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A study of body mass index in pregnancy and its correlation with maternal and perinatal outcome

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Abstract

Objective: To study body mass index in pregnant women, to correlate body mass index in pregnancy with obstetrics outcome and to correlate body mass index in pregnancy with perinatal outcome.

Materials and Method: Women attending antenatal OPD for antenatal check up at SSMC, Tumkur from January 2015 to June 2016 will be included after informed written consent. The above were placed in standard BMI categories and their obstetric outcomes and perinatal outcome variables were evaluated.

Results: Increased rate of LSCS was associated with high BMI group 41.67% (n=20) when compared to normal 16.67 % (n=6) p=0.013, Significant. Increased rate of Hypothyroid was associated with high BMI group 12.5 % (n=6) when compared to normal 2.77% (n=1) p=0.109, significant. Increased rate of GDM was associated with high BMI group 20.83%(n=10) when compared to normal 8.34%(n=3)p=0.058, significant. Increased rate of GHTN was associated with high BMI group 20.83% (n=10) when compared to normal 8.34% (n=3) p=0.058, significant. Increased rate of in NICU admission was associated with underweight group 37.5% (n=6) when compared to normal 8.34% (n=3)p=0.000214, significant. Increased rate of anaemia was associated with underweight group 56.25% (n=10) when compared to normal 27.77% (n=10) p=0.04, significant.

Conclusion: Body Mass Index plays a significant role in adverse pregnancy outcome. High BMI is associated with increased incidence of hypothyroid, gestational diabetes mellitus, gestational hypertension, instrumental delivery, caesarean delivery. There is significant association of underweight BMI with anaemia, low birth weight.

Keywords: BMI, Underweight, Obesity, Maternal outcome, Perinatal outcome.

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Introduction

Excessive weight is a major health problem in all affluent societies. Obesity continues to rise in the prevalence around the globe. The globe epidemic of obesity continues to grow at an alarming rate, crossing boundaries of age, race and gender. Indeed, it is now so common that it is replacing the more traditional public health care concerns including under nutrition and infectious disease as one of the most significant contributions to ill health.(1) The prevalence of obesity is increasing in pregnancy(2) and has prompted the American College of Obstetricians and Gynaecologists (ACOG) to recommend that the body mass index to be recorded for all women at the initial prenatal visit and that information concerning the maternal and fetal risks of a very elevated BMI in pregnancy should be provided.

WHO in 2009 announced obesity in pregnancy as one of the important non-communicable diseases that threaten maternal and child health. Maternal obesity has been associated with adverse perinatal outcomes. Obese pregnant women are at increased risk of Gestational Diabetes, pre-eclamsia, infections, operative vaginal delivery and caesarean delivery.(3) They are also at increased risk of wound infection and endometriosis. Their offsprings are at increased risk of birth defects, macrosomia and morbidity associated with subsequent child obesity.

In developing countries like India, they also face problems of malnutrition complications related to underweight are anaemia, premature rapture of membranes, low APGAR score, low birth weight babies, preterm delivery and increased perinatal mortality.(4) National health goals stated goal of health policy 2000 was to reduce the prevalence of overweight people to 20% or less by the end of 20th century. This goal was not achieved, but by 2000, more than half of the population was overweight. There emphasize the need for the study. The purpose of study is to correlate the BMI in pregnancy with maternal and perinatal outcome.

Materials and Method

Women attending antenatal OPD for antenatal check up at SSMC, Tumkur from January 2015 to June 2016 will be included after informed written consent. A minimum of 100 patients will be studied. It's a prospective observational study.

Inclusion criteria include, age of 18-35 years, Singleton pregnancy, spontaneous conception and first trimester visit for confirmation of pregnancy. Exclusion criteria include women with multiple pregnancy, women with chronic diseases such as hypertension,

diabetes, thyroid disorders, bronchial asthma, women with previous Caesarean section and with uterine and fetal congenital anomalies.

Women will be informed about the study and purpose of study in detail. A detailed history regarding name, age, obstetric score, will be taken. Estimated gestational age will be calculated based on the recalled last menstrual period and 1st trimester ultrasound studies. Baseline weight and height will be recorded during the initial visit in the first trimester and the basal BMI will be calculated using the formula weight in kilograms divided by height in meter square (kg/m2). The above women will be placed in standard BMI categories and the obstetric outcome variables will be evaluated.

The women will be categorised into four groups according to their BMI as per WHO classification as follows;

Underweight (group 1): less than or equal to BMI 18.5KG/M2

Normal (group 2): BMI > 18.5-24.9 KG/M2

Overweight (group 3): BMI 25-29.9 Kg/m2

Obese (group 4): BMI: 30-34.9 Kg /m2

In First trimester all women were subjected to the routine antenatal investigations including early scan between 10-13 weeks to rule out anomalies. In second trimester at 24-28weeks OGCT was performed. At each visit, BP was noted and thorough general examination was conducted including an abdominal examination to look for the fundal height, fetal heart rate, position of the fetus. Hematology and urine routine was tested every 4 weeks. Till 28 weeks, the patient was reviewed every 4 weeks and then every two weeks upto 36 weeks and weekly there after till delivery. In third trimester thorough general examination and obstetrical examination was done. OGCT was repeated at 32-34wks if it was normal the previous two times. Pelvic assessment done at 38wks. Any abnormal observations or if the patient developed any complications at any time of the study it should be documented and management of the complications was implemented.

The outcome variables of the study included;

1. Development of hypertensive disorders of pregnancy
2. Development of gestational diabetes mellitus
3. Development of hypothyroidism
4. Development of anemia and any infections
5. Mode of delivery
6. Birth weight of baby, APGAR score at 5 min and need for NICU admission
7. Postpartum complications.

Statistical Analysis was done using SPSS version17 categorized variables were reported using number and percentages. Chi-square test and fisher's exact test was done to find the association between the BMI categories and the outcome variables.

Results

Table 1: Distribution according to age

Age	18-22	23-29	30-35	Total
Under Weight	3(18.75%)	9 (56.25%)	4 (25%)	16
Normal	7 (19.44%)	26 (72.22%)	3 (8.33%)	36
Over Weight	9 (23.68%)	25 (65.78%)	4 (10.52%)	38
Obesity	2 (20%)	6 (60%)	2 (20%)	10
Total	21	66	13	100

Table 1 shows; 21% (n=21) of women are between 18-22 age group. 66% (n=66) of women are in 23-29 age group. 13% (n=13) of women are between 30-35 age. Majority of study population 66% (n=66) were in the age group between 23-29. Mean age of women in the study was 25.84 years.

Table 2: Distribution according to parity

Parity	Primi	P1	P2	Total
Under Weight	6 (37.5%)	8 (50%)	2 (12.5 %)	16
Normal	27 (75%)	6 (16.66%)	3 (8.34%)	36
Over Weight	28 (73.68%)	7 (18.42%)	3 (7.89%)	38
Obesity	7 (70%)	2 (20%)	1 (10%)	10
Total	68	23	9	100

Table 2 shows; 68% (n=68) women are primi. 23% (n=23) women are para 1. 9% (n=9) women are multiparous.

Table 3: Mode of delivery with each BMI category

Mode of Delivery	VD	LSCS	INST	Total
Under Weight	14 (87.5%)	2 (12.5%)	-	16
Normal	29 (80.55%)	6 (16.66%)	1 (2.77%)	36
Over Weight	22 (57.89%)	14 (36.84%)	2 (5.26%)	38
Obesity	1 (10%)	6 (60%)	3 (30%)	10
Total	66	28	6	100

In present study 66% of women had vaginal delivery, underweight group were 87.5% (n=14), normal 80.55% (n=29), Overweight were 57.89% (n=22), obese 10% (n=1).

Among 28% of women with LSCS underweight group were 12.5% (n=2), normal 16.66% (n=6), overweight were 36.84% (n=14), obese 60% (n=6). Among 6% of women with instrumental delivery normal BMI 2.77% (n=1).0verweightweight were 5.26% (n=2), obese 30% (n=3).Significant increase in instrumental delivery as BMI increases CHI SQUARE: 10.753. P-Value 0.013, statistically significant increase in operative delivery as BMI increases. Increased rate of LSCS seen in obese group 60% (n=6) and overweight group 36.84% (n=14)P Value – 0.013. Significant linear trends in the increase of LSCS rates as BMI increases. Increased rate of vaginal delivery in underweight group 87.5% (n=14)P Value- 0.013. Significant linear trend in the decrease in normal delivery as BMI increases.

Table 4: BMI and birth weight

Birth Weight	<2.5	2.6-3.0	3.1-3.5	>3.6	Total
Under Weight	13 (81.25%)	3 (18.75%)	-	-	16
Normal	11 (30.55%)	19 (52.77%)	5 (13.88%)	1 (2.77%)	36
Over Weight	6 (15.78%)	15 (39.47%)	14 (36.84%)	3 (7.89%)	38
Obesity	_	3 (30%)	4 (40%)	3 (30%)	10
Total	30	40	23	7	100

Table 4 shows; 30% babies with birth weight <2.5 kg 81.25% (n=13) were in underweight group, 30.55% (n=11) were in normal group, 15.78% (n=6) were in over weight group.

40% babies with birth weight 2.6-3kg 18.75% (n=3) were in underweight group 52, 77% (n=19) were in normal group, 39.47% (n=15) were in overweight group, 30% (n=3) were in obese group. 23% babies with birth weight 3.1-3.5kg 0% (n=0) were in underweight group, 13.88% (n=5) were in normal group, 36.84% (n=14) were in over weight group, 40% (n=4) were in obese group. 7% babies with birth weight >3.6kg 0% (n=0) were in under weight group, 2.77% (n=1) were in normal group, 7.89% (n=3) were in over weight group, 3% (n=3) were in obese group.

Majority of babies birth weight 40% (n=40) were in between 2.6-3kgs.

Mean weight of babies in the studies was 2.80kg. Also shows that majority of underweight women significantly associated with low birth weight, as BMI increases birth weight increases.

Table 5: APGAR at 5 minute with BMI

APGAR	5-7	>8	Total
Under Weight	12 (75%)	4 (25%)	16
Normal	1 (2.77%)	35 (97.22%)	36
Over Weight	2 (5.26%)	36 (94.73%)	38
Obesity	2 (20%)	8 (80%)	10
Total	17	83	100

Table 5 shows; 17% (n=17) score between 5-7, 83% (n=83) score >8, average APGAR score at 5 minutes was 8.43%.

Table 6: Comparing study variables between normal, under weight and high BMI Groups

Variables	Normal	Under Weight	High BMI	P-Value
Mode of Delivery				0.013
VD	30(83.33)	14(87.5)	28(58.33)	
LSCS	6(16.67)	2(12.5)	20(41.67)	
Hypothyroid				0.109
Yes	1(2.77)	0(0)	6(12.5)	
No	35(97.23)	16(100)	42(87.5)	
GDM				0.058
Yes	3(8.34)	0(0)	10(20.83)	
No	33(91.66)	16(100)	38(79.16)	
GHTN				0.058
Yes	3(8.34)	0(0)	10(20.83)	
No	33(91.66)	16(100)	38(79.16	
Anemia				0.04
Yes	10(27.77)	9(56.25)	7(14.58)	
No	26(72.23)	7(43.75)	41(85.42)	
Instrumental				0.187
Yes	1(2.77)	0(0)	5(10.42)	
No	35(91.23)	16(100)	43(89.58)	
NICU				0.000214
Yes	3(8.34)	6(37.5)	1(2.08)	
No	33(91.66)	10(62.5)	47(97.92)	

Table 6 shows; increased rate of LSCS was associated with High BMI group 41.67%(n=20) when compared to normal 16.67%(n=6) P=0.013, Significant.

Increased rate of Hypothyroid was associated with High BMI group 12.5%(n=6) when compared to normal 2.77% (n=1) P=0.109, Significant. Increased rate of GDM was associated with High BMI group 20.83% (n=10) when compared to normal 8.34% (n=3) P=0.058, Significant. Increased rate of GHTN was associated with high BMI group 20.83% (n=10) when compared to normal 8.34% (n=3) P=0.058, Significant. Increased rate of NICU Admission was associated with underweight group 37.5% (n=6) when compared to normal 8.34% (n=3) P=0.000214, Significant. Increased rate of Anemia was associated with Underweight group 56.25% (n=10) when compared to normal 27.77% (n=10) P=0.04, Significant.

Discussion

In this study women were divided into 4 BMI group, out of 100 women 16% (n= 16) in present study were in under weight group with BMI less than 18.5 kg per metre square, 36% (n= 36) were in normal group with BMI 18.5 to 24.9 KG per metre square. Overweight group were 38% (n=38) with BMI 25 - 29.9 KG per metre square and obese were 10%(n=10) with BMI>30kg/sq m. Anjana Sharma[5] et al study 14.79% were underweight and 51.78% belonged to the normal weight category, while 21.04%, 10.71% women were from the overweight, obese categories respectively. Yazdani et al study 12.8% were underweight, 41.2% were normal, 35.6% were overweight and 9.8% were obese.

In present study Hypothyroid is found in 7%(n=13), which correlats with 6.5% of Sahu et al, 7.4% of Taghari[6] et al, with 9% of Sapna C Shah et al. Present study shows statistically significant increase of Hypothyroid (p=0.015) as BMI increases. In present study GDM is found in 13%(n=13) correlates with 16.5% of Seshiah V[7] et al gestational diabetes in India. Study done in TN with 17.8% GDM in urban, 13.8% in semi-urban, 9.9% in rural areas. In present study GHTN is found in 13% (n=13), 30%(n= 3) in obese, 18.42%(n=7) in over weight and 8.34%(n=3) in normal BMI group. Kumari[8] et al study 28.8% of GHTN in obese with 2.9% in the non obese. Significant correlation of high BMI with GHTN. In present study anaemia is found in 26%(n=26). Present study correlates with 21.7% of Emmanuel[9] et al study anaemia in relation to BMI. In present study 56.25%(n=9) in underweight, 15.78%(n=6) in overweight and 10% (n=1) in obese women had anaemia. Qin Yu et al in study says in Chinese women inverse association was found between overweight, obese, and anaemia.

In 100 women, 66% (n=66) of women had normal vaginal delivery, 28%(n=28) of women had lSCS with 6% (n=6) women had instrumental delivery. Statistically significant increase in LSCS as BMI increases with P value 0.0131. Poobalon et al metaanalysis found that risk of LSCS was higher in overweight or obese women then with normal BMI. Johnson[10] et al stated obesity causes increase incidence

of operative vaginal delivery. In present study lower BMI was significantly associated with low birth weight as BMI increases there was increase in birth weight of baby, correlating with studies of Fredrick[11] et al. Present study fail to have a significant correlation between BMI and APGAR score which corresponds with Katie L Dickinson B S[12] et al who found similar findings that pre-pregnancy BMI was not predictive of poor APGAR. There is significant increase in NICU admissions as BMI decrease, corresponding with Patricia Noorwood[13] et al study that low BMI associated with increased risk of NICU admission. In present study risk of PPH with increasing BMI was not significant corresponding with Bianco[14] et al found no such difference in the incidence.

Conclusion

Body mass index plays a significant role in adverse pregnancy outcome. In this study we correlated the association of BMI on various pregnancy outcomes. The study of maternal BMI shows strong associations with pregnancy complications and outcomes.

High BMI is associated with increased incidence of Hypothyroid, gestational diabetes mellitus, gestational hypertension, instrumental delivery, caesarean delivery. There is significant association of underweight BMI with anemia and low birth weight. Present study results, together with existing literature, suggest an independent role of abnormal BMI as a determinant of adverse pregnancy outcomes.

Disclosure of Interests

None declared. Completed disclosure of interests from available to view online as supporting information.

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