Maternal early pregnancy body mass index and pregnancy outcomes among nulliparous women registered in tertiary care hospital and urban slum hospital of a metropolitan city

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Abstract:

BACKGROUND: Underweight is still prevalent in developing countries like India. Prepregnancy body mass index (BMI) is used as the standard against which the measurements are made in pregnancy.

AIM: To study the association between early pregnancy BMI and feto-maternal outcome among nulliparous women

METHODOLOGY: This is a prospective observational study, with a sample size of 294. The antenatal patients were categorized into four categories of BMI according to the WHO classification, and pregnancy outcomes were compared. Data were analyzed using SPSS Software Version 17.0. Statistical tools used were percentages and mean, and categorical variables were analyzed by Chi-square statistics.

RESULTS: 48.94% of the patients enrolled in the study had normal early pregnancy BMI, and 44.22% and 6.8% were underweight and overweight, respectively. Obese women who gained more weight were at a higher risk of preterm delivery, cesarean section, and more time required for resumption of normal routine. Underweight women were at higher risk of postterm delivery, low birth weight, and increased hospital stay.

CONCLUSION: Adverse maternal and fetal outcomes are seen more commonly with the extremes of BMI.

Keywords:

Body mass index, maternal, nulliparous, pregnancy outcomes

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Introduction

Undernutrition with the consequent underweight is still prevalent in developing countries, leaving these parts of the world with the consequences of both obesity and underweight.[1-4] In India, for example, obesity was reported in about 12.6% of pregnant women, with 21.04% being overweight and 14.79% being underweight in a nationwide study.[1] A body mass index (BMI) of less than 18.50 kg/m² is considered underweight, while one between and 29.99 kg/m² is overweight.[3-5] BMIs of 30 kg/m² and above are classified as obesity.[3-5] When measured before pregnancy, this prepregnancy BMI is used as the standard against which the measurements are made in pregnancy since pregnancy is associated with increased weight gain from the fetus, placenta, and liquor amnii, as well as changes in the uterus, breast, blood, extracellular fluids, and fats.[4,6] When prepregnancy BMI is not measurable

or not available, first-trimester BMI can be used since weight gain in the first trimester is negligible.[6,7]

In this study, we studied the early pregnancy BMI and maternal weight gain in the pregnant women primigravidae registered in the antenatal clinic (ANC) of tertiary care hospital and suburban slum area hospital.

The present study was planned to assess the validity of correlating early pregnancy BMI with fetal and maternal outcomes and the extent to which this can be used as a cost-effective technical tool to be used by grass root-level health workers such as anganwadi workers, accredited social health activist, and public health nurse and the medical officers at the primary health centers.

Methodology

Study population and study period
This was an observational prospective study conducted in two groups; Group 1 in tertiary care hospital ANC and Group 2 in urban health center ANC clinic for a period of 1 year and 6 months from August 2015 to May 2016.

The total sample size was of 294.

Ethical clearance and informed consent
Ethical clearance was obtained from the Institutional Review Board of the College after submitting the protocol and subsequently answering all their queries. In subsequent meetings, informed written consent was taken from the registered pregnant women, and then, questionnaire was administered to the study subjects.

Study procedure
Permission was obtained from the Head of Department of Obstetrics and Gynecology for conducting the study after giving detailed explanation of all the procedures. Preliminary self-introduction was given, and rapport building was done with the respondents. The subjects were oriented regarding objectives of the study. During the preparatory phase for the formulation of a questionnaire, a pilot study was done on 20 subjects to assess communication needs and contents of the questionnaire. A semi-structured questionnaire was prepared in accordance with the study objectives.

Nulliparous pregnant women within 12 weeks of pregnancy without high risk attending antenatal outpatient department who have given their consent were selected by convenient sampling, i.e., all women registered in that duration were included in the study. They were weighed and their weight and height were measured during the first trimester before 12 weeks of pregnancy using standardized calibrated instrument and the same instrument was used for all study subjects.

BMI was calculated using the formula, weight/height in meters^2. Maternal and fetal outcomes were measured after delivery and were correlated with early pregnancy BMI. All of the women were categorized according to the modification for Asian population proposed by the WHO, as underweight (BMI less than 18.5 kg/m^2), normal weight (BMI between 18.5 and 24.9 kg/m^2), overweight (BMI between 25 and 29.9 kg/m^2), and obese (BMI over 30 kg/m^2).[8]

Statistical analysis
All responses were tabulated by the investigator using Microsoft-Excel 2007 Software (Mumbai, Maharashtra, India). Data were analyzed using SPSS Software Version 17.0 (Mumbai, Maharashtra, India). Statistical tools used were percentages and mean, and categorical variables were analyzed by Chi-square statistics. For small numbers, Fisher's exact test was applied wherever required. $P < 0.05$ was considered as statistical significance.

Results

Sociodemographic and economic characteristics of the participants are described in Table 1. Tertiary care hospital respondents belonged predominantly to Hindu religion, while in suburban hospital, respondents were predominantly Muslim. Majority nulliparae in both the groups were educated till 10th standard, were unskilled workers, and had per capital income lower than 6000 INR.

Table 2 shows maternal characteristics. Mean age of the study subjects in Group 1 was 24.38 and in Group 2 was 23. Majority nulliparae in both the groups were below 30 years and had diet deficient in calories and proteins. High number (44.22%) of the respondents in both the hospitals was underweight (early BMI less than 18.5 kg/m^2).

Table 3 show the association of early pregnancy BMI with maternal and fetal outcome. 48.94% of the patients enrolled in the study had normal early pregnancy BMI, and 44.22% and 6.8% were underweight and overweight, respectively. Significant association was found between maternal early pregnancy BMI and maternal outcomes such as mode of delivery, maternal complications, time required for resumption of normal routine, and duration of hospital stay as well as fetal outcomes such as birth weight, preterm birth, and neonatal care admission needed.

Discussion

In our study, we found that only 50% of the nullipara enrolled in the study had normal early pregnancy BMI, and 44.22% and 6.8% were underweight and overweight, respectively. Significant association was found between

Table 1: Sociodemographic information of respondents in both the groups

Variable	Range	Tertiary care antenatal clinic (%)	Suburban antenatal clinic (%)	Total (%)
Religion	Hindu	125 (63.5)	23 (23.7)	148 (50.34)
	Muslim	51 (25.9)	62 (63.9)	113 (38.44)
	Christian	12 (6.1)	7 (7.2)	19 (6.46)
	Others	9 (4.6)	5 (5.2)	14 (4.76)
Education	Primary	46 (23.4)	48 (49.5)	94 (34.97)
	Secondary	98 (49.7)	41 (42.3)	139 (47.28)
	Higher secondary	30 (15.2)	2 (2.1)	32 (10.88)
	Graduate and above	14 (7.1)	0 (0)	14 (4.76)
Occupation	Unskilled	27 (13.7)	16 (16.5)	43 (14.62)
	Skilled	7 (3.6)	0 (0)	7 (2.38)
	Semiprofessional	5 (2.5)	0 (0)	5 (1.7)
Per capita income	≤3000	73 (37.1)	40 (41.23)	113 (38.44)
	3001-6000	101 (51.3)	53 (54.6)	154 (52.38)
	6001-9000	18 (9.1)	4 (4.12)	22 (7.49)
	>9000	5 (2.5)	0 (0)	5 (1.7)
Socioeconomic classification (Kuppuswamy)	Upper middle	15 (7.6)	0 (0)	15 (5.1)
	Lower middle	62 (31.5)	42 (43.3)	104 (35.37)
	Upper lower	120 (60.9)	55 (56.7)	175 (59.52)

Table 2: Maternal characteristics of both the groups

Variable	Range	Tertiary care antenatal clinic (197) (%)	Suburban antenatal clinic (97) (%)	Total (294) (%)
Age	≤20	20 (10.2)	21 (21.6)	41 (13.95)
	21-25	111 (56.3)	63 (64.9)	174 (59.18)
	26-30	48 (24.4)	13 (13.4)	61 (20.75)
	>30	18 (9.1)	0 (0)	18 (6.12)
Dietary calorie intake	Average intake	1971.68 Kcal	1867.78 Kcal	1919.73
	Average deficit	412.32 Kcal	489.94 Kcal	451.13
	Average excess	434.69 Kcal	283.64 Kcal	359.17
Dietary protein intake	Average intake	69.64 g	68.09 g	68.87
	Average deficit	11.36 g	11.69 g	11.53
	Average excess	5.17 g	4 g	4.59
Early pregnancy BMI	Low BMI <18.5	82 (41.62)	48 (49.48)	130 (44.22)
	Normal BMI 18.5-24.9	102 (51.78)	42 (43.30)	144 (48.94)
	Overweight/obese BMI >25	13 (6.60)	7 (7.22)	20 (6.8)
Weight gain during pregnancy	Low (<8 Kg)	33 (16.75)	46 (47.42)	79 (26.87)
	Normal (8-16 Kg)	148 (75.13)	45 (46.39)	193 (65.65)
	High (>16 Kg)	16 (8.12)	6 (6.19)	22 (7.48)

BMI=Body mass index

maternal early pregnancy BMI and maternal outcomes such as mode of delivery, maternal complications, time required for resumption of normal routine, and duration of hospital stay as well as fetal outcomes such as birth weight, preterm birth, and neonatal care admission needed. Obese women were at a higher risk of preterm delivery, cesarean section, and more time required for resumption of normal routine. Underweight women were at higher risk of postterm delivery, low birth weight, and increased hospital stay.

Our study showed the rate of cesarean section was high (34.76%) in high BMI nullipara, which was similar to the findings of a study by Meenakshi *et al*.[9] Similarly, a study by Takai *et al*. showed that increased cesarean section rate and instrumental delivery were seen in obese (38.6%) and overweight (30.0%) groups compared to those with normal weight (28.6%).[10] Similar results were also seen in the studies by Martin *et al*., Enomoto *et al*., and Narayani *et al*.[11,12]

Maternal complication rate in underweight and high BMI category was 9.23% and 9.14%, respectively. Meenakshi *et al*. in their study observed that prolonged hospital stay (33.8%), impaired wound healing (38.1%), urinary tract infection (12.5%), and pyrexia (18.8%) had a higher incidence in obese group.[9] In a study by Takai *et al*., all degrees of perineal tears were more common among cases with normal weight (39.2%), closely followed by the overweight group (30.4%). It was similar among the obese (15.7%) and the underweight (14.7%) groups (*P* = 0.0001).[10]

Table 3: Association between maternal early pregnancy body mass index and feto-maternal outcomes

Feto-maternal outcomes	Maternal early pregnancy BMI		χ^2	P
	≤18.5 kg/m² (%)	>18.5 kg/m² (%)		
Mode of delivery				
Vaginal	117 (90)	107 (65.24)	8.96	0.003
Cesarean/instrumental	13 (10)	57 (34.76)		
Maternal complications				
Present	12 (9.23)	15 (9.14)	46.881	0.034
Absent	118 (90.77)	149 (90.86)		
Duration of hospital stay (days)				
≤3	87 (66.92)	117 (71.34)	4.575	0.032
>3	43 (33.08)	47 (28.66)		
Time required for resumption of normal dury (days)				
≤3	102 (78.46)	139 (84.76)	2.03	0.021
>3	28 (21.54)	25 (15.24)		
Terms of gestation completed (weeks)				
≥37	118 (90.76)	147 (89.63)	7.284	0.007
<37	12 (9.23)	17 (10.37)		
Birth weight (kg)				
≥2.5	82 (63.07)	133 (81.09)	8.485	0.004
<2.5	48 (36.93)	31 (18.91)		
Special attention needed				
Yes	12 (9.23)	17 (10.37)	7.28	0.007
No	118 (90.76)	147 (89.63)		

The study by Baeten *et al.* quoted increased risk of preterm births in obese patients.[13] Bianco *et al.* also found no association between BMI and preterm labor, which was similar to our study findings. A study by Takai *et al.* also showed increased risk of preterm births in obese patients. A study by Takai *et al.* also showed that low birth weight babies were found to be more in underweight group similar to the present study observed that low birth weight babies were found to be more in underweight group with the statistically significant difference.[10] In a study by Lima *et al.*, higher prepregnancy BMI values increased birth weight which was similar to our study.[14] Similar results were seen in a study by Martin *et al.*, Enomoto *et al.*, and Narayani *et al.*[11,12,15]

In the present study, prolonged postnatal stay (more than 3 days) was observed in 28.66% in high BMI category as compared to 17.69% in underweight category. 9.23% and 10.37% of the babies born to women in the present study in underweight and high BMI categories, respectively, needed special attention like admission to neonatal intensive care unit (NICU). S imilarly, in a study by Maya *et al.*, the risk of NICU admission and low APGAR score in singletons increased with maternal BMI.[16] In a study by Tharihalli and Thathagari, low APGAR score at birth was seen more in obese (24%) and in underweight (17.3%) groups.[17]

Conclusion

Underweight as well as overweight and obesity during early pregnancy could lead to adverse pregnancy outcomes. These results highlight the need for maintaining adequate BMI before and during pregnancy. Preconception counseling, especially for underweight weight and obese women, emphasizing the importance of proper physical activity and healthy eating to avoid less or excess weight gain and its adverse effects, could have beneficial outcomes in Asian Indian women.

Conflicts of interest
There are no conflicts of interest.

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