Gestational Weight Gain among women with different pre-pregnancy BMI and its relation with Birth Weight of Neonates

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ABSTRACT

Aim: To find out the relationship between gestational weight gain among women with different early pregnancy Body Mass Index and birth weight of neonates.

Methods: This is an analytical observational hospital based study. Singleton pregnancy within 10 weeks of gestation were included in the study and they were followed at term. First trimester Body Mass Index was calculated and the women were divided in to underweight, normal weight, overweight and obese according to World Health Organization classification. Total gestational weight gain was calculated and compared according to the American College of Obstetrics guideline. The birth weight of neonate was recorded soon after the delivery and the relation between gestational weight gain and birth weight of the neonate was studied.

Results: Total 228 women were analyzed. Most of the women (69%) had normal Body Mass Index with the mean gestational weight gain of 10.59±4.317 kg and the mean birth weight 3.03±0.487 kg. Underweight and normal weight women had less pregnancy weight gain; overweight women had slightly higher weight gain whereas obese women had weight gain as per the recommendation. The birth weight of neonate was higher in overweight and obese women (p=0.004) but without positive correlation.

Conclusions: The gestational weight gain is not related to the birth weight of neonates but related to the early pregnancy BMI.

Key words: birth weight, body mass index, gestational weight gain

INTRODUCTION

Every woman put on some weight during her gestational period. Gestational weight gain (GWG) is an important factor for better maternal and fetal outcome. GWG occurs as a result of growth of mother due to alteration in nutritional status, metabolism, endocrinology, circulation and fetal growth.[1] Consumption of foods with appropriate vitamin and mineral supplementation, avoidance of alcohol and other harmful substances provides good nutritional status to the mother.[2]

There are recommended ranges of total weight gain of 12.5-18.0 kg during pregnancy as optimal with a gain of 11.5-16.0kg in women with normal BMI and of 7.0-11.5kg for high BMI (overweight) and less than 7kg for obese women.[4]

Pregnancy is a major time point in a woman's life when she develops weight gain.[5] Half of all low birth weight babies are born in South Central Asia, where more than a quarter (27%) of all infants weighs less than 2,500 g at birth.[6] Appropriate gestational weight gain is one of the most improtant predictor of maternal and neonatal well being.[7] The mean birth weight in Nepal is 2.96 kg and the mean weight gain by the mother is 9.48 kgs.[8] However very few studies have been conducted in nepal even though the low birth weight is a public health problem and complicates around 17% of all births world-wide.[3] This study is aimed to assess the weight gain in women with different early pregnancy BMI and its relation with birth weight of neonates.

METHODS

An analytical prospective study was carried out in department of obstetrics and gynaecology in Kathmandu Medical College (KMC) from April 2017 to June 2018, after receiving the ethical approval from institutional review committee. The convienent sampling method was applied to calculate sample size as:

$N=z^2\frac{sd^2}{d^2}$ taking z=1.96, SD=0.35 and d=10%.

Cases within 10 weeks of gestation by either last menstrual period or ultrasonography were taken. Hypertension (HTN), Diabetes Mellitus (DM), placenta previa, Tuberculosis (TB), psychiatric illness, thyroid disorder, multiple pregnancies and Pregnancies resulting in preterm deliveries were excluded. Weight and height of the patient were taken using 'Prestige' weight measuring machine and stadiometer and BMI was calculated and then followed up till delivery to record weight of mother and neonate.

Data analyzed using SPSS version 20. To calculate the results one-way Anova with post hoc Bonferroni test and chi square tests were done.

RESULTS

Out of 250 cases enrolled 228 were analyzable. The mean age was 25.8±4.317 years. The 3/4th of the study group (74.54%) was in between the age group of 20- 29 years and only 2.19% belonged to

the age group less than 19 years; and 3/4th (69%) were of normal weight, 9% underweight and 22% overweight or obese. The gestational weight gain of the study population was in the range of 2 to 28 kg with the mean gestational weight gain of 10.59±4.317 kg. Underweight and normal weight women had less pregnancy weight gain whereas overweight women had slightly higher and obese women had adequate weight gain as per the recommendation. While comparing the gestational weight gain in between two groups underweight and normal weight with overweight and obese, the gestational weight gain was not significantly different (p=0.336). [Table-1]

The birth weight of the neonates was in the range of 2.1-4.2 kg with the mean birth weight of 3.03±0.487 kg. Mean birth weight increased as the BMI increased. [Table-2]

Table-2: Birth weight by early pregnancy BMI

BMI	Mean Birth weight(kg)	p-value
Underweight (<18.5)	2.92 ± 0.472	0. 004
Normal weight (18.5-24.9)	3.02 ± 0.42	
Overweight (25-29.9)	3.18 ± 0.51	
Obese (30 and above)	3.45 ± 0.33	

Table-1: Gestational weight gain with different mean pearly pregnancy BMI

Early pregnancy BMI	Frequency n = 228	Mean initial weight (kg)	Mean final weight (kg)	Mean weight gain (kg)	*Recommended weight gain (kg)
Underweight (<18.5)	21	44.10	55.76	11.67	12.71 - 18.16
Normal (18.5-24.9)	157	51.62	61.92	10.29	11.35 - 15.89
Overweight (25-29.9)	44	59.86	71.41	11.55	6.81 - 11.35
Obese (30 and above)	6	69.83	77.50	7.67	4.99 - 9.08

* *IOM recommendation*

Those women who had excess weight gain there were no low-birth-weight neonate [Table-3] and scattered diagram shows no significant positive correlation between gestational weight gain and birth weight of newborn (r = 0.078, p = 0.243). [Figure-1]

Table-3: Distribution of birth weight group by gestational weight gain as per IOM guidelines

Gestational weight gain	Frequency N = 228	Low birth weight n = 17	Normal birth weight n = 205	Macrosomiac n = 6
Low weight gain	158	11 (6.92%)	124 (78.48%)	3 (1.89%)
Normal weight gain	56	6 (10.71%)	48 (85.71%)	2 (3.57%)
Excess weight gain	34	0 (0.00%)	33 (97.05%)	1 (2.91%)

Majority of all BMI group women gave birth to normal weight neonate and the BMI group and Birth weight grouping were not statistically different (p=0.161). [Table-4]

Table-4: Distribution of BMI group of women by birth weight group

Birth weight (kg)	Early pregnancy BMI					p-value
	Underweight (n=21)	Normal (n=157)	Overweight (n=44)	Obese (n=6)	Total N = 228	
Low (<2.5)	6 (28.57%)	19 (12.10%)	5 (11.36%)	0 (0.00%)	30 (13.13%)	0.161
Normal (2.5-3.9)	14 (66.66%)	136 (86.62%)	36 (81.81%)	6 (100%)	192 (84.21%)	
Macrosomiac (≥4)	1 (4.76%)	2 (1.27%)	3 (6.81%)	0 (0.00%)	6 (2.63%)	
Mean	2.92±0.472	3.0±0.42	3.18±0.51	3.45±0.33		

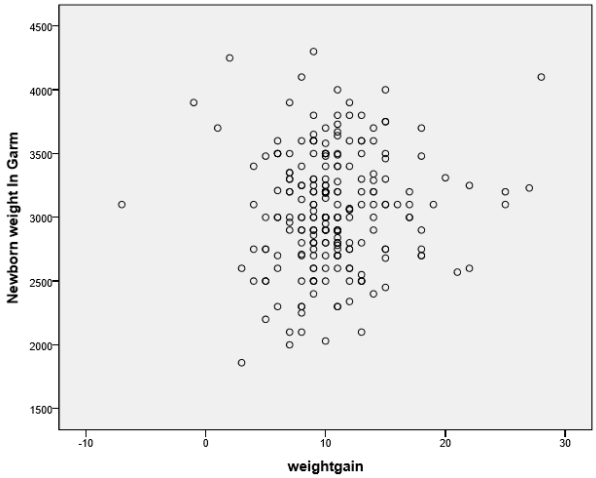

Figure-4: Scattered diagram showing relationship between gestational weight gain and birth weight of neonates

DISCUSSION

The women of this study were in 17-36 years age (25.81±4.317) years and the most of the women were in age group of 20 -29 years. Similar report was from Rooney BL and Schauberger CW (26-30 years)[9] and Lumbanraja et al on 2013 (20 – 35 years).[10]

The first trimester BMI was normal in majority (69%) like in reports of Verma et al,[11] Al-Kubaisy et al[12] and Hoellen et al.[13] A national representative survey 2009 had showed that 10.1% of women in Nepal , 8.9% of women in Bangladesh and 14.8 % of women in India were overweight and obese, but our study showed quite higher percentage (22 %) of over weight and obese women which may be due to the inclusion of the urban population in study group.[14]

The gestational weight gain is in the range of 2 to 28 kg (10.59±4.317) like in the report of Shrestha et al (9.48 kg).[15] The studies done by Asefa F et al in Ethopia and and Rao et al in India found that the mean gestational weight gain was 8.96 kg and 8 kg respectively which is less than the mean gestational weight gain in our study.[16,17] A multi-centric study done in Australia and New Zealand reported 13.9 kg of gestational weight gain in women, which is higher than this study.[18] Study done in USA, has reported 15.6 kg of gestational weight gain among their women which is much higher than this study may be due to the different lifestyles and dietary habit.[19]

Regarding gestational weight gain of the women as per the recommendation of IOM, this study showed underweight and normal weight women had less pregnancy weight gain as compared to overweight and obese which is similar to the study done by Li et al in China.[20] Pongcharoen et al in Thailand found that 23% of the women had adequate gestational weight gain which is similar to our study.[21]

Among total 21 underweight patients more than half (66.66%) gained inadequate weight, only one patient (4.76%) gained excess weight and 28.57% gained adequate weight as per the recommendation which is similar to the study done by Papazian et al. 2017 and Bertoldi Nucci et al. 2001.[22,23]

The birth weight of the neonates was in the range of 2.1 kg to 4.2 kg with the mean birth

weight of 3.03 kg which is almost similar to the study done by Shrestha et al and Upadhyay et al in Nepal.[15,24]

The scattered diagram was plotted to study the relationship between gestational weight gain and birth weight of newborn, but it failed to show correlation between gestational weight gain and neonatal weight whereas Shrestha et al in Patan hospital had found positive correlation between gestational weight gain and birth weight of newborn.[15] Another study done by Upadhyay et al had found that the heavier mothers give birth to the heavier babies which is similar to the findings of this study where the overweight and obese women had significantly heavier babies than under weight and normal weight women.[24] The Study done by Lumbanraja et al 2013 found that 13% of newborns born from mothers having excess weight gain had macrosomiac babies.[10]

Among 6 obese women all had normal weight babies and only one obese women had low birthweight baby. Study done by Upadhyay et al found that most of the obese women had normal weight which is similar to the findings.[24]

CONCLUSION

Underweight and normal weight women had less pregnancy weight gain as compared to overweight and obese women but there was no significant weight difference. Over weight and obese had excess gestational weight gain as compared to normal weight and underweight women suggesting that the women with higher BMI had more weight gain. The birth weight increases as per the BMI of the women. The birth weight of neonate is not related to gestational weight gain.

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