



## Original Article

### Patterns and Determinants of Birth Weight in Term Babies Delivered at an Urban Multi-Specialty Private Hospital in Southern Nigeria. A Retrospective Cross-Sectional Study

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## Abstract

**Background:** Birth weight is among the most common measures for assessment of intrauterine growth, particularly in developing countries. Aberrations in intrauterine growth can result in profound sequelae in the immediate neonatal period and later in life. In Nigeria, there is generally a poor national summary of abnormal birth weight pattern.

**Aim of work:** To describe the patterns of birth weight and associated factors among term babies delivered in an urban private hospital setting. **Patients and methods:** This was a single-center cross-sectional study. Records of all babies delivered from January 1<sup>st</sup>, 2020, to December 31<sup>st</sup>, 2020, were retrospectively reviewed. Preterm deliveries were excluded from the data. **Results:** There were 411 term deliveries during the study period, 255 vaginal deliveries and 156 caesarean deliveries. 407 babies were from singleton pregnancies and 8 by twin pregnancies. Thirty-one (7.5%) of the term babies had macrosomia and 14 (3.4%) had low birth weights. Bivariate analysis shows statistically significant association between birth weights of term babies and type of gestation ( $\chi^2 - 11.288$ ,  $p - 0.002$ ) and mode of delivery ( $\chi^2 - 9.718$ ,  $p - 0.035$ ). There was however no association between birth weights and mother's age or parity and baby's sex. **Conclusions:** Our findings show that newborn under-nutrition (LBW) and over-nutrition (HBW) are significant public health problems even among high income mothers in Benin City.

**Key words:** Macrosomia, Low birth weight, Term babies, Private hospital

## **Introduction**

Intrauterine growth and development are highly vulnerable processes in human life cycle [1]. Birthweight, length, and occipito-frontal circumference are among the most common measures for assessment of intrauterine growth, particularly in developing countries [1]. Birthweight (the weight of a child immediately after delivery or not more than 24hours post-delivery), can be classified as normal, high or low. Normal birthweight (NBW) refers to weight from 2.5Kg to less than 4.0Kg while Low birthweight (LBW) is weight less than 2.5Kg and Macrosomia or High birth weight (HBW) is birthweight from 4.0kg and above [2]. Low birthweight can be further classified into: Low birthweight (1.5-2.499kg), Very low birthweight (1.0-1.499kg) and extremely low birthweight (<1.0kg) [3].

Aberrations in intrauterine growth can result in profound sequelae in the immediate neonatal period and later in life. Low birthweight (LBW) and HBW

are implicated in increased neonatal morbidity and mortality, as well as development of adverse medical conditions like type 2 diabetes mellitus and coronary heart diseases in adult life [4]. LBW is also known to have debilitating long-term consequences on a child's height, academic achievement, economic productivity, and birth of offspring [5, 6]. HBW on the other spectrum is associated with shoulder dystocia, birth injuries, birth asphyxia and neonatal deaths [7]. Mothers of macrosomic or HBW babies are at increased risks of caesarean deliveries, prolonged labour, birth trauma and hemorrhage [8].

Several maternal and pregnancy-related factors have been associated with birth weight abnormalities in newborns. Factors associated with low birth weight in children include maternal extremes of age (<20years and >35years), pregnancy stress, maternal under-nutrition before and during pregnancy, nulliparity, chronic maternal illnesses, low socio-

economic status, and poor usage of antenatal facilities [9]. Conversely, factors associated with macrosomia include male gender, high pre-pregnancy weight or Body mass index (BMI), post datism, gestational and pre-gestational diabetes, as well as excessive weight gain during pregnancy [10,11].

Globally, the world health organization estimates that about 20million LBW babies are born each year, of which 96.5% of them are in developing countries. The WHO also notes that macrosomia affects an average of 3-15% of all pregnancies. Using the Nigeria, demographic and health survey of 2013 and 2018 report, Fayehun and Asa [12] reported a national prevalence of macrosomia of 10.7% and LBW of 7.5% in urban setting. These data are usually from public health facilities and thus may not reflect the patterns and peculiarity of babies born in private hospitals setting. It is thus necessary to have an idea of the birthweight patterns of neonates delivered in private hospital settings, as

this will give a more robust representation of the national birthweight dynamics. The aim of this study was to describe the patterns of birth weight and associated factors among term babies delivered in an urban private hospital setting in Southern Nigeria.

### **Methods**

Setting: This was a retrospective study at Lily Hospitals Limited, Benin City, Nigeria. The hospital is a 48-bed capacity multi-specialty private hospital established in 2015. Most of its clients are from the high- and middle-income socio-economic class. The hospital has it's headquarter in Warri, Delta state with branches in other parts of Nigeria. It provides clinical care, laboratory services, radiologic services and occupational health services etc. on in-patient and out-patient basis. Specialties available include obstetrics, gynecology, pediatrics, neonatology, general surgery, pediatric surgery, orthopedics, otorhinolaryngology, family Medicine, anesthesia, radiology, physiotherapy and

public health. There are three consultant obstetricians and two pediatricians who provide 24-hours service daily including weekends. About 450 deliveries are supervised yearly in the hospital.

Study design and data collection: We retrospectively reviewed birth records of all babies delivered at the hospital from January 1<sup>st</sup>, 2020, to December 31<sup>st</sup>, 2020. Data were retrieved from hospital electronic medical records and entered into Microsoft excel spread sheet. The neonatal birth weight was considered as the outcome while factors like mother's age, parity, mode of delivery, type of gestation and sex of the baby were considered as predictors of birth weight (independent variables). The birth weight was measured within one hour of birth using a Beurer BY 80 956.05 baby scale (Beurer GmbH, Söflinger Str. 218, 89077 Ulm, Germany) with a 5-gram accuracy and recorded in the hospital birth register. The birth weights were categorized into high birth weight ( $\geq 4.0\text{Kg}$ ), Normal birth weight ( $2.5\text{Kg} -$

$3.99\text{Kg}$ ) and Low birth weight ( $< 2.5\text{Kg}$ ). Preterm deliveries were excluded from the data.

### **Ethical approval**

Ethical approval for the study and to use the hospital data was granted by the Lily Hospital limited Ethics and Research committee. Personal identifiers like name and address were not extracted from the delivery records.

### **Statistical analysis**

Data analysis: The statistical analysis was done using the International Business Machine Statistical Package for Social Sciences (IBM SPSS) for window-version 21.0. Frequency tables were used for descriptive statistics and cross tabulations for relationship between variables. The associations between birth weight and independent variables such as mothers age, parity, type of gestation, mode of delivery and baby's gender, were investigated using Chi square statistics. A p value of less than 0.05 was accepted as the level of statistical significance

## Results

During the study period there were 477 deliveries including 411 term and 66 preterm deliveries. The data for the term deliveries only were analyzed.

Clinical characteristics of term deliveries: Of the 411 term deliveries, 255 were normal vaginal and 156 by caesarean section. There were 407 singleton pregnancies and 4 multiple gestations. The age of the mothers ranged from 20 years to 62 years with a mean age of 30.9 years (SD – 5.2 years). The mean parity score was 1.17 with 10.46% of mothers having their first pregnancies. Four hundred and fifteen term babies were delivered during the study period out of which 225 (54.2%) were males. The clinical characteristics of the term pregnancies are shown in (Table 1).

Weight distribution of term babies: The birth weight of term babies ranged from 2.0kg to 5.4kg. The mean birth weight of term babies was 3.32kg (SD – 0.49kg). Thirty-one (7.5%) of the term babies had high birth weight, 370 (89.1%) were

normal birth weight and 14 (3.4%) had low birth weights. This is shown in (Figure 1).

Bivariate analysis: Factors associated with birth weights of term babies were type of gestation ( $\chi^2 - 11.288$ ,  $p - 0.002$ ) and mode of delivery ( $\chi^2 - 9.718$ ,  $p - 0.035$ ). There was a tendency for the chance to have a low-birth-weight baby to increase with increasing maternal age. The percentage of low-birth-weight babies was 0.0 % in mothers 20-24 years; 2.1% in mothers 25-30 years; 4.4% in those from 31-34 years and 5.1% in those over 35 years. However, this was not statistically significant ( $p-0.215$ ). Similarly, there was a tendency to have babies with HBW with increasing parity; but this observation was also not statistically significant. There was also no association between birth weights and the baby's sex ( $p-0.510$ ). This is shown in (Table 2).

Multivariate analysis: In a multivariate analysis, none of the factors was independently associated with high birth

weight or low birth weight in term babies.

### **Discussion**

The current study investigated the prevalence and pattern of birth weight abnormalities in term babies. Our findings indicate that about one in 10 term babies born in urban private facilities have birthweight abnormalities. The prevalence of high birth weight in the current study was 7.5% and low birth weight was 3.4%. Factors associated with birth weight included type of gestation and mode of delivery. Mother's age, parity and the baby's sex did not have significant association with birth weight in the present study.

The prevalence of High birth weight in the current study (7.5%) is similar to findings from Irrua, Nigeria (8.0%) [13], Port Harcourt, Nigeria (7.4%) [14], Ghana (6.5%) [15], Ethiopia (7.54%) [16] and China (7.3%) [17]. The prevalence is; however, lower than 10.7% reported by Fayehun and Asa [12] among babies delivered in Nigerian

urban setting. Fayehun and Asa used data from the Nigerian demographic and health survey data of 2013 and 2018 for their study. The reason for the difference in prevalence is not apparent. It is likely that factors not examined by the present study may have had some influences on the observed prevalence.

Low birth weight was present in 3.4% of term babies studied. The prevalence is similar to those reported in Uganda (4.3%) [18] and Brazil (3.7%) [19]. The prevalence of low birth weight in the current study, is however, lower than what was reported by Fayehun and Asa (7.5%) [12]. Among Nigerian babies delivered in urban facilities. The authors included both term and preterm babies delivered in urban setting in their study. Prematurity is a significant contributor to the burden of low-birth-weight babies. However, the presence of low birth weight in preterm babies may not necessarily suggest fetal under-nutrition. The exclusion of preterm babies from the present study provides evidence for the

true burden of fetal under-nutrition in Nigeria. Hospital studies from Ethiopia (10%) [20] and Pakistan [21] have reported higher prevalence of LBW in term babies.

High birth weight (7.5%) was more prevalent than low birth weight (3.4%) in the current study. This agrees with the observation made by Fayehun and Asa [12]. Macrosomia appears to be commoner than low birth weight in term babies delivered in urban facilities. This may be due to better in socio-economic capacity in urban settings compared to rural areas. The link between income or socio-economic class and birth weights have been established in previous studies [22, 23]. Higher income mothers are more likely to have high birth weight babies than their lower income counterparts. Our study was carried out in a private hospital which serves high- and middle-income mothers. This may be responsible for higher prevalence of HBW compared to LBW.

In the current study, Macrosomia was significantly more common in singleton babies compared to babies from twin gestations. The absence of competition for space and nutrition in singleton babies compared to twin gestation may be the reason for this observation. In a Catalonian study, Gortazar and colleagues [24] reported that macrosomia was more likely in singleton pregnancies than in twin pregnancies in both diabetic and non-diabetic mothers. However, in the current study, no effort was made to determine if mothers of macrosomic babies were diabetic or had other associated risk factors for macrosomia.

The mode of delivery of a baby is commonly determined by the estimated weight of the baby. Fetal macrosomia may make delivery via the vaginal route risky for the baby and the mother. Also, the presence of fetal under-nutrition and LBW at term may indicate adverse intrauterine conditions which may compromise the baby's capacity to withstand the stress of labour and vaginal

delivery. Our study found that babies delivered via caesarean section were more likely to have low birth weight compared to those delivered via SVD. Jeena et al [25] in South Africa reported similar association between birth by caesarean section and low birth weight. It is likely, that the choice of the route of delivery of these babies was influenced by the estimated weight in them and the presence of other conditions like pre-eclampsia and co-morbid medical conditions in the mothers. Maternal factors like age and parity were not associated with the birth weight of term babies in the current study. Although there was no significant association between birth weight and maternal age or parity, there was a trend observed. The prevalence of low birth weight seems to increase with increasing maternal age while the prevalence of high birth weight increased with increasing parity.

**Limitations:** Our study has a few limitations. Firstly, the study was a single hospital study and so may not reflect the

experience in other private hospital facilities. Secondly, only a few factors were considered in the current study. Factors like maternal height, literacy level and marital status which have been suggested to affect birth weight in babies were not considered. Despite these limitations, the current study provides evidence of birth weight abnormalities in term babies born in urban private hospital in Nigeria.

### **Conclusions**

In conclusion, abnormal birth weights are a significant public health problem even among high income mothers in Benin City. Macrosomia seems to be more common than low birth weight babies in urban private hospital. Singleton birth was associated with high birth weight while there was an increasing tendency for babies born by caesarean section to have low birth weight.

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### **Author's contributions**

PEI conceptualized the work and designed the study. He also participated in data analysis, interpretation of data as well as drafting of the article. He approved the final the version to be published. KIA – conceptualization and study design, data collection, interpretation of data, revision of draft critically for important intellectual content; and final approval of the version to be published. CRO - conceptualization and study design, drafting the article and final approval of the version to be published. EE - study design, interpretation of data, revision of draft critically for important intellectual content and final approval of the version to be published

### **Conflict of interest**

The authors declare that they have no competing interests

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**Table 1: Clinical Characteristics of Term deliveries**

| Characteristics          | Frequency | Percentage |
|--------------------------|-----------|------------|
| <b>Mothers Age</b>       |           |            |
| 20-24 years              | 37        | 9.0        |
| 25-29 years              | 140       | 34.1       |
| 30-34 years              | 159       | 38.7       |
| ≥ 35 years               | 75        | 18.2       |
| <b>Parity</b>            |           |            |
| 0                        | 43        | 10.4       |
| 1                        | 266       | 64.1       |
| ≥2                       | 106       | 25.5       |
| <b>Mode of delivery</b>  |           |            |
| SVD                      | 255       | 62.0       |
| CS                       | 156       | 38.0       |
| <b>Type of gestation</b> |           |            |
| Singleton                | 407       | 99.0       |
| Twin gestation           | 4         | 1.0        |
| <b>Gender of Baby</b>    |           |            |
| Male                     | 225       | 54.2       |
| Female                   | 190       | 45.8       |

SVD – Spontaneous vaginal delivery; CS – Caesarean section

**Table 2: Association between Birth Weight and Clinical Characteristics**

| Clinical Characteristics | Birth weight category |     |     | $\chi^2$ | p      |
|--------------------------|-----------------------|-----|-----|----------|--------|
|                          | HBW                   | NBW | LBW |          |        |
| <b>Mothers Age</b>       |                       |     |     |          |        |
| 20-24years               | 0                     | 37  | 0   | 7.858    | 0.215  |
| 25-29years               | 14                    | 123 | 3   |          |        |
| 30-34 years              | 10                    | 143 | 7   |          |        |
| ≥ 35 years               | 7                     | 67  | 4   |          |        |
| <b>Parity</b>            |                       |     |     |          |        |
| 0                        | 1                     | 40  | 2   | 4.520    | 0.313  |
| 1                        | 19                    | 240 | 7   |          |        |
| ≥2                       | 11                    | 90  | 5   |          |        |
| <b>Type of gestation</b> |                       |     |     |          |        |
| Singleton                | 31                    | 364 | 12  | 6.666    | 0.046* |
| Twin gestation           | 0                     | 6   | 2   |          |        |
| <b>Mode of delivery</b>  |                       |     |     |          |        |
| SVD                      | 16                    | 235 | 4   | 8.054    | 0.014* |
| CS                       | 15                    | 135 | 10  |          |        |
| <b>Sex of baby</b>       |                       |     |     |          |        |
| Male                     | 19                    | 200 | 6   | 1.357    | 0.510  |
| Female                   | 12                    | 170 | 8   |          |        |

\* Significant at p < 0.05; LBW – Low birth weight; NBW – Normal birth weight; HBW – High birth weight; SVD – Spontaneous vaginal delivery; CS – Caesarean section

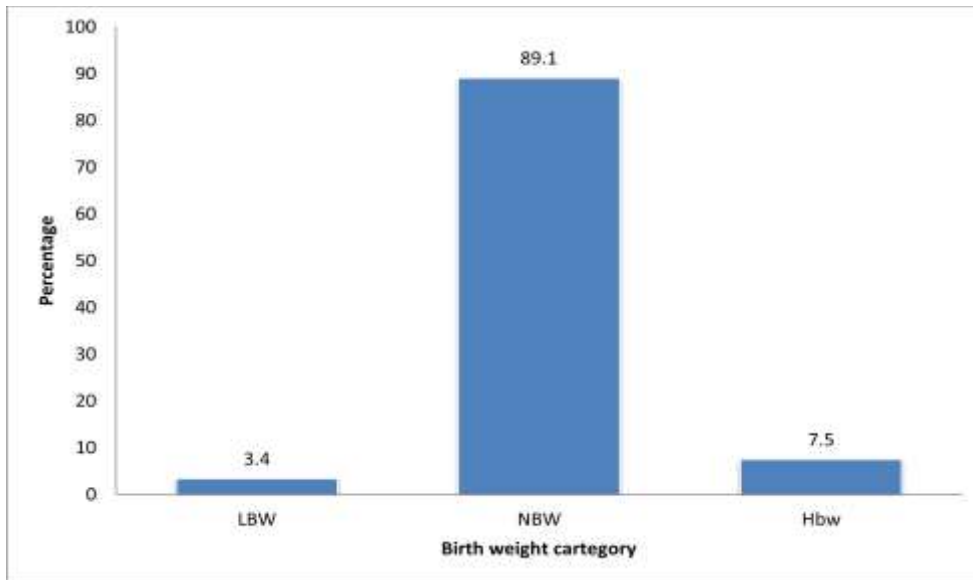


Figure (1): Comparison between birth weight categories of term babies

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