Original Research Article **Pharmacy practice**

International Journal of Life science and Pharma Research

ISSN 2250-0480

ASSESSMENT OF THE EFFECT OF MATERNAL PRE-PREGNANCY BODY MASS INDEX ON PREGNANCY OUTCOMES

[1]DR.HEDIEH VAFAEEROK *, [2]DR.SHOBHA RANI.R. HIREMATH, [3]DR.MOHAMMED KAZIM SHERIFF [4]DR.SHOBHA GUDI,

[1]PharmD (Intern), Al-Ameen college of pharmacy, Bangalore, India.
[2]Hiremath, Professor and Head Department of Pharmacy Practice, Al-Ameen College of Pharmacy, Bangalore, India.
[3]Faculty, Department of Pharmacy Practice Al-Ameen College of Pharmacy, Bangalore, India.
[4]Sr.Consultant and Head Department of Obstetrics and Gynaecology St. Philomena Hospital, Bangalore, India.

ABSTRACT

Obesity is a significant health problem which can lead to serious health complications. It does not exclude pregnant population. It is well known that maternal pre pregnancy obesity and overweight is a common health problem which can lead to adverse neonatal and maternal outcomes such as gestational diabetes, pre eclapmsia, post partum haemorrhage, caesarean delivery, neonatal intensive care unit admission, small/ large for gestational age, stillbirth, etc. The aim of the present study is to assess the effect of maternal pre- pregnancy BMI on maternal and fetal outcomes. It was a prospective hospital based cohort study that was carried out for a period of 6 months at St. Philomena's Hospital, Bangalore. The subjects were included after obtaining informed consent. Women with multiple pregnancies and pregnant women whose gestational period was<20 weeks and those who were not willing to participate in the study were excluded. All the relevant data of both maternal and fetal demographic details, type of delivery and neonatal outcomes were collected. Chi square test was used to assess associations between maternal BMI and period of gestation, fetal position, type of delivery, fetal weight, newborn complications and Apgar score. A total of 432 pregnant women were included in the study comprising 49.5% normal weight, 29.3% overweight and 21.2% obese women. We observed higher incidence of LSCS and neonatal complications including pneumonia, hydronephrosis, hypoglycaemia, respiratory distress syndrome, transient tachypnea of newborn in obese and overweight mothers compared to normal weight mothers. We could not find any significant relation between pre pregnancy BMI and neonatal birth weight, period of gestation, Apgar score and fetal position at time of delivery. Maternal and neonatal complications are associated with pre pregnancy obesity.

Key word: ***Obesity, Pregnancy, Neonatal Complications, Overweight***

***DR.HEDIEH VAFAEEROK**
PharmD (Intern), Al-Ameen college of pharmacy, Bangalore, India.

Received on: 06-06-2019
Revised and Accepted on: 04.07.2019
DOI: http://dx.doi.org/10.22376/ijpbs/lpr.2019.9.3.P26-31

INTRODUCTION

Obesity is a major risk factor for many health-related complications including, hypertension, type 2 diabetes mellitus, coronary heart disease, etc.[1]Many unwanted consequences arise during the pregnancy of obese women, their delivery. It also affects their offspring's health condition.[2,3] Obesity during pregnancy contributes to different complications and adverse outcomes including preeclampsia, gestational diabetes, caesarean delivery and fetal macrosomia.[4,5] According to the National Family Health Survey (NFHS-4) conducted in India in 2015-2016, one-fifth of Indian women (20.6%) in the age group of 15-49 are overweight. Whereas, NFHS-3 survey conducted in 2005-2006, reported the obesity rate of women as 12.6%. This shows rise in obesity rate among Indian women in the past 10 years .[6] The international healthcare community has asserted the ideal rate for caesarean sections to be between 10-15% since 1985. However, caesarean sections have become so common in developed as well as in developing countries .[7] As per National Family Health Survey, the overall rate of caesarean section delivery in 2015-2016 was found to be 17.2%. In India it was higher than the previous decade (8.5%).[6] There could be various factors causing an increase in the rate of caesarean delivery.[8]But this is corresponding to the increase in the rate of obesity in women, suggesting a relationship between obesity and caesarean section delivery. Hence, this study was conducted to assess the effect of maternal overweight and obesity on maternal and fetal outcome. (in response to your comment 4: we don't mean that C-section leads to adverse outcomes, though we mean as per literatures obesity and overweight is linked to neonatal and pregnancy adverse outcomes, so it means obesity is one of the factors leading to higher rate of C-section. Please intimate us if any further clarification is required)

MATERIAL AND METHODS

Ethical clearance(with reference number of AL-Am/2017/145) was obtained from the Institutional Ethics Committee of St. Philomena's Hospital in Bangalore before conducting the study. The informed consent was obtained from all study subjects. A prospective, hospital-based, cohort study was conducted at the inpatient ward of Obstetrics and Gynecology Department of Hospital for a period of 6 months from October 2018 to March 2019.Pregnant mothers whose gestational period was<20 weeks and those who were not willing to participate in the study were excluded. The former group was not included as their follow up would not be possible due to insufficient time span of 6 months study. We also did not include multiple pregnancies to avoid confounding variable. (response to comment 6: it is less than 20 weeks. Because our duration of study is limited to 6 months. So if any women of less than 20 weeks of gestation was included we were not able to follow up till delivery. That's why we considered greater than 20 weeks gestation as an average for inclusion of women)The demographic details of the patients were collected from the case sheets. The study participants were categorised based on their body mass index (BMI) into normal weight (BMI 18.5-24.9 kg/m²), over weight (BMI 25- 29.9 kg/m²), obese class I (BMI 30- 34.9 kg/m²), obese class II (BMI 35-39.9 kg/m²) and obese class III (BMI ≥ 40 kg/m²).

STATISTICAL ANALYSIS

All cases were followed up till delivery and post delivery to find out the details about fetal position, delivery patterns and neonatal outcomes. Information regarding period of gestation, fetal weight at the time of birth, types of complication in the newborn and overall well being of the newborn (APGAR score) was collected. Analysis was done using the Statistical Package for Social Science (SPSS) for Windows software (Version 22.0; SPSS Inc, Chicago). Association between variables was analysed by using Chi-square test for categorical variables and level of significance was set as 0.05.

RESULTS

A total of 432 pregnant women with singleton pregnancy were selected forthis study. The general pre- pregnancycharacteristics of mothers including their age, BMI and their comorbidities are depicted in table No.1.

Table 1
Pre- pregnancy demographic characteristics of pregnant women

Characteristics	No.	Percentage
Age (Years)		
19-24	207	48
25-29	137	31.7
30 & above	88	20.3
BMI (kg/m^2)		
18.5-24.99	214	49.5
25.0-29.99	127	29.3
30.0-34.99	57	13.2
35.0-39.99	25	6
40 & above	9	2
Comorbidities		
Hypothyroidism	103	23.8
Diabetes mellitus	34	7.8
Urinary tract infection	5	1.1
Anaemia	10	2.3
Polycystic ovary syndrome	19	5
Epilepsy	2	4.3
Hypertension	11	2.5
Asthma	4	0.9
None	244	56.4

Table No.2 shows the association between pre-pregnancy BMI and maternal and fetal characteristics. It was shown that the caesarean sections delivery was more in overweight, obese I, obese II and obese III groups compared to normal weight women. The difference was found to be statistically significant (P<0.001). Similarly we observed more incidences of neonatal complications in obese III (44.4%), obese II (20%) and over weight (12.5%) and obese I (10.6%) groups compared to normal weight women (2.5%) which was found to be statistically significant (P <0.001). There was no significant relation between pre pregnancy BMI and neonatal birth weight, period of gestation, Apgar score and fetal position at time of delivery.

Table 2
Association between pre pregnancy BMI and maternal and fetal characteristics

Maternal and fetal characteristics	BMI				
	Normal N= 214	**Overweight N= 127**	**Obese I N= 57**	**Obese II N= 25**	**Obese III N=9**
Period of gestation	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
- Full term	203 (94.9)	121 (95.3)	49 (86)	24 (96)	8 (88.9)
- Preterm	11 (5.1)	6 (4.7)	8 (14)	1 (4)	1 (11.1)
P value	**P value = 0.115, Not Significant**				
Fetal position					
- Cephalic	207 (96.7)	123 (96.9)	55 (96.5)	25 (100)	8 (88.9)
- Breech	7 (3.3)	4 (3.1)	2 (3.5)	0	1 (11.1)
P value	**P value = 0.621, Not Significant**				
Type of Delivery					
- LSCS*	51 (23.8)	68 (67.7)	41 (71.9)	20 (80)	7 (77.8)
- Vacuum	0	3 (2.4)	3 (5.3)	0	1 (11.1)
- NVD*	163 (76.2)	38 (29.9)	13 (22.8)	5 (20)	1 (11.1)
P value	**P value < 0.001, Significant**				
Birth weight					
- ELBW* (< 1 kg)	1 (0.5)	0	1 (1.8)	0	0

- VLBW* (< 1.5 kg)	4 (1.9)	3 (2.4)	1 (1.8)	2 (8)	1 (11.1)
- LBW* (<2.5 kg)	186 (86.9)	108 (85)	49 (86)	20 (80)	7 (77.8)
-Normal birth weight (2.5-4.2 kg)	23 (10.7)	16 (12.6)	6 (10.5)	3 (12)	1 (11.1)
P value	**P value = 0.673, Not Significant**				
Complications of newborn					
- Pneumonia	2 (0.9)	8 (6.3)	0	1 (4)	0
- Hydronephrosis	0	4 (3.1)	2 (3.5)	1 (4)	0
- RDS*	3 (1.4)	4 (3.1)	1 (1.8)	2 (8)	1 (11.1)
- TTNB*	0	0	1 (1.8)	0	1 (11.1)
- Hypoglycaemia	1 (0.5)	0	2 (3.5)	1 (4)	2 (22.2)
P value	**P value < 0.001, Significant**				
APGAR Score at 5 min					
- 8/10	13 (6.1)	8 (6.3)	4 (7)	0	1 (11.1)
- 9/10	201 (93.9)	119 (93.7)	53 (93)	25 (100)	8 (88.9)
P value	**P value = 0.711, Not Significant**				

P< 0.05 (significant), N (total =432)

**** LSCS: Lower segment caesarean section * NVD: Normal vaginal delivery * ELBW: Extremely low birth weight * VLBW: Very low birth weight * LBW: Low birth weight * RDS: Respiratory distress syndrome *TTNB: Transient tachypnea of newborn***

DISCUSSION

A total of 432 pregnant women were selected of which majority of them (207, 48%) were in age range of 25-29 years. The mean age was found to be 27.34 ± 4.19 (SD) years. We found that the mean BMI of women was found to be 26.42 ± 5.32 (SD) kg/m^2.These findings were consistent with the results of a study by Dwyer et al., where the mean age was 28.3 years and mean BMI was reported as 25.6 kg/m^2.[9] Among all recruited women, 188 (43.5%) had pre-pregnancy comorbidities. The most commonly observed pre-pregnancy comorbidity was hypothyroidism (103, 23.8%) followed by diabetes mellitus (34, 7.8%), polycystic ovary syndrome (19, 5%), hypertension (11, 2.5%) and anemia (10, 2.3%). The results of the present study showed that full term period of gestation was the most common one in all BMI categories which suggests no association between obesity or overweight and preterm delivery. Similar findings were reported by Marie I. Cedergren that delivery at 42 weeks of gestation was higher compared to preterm delivery in obese women.[10] However, Jared M.Baeten et al found that obese and overweight women were at higher risk of preterm delivery compared to normal weight women.[11] In the present study, the fetal position among different BMI groups was monitored. Majority of women in all BMI groups delivered baby in cephalic position. The results of our study showed that most of overweight women (67.7%) and most of obese women (obese I (71.9%), obese II (80%), obese III (77.8%)) had LSCS (lower segment caesarean section) delivery while most of normal weight pregnant women (76.2%) had NVD (normal vaginal delivery). It showed that there was higher incidence of caesarean section delivery in women with BMI ≥ 25 compared to women having normal weight and the difference was statistically significant (P value <0.001).These findings were similar to other study conducted in India by Anjana Verma et al which reported higher incidence of caesarean sections in overweight, obese and morbidly obese women.[12] Similar findings were reported by other Danish, Netherlands and UK studies that all had shown higher rate of caesarean section delivery in obese and overweight pregnant women.[13-15] In the present study no relation was found between maternal BMI and neonatal birth weight and we observed that most of neonates in all maternal BMI categories had low birth weight. It was in contrast to findings of studies conducted in London and China that they found the positive association between maternal higher pre-pregnancy BMI and higher neonatal birth weight.[13,16] The results of the present study showed the higher incidence of neonatal complications including pneumonia, hydronephrosis, RDS, TTNB, hypoglycaemia leading to neonatal intensive care unit admissions and it was found to be statistically significant (P value <0.001), though we admit that generalisation of this finding of present study is limited due to less number of neonatal complications (37, 8.5%) . Similar findings were reported by Perlow JH et al that higher incidence of neonatal complications including intrauterine growth retardation and

neonatal intensive care unit admission were observed in obese pregnant women compared to women of normal pre pregnancy BMI.[17]GulzhanAimukhametova et al also found that neonatal complications including pneumonia and fetal macrosomia and congenital baby birth defects were more common among neonates of obese mothers.[18] This study showed no significant association with pre pregnancy BMI of overweight and obese mother on Apgar score. Similar findings were reported by other researcher's too.[19]

CONCLUSION

An increased risk of maternal and neonatal complications was found in obese and overweight pregnant women. It is suggested that counselling, educational and nutritional programs for women before and during pregnancy is of great concern and it could have valuable impact on well-being of mothers as well as their off springs.

AUTHORS CONTRIBUTION STATEMENT

Dr. Shobha Rani R.Hiremath and Dr. Shobha Gudi conceived the idea and designed the study. Dr. Hedieh Vafaeerokh carried out the study and wrote the manuscript with supervision and support of Dr. Mohammed Kazim Sheriff.

CONFLICT OF INTEREST

Conflict of interest declared none.

REFERENCES

1. Bendixen H, Holst C, Sørensen TIA, Raben A, Bartels EM, Astrup A. Major Increase in Prevalence of Overweight and Obesity between 1987 and 2001 among Danish Adults. Obes Res . 2004;12(9):1464–72. DOI:.org/10.1038/oby.2004.183
2. Visscher TLS, Seidell JC. The Public Health Impact of Obesity. Annu Rev Public Health . 2001;22(1):35575.DOI:.org/10.1146/annurev.publhealth.22.1.355
3. Catalano PM. Obesity and Pregnancy—The Propagation of a Viscous Cycle? J Clin Endocrinol Metab . 2003;88(8):3505–6. DOI:.org/10.1210/jc.2003-031046
4. Gross T, Sokol RJ, King KC. Obesity in pregnancy: risks and outcome. Obstet Gynecol . 1980 Oct;56(4):446–50. Available from:http://www.ncbi.nlm.nih.gov/pubmed/7422189
5. Edwards L. Pregnancy Complications and Birth Outcomes in Obese and Normal-Weight Women: Effects of Gestational Weight Change. Obstet Gynecol . 1996;87(3):389–94. DOI:.org/10.1016/0029-7844(95)00446-7
6. National Family Health Survey-4 (NFHS-4), India-Fact sheet. International Institute for Population Sciences (IIPS) and Ministry of Health and Family Welfare. [Online]. 2015-16 [cited 2019 Feb 21]. Available from: URL:http://rchiips.org/NFHS/pdf/NFHS4/India.pdf
7. WHO Statement on caesarean section rates. Reprod Health Matters . 2015;23(45):149–50. DOI:.org/10.1016/j.rhm.2015.07.007
8. Farah N, Geary M, Connolly G, McKenna P. The caesarean section rate in the Republic of Ireland in 1998. Ir Med J . 2003 Sep;96(8):242–3. Available from: http://www.ncbi.nlm.nih.gov/pubmed/14653377
9. O'Dwyer V, Farah N, Fattah C, O'Connor N, Kennelly MM, Turner MJ. The risk of caesarean section in obese women analysed by parity. Eur J Obstet Gynecol Reprod Biol . 2011;158(1):28–32. DOI:.org/10.1016/j.ejogrb.2011.04.007
10. Cedergren MI. Maternal Morbid Obesity and the Risk of Adverse Pregnancy Outcome. Obstet Gynecol . 2004;103(2):219–24. DOI:.org/10.1097/01.aog.0000107291.46159.00
11. Baeten JM, Bukusi EA LM. Pregnancy complications and outcomes among overweight and obese nulliparous women. Am J Public Health . 2001;91(3):436–40. DOI:.org/10.2105/ajph.91.3.436
12. Verma A. Maternal Body Mass Index and Pregnancy Outcome. J Clin DIAGNOSTIC Res.2012;DOI:.org/10.7860/jcdr/2012/4508.2551
13. Sebire NJ, Jolly M, Harris JP, Wadsworth J, Joffe M, Beard RW . Maternal obesity and pregnancy outcome: a study of 287 213 pregnancies in London. Int J Obes . 2001;25(8):117582.DOI:.org/10.1038/sj.ijo.0801670

14. Ovesen P, Rasmussen S, Kesmodel U. Effect of Prepregnancy Maternal Overweight and Obesity on Pregnancy Outcome. Obstet Gynecol . 2011;118(2, Part 1):305–12. DOI:.org/10.1097/aog.0b013e3182245d49
15. Gaillard R, Durmuş B, Hofman A, Mackenbach JP, Steegers EAP, Jaddoe VW V. Risk factors and outcomes of maternal obesity and excessive weight gain during pregnancy. Obesity . 2013;21(5):1046–55. DOI:.org/10.1002/oby.20088
16. Li N, Liu E, Guo J, Pan L, Li B, Wang P, Maternal Prepregnancy Body Mass Index and Gestational Weight Gain on Pregnancy Outcomes. PLoS One . 2013;8(12):e82310. DOI:.org/10.1371/journal.pone.0082310
17. Perlow JH, Morgan MA, Montgomery D, Towers C V, Porto M. Perinatal outcome in pregnancy complicated by massive obesity. Int J Gynecol Obstet . 1993;41(3):331. DOI:.org/10.1016/0020-7292(93)90589-o
18. Aimukhametova G, Ukybasova T, Hamidullina Z, Zhubanysheva K, Harun-Or-Rashid M, Yoshida Y . The impact of maternal obesity on mother and neonatal health: study in a tertiary hospital of Astana, Kazakhstan. Nagoya J Med Sci . 2012 Feb;74(1–2):83–92. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22515114
19. Sekhavat L, Fallah R. Could maternal pre-pregnancy body mass index affect Apgar score? Arch Gynecol Obstet . 2012;287(1):15–8. DOI:.org/10.1007/s00404-012-2503-3