International Journal of Clinical Obstetrics and Gynaecology

ISSN (P): 2522-6614
ISSN (E): 2522-6622

www.gynaecologyjournal.com
2020; 4(6): 36-39
Received: 25-08-2020
Accepted: 29-09-2020

Dr. Aishwarya Jagan
Associate Professor, Department of Obstetrics and Gynecology, Sri Lakshmi Narayana Institute of Medical Science, Osudu Agaram Village, Kudampakkam, Puducherry, India

Dr. Karuppiah Pandi
Associate Professor, Department of Pediatrics, Sri Lakshmi Narayana Institute of Medical Science, Osudu Agaram Village, Kudampakkam, Puducherry, India

Dr. Sendhil Coumary
Professor, Department of Obstetrics and Gynecology, Mahatma Gandhi Medical college and Research Institute, Pillaiyarkuppam, Puducherry, India

Corresponding Author:
Dr. Aishwarya Jagan
Associate Professor, Department of Obstetrics and Gynecology, Sri Lakshmi Narayana Institute of Medical Science, Osudu Agaram Village, Kudampakkam, Puducherry, India

Effect of body mass index on maternal and perinatal outcomes in nulliparous women: A prospective comparative study

Dr. Aishwarya Jagan, Dr. Karuppiah Pandi and Dr. Sendhil Coumary

DOI: https://doi.org/10.33545/gynae.2020.v4.i6a.731

Abstract
Background: Obesity in women has a significant impact on every aspect of female reproductive life both in terms of infertility and pregnancy complications. The aim of this study is to know the impact of Pre pregnancy BMI on the maternal and perinatal outcomes in a tertiary care centre.
Methods: A prospective comparative study done at a tertiary care centre in South India. According to pre pregnancy body mass index (BMI), participants were categorized into two groups of 200 each, women with BMI 20-24.9Kg/m^2 belong to control group and overweight (BMI 25-29.9Kg/m^2) and obese (BMI > 30Kg/m^2) women belong to study group. The maternal and fetal outcomes were compared by univariate and multivariate analysis.
Results: Compared to women with normal BMI, the following outcomes were significantly more in obese pregnant women gestational diabetes mellitus (RR=3.94); hypertensive disorders (RR=4.81) and large for gestational age (RR=9.43). Spontaneous onset of labour was recorded in 58.5% of women with normal pre-pregnancy BMI, whereas 54.5% of obese women had their labour induced. Among women with induced labor, obesity was a significant risk factor for delivery by C-section ($p<0.001$).
Conclusion: It is readily apparent that obesity in pregnant women is associated with significant adverse maternal and perinatal outcomes.

Keywords: Nulliparous women, body mass, pregnancy complications

1. Introduction
Over the past two decades, obesity has emerged as a major public health problem globally [1, 2]. Obesity can be seen as the first wave of a defined cluster of noncommunicable diseases called "New World Syndrome," creating an enormous socioeconomic and public health burden. According to the National Family Health Survey (NFHS), the percentage of ever-married women aged 15-49 years who are overweight or obese increased from 11% in NFHS- 2 to 15% in NFHS-3.
Body mass index (BMI) is defined as weight in kilograms divided by height in square meters. In healthy adults, BMI ranges from 19.8 to 24.9. When BMI is between 25 and 29.9 it indicates overweight, and when BMI is 30 or more it indicates obesity [3]. Maternal obesity has become one of the most commonly occurring risk factors in obstetric practice [4, 5, 6].
Emerging evidence suggests obesity is associated with increased complications during pregnancy, labour and delivery, and into the postpartum period, as well as adverse neonatal outcomes which include fetal growth abnormalities such as macrosomia [7, 8], neural tube defects [9], and still birth [10, 11]. These have implications for obstetrical management and maternal and neonatal care [12, 13].
This study aimed to evaluate the association between Pre pregnancy Body Mass Index and their Obstetric and Perinatal outcomes during pregnancy.

2. Methods
This is a hospital based prospective comparative study conducted at Department of Obstetrics and Gynaecology, Mahatma Gandhi Medical College and Research Institute, Puducherry, from January 2017 to December 2017 on 400 singleton nulliparous women. The study protocol was approved by the Institute Ethics Committee. Informed consent was taken prior to the inclusion of the individual into the study.

2.1 Inclusion Criteria
- Primigravida
- Singleton gestation
- Patients booked at MGMCRI in the first trimester
- Gestational age more than 28 weeks

2.2 Exclusion criteria
- Multiple pregnancy
- Multigravida
- Pre-existing diabetes mellitus
- Chronic hypertension and pre existing renal disease
- History of thromboembolism, connective tissue disorders

2.3 BMI calculation and grouping
All anthropometric measurements were carried out by means of standard methodology as described by Lohman *et al* [14]. Women fulfilling exclusion and inclusion criteria are selected and the prepregnant or first trimester BMI is calculated using standard formula. These women were followed till delivery. Newborn baby weight was taken at the time of birth without any cloths. To remove interobserver bias and instrumental bias, all measurements were taken by the same measuring instrument/ scale and by the same person. BMI was calculated by using the formula BMI = (weight in kilograms /height in meters^2). Based on this, patients to be studied were divided into 2 groups of 200 patients each

1 BMI more than 20 and less than 24.9 (Control Group)
2 BMI more than 25 (overweight and obese women) (Study Group)

The group with BMI in the normal range (20–24.9 kg/m2) will be used as the reference or comparison group for the analysis.

2.4 Outcome measured:
- Obstetric outcomes include the following—gestation hypertension, diabetes, mode of delivery, PPH, and wound infection

Perinatal outcomes in form of birth weight and NICU admissions were assessed.

2.5 Statistical analysis
Statistical analysis was carried out using SPSS version 19.0 (IBM SPSS, US) software. Descriptive statistics were expressed as arithmetic mean and standard deviation, and categorical outcomes were compared by chi-square test and relative risk ratio. A p value < 0.05 was considered as significant.

3. Results

Table 1: Sociodemograghic Characteristics

Characteristics	Study	Control
Age		
18-24 year	56	116
25-29 years	89	54
30-34 years	34	21
≥35 years	21	9
Socioeconomic Status		
Class I	62	96
Class II	78	74
Class III	56	30
Class IV	4	0
Class V	0	0

In this study obesity is predominant among pregnant women of >30 years of age. The mean maternal age was 26.25±3.86 ranging from 18 – 36 in obese group compared to 25.56±3.58, ranging from 20 to 37 years in the control group. Table 1 summarizes the results of sociodemographic characteristics and age of the participants. Among the 400 women included in the study, BMI > 25 was more prevalent in women belonging to class I and II.

Table 2: Mean age and BMI in both groups

	Study	Control	P Value
	Mean ± SD	Mean ± SD	
Age	26.25 ± 3.86	25.56 ± 3.58	NS 0.07
BMI	30.58 ± 2.18	23.94 ± 1.98	<0.001

Table 2 summarizes the mean BMI of study group was 30.58 ± 2.18 and in control group was 23.94 ± 1.98

Table 3: Type of Conception

Conception Type	Study	Control	P value
Spontaneous	137 (68.5%)	173 (86.5%)	<0.0001
Assisted	63 (37%)	27 (13.5%)	

Table 3 summarizes the type of conception where, women requiring treatment for infertility prior to conception was more in obese group (37%) than in women with normal BMI (13.5%)

Table 4: Incidence of antepartum complications

Complication	Study (n=200)	Control (n=200)	RR
Hyperemesis Gravidarum	26(13%)	20(10%)	1.3
Hypertensive disorders	77(38.5%)	16(8%)	4.81
Gestational diabetes	63(31.5%)	16(8%)	3.94
Anaemia	45(22.5%)	72(36%)	0.63
Antepartum haemorrhage	10(5%)	4(2%)	2.5
IUGR	4(2%)	6(3%)	0.67
LGA	66(33%)	7(3.5%)	9.43
PROM	26(13%)	36(18%)	0.72
Preterm labour	12(6%)	9(4.5%)	1.33
Post dates	24(12%)	29(14.5%)	0.83

Table 4 summarises the different obstetric parameters, obese women had a significantly higher prevalence of hyperemesis gravidarum (13%), hypertensive disorders (38.5%), gestational diabetes (31.5%) and antepartum haemorrhage (5%). Obese women had the highest rate of LGA babies (33%).

Table 5: Intapartum and Postpartum Events

Type of Labour	Study	Control	P-value
Spontaneous	71 (35.5%)	117 (58.5%)	<0.001
Induced	129 (54.5%)	83 (41.5%)	
Mode of Delivery			
Normal vaginal delivery	86 (43%)	128 (64%)	<0.001
Instrumental delivery	9 (4.5%)	10 (5%)	0.81
Caesarean section	105 (52.5%)	62 (31%)	<0.001
Failed Induction	58 (55.2%)	27 (32.5%)	0.71
PPH	61 (30.5%)	22 (11%)	<0.001
Wound Infection	20 (19%)	3 (4.8%)	0.01

The intrapartum and postpartum parameters are summaries in table 5, the higher the pre pregnancy BMI the lower the chance of spontaneous onset of labour. Labour was induced in 54.5% of the women in obese group, whereas only 41.5% with normal BMI required induction. Conversely spontaneous labour was more frequent in women with normal BMI (53.5%).
With regards to the mode of delivery, majority of the women

with normal BMI ended up with normal vaginal delivery (64%). The incidence of caesarean section (52.5%) where more in women with BMI > 25, who also had a lower rate of operative vaginal deliveries (4.5%). There was no significant difference in operative vaginal delivery in both the groups. Postpartum haemorrhage was encountered in 30.5% of women in obese group which was significantly higher when compared with 11% in the control group.

Table 6: Neonatal Outcomes

Parameters	Study	Control	P-value
Fetal weight	3412.08±824.18	2364.56±376.85	<0.001
Shoulder dystocia	1	0	0.5
Birth asphyxia	15	6	0.053
Hypoglycaemia	5	1	0.14
Phototherapy	43	14	<0.001
Admission to NICU	52	21	<0.001
Hospitalization (days)	4.1+3.9	3.0±1.8	<0.001

Table 6 summarizes the neonatal outcomes in the control and obese group.

4. Discussion

Obesity is considered as an emerging problem globally and it may have a profound significant impact on pregnancy and its outcome. Different studies on obesity and pregnancy worldwide have given a varied result. Pregnant women with other risk factors like chronic hypertension, diabetes, thrombophilia and previous caesarean section or any other surgical and medical history were excluded from our study to evaluate obesity as the only risk factor and its impact on maternal and fetal outcomes.

In our study, the incidence of obesity (BMI> 25) was more in women belonging to higher socio-economic class. This reflects the difference in social and dietary habits among people of various class.

In our study, obesity was associated with an increased risk of both gestational hypertension and pre eclampsia about five (RR= 4.81) times compared to control group. Doherty *et al* reported an increased risk in both gestational hypertension and pre-eclampsia (4.8% in control group and 10.2% in obese group) similar to our study.

In our study we found that obese women were associated with increased risk of gestational diabetes about seven (RR= 7.2) times compared to non-obese group. Doherty *et al* reported the incidence of gestational diabetes in both obese (6.3%) and morbidity obese (9.5%) patients was increased compared with the control group (2.3%) [15]. In a study, the incidence of gestational diabetes was 24.5% for patients with a BMI greater than 40 compared with 2.2% for patients with BMI of 20 to 24.9 (P <0.001) [15]. The incidence of anaemia, preterm rupture of membrane and post-dated pregnancies have not significantly changed among both groups in the present study. A similar observation was made by various other studies.

We observed that obese women are less likely to experience spontaneous labor at term than women with normal BMI (p value <0.05), similar to other studies. The factors that influence the decrease in spontaneous onset of labour in our study are similar to the mechanism that contribute to labor dystocia in obese women, requirement of higher cumulative doses of oxytocin and abnormal contractility of myometrium in obese women [16, 17]. Doherty *et al* reported an increased caesarean delivery rate was 33.8% in obese women compared to that of 22.7% in the control group. A similar result was observed in our study, the risk of caesarean delivery increased significantly (P<0.001) in women with increased BMI (31% in women with normal BMI and 52.5% in women with BMI > 25). This increase in the caesarean section rate in obese women is attributed mainly due to dysfunctional labour subsequent to increase in induction rate. The incidence of failed induction was more in women in the study group compared to the control but the difference was not statistically significant. Other factors that increase the caesarean rate are macrosomia, fetal distress and more so on maternal request in recent times. To date, no BMI thresholds have been reported above which the rates of labour dystocia, and consequently operative delivery, climbs significantly which probes in for further research in this field.

Maternal obesity was associated with increased incidence of postpartum haemorrhage than normal weight mothers (p value <0.001). This is attributed to dysfunctional prolonged labour, macrosomia and increased incidence of operative vaginal delivery and caesarean section in obese women. In our study the incidence of post – caesarean delivery wound infection in obese women was higher with a statistically significant p value of 0.001, which is similar to a study conducted by Cranes *et al* in 1997 [8]. This increase in due to overall increase in the duration of surgery in obese women, dense adipose tissue and delay in mobilisation of patients' post-surgery. We observed that the incidence of anaemia, preterm rupture of membrane and post-dated pregnancies have not significantly changed among both groups.

In our study there is no significant increased risk for IUGR suggesting that IUGR is not influenced by BMI. On the other hand, an increased risk of fetal macrosomia and large for gestational age neonates has been observed with maternal obesity. Usha *et al*., has reported that obese mothers had a higher incidence of large for gestational age delivery compared to normal weight mothers (14.8% vs 7.6%) [18]. In our study the incidence of LGA in obese women was nine (RR= 9.43) times more than the study group. We found that obese patients have a significantly increased risk for LGA babies with a birth weight greater than 3500g compared with controls. These findings emphasise on the importance of clinical estimation of fetal weight in the labor room, to avoid dystocia. The incidence of shoulder dystocia was not significantly increased in spite of increase in LGA babies in our study; this due to good monitoring and practice of labour management. The mean (SD) fetal weight was found to be significantly higher in babies of obese mothers than normal BMI mothers. Requirement of phototherapy was 3 times higher in new-borns of obese mother than normal BMI mothers. But shoulder dystocia, birth asphyxia and hypoglycaemia were not significantly different between the two groups. Need for admission to NICU and hospitalization were significantly higher in babies of obese mothers than normal weight mothers.

5. Conclusion

In summary, our study comprehensively analysed that among primiparous women with term singleton pregnancies who had a institutional antenatal care and delivery, those with increased pre pregnancy BMI were at increased risk of pregnancy complications and perinatal outcomes. Pre pregnancy counselling should be given to women of child bearing age to maintain normal BMI to prevent maternal and neonatal complications.

6. References

1. Rasmussen KM, Yaktine AL. Weight Gain During Pregnancy: Reexamining the Guidelines: The National

Academy Press, 2009.
2. World Health Organization. Global Database on BMI [http://apps.who.int/bmi]
3. Yao M, Roberts SB. Dietary energy & weight regulation. Nutr Rev. 2001; 49:247-58.
4. Sebire NJ, Jolly M, Harris JP, Wadsworth J, Joffe M, Beard RW *et al*. Maternal obesity and pregnancy outcomes: A study of 287, 213 pregnancies in London. Int. J. Obes. Relat. Metab. Disord. 2001; 25:1175-1182. doi: 10.1038/sj.ijo.0801670.
5. Guelinckx I, Devlieger R, Beckers K, Vansant G. Maternal obesity: Pregnancy complications, gestational weight gain and nutrition. Obes. Rev. 2008; 9:140-150. doi: 10.1111/j.1467-789X.2007.00464.x.
6. Lim CC, Mahmood T. Obesity in pregnancy. Best Pract. Res. Clin. Obstet. Gynaecol. 2015; 29:309-319. doi: 10.1016/j.bpobgyn.2014.10.008.
7. P, Lux LJ, Lohr KN. A systematic review of outcomes of maternal weight gain according to the institute of medicine recommendations: birth weight, fetal growth, and postpartum weight retention. Am J Obstet Gynecol. 2009; 201(4):339.e331-339.314.
8. Crane JM, White J, Murphy P, Burrage L, Hutchens D. The effect of gestational weight gain by body mass index on maternal and neonatal outcomes. J Obstet Gynaecol Canada: JOGC. 2009, 31(1):28-35.
9. Rasmussen SA, Chu SY, Kim SY, Schmid CH, Lau J. Maternal obesity and risk of neural tube defects: a metaanalysis. Am J Obstet Gynecol. 2008; 198(6):611-619. 10.1016/j.ajog.2008.04.021
10. Flenady V, Koopmans L, Middleton P, Frøen JF, Smith GC, Gibbons K *et al*. Major risk factors for stillbirth in high-income countries: a systematic review and meta-analysis. Lancet. 2011; 377(9774):1331-1340. 10.1016/S0140-6736(10)62233-7.
11. Chu SY, Kim SY, Lau J, Schmid CH, Dietz PM, Callaghan WM *et al*. Maternal obesity and risk of stillbirth: a metaanalysis. Am J Obstet Gynecol. 2007; 197(3):223-228. 10.1016/j.ajog.2007.03.027.
12. Baron CM, Girling LG, Mathieson AL, Menticoglou SM, Seshia MM, Cheang MS *et al*. Obstetrical and neonatal outcomes in obese parturients. J Matern Fetal Neonatal Med. 2010; 23(8):906-913. 10.3109/14767050903338472.
13. Catalano PM, Ehrenberg HM. The short- and long-term implications of maternal obesity on the mother and her offspring. BJOG: Int J Obstet Gynaecol. 2006; 113(10):1126-1133. 10.1111/j.1471-0528.2006.00989
14. Lohman TG, Roche AF, Martorell R. Anthropometric standardization reference manual. Champaign: Human kinetics Book, 1988.
15. Doherty DA, Magann EF, Francis J, Morrison JC, Newnham JP. Pre-pregnancy body mass index and pregnancy outcomes. International Journal of Gynecology and Obstetrics. 2006; 95:242-247
16. Zhang J, Bricker L, Wray S, Quenby S. Poor uterine contractility in obese women. BJOG. 2007; 114(03):343-348
17. Antonina I, Frolova, Judy J, Wang, Shayna N. Conner, Spontaneous Labor Onset and Outcomes in Obese Women at Term Am J Perinatol. 2018; 35(01):059-064
18. Usha Kiran TS, Hemmadi S, Bethel J, Evans J. Outcome of pregnancy in a woman with an increased body mass index: BJOG. 2005; 112:768-772