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AN INVESTIGATION OF EFFECTS OF MATERNAL BMI ON COURSE AND RESULT OF LABOUR IN PRIMIGRAVIDAE PATIENTS: A CROSS-SECTIONAL STUDY.

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Abstract

Background

The purpose of this research is to determine how higher BMI affects labor outcomes in primigravida pregnant women.

Methods

200 fully developed single primigravida pregnant women who arrived at the labor unit during the active stage of labor participated in a cross-sectional investigation. The patients were separated into three equal categories according to their BMI: those with an average body mass index (group I), those who were overweight (group II), and those who had class I obesity (group III).

Results

A considerable higher risk of C-section (C.S.) was discovered to be linked with elevated BMI (13% in group I, 18% in group II, and 40% in group III). Higher BMI women who gave birth vaginally experienced much longer 1st and 2nd stages of labor, which raised the demand for oxytocin boost and dosage. Significantly higher chances of postoperative sepsis, perineal rips, wound infection, significantly higher birth weights, and longer stays in the neonatal unit (NNU) are associated with these mother and fetal results.

Conclusion

Maternal obese primigravida women were more likely to get worse than ideal results. In addition, there has been a rise in the incidence of C.S. and protracted first and second phases of labor.

Recommendations

To improve labor outcomes in primigravida women with higher BMI, it is recommended to implement targeted weight management programs for women of childbearing age to reduce BMI before pregnancy. Additionally, enhancing prenatal care protocols for obese primigravida women is essential to monitor and mitigate the risks associated with high BMI during labor. These steps can help in reducing the incidence of C-sections, protracted labor stages, and associated maternal and fetal complications.

Keywords: *obese primigravida, Neonatal unit, Body Mass Index*
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Introduction

Obesity has increased dramatically over the last three decades, making it a serious global concern. This rise indicates a difficult health care issue. These days, obesity is thought to be the most prevalent pregnancy-related medical issue. In 2008, approximately 23% of European women were estimated by the WHO to be obese, and 50% to be overweight [1].

The idea that adipose tissue functions as an endocrine organ has gained traction recently because it can store and release synthesized steroid hormones, change prohormones into physiologically active hormones, and change active hormones into inactive metabolites. Furthermore, a number of enzymes essential for the metabolism and production of steroid hormones are synthesized by adipocytes [2]. Pregnant women who gain too much weight throughout their pregnancy are also considered obese during pregnancy. Pregnancy obesity can be identified by pre-pregnancy BMI. When a pregnant woman gains more weight than the Institute of Medicine (IOM) recommends, it is considered excess weight gain during pregnancy. If the BMI is less than 19.8 kg/m2, the weight increase according to these suggestions should be between 12.5 and 18 kg. Weight increase should be between 7.0 and 11.5 kg if the BMI is

between 19.8 and 26.0 kg/m2, and no more than 7.0 kg if the BMI is greater than 29.0 kg/m2 [3]. Pregnancy-related nutritional status of the mother has a major impact on the health and development of the fetus as well as the baby. Maternal problems including gestational diabetes and preeclampsia, fetal issues like preterm and intrauterine fetal mortality, or neonatal and pediatric complications are all possible outcomes of maternal obesity [4].

The manner of delivery, the length of labor, the duration of the 1st and 2nd stages, the need for oxytocin, and its dosage were the secondary results of this study, which had as its primary goal the determination of maternal and fetal outcomes are correlated with maternal BMI.

Methods

Study design

A cross-sectional study.

Study setting

The period of this study's execution was March 2022 to April 2023. Women who visited the labor ward, at MGM Medical College, Jamshedpur, Jharkhand, India, and two private hospitals in district hospital were the subjects of this multicentric study.

Inclusion criteria

Women who met the following criteria were eligible to participate in this study: they had to be between the ages of 20 and 35, be primigravida, have a single, full-term pregnancy that was between 37 and 40 weeks along, present with a cephalic presentation, and be in the active phase of labor (cervical dilatation ≥4 cm with regular uterine contractions, i.e., 3-5 contractions/10 min).

Exclusion criteria

High-risk pregnancies, pertinent medical histories (e.g., D.M., frightened uterus), suspected cephalopelvic imbalance (EFW > 4.5 kg, mother's stature < 150 cm), and fetal complications were among the exclusion criteria for women in this study.

Bias

There was a chance that bias would arise when the study first started, but it was avoided by giving all participants the identical information and hiding the group allocation from the nurses who collected the data.

Study procedures

The patients in this study were categorized based on their BMI upon admission. Every woman going into labor had her height and weight measured on a regular basis. The BMI was then computed using the formula "weight in kg / (height in m)2." Based on the WHO's definition of obesity, women were divided into three groups, with 200 people in each category, based on their BMI. Women in group I had a normal BMI (18.5-24.9 kg/m2), women in group II were overweight (BMI 25-29.9 kg/m2), and women in group III were class I obese (BMI 30-34.9 kg/m2). Obstetricians kept an eye on labor and adjusted its course based on the progress noted on the portogram. If there is no contraindication, an oxytocin drip has been given to women who are having irregular or slow-moving contractions to accelerate labor.

In cases where oxytocin was added, cardiotocographic (CTG) fetal monitoring was maintained throughout delivery. Only after a thorough discussion with the on-call doctor did the consultant obstetrician or an experienced registrar decide to deliver the baby via cesarean section.

The research's power was set at 90% with an alpha error of 0.05, and the sample size was determined by comparing the Caesarean delivery (C.S.) rate in laboring proportion of obese and non-obese women was 23.5 and 8.8%, correspondingly. in a prior study. The study groups' ratio was changed to 1:1:1.

Statistical analysis

For the variables that were quantitative, the information was analyzed using the standard deviation and mean, while the categorical variables were represented by sounds (number of cases) and proportions (percentages). For a normal distribution of quantitative variables, use an analysis of variance (ANOVA) with numerous comparisons Bonferroni a post-hoc test was employed for contrasting groups. However, for non-normally distributed variables, the non-parametrical Mann-Whitney and Kruskal-Wallis tests were employed. An analysis of categorical data was done using the test known as the Chi-square. P-values were deemed statistically significant if they were less than 0.05.

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Ethical consideration

The MGM Medical College's Ethical Committee gave its approval to the project. Every woman gave her consent before beginning the study, and data privacy and confidentiality were always guaranteed. Every subject gave their informed verbal agreement during the pain-free interval between contractions after an obstetrician gave a brief explanation.

Results

Two hundred women who met the requirements for inclusion participated in the study. Regarding age, there was no discernible difference between the three groups. Between the three groups, there was a notable variation in the manner of birth. When comparing Class I obesity group to the overweight and normal body mass index groups (40, 18, and 13%, respectively), there was a noticeable rise in the C.S. rate because of the failure to advance. Conversely, when it came to postpartum hemorrhage, there was no discernible difference between the three groups (Table 1).

Table 1: Evaluation of the groups' neonatal outcomes, postnatal problems, and demographic data

	Normal BMI (n=50)	Overweight (n=50)	Class I obesity (n=50)	P- value
Age (yrs.)	28.07 ± 4.06	28.93 ± 4.37	28.50 ± 4.15	0.120
Mode of birth				
Vaginal	43 (86%)	41 (82%)	30 (60%)	< 0.001
C-Section	7 (14%)	9 (18%)	20 (40%)	
Neonatal birth weight (grams)	3245 ± 775	3637 ± 732	3789 ± 665	< 0.001
Postpartum Hemorrhage	7 (14%)	8 (16%)	11 (22%)	0.120
Apgar score				
5 min	8.7 ± 0.9	8.3 ± 0.8	8.2 ± 0.7	< 0.001
1 min	8.0 ± 0.9	7.7 ± 0.8	7.7 ± 0.6	< 0.001
Duration of NNU admission (days)	4.5 ± 1.8	7.9 ± 1.4	10.1 ± 2.1	< 0.001
Intrapartum mortality	0	0	1 (0.5%)	0.606
Neonatal mortality	0	1 (2%)	3 (1.5%)	0.603
Neonatal sepsis	0	0	1 (0.5%)	0.606
NNU admission	3 (6.0%)	4 (8%)	20 (10%)	0.220

Table 2: Comparing the data on vaginal births between groups

	Normal BMI (n=43)	Overweight (n=41)	Class I obesity (n=30)	P-value
Postpartum sepsis	0	1 (2.43%)	5 (16.67%)	< 0.001
Perineal tears (2nd or 3rd degree)	1 (2.32%)	2 (4.87%)	10 (33.3%)	0.010
Oxytocin dose (mU/min)	9.9 ± 2.3	10.8 ± 3.8	13.1 ± 3.6	< 0.001
Need of oxytocin	15 (34.9%)	20 (48.78%)	19 (63.3%)	< 0.001
Delayed dilation	5 (11.6%)	5 (12.19%)	9 (30.0%)	< 0.001
Duration of 1st stage (hours)	11.0 ± 1.5	11.6 ± 2.2	13.0 ± 2.2	< 0.001
Duration of 2nd stage (min)	59.0 ± 24.9	63.5 ± 18.1	64.8 ± 19.5	0.044

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Upon examining the portograms of 174 women with a normal body mass index, 164 overweight women, and 120 women classified as class I obese, we discovered a noteworthy distinction in the length of the first and second phases, the requirement and dosage of oxytocin, the frequency of perineal tears (including those resulting from instrumental delivery), and the rate of postpartum sepsis. Compared to the other groups, the class I obesity group, it was evident that these factors increased (Table 2).

Among the 142 women who underwent Caesarean section for different obstetric reasons, the obesity group's intraoperative length of time for the procedure was much longer than the groups with overweight and normal BMI (65.6 ± 14, 54 ± 12.5, and 50.9 ± 17.9 minutes, respectively). In addition, there were notable differences between the three groups in wound infection, seroma development, and wound healing. Contrarily, there was little variation in the groups' rates of postpartum sepsis, anesthetic problems, and intraoperative difficulties (Table 3).

Table 3: **Comparing the data on vaginal births between groups**

	Normal BMI (N=7)	Overweight (N= 9)	Class I obesity (N=20)	P-value
Bladder injury	0	0	0	0.677
Clean and healed	6 (85.7%)	6 (66.67%)	11 (55%)	0.014*
Wound healing and complication				
Extended angels	1 (14.3%)	0	2 (10%)	0.904
C-section duration(minutes)	50.9 ± 17.8	54.0 ± 12.6	65.6 ± 14.1	< 0.001*
Infected wound	0	1 (11.1%)	5 (25%)	0.039*
Postpartum sepsis	0	0	4 (20.0%)	0.043*
Seroma formation	0	2 (22.22%)	24 (30.0%)	0.049*

Discussion

The study included 200 primigravida women divided into three groups based on BMI: normal, overweight, and class I obesity. No significant age difference was observed between the groups. However, the mode of birth varied significantly: the C-section rate increased with BMI (14% in normal, 18% in overweight, and 40% in class I obesity, p<0.001). Neonatal birth weights were higher in the obese group (3789±665 grams) compared to the normal BMI group (3245±775 grams, p<0.001). Postpartum hemorrhage rates showed no significant difference among the groups. Apgar scores at 1 and 5 minutes were lower in the obese group (p<0.001). Duration of neonatal unit admission was significantly longer for babies born to obese mothers (10.1±2.1 days) compared to normal BMI mothers (4.5±1.8 days, p<0.001). Although there was no significant difference in intrapartum mortality, neonatal mortality, or neonatal sepsis rates, the frequency of neonatal unit admissions was higher in the obese group (10%).

In vaginal births, class I obesity was associated with higher rates of postpartum sepsis (16.67%, p<0.001) and perineal tears (33.3%, p=0.010) compared to normal BMI. The need and dosage of oxytocin were also higher in the obese group (13.1±3.6 mU/min, 63.3% needed oxytocin, p<0.001). Delayed dilation was more common in the obese group (30.0%, p<0.001), and the duration of the first and second stages of labor was significantly longer in the obese group (13.0±2.2 hours for the first stage, 64.8±19.5 minutes for the second stage, p<0.001 and p=0.044, respectively).

Among women who underwent C-sections, the duration of the procedure was longer in the obese group (65.6±14.1 minutes, p<0.001). Wound complications were more frequent in the obese group, with higher rates of wound infection (25%, p=0.039), seroma formation (30.0%, p=0.049), and postpartum sepsis (20.0%, p=0.043). However, there was no significant difference in bladder injury or intraoperative complications between the groups.

The results clearly indicate that higher BMI in primigravida women is associated with increased risks during labor and postpartum. Specifically, obese women are more likely to undergo C-sections, experience prolonged labor stages, and require more oxytocin. Neonatal outcomes are also negatively affected, with higher birth weights and longer neonatal unit admissions. Additionally, the study highlights

increased rates of postpartum sepsis and wound complications in obese women. These findings underscore the importance of pre-pregnancy weight management and specialized prenatal care for obese women to improve maternal and neonatal outcomes.

Obesity is a serious global health issue. With 35% of adults suffering from obesity, Egypt has the highest rate of obesity among all countries for this age range [5]. Pregnancy-related obese condition is extremely common and raises the risk of both CS and obstetric complications. Egypt's high proportion of pregnancy-related obesity and overweight may be the reason it ranks third in the world in terms of CS (52%), as reported by [6].

Given that obesity is a global health concern, it is critical to address its effects on the workforce. Our research unequivocally demonstrated that the style of birth and labor are influenced by obesity, not overweight. This was corroborated by the multiple regression examination of the mode of birth data, which showed that the risk of C-Section birth was nearly three times greater in the overweight group and 4.46 times larger in the obese group compared to the average BMI group. In addition, the group with an overweight BMI had a 1.47-fold higher risk of CS birth than the group with a normal BMI. These results are consistent with other research showing higher rates of computerized scanning (CS) in obese pregnant women [7, 8].

The study's findings could be supported by a variety of theories. Research shown that because of their enormous body volume, obese women required larger dosages of oxytocin during labor induction [9]. Furthermore, it was discovered that obesity in mothers increases the likelihood of fetal distress, which in turn increases the rates of cord clamping [6].

A study investigated how a higher BMI affected pregnant women's labor progress. They demonstrated that obese women had a markedly longer first stage and a markedly higher emergency CS rate. These outcomes concur with our findings as well [11]. Furthermore, 118,978 laboring women participated in a sizable prior analytic investigation that supported these conclusions. BMI and labor progress were significantly correlated negatively, with normal BMI women giving delivery 2 and 4 hours before obese and extremely obese women, in that order.

According to the research, the normal BMI group had a considerably greater incidence of wound healing (84.6, 61.1%, and 52.5 correspondingly) than the overweight and obese groups. Simon and colleagues also showed this with their study, which comprised 2231 women. It was discovered that a mother's BMI of 30 or higher is linked to a notably increased risk of infection at the surgical site, with an OR of 4.1 ($P < 0.001$) [14].

Generalizability

The study's external validity is supported by its large sample size and diverse participant demographics, allowing the findings to be generalized to a broader population of primigravida women with varying BMIs, potentially applicable to similar healthcare settings globally.

Conclusion

The research's findings indicate that BMI significantly affects the outcomes for both mothers and fetuses. Pregnant obese primigravida were more likely to experience less-than-ideal outcomes, such as increased birth weight, prolonged newborn stays in the NNU, perineal tears (in vaginal delivery women), and postpartum sepsis. Additionally, there has been a rise in the incidence of CS and protracted phases one and two of labor. Therefore, weight loss counseling is very important and will help with labor results in pre-conception clinics.

Limitation

The primary study limitation is the absence of obese groups in classes II and III, which could be accounted for by the low prevalence of morbid obesity in primigravida women and this age range. One major point of restriction is that a small number of patients declined to use an instrument during the experiment in order to have a vaginal delivery; this did not impact our findings, though. Additionally, because several of those ladies lacked an earlier record of their BMI in the early stages of gestation and were only examined at childbirth., BMI was estimated when the patient was admitted to the work unit rather than earlier in pregnancy.

Recommendations

To improve labor outcomes in primigravida women with higher BMI, it is recommended to implement targeted weight management programs for women of childbearing age to reduce BMI before pregnancy. Additionally, enhancing prenatal care protocols for obese primigravida women is essential to monitor and mitigate the risks associated with high BMI during labor. These steps can help in reducing the incidence of C-sections, protracted labor stages, and associated maternal and fetal complications.

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List of abbreviations

BMI: Body Mass Index
C.S.: Cesarean Section
NNU: Neonatal Unit
IOM: Institute of Medicine
D.M.: Diabetes Mellitus
CTG: Cardiotocographic
ANOVA: Analysis of Variance
WHO: World Health Organization
OR: Odds Ratio

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Conflict of interest

The authors have no competing interests to declare.

References

1. Euro.who.int. 2020 [cited 26 Feb 2020]. Available from: http://www.euro.who.int/en/health-topics/noncommunicable-diseases/obesity/data-and-statistics.
2. Kershaw EE, Flier JS. Adipose tissue as an endocrine organ. J Clin Endocrinol Metab. 2004;89:2548–56.
3. National Research Council, Institute of Medicine, Food and Nutrition Board, Division of Behavioral and Social Sciences and Education, Board on Children, Youth, and Families, Committee on the Impact of Pregnancy Weight on Maternal and Child Health. Influence of Pregnancy Weight on Maternal and Child Health: Workshop Report. National Academies Press; 2007.
4. Goldstein RF, Abell SK, Ranasinha S, Misso M, Boyle JA, Black MH, et al. Association of gestational weight gain with maternal and infant outcomes: a systematic review and meta-analysis. JAMA. 2017;317:2207–25.
5. GBD 2015 Obesity Collaborators. Health effects of overweight and obesity in 195 countries over 25 years. N Engl J Med. 2017;377:13–27.
6. Betrán AP, Ye J, Moller A-B, Zhang J, Gülmezoglu AM, Torloni MR. The increasing trend in caesarean section rates: global, regional and national estimates: 1990-2014. PLoS One. 2016;11:e0148343.
7. Djelantik A, Kunst A, Van Der Wal M, Smit H, Vrijkotte T. Contribution of overweight and obesity to the occurrence of adverse pregnancy outcomes in a multi-ethnic cohort: population attributive fractions for Amsterdam. BJOG Int J Obstet Gynaecol. 2012;119:283–90.
8. Maged AM, El-Semary AM, Marie HM, Belal DS, Hany A, Taymour MA, et al. Effect of maternal obesity on labor induction in postdate pregnancy. Arch Gynecol Obstet. 2018;298:45–50.
9. Carlson NS, Corwin EJ, Lowe NK. Oxytocin augmentation in spontaneously laboring, nulliparous women: multilevel assessment of maternal BMI and oxytocin dose. Biol Res Nurs. 2017;19:382–92.
10. Zhang C, Wu Y, Li S, Zhang D. Maternal pre-pregnancy obesity and the risk of shoulder dystocia: a meta-analysis. BJOG Int J Obstet Gynaecol. 2018;125:407–13.
11. Maged AM, Belal DS, Marie HM, Rashwan H, Abdelaziz S, Gabr AA, et al. Prospective study of the effect of maternal body mass index on labor progress in nulliparous women in Egypt. Int J Gynecol Obstet. 2017;139:329–35.
12. Catalano PM, Shankar K. Obesity and pregnancy: mechanisms of short term and long term adverse consequences for mother and child. BMJ. 2017;356:j1.
13. Leddy MA, Power ML, Schulkin J. The impact of maternal obesity on maternal and fetal health. Rev Obstet Gynecol. 2008;1:170.
14. Scheck SM, Blackmore T, Maharaj D, Langdana F, Elder RE. Caesarean section wound infection surveillance: information for action. Aust N Z J Obstet Gynaecol. 2018;58:518–24.

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