## Original Article
# Risk factors of low birth weight at three hospitals in Khartoum State, Sudan

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## ABSTRACT

The aim of this study was to determine the percentage of women who give birth to low birth weight (LBW) children and to study the association of the different risk factors with LBW in three of large hospitals in Khartoum State, Sudan. This was a cross sectional study of 381 women. Three groups: 151, 130 and 100 women, who gave birth to live children, were selected from Alsuadi Teaching Hospital, Khartoum Teaching Hospital and Alribat University Hospital, respectively. Data were collected through structured interviews and the birth weights were recorded as measured by midwives. Uni-Multi variate analysis of the data was performed using SPSS 19. Permissions were taken from hospital administration and the participants before the conduction of the research. 13% of live born children were of low birth weight. The main risk factors for low birth weight in the study were the lack of adequate education (OR= 1.9) gestational age (OR= 5.5), type of pregnancy (OR= 9.6), presence of hypertension (OR= 3.6), renal disease (OR= 2.1), bleeding during pregnancy (OR= 6.1) and presence of moderate or severe anemia (OR= 3.19). While Adequacy of antenatal care (ANC) visits, presence of diabetes mellitus during pregnancy, smoking and malaria in the first three trimesters, presence of previous children and spacing were all found to be statistically not significant risk factors. Many of the risk factors are modifiable and can be prevented by improvement of the health care during pregnancy.

### Keywords:

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# INTRODUCTION

Low birth weight can be defined according to the WHO as birth weight of less than 2.500 gm [1]. According to the WHO and UNICEF estimates (2000), every year more than 20 million infant were born with low birth weight in the world. Moreover, they estimated that about 95% of these children were born in the developing countries, mainly Asia and Africa [1].

According to a large study, which was done in Madani, Sudan, about 12.7 % of all deliveries was of low birth weight [2]. While according to the safe motherhood survey in 1999, the prevalence of low birth weight in Sudan was 31% [1]. Although the situation varies between countries, the incidence of low birth weight has increased significantly over the last years in the majority of developed and developing countries [1,3,4].

Low birth weight has many consequences both in the short term and long term. It has been found that children with low birth weight have higher perinatal mortality and morbidity compared to normal birth weight children [1,5]. Moreover, the morbidity continues during infancy in addition to the cognitive and growth impairment and many chronic diseases that develops later in life [1].

There are many factors that were thought to affect the childbirth weight. Kramer et al has pointed in his study that there are more than 43 identified risk factors [6]. He grouped these risk factors into seven categories; firstly, genetic and constitutional factors like child sex, ethnic group and parenteral anthropometric measurement. Secondly, demographic and psychosocial factors like maternal age, psychological and socioeconomic status. Thirdly, obstetric factors like parity and pregnancy interval. Fourthly, the antenatal cares (ANC) follow up: regularity and number of visits. The last three categories are maternal morbidity during pregnancy, nutritional status and toxic exposures. In my opinion the distribution and strength of association of these factors differs between developed and developing countries. Moreover, it even differs within the same country because of the differences in cultures, nutritional habits, lifestyles and also the health seeking behaviors. The aim of this study is to determine the percentage of women who gave birth to LBW children and to study the association of the different risk factors with LBW in a three of large hospital in the Khartoum state.

# MATERIALS AND METHODS

This study was a cross sectional study conducted in three large hospitals in Khartoum State (Khartoum Teaching Hospital, Alribat University Hospital and Alsuadi Teaching Hospital) in July 2012, when 381 women were included in the study after being consented. All deliveries in the three hospitals during a period of one week (6 working hours a day) were included regardless of their mode of delivery or number of fetuses. Three groups: 151, 130 and 100 women were selected from Alsuadi Teaching Hospital, Khartoum Teaching Hospital and Alribat University Hospital, respectively.

Data were collected through structured interviews. Information about maternal age and educational level were collected; mothers were classified into two groups; primary or no education and secondary education or above. Moreover, childbirth weights as measured by the midwives were recorded. Mothers were asked about the presence of chronic diseases like; hypertension, diabetes mellitus and renal disease (including UTI). In addition, exposure for smoking (both active and passive) during pregnancy was assessed. Mothers were asked if they were diagnosed as having Malaria in the first three months of pregnancy.

In addition to the assessment of maternal parity, the inter-pregnancy periods were assessed by measuring the date of the LMP (also used to measure the

gestational age) and the date of the last labor and considered adequate if it is equal to or more than 2 years. Furthermore, type of pregnancy whether singleton or twin were assessed. Due to the incomplete records, HB level measured at the time of labor was used as estimator for the HB level during pregnancy, anemia were classified as mild anemia (HB 9 – 11), moderate to severe anemia (HB<9).

Preterm was defined as labor before completed 37 weeks and anemia as HB level below 11 g/dl. Adequacy of ANC was considered when the women had 5 or more visits during their pregnancy.

Data were entered and analyzed using SPSS program version 19, univariate analysis was used to assess the association between each of the risk factors and low birth weight as dependent variable, and odd ratios

"OR" and chi-square values were calculated. Then risk factors, which were found significantly associated with low birth weight (p<0.05), were analyzed by multivariate analysis using logistic regression.

## RESULTS

Three hundreds and one women participated in the study, 13% of them gave birth to children of low birth weight (<2.5 Kg) (Figure 1), of who 13.9% were preterm. The mean age of women in the study was 27.3 and on average they have 2.8 children in their family. Their data shown 42.3% of mothers had primary level education or no education, 93.4% of the participants had singleton pregnancy, 94.8% went to ANC clinics, but only 81.1% of them had adequate ANC visits (>5 visits).
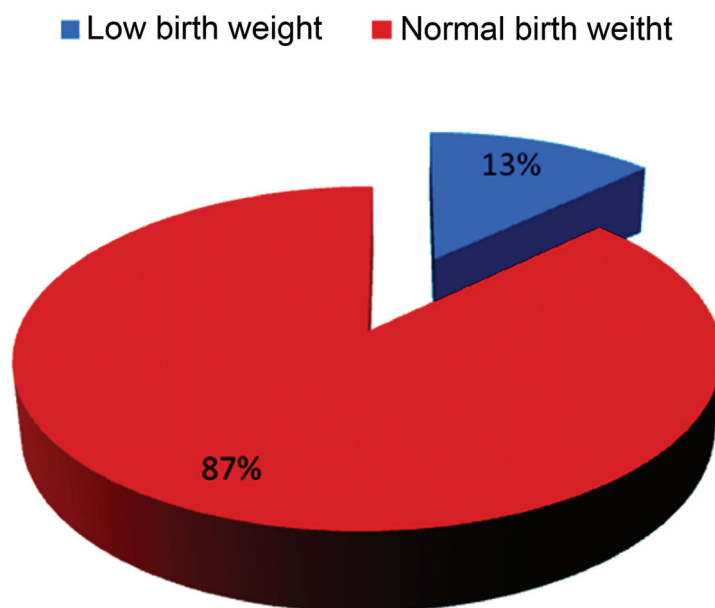


**Figure 1- the percentage of low birth weight in the study population in three of Khartoum State hospitals in 2012**

Regarding the medical history of the women during pregnancy, 1.8% of them had diabetes Mellitus and 9.4% had hypertension while 13.4% of them were diagnosed as having some form of renal disease. Moreover, 6.8% of women complained of bleeding

during their pregnancy, 29.4% were exposed to smoking in the first three months of their pregnancies. Twelve percent and 51.2% of the women complained of moderate/severe and mild anemia, respectively (Table 1).

**Table 1- The socio-demographic and maternal characteristics of the low birth weight and normal birth weight children at three Hospitals in Khartoum State in 2012**

| Variable | | LBW Mean (SD) | Normal BW Mean (SD) | Total Mean (SD) |
|---|---|---|---|---|
| Age | | 27.02 (6.24) | 27.36 (5.92) | 27.3 (5.96) |
| Number of previous children | | 3.09 (2.3) | 2.72 (1.83) | 2.8 (1.89) |
| | | **Frequency (%)** | **Frequency (%)** | **(%)** |
| Educational level | Primary or no education | 27 (55.1%) | 130 (39.3%) | 41.3% |
| | Secondary or above | 22 (44.9%) | 201 (60.7%) | 58.7% |
| Type of pregnancy | Singleton | 36 (73.5%) | 320 (96.4%) | 93.4% |
| | Twin | 13 (26.5%) | 12 (3.6%) | 6% |
| Presence of previous children | Yes | 32 (65.3%) | 245 (74%) | 72.9% |
| | No | 17 (34.7%) | 86 (26%) | 27.1% |
| Gestational age | Preterm | 19 (38.8%) | 34 (10.3%) | 13.9% |
| | Term | 30 (61.2%) | 297 (89.7%) | 86.1% |
| ANC follow up | Yes | 45 (91.8%) | 316 (95.2%) | 94.8% |
| | No | 4 (8.2%) | 16 (4.8%) | 5.2% |
| Adequacy of ANC visits | Yes | 14 (28.6%) | 75 (22.6%) | 23.4% |
| | No | 35 (71.4%) | 257 (77.4%) | 76.6% |
| Presence of DM | Yes | 1 (2%) | 6 (1.8%) | 1.8% |
| | No | 48 (98%) | 326 (98.2%) | 98.2% |
| Presence of HTN | Yes | 11 (22.4%) | 25 (7.5%) | 9.4% |
| | No | 38 (77.6%) | 307 (92.5%) | 90.6% |
| Presence of renal disease | Yes | 11 (22.4%) | 40 (12%) | 13.4% |
| | No | 38 (77.6%) | 292 (88%) | 86.6% |
| Presence of bleeding during pregnancy | Yes | 11 (22.4%) | 15 (4.5%) | 6.8% |
| | No | 38 (77.6%) | 317 (95.5%) | 93.2% |
| Smoking in the first three months in pregnancy | Yes | 13 (26.5%) | 99 (29.8%) | 29.4% |
| | No | 36 (73.5%) | 233 (70.2%) | 70.6% |
| Anemia | No anemia | 14 (29.2%) | 123 (37.8%) | 36.7% |
| | Mild anemia | 22 (45.8%) | 169 (52%) | 51.2% |
| | Moderate& severe anemia | 12 (25%) | 33 (10.2%) | 12.1% |
| Spacing | Not adequate | 11 (28.2%) | 91(28.2%) | 31.9% |
| | Adequate | 28 (71.8%) | 190(67.6%) | 68.1% |
| Malaria in the first three months of pregnancy | Yes | 8 (16.3%) | 30 (9.1%) | 10% |
| | No | 41 (83.7%) | 301 (90.9%) | 90% |

ANC – Antenatal care, BW – Birth weight, DM – Diabetes mellitus, HTN – Hypertension, LBW – Low birth weight.

**Results of the univariate analysis:** through the univariate analysis, the main risk factors for low birth weight in the study were found to be: lack of adequate education (OR= 1.9, 95% CI= 1.03-3.47; P= 0.04), gestational age (OR= 5.5, 95% CI= 2.8-10.9; P< 0.001), type of pregnancy (OR= 9.6, 95% CI= 4.1-22.7; P< 0.001), presence of hypertension (OR= 3.6, 95% CI= 1.6-7.8; P= 0.001), renal disease (OR= 2.1, 95% CI= 1-4.5; P= 0.046), bleeding during pregnancy (OR= 6.1, 95% CI= 2.6-14.3; P< 0.001) and presence of moderate or severe anemia (OR= 3.19, 95% CI= 1.35-7.58; P= 0.008). While Adequacy of ANC visits, presence of DM during pregnancy, smoking and malaria in the first three trimesters, presence of previous children and spacing were all found to be statistically not significant risk factors (table 2).

**Table 2 - The associations between the risk factors and LBW in both the univariate and multivariate analysis in the study population at three of Khartoum State hospitals in 2012**

| Variable | Univariate Analysis | | | Multivariate Analysis | | |
|---|---|---|---|---|---|---|
| | OR | 95% CI | P value | OR | 95% CI | P value |
| Educational level | 1.9 | 1.03 – 3.47 | 0.04 | 2.04 | 1 – 4.15 | 0.049 |
| Type of pregnancy | 9.6 | 4.1 – 22.7 | <0.001 | 11.7 | 4.3 – 31.6 | <0.001 |
| Presence of previous children | 1.5 | 0.8 – 2.9 | 0.2 | | | |
| Gestational age | 5.5 | 2.8 – 10.9 | <0.001 | 2.9 | 1.3 – 6.6 | 0.01 |
| Lack of ANC follow up | 0.6 | 0.2 – 1.8 | 0.3 | | | |
| Adequacy of ANC visits | 1.37 | 0.7 – 2.7 | 0.36 | | | |
| Presence of DM | 1.13 | 0.13 – 9.6 | 0.9 | | | |
| Presence of HTN | 3.6 | 1.6 – 7.8 | 0.001 | 2.5 | 0.9 – 6.7 | 0.07 |
| Presence of renal disease | 2.1 | 1 – 4.5 | 0.046 | 2.67 | 1.07 – 6.7 | 0.04 |
| Presence of bleeding during pregnancy | 6.1 | 2.6 – 14.3 | <0.001 | 6.8 | 2.4 – 19.4 | <0.001 |
| Smoking in the first three months in pregnancy | 0.85 | 0.43 – 1.67 | 0.64 | | | |
| Malaria in the first three months in pregnancy | 1.96 | 0.84 – 4.56 | 0.11 | | | |
| Anemia (moderate and severe) | 3.19 | 1.35 – 7.58 | 0.008 | 2.5 | 0.86 – 7.2 | 0.09 |
| Spacing | 0.8 | 0.4 – 1.7 | 0.6 | | | |

ANC – Antenatal care, DM – Diabetes mellitus, HTN – Hypertension, LBW – Low birth weight.

**Results of the multivariate analysis:** when the Odd ratios were adjusted using logistic regression, moderate to severe anemia and presence of hypertension became not statistically significant, while the rest of the risk factors remained significant (Table 3).

# DISCUSSION

The percentage of low birth weight was almost the same as to what found in the previous study in Wad Madani, Sudan, and what was reported by the UNICEF and WHO in sub-Sahara Africa, but higher than what was reported by El Shibly in Khartoum-Sudan [1,2,7].

The study showed that statistically significant risk factors, both in the uni and multi variate analysis, are: non-education, type of pregnancy, gestational age, bleeding and renal disease during pregnancy. Being non educated or of just primary education almost doubled the risk of having low birth weight which unlike the study in Madani-Sudan but similar to a study in Pakistan [2,8]. Twin neonates were found 10 times more likely to be of low birth weight compared to singleton ones, which was similar to what found in the United States (US) [9].

Preterm birth was found to increase the risk of low birth weight five times (three times in the multivariate analysis), while it increased the risk six times in a study that was performed in Pakistan [8]. Renal diseases and bleeding during pregnancy increase the risk of low birth by two and six times, respectively.

It has been found that having moderate to severe anemia triple the risk of low birth weight, but this difference becomes statistically non-significant with the multivariate analysis. Anemia was also found to be a significant risk factor in many previous studies that were done in Sudan [2,10]. The problem in this study was that hemoglobin (HB) levels in the first three trimesters were not available for the majority of the study population, so HB at time of labor was taken as an estimator.

Adequacy of ANC visits, presence of DM during pregnancy, smoking and malaria in the first three trimesters, presence of previous children and spacing were all found to be statistically not significant risk factors. The same result about Malaria was found in the previous study in Madani, but different from the results of a research done in central Sudan [2,11]. The problem of this research is that the diagnosis of Malaria was dependent on the history only, which is not accurate.

Although the Number and adequacy of ANC visits were shown to be associated with low birth weight in many researches, the association was not significant in this study [2,8]. This may be caused by the small sample size and the fact that only 5% of the study population lacks ANC. Smoking, like the previous study in Madani, was statistically non-significant risk factor may be because active smoking is relatively uncommon among Sudanese women due to the culture [2]. Moreover, it was difficult to measure the amount of passive exposure accurately.

The current study showed that there is no statistical significant association between low birth weight and inter-pregnancy spacing. In the contrary, a large meta-analysis showed that short spacing which is defined as less than 18 month is a risk factor [12]. Another study in the US found that the shorter the spacing interval the higher the risk of low birth weight [13]. One of the problems of this study was the difficulty to calculate the spacing interval because the lack of proper documentations and the inability of many of the study population to remember the dates of the last labor.

# CONCLUSION

This was a small hospital based study intended to

explore the risk factors of LBW in Khartoum. The small sample size and difficulty of measuring some of the risk factors might account for the failure of finding significant associations of some of the risk factors.

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