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# **Original Research Article**

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# Effect of maternal age and gestational weight gain on anthropometry of the newborn in semi urban area of Chhattisgarh, India

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## **ABSTRACT**

**Background:** Maternal undernutrition is a known to be a major factor contributing to adverse pregnancy outcomes. Gestational weight gain and young maternal age at childbearing years is associated with an increased risk low birth weight babies and infant mortality.

Methods: Prospective observational study carried out in the post-natal ward of a tertiary care hospital (CM hospital) in a semi-urban area over a period of 1 year in between March 2018 and March 2019. Total 150 mothers who satisfied the inclusion criteria were enrolled. Age of the mothers was noted and were divided into 5 groups. Last known prepregnancy weight was recorded on re-call basis, recorded data on first visit during first month of pregnancy and again they were weighed in the third trimester at the time of admission using standard electronic weight machine. Data collected were entered in Microsoft Excel Work sheet 2018 which was imported to SPSS (version16) for data analysis. Quantitative data has been analysed by Mean, Standard deviation, T test and Karl Pearson correlation.

**Results:** Mean birth weight among young age mother (<20 years) was 2068 g (95%CI,±223.99) which was significantly lower than mean birth weight of 20-30 year old mother (271.19 g±95%CI, 437.02) and >30 year old mother (2932.78, 95%CI±429.99). With increase in gestational weight gain there was a corresponding increase in mean birth weight and this increase was statistically significant (r=0.435, p=<0.001).

**Conclusions:** Maternal age and gestational weight gain had significant impact on new-born anthropometry. Young age (<20yrs) and decreased gestational weight gain is associated with increased number of low birth weight babies.

Keywords: Body mass index, Gestational weight gain, Low birth weight, Maternal age

# INTRODUCTION

Growth of a new-born is affected by many factors and events which occur during prenatal, perinatal and postnatal period. It is a well-known fact that adequate nutrition before and during pregnancy has the greatest potential for long term health of mother and the child. In developing countries, maternal undernutrition is a known to be a major factor contributing to adverse pregnancy outcomes. Assessment of maternal nutritional status relies upon maternal physical markers like pre-pregnancy

weight, height, body mass index (BMI), gestational weight gain (GWG) etc.<sup>2-3</sup> Infants with low birth weight are at higher risk of dying in early age.<sup>4</sup> Also young maternal age at childbearing (≤19 years) is associated with an increased risk of preterm birth and intrauterine growth restriction, infant mortality, and child undernutrition.<sup>5-6</sup> Perinatal mortality and morbidity is 20 times more likely for low birth weight(LBW) babies as compared to babies heavier than 2.5kg at birth.<sup>7</sup> The two leading causes of neonatal deaths are low birth weight and prematurity. The causes of low birth weight and

prematurity are complex and interdependent, but the anthropometry of the mother and her nutritional intake are among the most important.

Gondwe A et al, conducted a study on pre pregnancy BMI and GWG association with birth outcome in rural Malawi. Similarly, Tela FG et al, conducted a prospective observational study on the effect of GWG on birth weight in Ethiopian women among 332 mother baby pairs. <sup>8,9</sup> Both concluded that GWG had significant effect on birth weight. Considering this, the present study has been planned to evaluate the effects of maternal age and GWG on their infant's anthropometry in semi urban area of Durg district of Chhattisgarh.

### **METHODS**

This was a prospective observational study carried out in the post-natal ward of a tertiary care hospital (CM hospital) in a semi-urban area over a period of 1 year in between March 2018 and March 2019. Clearance was obtained from the hospital's ethical committee for the study. Before delivery, an informed consent was obtained from the participants and those willing was enrolled for this study.

#### Inclusion criteria

- Pre-term and term live birth neonate- mother pairs whose hospital stay exceeded 24 hours.
- New-borns born by vaginal and caesarean delivery.

#### Exclusion criteria

- Unregistered and un-investigated mothers.
- Mothers with diabetes mellitus, pregnancy induced hypertension, cardiovascular disease and severe anaemia.
- Twin new-borns.
- New-borns having congenital malformations.

# Methodology

Maternal background information, height, last known pre-pregnancy weight, GWG, third trimester weight, gestational age and number of children was obtained and recorded in semi-structured case proforma. Last known pre-pregnancy weight was recorded on re-call basis, recorded data on first visit during first month of pregnancy. The mothers were weighed in the third trimester at the time of admission using electronic

weighing machine with minimum clothing after correcting zero error. The weighing machine was standardized frequently. The weight was recorded to the nearest 50 gm. GWG was calculated by subtracting prepregnancy weight from third trimester weight just prior to the delivery.

Gestational age was calculated from the Ballard Scoring chart. New-born weights were measured using electronic weighing scale to the nearest of 20 gm. Length, head circumference (HC) and chest circumference (CC) were measured within 24 hours after birth using non-stretchable measuring tape to the nearest of 0.5 cm. Genders of the babies were recorded. Ponderal index of the new-borns was calculated using formula Weight (g)/Length (cm3).

#### Statistical methods

Continuous data was summarized as Mean±SD (standard deviation), while discrete (categorical) data summarized in number and percentage. Quantitative data has been analysed by Mean, Standard deviation, T test and Karl Pearson correlation.

#### **RESULTS**

Out of total 150 mothers, 5 were of <20 years of age which accounts for (3.33%) of the total mothers who participated in the study (Table 1). Male babies born were 77 (51.33%) and rest were females 73(48.67%) (Table 2).

Table 1: maternal age in years, number of mother (N) and percentage (%) in each age category.

Age of mother	N	0/0
≤20 years	5	3.33
21-25 years	48	32
26-30 years	61	40.67
31-35 years	28	18.67
>35 years	8	5.33
Total	150	100

Table 2: Table showing gender of the new-born, number (N) and percentage (%) of babies in each category.

Gender of newborn	N	%
Male	77	51.33
Female	73	48.76
Total	150	100

Table 3: Influence of maternal age on birth weight, length, head circumference, chest circumference (n=150).

Maternal age	Birthweight(g)Mean±Sl	D Length(cm)Mean±SD	HC(cm)Mean±SD	CC(cm)Mean±SD
<20 years	2068±223.99	46.4±0.89	29.8±0.84	27.7±1.3
20-30years	2719.91±437.02	50.04±2.18	32.33±1.81	30.24±1.76
>30 years	2932.78±429.99	51.11±2.2	33.25±1.96	31.24±1.93

Table 4: Pearson correlation coefficients (p-values in brackets) between maternal age and neonatal parameters (birth weight, length, HC, CC and ponderal index).

Parameters	Birthweight(kg)	Length (cm)	HC(cm)	CC(cm)	Ponderal index
Mothers-age(years)	0.280(<0.001)	0.286(<0.001)	0.290(<0.001)	0.325(<0.001)	0.121(0.140)

As seen in the (Table 3) the mean birth weight, length, head circumference, and chest circumference was lowest for babies born to mother ages <20 years and the p value was significant (Table 4).

In mothers with GWG less than 7 kg, the mean birth weight was 2.465 kg only which was lowest in the category whereas in those with GWG of >11kg, the mean birth weight was 2.987kg (Table 5). Similar observation (lowest values) was noted for length, HC and CC of the babies of mothers who had weight gain of <7kg during gestation (Table 6).

Table 5: Influence of gestational weight gain(kg) on birth weight (n=150).

Gestational	Birth weight (gm)		
weight gain (kg)	N	Mean±SD	
Less than 7	23	2465.22±500.1	
7.0-8.9	60	2644.33±402.9	
9.0-10.9	36	2900.83±375.7	
≥11	31	2987.1±439.82	

Table 6: Influence of gestational weight gain on length, head circumference (HC), chest circumference (CC) of the baby (n=150).

Gestational weight gain (kg)	N	Length (cm)	HC(cm)	CC(cm)
Less than 7	23	49.15±2.47	31.2±1.99	29.24±2
7.0-8.9	60	49.25±1.99	32.03±1.92	29.91±1.88
9.0-10.9	36	51.44±1.89	33.42±1.71	31.32±1.7
More than 11	31	51.24±2.05	33.18±1.25	31.11±1.28

Table 7: Pearson correlation coefficients (p-values in brackets) between Gestational weight gain and neonatal parameters (anthropometry).

Parameters	Birth weight(kg)	Length (cm)	HC(cm)	CC(cm)	Ponderal Index
Gestational weight gain (kg)	0.435(<0.001)	0.427(<0.001)	0.397(<0.001)	0.388(<0.001)	0.149(0.068)

The p-value between GWG and neonatal parameters was significant as seen in (Table 7) but it must be noted that the gestational weight gain didn't show significant association with ponderal index.

# **DISCUSSION**

Out of 150 new-borns studied 77(51.3%) were male and 73(48.6%) were female which showed skewed ratio in favour of male child. In our study nearly two thirds of the deliveries were by caesarean section (63.3%). The higher number of caesarean sections could be attributed to multiple foetal and maternal indications at the tertiary care centre.

The incidence of low birth weight as calculated by our study is 30% (45/150) which was similar to estimates of

28% in South east Asia but higher than DLHS 4 study conducted in 2011 by Statistical Institute of India which reported nearly 20% of new-born have low birth weight in India.<sup>10</sup>

We found that mean age of mother was 27.6 years (95% CI, ±4.32). Out of 150 mothers enrolled, age of mother <20 year constituted 3.33% of study while 20-30 year age group formed 73.66% of group and >30 year aged mother formed 24% of total sample size. The World Health Organization (WHO) defines teenage pregnancy as pregnancy in which the mother age is under the age of 20 at the time the pregnancy ends. Teenage pregnancy is often referred to as 'at-risk pregnancy' and is of grave concern. In adolescent pregnancy illicit abortion and its consequences and limits on educational opportunity in this age are but two undesirable impacts. Under the

economic conditions prevailing in rural India, coupled with poor utilization of health services, the problem of adolescent motherhood is linked with child survival and maternal mortality and morbidity. The National Family Health Survey 4 (2015-2016) found that average of teenage mother aged 15-19 years (5% in urban area and 9.2% in rural area) was 7.9% which was significantly better than (16%) of NFHS 3 survey. In Bhilai city of Durg district, teenage mother ratio as per our study (3.33%) was comparable to (5%) national data of urban area.

In our study as shown in (Table 3), mean birth weight among teenage mother (<20 years) was 2068 g (95%CI, ±223.99) which was significantly lower than mean birth weight of 20-30 year old mother (2719.19 g±95%CI, 437.02) and >30 year old mother (2932.78, 95%CI±429.99). Thus, leading to our conclusion that teenage mother gave birth to increased number of LBW babies. Bisai et al, also in his study noted that the young mothers (<19 years) had 2.9 (95% CI: 1.53-5.65, p < 0.001) times more risk than those mothers aged between 19-28 years of delivering LBW babies. 15 Similar findings were noted by Shajari H et al, in a study conducted in Tehran, where their study found that babies born of mothers aged 20 years and below had birth weight of 100g-300g lower than those mothers older than 20 years.16 Other studies like Dhar B et al, and Kapoor S et al, had similar findings in their study. 17,18

As shown in (Table 3), other neonatal anthropometry features like Length, HC and CC showed highly significant positive correlation with increasing maternal age where older mothers gave birth to babies with better length (r=0.286, p=<0.001), HC (r=0.290, p=<0.001) and CC (r=0.325, p=<0.001). In a study, Kapoor S et al.18 found significant effect of maternal age on length of the child but failed to find statistically significant relation of maternal age with HC and CC.

In our study 48 women (32%) gained weight during pregnancy according to IOM guidelines which was similar to study conducted by Bhavdharini et al, in which 30% of Indian women gained weight as per the IOM recommendations. <sup>19</sup>

It was evident from our results (Table 5) that with an increase in GWG there was a corresponding increase in mean birth weight and this increase was statistically significant (r=0.435, p=<0.001). Gondwe et al, in their study conducted in rural Malawi population found a similar outcome (r=0.22, p=<0.001) and Lima et al, also found similar outcome where GWG had statistically significant effect on birth weight of child (r=0.280, p=<0.001).  $^{8,20}$ 

GWG had a positive correlation with neonatal anthropometry of the child i.e. length of child (r=0.435, p=<0.001), HC (r=0.427, p=<0.001), CC (r=0.388, p=<0.001) (Table 6) apart from birth weight. It was similar to study conducted by Gondwe et al.20where

GWG had positive impact on length and HC of child. Similar findings were reported by Kanade et al, in his study on maternal nutrition and effect on birth size and found a positive correlation between HC and length with GWG.<sup>21</sup> Both these studies did not take CC as an indicator. In our study we found positive correlation between GWG and CC of new-born which was statistically significant.

#### CONCLUSION

Maternal age and gestational weight gain have the most important determinant influence during the development of the foetus. Birth weight and size of new-born is directly influenced by general level of health status of the mother. Data on maternal anthropometry are relatively easy to collect and inexpensive to analyse and points towards the early detection of LBW.

Young age and gestational weight gain showed significant impact on neonatal anthropometry. Thus, we can conclude that teenage pregnancies and decreased GWG leads to increased number of LBW and SGA babies.

This study is a tertiary centre-based study in semi urban area. The higher number of referred cases included are not representative of large number of deliveries happening in remote areas and primary centres.

# Recommendations

Since higher number of LBW deliveries were recorded in our study than national average so a larger study in this area is required to confirm our findings and then appropriate action by the local authorities is advised.

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