Association of Maternal Third Trimester Weight Gain with Birth Weight among Nulliparous Women in Two Nigerian Tertiary Hospital

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Considering the high rate of maternal and infant mortality in Nigeria, effort is shifting towards preventive measures. Also, with the epidemic of obesity worldwide and the increase in maternal pre-pregnancy weight, it becomes important to find out how maternal weight gain in third trimester affects neonatal birthweight.

Aim: This study therefore aims to determine the association of maternal third trimester weight gain with birth weight Among in two Nigerian Tertiary Hospital.

Methods: It was an observational study done at Lagos University Teaching hospital and 68 Nigerian Army Reference hospital Yaba, Lagos. Serial weight of the women in third trimester were measured at the antenatal clinic and subsequently compared with the birth weight of the newborns at delivery in the labour ward of both hospitals. Data was collected using a spreadsheet, which was later exported to SPSS for analysis.

Results: A total of 260 antenatal women within the age range of 20 and 39 years, were recruited for the study. Their mean gestational age at delivery in weeks was 39±1. They had preponderance of male babies at delivery accounting for over half (55.2%). All in all, less than one-fifth of the babies were low birth weight (17%). A significant proportion of our cohorts (28.5%) had less than <1kg additional weight gain between 30 and 34 weeks, among which 22.7% also had low birth weight newborns. In addition, at 34-38 weeks' gestational age, 21.6% of our cohorts also added <1kg to their pre-pregnancy weight 30% of which also had low birth weight babies.

Conclusion: In conclusion, it has been shown that there is an association between maternal weight gain in 3rd trimester and the neonates birth weight at delivery.

1. INTRODUCTION

Nowadays, there have been a continuous rise in the number of women becoming obese in the society [1]. This apparently also affects reproductive age women. It has been argued that maternal energy balance (nutritional intake and expenditure) invariably affects her pre-pregnancy weight [1]. Maternal weight gain during pregnancy have been suggested to play an important role in her immediate and long term health status and also in the fetal and pregnancy outcomes [1,2]. This is because excessive maternal weight gain has been fingered in the aetiopathogenesis of many diseases and pregnancy related cpmplications [1,2,3].

In addition, in as much as weight loss during pregnancy is not advocated by the obstetricians, a balance in weight gain is necessary for good feto-maternal outcomes as it has been shown that maternal obesity has a detrimental effect in pregnancy.

Evidence abounds to support why the association between weight gain in pregnancy, and its possible effect on low-birthweight (LBW) babies, macrosomia, shoulder dystocia and other undesired effects need to be re-considered. Historically, the inter-play between LBW and under five mortalities, and even the infants mental development is well established [2,3].

Therefore, proper monitoring of weight gain in maternities will assist the obstetricians and midwives in early detection of maternal starvation, suspect cases of gestational diabetes mellitus in pregnancy, intrauterine growth restriction/poor fetal weight gain *et cetera* which will improve outcome [4]. However, it is important to state that recording of maternal weight gain alone is not sufficient on its own as it does not differentiate between maternal weight gain, from fetal weight gain or the various components (maternal fat stores, maternal lean tissue, amniotic fluid volume, placenta weight etc), although it is a simple tool available in both high and low income countries [4,5]. A minimum weight gain of 12-20kg throughout pregnancy have been reported [5].

This study therefore aims to determine the association between maternal weight gain in 3rd trimester of pregnancy and neonatal birthweight [6].

2. MATERIALS AND METHODS

2.1 Study Setting/Design

It was an observational study done Lagos University Teaching Hospital (LUTH) and 68

Nigerian Army Reference Hospital Yaba, Lagos Nigeria June 2022 and May 2024.

2.2 Study Population

This included women who attended antenatal clinic and labour ward unit of the two hospitals during the study period.

2.3 Inclusion Criteria

Pregnant women in 3rd trimester who were seen at the antenatal clinic both tertiary facilities during the study period.

* Nulliparous women aged 20 – 39 years, with a viable, singleton pregnancy and who consented to participate in the study.

2.4 Exclusion Criteria

Multiparous women, women that are diabetic, chronic hypertensive, asthmatic, HIV positive, sickle cell disease, antepartum haemorrhage were excluded from the study.

2.5 Determination of Sample Size

A minimum sample size of 75 was calculated. This was based on 5% margin of error, 95% confidence interval, response distribution rate of 50% and 20,000,000 estimated population was derived using the Raosoft online sample calculator [7]. However, to improve the power of the study, more pregnant women were recruited.

2.6 Data Collection

These women were consecutively recruited from the antenatal clinics of both facilities on Wednesdays and Thursdays at 68 NARHY and every weekday besides Wednesdays at LUTH. Their height, weight and BMI were recorded by the attending midwives together with a research assistant dedicated to this study. They were followed up till delivery, and a tag was attached to the case note of each consenting woman. The babies were also weighed using the weighmaster in labour ward at delivery. Two hundred and sixty maternities were recruited into the study. All the women (28) who had missing data were excluded from the study. Therefore, a total of 232 case records were analysed.

Data collected was entered into an excel spread sheet and later analysed using SPSS version 29 (IBM UK). Measures of central tendency and dispersion were computed for quantitative variables such as age. Frequency distribution tables were also generated where appropriate. The statistical significance or otherwise of observed differences were determined using chi square test. A p-value of <0.05 was considered significant.

2.7 Key Terms and Definitions

1. Birth weight: The immediate weight of the newborn following birth.
2. Low birth weight: When a newborn weighs less than 2.5 kilograms.

3. RESULTS

The study population included 260 pregnant women. Twenty-eight of them had incomplete data. Approximately 17% of the babies weighed less than 2500 grams.

The mean maternal age of our cohorts was 28.12±0.4. See Fig. 1.

Between the 30th and 34th week of gestation, 66 women (28.5%) gained < 1kg. This is shown in Fig. 2.

Fifteen (22.7%) out of the above 66 women delivered babies who were low birth weight (LBW) i.e. weighed <2.5kg at birth. Therefore, the incidence of LBW babies in this group is 23%. The odds ratio of having a LBW baby in the group is 0.3. The p value is 0.0001. Fig. 3 shows the observed birth weight pattern in the study against what is expected.

Between the 34th and 38th week of gestation, 50 women (21.6%) gained <1kg. This is shown in Fig. 4.

Fifteen (30%) of the above 50 women delivered babies who were LBW.

Therefore, the incidence of LBW babies in this group is 30%. The odds ratio of having a LBW baby in the group is 0.4. The p value is 0.0001. Fig. 4 shows the observed birth weight pattern in the study against what is expected.
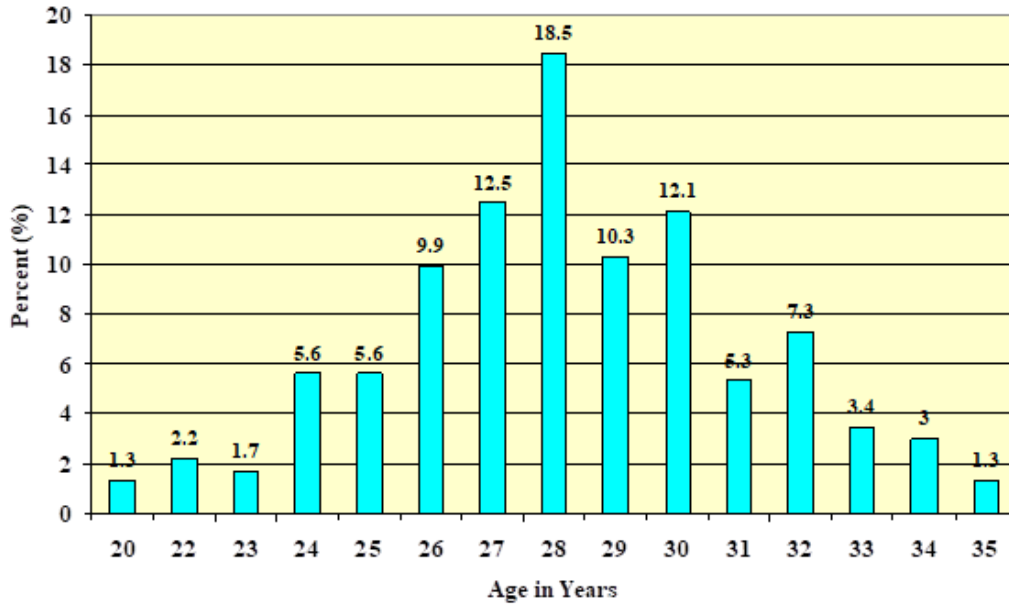
Age of Study Participants

Fig. 1. Age distribution of the participants

Weight gain/loss

30 - 34 weeks

Std. Dev = 7.93

Mean = -2.1

N = 66.00

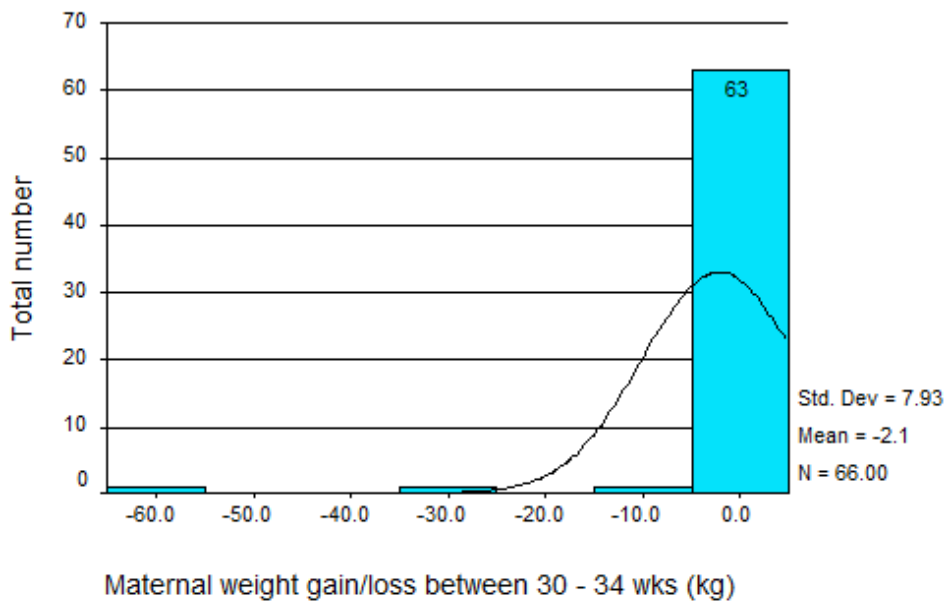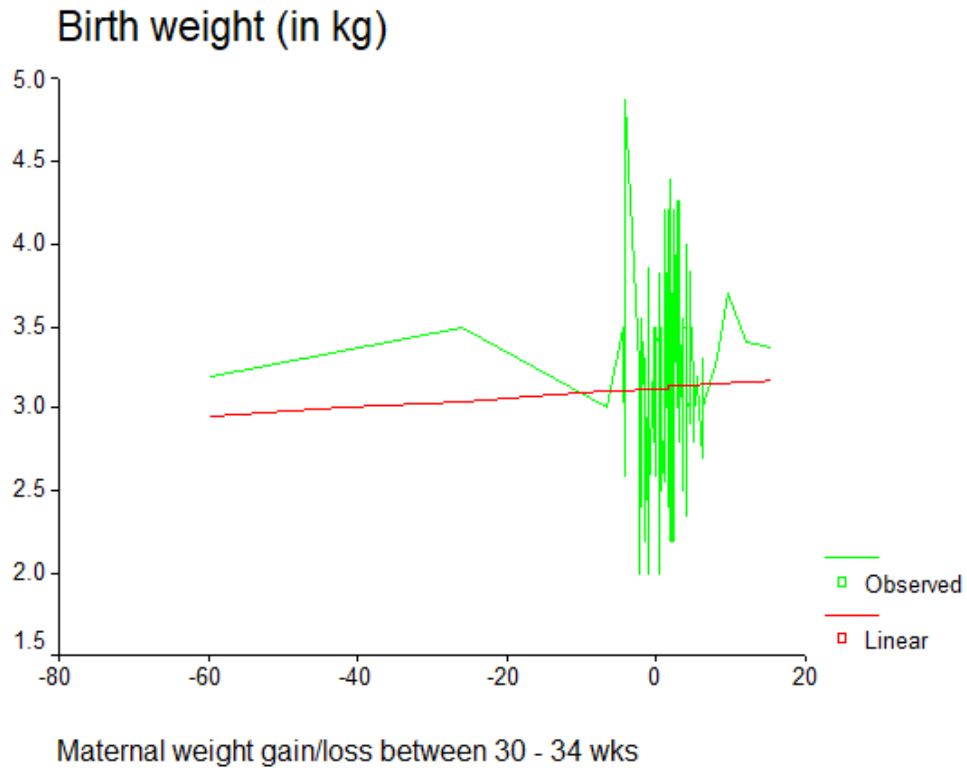Maternal weight gain/loss between 30 - 34 wks (kg)
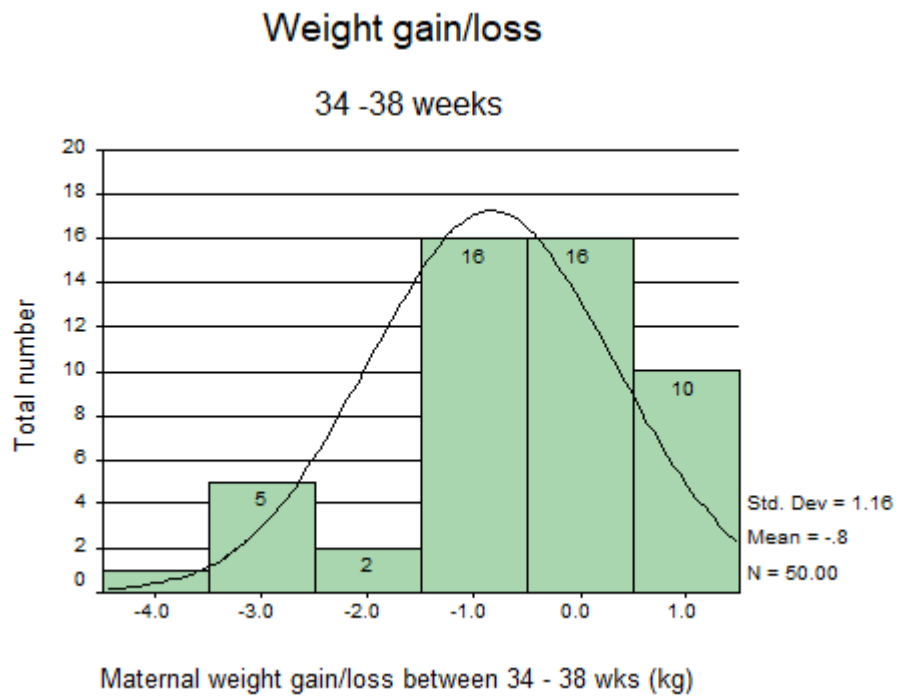
Fig. 2. Maternal weight gain between 30 and 34 weeks

Fig. 3. Neonatal birthweight at delivery

Fig. 4. Maternal weight distribution from 34-38 weeks

4. DISCUSSION

A Reducing the incidence of low birthweight (LBW) will in no doubt reduce infant mortality in developing countries and as such reduce the number of times a woman will desire to procreate and eventually dying from pregnancy related causes. This is because LBW has consistently been fingered as one of the factors associated with the high perinatal and neonatal mortality rates across Nigeria [8,9,10].

The incidence of LBW in this study is 17%. This is similar to the estimated global average of LBW which is between 15-20% [11]. However, this is lower than the prevalence of LBW in India reported recently which ranges from 20.1-21% [12]. This difference may be because our study was conducted for a short duration, it may also be because it was a hospital-based study. The Indian study was a national family survey with over 149,279 women. This may have accounted for its robust nature and heterogeneity.

The proportion of pregnant women with poor weight gain at 30-34, and 34-38 weeks, (less than 1000g), were also statistically significant. This is supported by the work of other researchers [12,13,14,15,16]. Maternal and fetal weight gain in pregnancy is a complex process. The association of poor or excessive maternal weight in pregnancy have been in implicated in many adverse pregnancy outcomes [1,11,13-20].

This study was able to demonstrate that poor maternal weight gain in pregnancy is associated with poor fetal weight gain which will invariably lead to increased neonatal mortality, morbidity, extended neonatal intensive care unit admission and increased healthcare cost [21].

We do acknowledge that his study was limited by some factors such as irregular antenatal clinic attendance by some mothers thereby making weight assessment at the specified periods impossible. It was also limited to only two facilities in a state with a population of over 20 million people [22].

5. CONCLUSION AND RECOMMENDA-TION

In conclusion, this study showed that an association exists between maternal weight gain in the 3rd trimester and the newborn birth weight.

Multicenter longitudinal study is therefore recommended to further examine this relationship especially now that all effort is been made to reduce maternal and infant mortality worldwide.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

We hereby declare that no generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during writing or editing of manuscripts.

CONSENT

As per international standards or university standards, patient(s) written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

This study was approved by the research committee of the 68 Nigerian Army Reference Hospital Yaba. Reference: 68 NARHY 102GY.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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