6 | 9.0% | 0 | .0% | 0 | 0.0% |

| | | | | | | | | |
|--------------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|
| Antibiotics | 3 | 11.5% | 8 | 11.9% | 4 | 11.8% | 4 | 17.4% |
| Vitamins | 4 | 15.4% | 4 | 6.0% | 2 | 5.9% | 9 | 39.1% |
| Total | 26 | 100% | 67 | 100% | 34 | 100% | 23 | 100% |

P value=0.002

Table (14) shows that, (96.0%) of the mothers had taken drugs during pregnancy such as folic acids (66.7%), antibiotics (12.7%), vitamins (12.7%), and aspirin (4.0%), while only (4.0%) of them did not use any type of drugs. In table (4.15), significant correlation was found between the use of drugs during pregnancy and weight of new born ($p=0.002$). A study had shown that, uses of iron and folic acid supplements appeared to affect birth weight. Mothers who took supplements appeared to have low percentage of LBW babies. While the use of certain

medications such as antibiotics and aspirin by the mother during pregnancy was associated with having a LBW baby, the association being statistically significant (Kramer, 1991). In this study more than three quarters of the studied mothers had been used to take vitamins and minerals supplements (79.4%) needed during pregnancy. Poor socioeconomic status of families and unavailability and inaccessibility of antenatal care services could be blamed to cause this result.

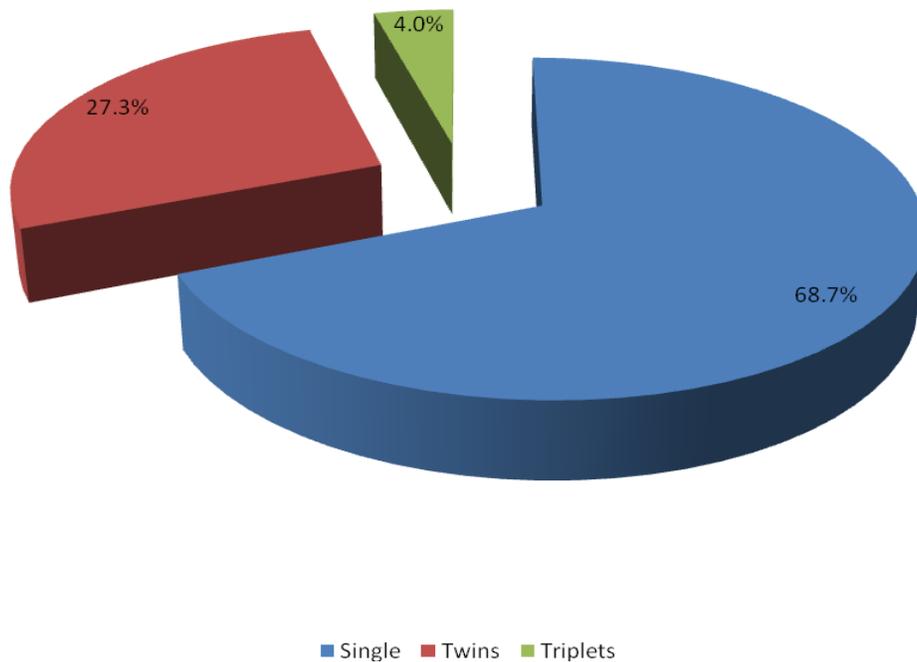


Figure (4) Type of outcome

In figure (4), the present study demonstrated that (68.7%) of the mothers had single outcome, (27.3%) had twins whereas only (4.0%) had triplets outcome. The risk of giving birth to a LBW infant increased significantly in multiple gestations as stated in many studies. Multiple pregnancies ([twins](#), triplets, etc.) are

significant factors in preterm births. Study by Gardener, et.al, (1995) found that, (54%) of twins were delivered preterm versus (9.6%) of singleton births. Triplets and more are even more endangered.

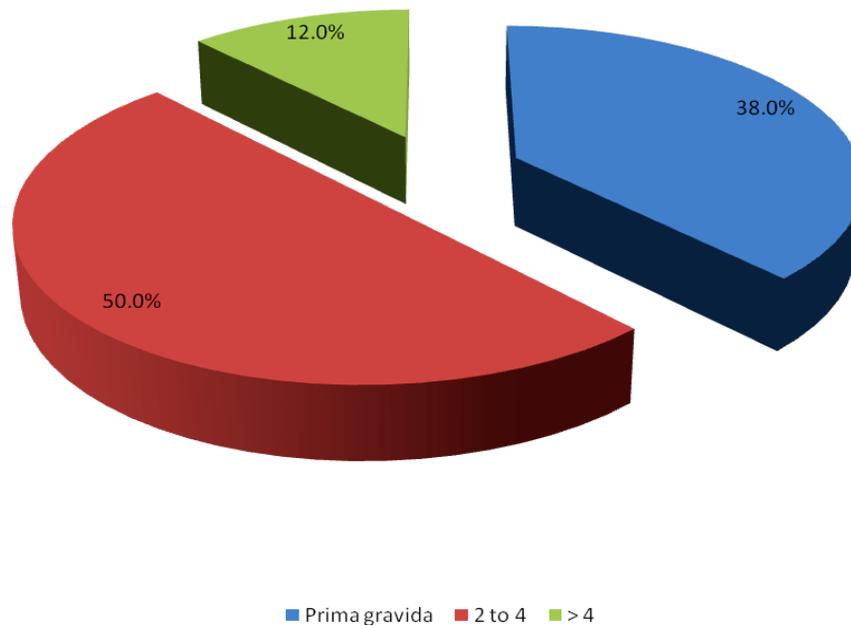


Figure (5) Number of deliveries

The above figure demonstrates that, half of the mothers were multigravid with 2-4 children and (12.0%) of them have more than four children. (38.0%) of the studied mothers were primagravid. The present study was similar to study revealed

that, prima gravid mothers were comparatively at lower risk of delivering LBW babies (18.4%) as compared to multi-gravid mothers (28.9%) (Sharma, et.al, 2009).

Table (16) Weight of newborn:

| Weight of new born | Frequency | Percentage |
|--------------------|------------|---------------|
| < 1kg | 26 | 17.3% |
| 1-1.4 kg | 67 | 44.7% |
| 1.5-1.9kg | 34 | 22.7% |
| 2-2.4kg | 23 | 15.3% |
| Total | 150 | 100.0% |

Regarding birth weight of new born, table (4.16) demonstrated that (44.7%) of the new born weight ranged between 1-1.4 kg, (22.7%) their weight ranged between 1.5-1.9 kg, and (15.3%) ranged between 2 -2.4 kg.

Table (17) Type of delivery:

| Type of delivery | Frequency | Percentage |
|------------------|------------|---------------|
| Normal | 77 | 51.3% |
| Cesarean | 73 | 48.7% |
| Total | 150 | 100.0% |

Table (17) found that, nearly half of the mothers delivered through cesarean section (48.7%).The chance of the baby and his mother survival may increase through cesarean section. A survival advantage observed among very low birth weight infants

delivered through cesarean section independent of a number of maternal medical and labor complications, and demographic risk factors (Malloy, 2008).

Table (18) Mothers' weight (in kg):

| Mother's weight(in kg) | Frequency | Percentage |
|------------------------|------------|---------------|
| < 50 | 18 | 12.0% |
| 50-60 | 46 | 30.7% |
| 61-70 | 53 | 35.3% |
| > 70 | 33 | 22.0% |
| Total | 150 | 100.0% |

Table (19) Weight of newborn and mothers' weight:

| Mother's weight (in kg) | Weigh of new born | | | | | | | |
|-------------------------|-------------------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|
| | < 1kg | | 1-1.4 kg | | 1.5-1.9kg | | 2-2.4kg | |
| | F | % | F | % | F | % | F | % |
| < 50 | 2 | 7.7% | 6 | 9.0% | 4 | 11.8% | 6 | 26.1% |
| 50-60 | 8 | 30.8% | 22 | 32.8% | 12 | 35.3% | 4 | 17.4% |
| 61-70 | 8 | 30.8% | 25 | 37.3% | 10 | 29.4% | 10 | 43.5% |
| > 70 | 8 | 30.8% | 14 | 20.9% | 8 | 23.5% | 3 | 13.0% |
| Total | 26 | 100.0% | 67 | 100.0% | 34 | 100.0% | 23 | 100.0% |

P value=0.03

Table (18) shows that, (35.3%) of the mothers' weight ranged between 61-70 kg, (30.7%) of the mothers their weights ranged between 50-60 kg, (22.0%) of them their weights were more than 70 kg, and (12.0%) of those mothers' weights were less than 50 kg. In table (4.19), a significant correlation was found between newborn weight and mothers' weight (P=0.03).

Numerous studies have clearly established a good correlation between birth weight and maternal weight. Previous study revealed that, poorly nourished mothers with pre pregnancy weight below 45kg was found to have a significant risk for deliver low birth weight infants (P=0.001) (Sharma, et. al, 2009).

Table (20) Mothers' height (in cm):

| Mother's height (in cm) | Frequency | Percentage |
|-------------------------|------------|-------------|
| < 150 | 46 | 30.7% |
| > 150 | 104 | 69.3% |
| Total | 150 | 100% |

Table (21) Correlation between mothers' height and newborn weight:

| Mother's height (in cm) | Height of new born | | | | | | | |
|-------------------------|--------------------|---------------|-----------|---------------|-----------|---------------|-----------|---------------|
| | < 1kg | | 1-1.4 kg | | 1.5-1.9kg | | 2-2.4kg | |
| | F | % | F | % | F | % | F | % |
| < 150 | 10 | 38.5% | 22 | 32.8% | 10 | 29.4% | 4 | 17.4% |
| > 150 | 16 | 61.5% | 45 | 67.2% | 24 | 70.6% | 19 | 82.6% |
| Total | 26 | 100.0% | 67 | 100.0% | 34 | 100.0% | 23 | 100.0% |

P value=0.01

Regarding mothers' height, (69.3%) of the mothers' heights were more than 150 cm, and the other (30.7%) of them were below 150 cm. In table (4.21), a significant correlation was found between increased maternal height and low weight of new born babies (P=0.01). Maternal height is a result of genetic factors, environmental effects and nutrition. The exact mechanism of how a maternal height influences pregnancy outcome is not clear.

The present study was different from study stated by Ghosh, et.al, (2000), who found that mothers who were less than 150 cm in height were more prone to have low birth weight infants. Reasons behind this result may include inadequate nutrition, poor levels of education and occupation, inaccessible health and nutrition care services.

Table (22) Smoking habit

| Smoking use | Frequency | Percentage |
|------------------------|------------|---------------|
| Yes | 2 | 1.3% |
| No | 130 | 86.7% |
| Passive smoking | 18 | 12.0% |
| Total | 150 | 100.0% |

Table (4.22) shows that, (86.7%) of the mothers did not use to smoke, and (12%) of them were exposed to smoking while only (1.3%) of them were smokers. This is confirmed with recent studies demonstrated that pregnant women who exposed to passive smoking have higher risks of delivering a child with

congenital abnormalities, smaller head circumferences, and low birth weight (Salmasi, et. al, 2010).

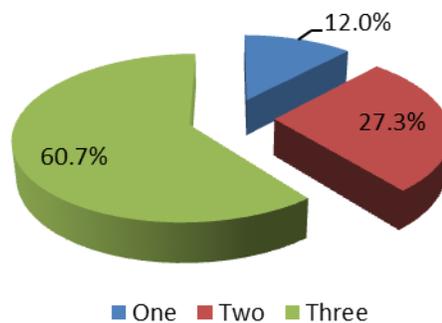


Figure (6) Number of meals per day

Figure (6) shows that, (12.0%) of the mothers had taken one meal per day, (27.3%) had taken two meals per day, while (60.7%) of the mothers had taken three meals per day or more. Some women during pregnancy suffer from [heartburn](#) or other

eating disorders and advised to eat small frequent meals. Nutritional deficiencies usually associated with birth defects and several health and nutritional consequences for both infants and their mothers (Lundy & Janes, 2001).

Table (23) Food frequency:

| Food items | Daily | 2times/ week | Once/week | Monthly | Never | Total |
|-------------------------------|--------|-----------------|-----------|---------|-------|-------|
| | % | % | % | % | % | % |
| Cereals | | | | | | |
| Rice | 0.0% | 36.7% | 25.3% | 38.0% | 0.0% | 100% |
| Bread | 100.0% | 0.0% | 0.0% | 0.0% | 0.0% | 100% |
| Kisra | 25.3% | 24.7% | 0.0% | 12.0% | 38.0% | 100% |
| Legumes | | | | | | |
| Bean | 24.7% | 50.0% | 12.7% | 12.7% | 0.0% | 100% |
| Lentils | 0.0% | 50.0% | 25.3% | 12.0% | 12.7% | 100% |
| Meats | | | | | | |
| Beef | 37.3% | .0% | 50% | 0.0% | 12.7% | 100% |
| Lamb | 24.7% | 25.3% | 50% | 0.0% | 0.0% | 100% |
| Chicken | 0.0% | 37.3% | 37.3% | 0.0% | 25.3% | 100% |
| Fish | 0.0% | 25.3% | 25.3% | 12.7% | 36.7% | 100% |
| Egg | 25.3% | 36.7% | 0.0% | 38.0% | 0.0% | 100% |
| Milk and milk products | | | | | | |
| Milk | 62.0% | .0% | 12.7% | 12.7% | 12.7% | 100% |
| Yoghurt | 12.7% | 24.7% | 25.3% | 12.7% | 24.7% | 100% |

| | | | | | | |
|----------------------|-------|-------|-------|-------|-------|------|
| Cheese | 36.7% | 0.0% | 12.7% | 25.3% | 25.3% | 100% |
| Vegetables | | | | | | |
| Cooked vegetables | 62.7% | 24.7% | 0.0% | 12.7% | 0.0% | 100% |
| Fresh vegetables | 87.3% | 0.0% | 0.0% | 0.0% | 12.7% | 100% |
| Drinks | | | | | | |
| Fresh natural juices | 50.0% | 12.0% | 0.0% | 12.7% | 25.3% | 100% |
| Coffee | 12.7% | 12.7% | 0.0% | 0.0% | 74.7% | 100% |
| Tea | 12.0% | 12.7% | 12.0% | 25.3% | 38.0% | 100% |
| Soft drinks | 12.7% | 0.0% | 24.7% | 0.0% | 62.7% | 100% |
| Fruits | | | | | | |
| Fresh fruits | 36.7% | 25.3% | 12.7% | 25.3% | 0.0% | 100% |

The process of pre-pregnancy nutrition is a process of "building up" the immune system in preparation of pregnancy, and is known as being one of the major factors in determining the success rate of conceiving healthy children. Inadequate nutrition is the most commonly implicated cause of impaired foetal growth (Lundy & Janes). Table (4.23) demonstrated frequency of food consumed by the mothers in the present study.

It was observed that bread, milk and its products, stewed and fresh vegetables, and fresh juices were more consumed by the subject mothers more than the other types of food. Milk is an important source of dietary calcium and an association was observed in epidemiological studies from Ethiopia where the high calcium content in the diet has led to reduced incidence of preeclampsia and eclampsia (Atallah, et. al, 2002).

Lamb and beef were more consumed than the other types of meat among the subject mothers. White meat and red meat were classified under the most expensive types of food in Sudan, as most of the people cannot afford. Pregnant women need food contain protein of high biological value to face the fetal demand.

Regarding consumption of vegetables, mothers in the present study consumed fresh vegetables more than cooked vegetables, this reflected the women' knowledge of the nutritive values of fresh vegetables which is considered as protective foods and good source of vitamins, minerals, and fibre. Half of the women in the present study have been used to drink natural fruits juices. Drinking of juices is highly recommended for the pregnant woman. From our observation these mothers do not reveal the right amount food they consumed otherwise they would deliver normal weight infants.

III. CONCLUSION AND RECOMMENDATIONS

Low birth weight affects a large number of births annually and is one of the leading health problems of the world.

The factors that causing low birth weight are so many and vary from community to another and they may be interdependent on each others. It was concluded that, low birth weight solutions require package of interventions ,and that these need to be incorporated into all antenatal health care programs including safe motherhood programs, reproductive health programs and integrated management of childhood illness programs.

The study recommended multiple approaches including ,early and regular prenatal care ,hospitals or clinics should provide high quality care services, mothers should be advised on good nutrition before and during pregnancy which serves as one of the pillars of a healthy status, and effective health education

programs for mothers should be organized using different mass media. More researches are needed in the area of low birth weight to guide education effort to modify behaviors leading to birth of low weight babies.

REFERENCES

- [1] Atallah, A.N., Hofmeyr, G. J., Duley, L. (2006). Calcium Supplementation During Pregnancy for Preventing Hypertensive Disorders and Related Problems. Cochrane Database System Rev.Update in: Cochrane Database Syst Rev. 2010;(8):CD001059. PMID: 16855957.
- [2] Behrman, R.E. &Kliegman, R.M.(2002) Nelson Essentials of Pediatrics .4thedition. Philadelphia, W.B. Saunders.
- [3] Bujold, E. & Gauthier, R.J., (2010). Risk of Uterine Rupture Associated with an Inter Delivery Interval Between 18 and 24 Months. *Jobstetrics & Gynecology*. vol. 115:1003.
- [4] Coall, D.A. (2003).Weight. *Chisholm JSocSci Med*. Vol. 57(10):1771-1781.
- [5] Currie, J. &Moretti, E. (2003). Mother's Education and the Intergenerational Transmission of Human Capital: Evidence from College Openings. *Quarterly Journal of Economics*. vol. 118, (4):1495-1532.
- [6] Ghosh, S., Hooja, V. and Ahmed, H.A. (2000). Longitudinal Study of Length, Weight and Head Circumference from Birth to Two Years among Children of Higher Socio-economic Urban Community in Delhi. *Indian Pediat*. vol. 11:395-398.
- [7] Judith, P. & Laura, K. (2000). Low Birth Weight. *Nutrition Policy Paper*. No.18,Bangladesh: International Centre for Diarrhoeal Disease Research.
- [8] Kramer, M.S. (1991). The LBW Determinants. *Bulletin of the World Health Organization*, 1:1-377.
- [9] Lawoyin, T.O. (1997).The Relationship Between Maternal Weight Gain in Pregnancy, Hemoglobin Level, Stature, Antenatal Attendance and Low Birth Weight. *Southeast Asian J Trop Med Public Health*. vol. 28(4):873-6.
- [10] Lundy, K.S &Janes, S. (2009).Community Health Nursing: Caring for the Public's Health.2nd edition. Sudbury: Jones and Bartlett learning.
- [11] Mahjub, H.,Rahimi, A. &Moshtaghi, A.A. (1997).Determination of Some Risk Factors of LBW in Hamadan. *Journal of Hamadan University of Medical Sciences*. vol. 5(9):25-28.
- [12] Malloy, M.H. (2008).Impact of Cesarean Section on Neonatal Mortality Rates among Very Preterm Infants in the United States, 2000-2003. *Pediatrics*. vol. 122 (2): 285-292.
- [13] Mbuagbaw, L.C.& Gofin, R. (2010). Social of Behavioral. *Maternal and Child Health Journal*. USA: University of Nebraksa.Vol. 10(5): 451-460.
- [14] Miller, H.S.,Lesser, K.B. & Reed, K.L. (1996). Adolescence and Very Low Birth Weight Infants: a disproportionate Association. *J Obstetric Gynecology*. vol. 87:83-88.
- [15] Monsour, E.,Eissa, A.N., Nofal, L.M., Kharboush, I., Wagida, A.& Sallam, I. (2002). Incidence and Factors leading to low birth weight in Egypt. *International pediatrics*.vol. 17 (4):223-229.
- [16] Oni, G.A. (1986). The Effects of Maternal Age, Education, and Parity on Birth weight in a Nigerian Community. *Journal of Tropical Pediatrics*.vol. 32. No. 6: 295-300.
- [17] Onis, M.D.(2001). Intrauterine Growth Retardation. Health and nutrition emerging and reemerging issues in developing countries. Brief 6 of 11.

- [18] Phillips, R., Heine G.K.& Swamy, G.K. Vaginal Bleeding During Early Pregnancy. The Merck Manuals. New Jersey: Merck Sharp & Dohme Corp; (2009).
- [19] Ramsay, P. S.& Goldenberg, R. L. (2001).Obstetric management of prematurity. In: Fanaroff, A.A., Martin, R. J., eds. Neonatal Perinatal Medicine: Disease of fetus and infants. Mosby, 287-319.
- [20] Sharma, M.K., Kumar, D., Huria, A.,& Gupta, P. (2009). Maternal Risk Factors of Low Birth Weight in Chandigarh India. The Internet Journal of Health. vol. 9 No 1.ISSN 1528-8315
- [21] Scholl, T.O. & Reilly, Thomas (2000).Iron Deficiency Anemia and Pregnancy Outcomes. Journal of Nutrition. vol. 130:443S-447S
- [22] Simpson, J.L. (1993). Are Physical Activity and Employment Related to Preterm Birth and Low Birth Weight?.Am J Obstetrics & Gynecology. vol. 168:1231-1238.
- [23] World Health Organization, (2009). Feto-maternal Nutrition and Low Birth Weight. Geneva: WHO (2009).
- [24] UNICEF, (2004). Low birth Weight: Country, Regional, and Global Estimates. New York, UNICEF (2004).
- [25] Uncu, Y., Uncu, G., Esmer, A. & Bilgel, N. (2002).Should Asymptomatic Bacteriuria be Screened in Pregnancy? Clin Exp Obstet Gynecol.vol .29(4):281-285.

AUTHORS

First Author – Dr.Somiya Gutbi Salim Mohammed, Somiya
1982@hotmail.com