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Effect of high maternal BMI on mode of delivery

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Abstract---Introduction: Obesity during pregnancy has increased recently, which has led to issues for the mother, the developing baby, and the newborn. Pathology during pregnancy and in the fetus is more likely in people with higher body mass indices (BMI). Of the 10 nations hosting half of the 693 million people with high BMIs worldwide, Pakistan comes in at number eight. Objective: Objective of the study was to determine how a high maternal BMI affected the manner of delivery. Methods: This study included 1272 pregnant women having a BMI>31kg/m2. Data on the mother, fetus, pregnancy, mode of delivery, i.e. normal vaginal delivery (NVD), instrumental-delivery (ID) and caesarean section delivery (CSD), and any potential neonatal unit admission) were gathered. Using the statistical program SPSS, variables connected to the chance of having a CSD were identified using univariate and multiple logistic regression analysis (v.25). Results: The women's mean age was 27.5 years, having mean BMI 27.2 kg/m2, and 26.69% of them were obese (n=310). 70.12% of women delivered naturally vaginally, 13.83% underwent a cesarean section, and 16.03% used equipment. A noticeably rise in percentage with rising BMI of women who

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underwent a CS was observed. 10% of women with a normal BMI underwent a CS, 15% of those with an overweight BMI, and 25% of those with an obese BMI (p≤ 0.001). A normal BMI resulted in a percentage of 16%, an overweight BMI of 13%, and an obese BMI of 11% without showing significant association (p=0.481). Conclusion: In women who had induced labor, an increasing BMI was linked to higher CSD rates, poorer Apgar ratings, a longer dilation phase, a higher likelihood of having a baby that weighed more than 4000 g, and longer dilation and expulsion durations. An older mother's age is linked to a longer ejection time. Weight management must be a priority during the whole pregnancy and delivery process.

Keywords---obesity, maternal BMI, gestation, delivery, fetal development.

Introduction

Over the past few years, obesity has become more common everywhere. According to Rodriguez-Mesa *et al.* (2019), the incidence of obesity in women will be more than 21% worldwide by 2025. Of the 10 nations housing half of the 693 million obese people worldwide, Pakistan ranks at number eight (Asif *et al.*, 2020). Obesity is linked to several pathologies and is regarded as a cause for many disorders (Chan *et al.*, 2014). Obesity among pregnant women has grown recently, which has led to issues for the mother, the developing baby, and the newborn. A higher BMI increases the risk of fetal and gestational disease (Marchi*et al.*, 2015). Pregnancy hypertension, preeclampsia, gestational diabetes, and HELLP syndrome are all more common in high maternal BMI (Denison *et al.*, 2018). Preterm delivery, foetal macrosomia, perinatal mortality, and congenital malformations are the foetal hazards linked to maternal obesity (Rodrguez-Mesa *et al.*, 2019).

Obesity increases the labour duration, the likelihood of CSD and ID, the risk of postpartum haemorrhage, perianal tears, problems due to anaesthesia and surgery, urinary tract infection and surgical wound infections (Ellekjaer*et al.*, 2017). The dangers to the foetus and related diseases support induced labour (Rogers *et al.*, 2018). Recent years have seen a significant increase in research on the morbidity and death caused by excess weight in pregnant women; But nobody has looked at the consequences of obesity on labour and delivery. Presently, a lot of fat women receive care in maternity rooms in Pakistan. It is crucial to look at how long different birth phases take since these pregnant women display distinct traits throughout delivery.

BMI can divide women into four groups, underweight (18.5kg/m2), normal (18.6-24.9kg/m2), overweight (25-30 kg/m2), and obese (31kg/m2) (WHO, 2017). According to statistics, rates of overweight women in the beginning of pregnancy range from 15% to 30% (25 kg/m2) (Masho*et al.*, 2013; Papoutsis *et al.*, 2017).To the best of our knowledge, no investigations of nulliparous obese women and its impact on the mode of delivery have been conducted in Pakistan. Current

research was carried out to analyze the effect of high maternal BMI on method of delivery.

Material and Methods

Study design and area

A quantitative cohort research was carried out at Department of Gynecology in Hayatabad Medical Complex, Peshawar, Pakistan from January 2019 to October 2021. This research included 1272 pregnant women with a BMI more than 31kg/m^2.

Inclusion and exclusion criteria

We considered nulliparous expectant mothers with a single term fetus (36–42 weeks) because parity and older maternal age are all risk variables that may affect the delivery method. The research excluded women who underwent inductions for stillbirths, fetal hereditarydeformities, and multiple gestations.

Data collection

The hospital's birth records were used by the researchers to gather data. All the information required for this investigation was provided in this registration. At the first prenatal appointment when the women had reached 8 weeks' pregnancy, the female's height and weight as mothers were noted. Gestational age at delivery, delivery method (NVD, ID and CSD) and appearances during labour and delivery were all included in the data. Fetal gender, birth weight, head size, Apgar scores, cord gas measurements collected at delivery, and any potential hospitalization to maternity ward were among the neonatal data that were documented.

Statistical analysis

Proportions of delivery modes was analyzed by Chi-squared test. Findings from univariate and multivariate logistic regression analysis were utilized to identify variables associated with propensity for a CS. The findings of the logistic regression analysis were converted into odds ratios (OR) and 95% confidence intervals (CI). There were two tails for each given *p-value*. SPSS (v.25) was used to conduct the statistical analyze and $p \leq 0.05$ was taken significance value.

Results

Current research included 1272 females who had gone throughdelivery and had an average age of 27.5 years (SD=6.1) with the average BMI of 27.2 kg/m2 (SD=6.0). Few women wereoverweight(28.69%) and 24.37% being obese (n=310). 70.12% of women had a NVD, 13.83% had a CS, and 16.03% had an ID (Table 1). Figure 1 represents the percentage of women who had a NVD, a CS, or an ID based on their BMI. With rising BMI, the frequency of women who had a CS birth increased dramatically.Figure 1 reveals that 10% of women having a normal BMI had a CS, 15% were overweight, and 25% were obese (p=0.001). 16% participants

with a normal BMI, 13% overweight, and 11% obesehad ID, however, no significant association was observed (p=0.481).

Table 1
Association of maternal parameters with mode of delivery

Variables	Sample no. (%)	Mode of delivery		
		NVD	*CSD+ID*	*P*
Maternal age (in years)	27.5 (6.1)	26.3 (6.1)	28.1	0.002
MBMI (kg/m2)	27.2 (6.0)	26.5 (5.8)	29.4 (6.6)	<0.001
NBMI	597 (44.57)	527 (41.43)	56 (4.40)	0.002
OWBMI	365 (28.69)	314 (24.68)	59 (4.63)	
OBMI	310 (24.37)	235 (18.47)	81 (6.36)	
Gestation in days, mean (SD)	277.8 (12.7)	278.6 (12.6)	277 (15.0)	0.001
Mode of delivery				
1. NVD	892 (70.12)			
2. CSD	176 (13.83)			
3. ID	204 (16.03)			
Apgar score at 1 minute, median (IQR)	9 (8-9)	9 (9-9)	9 (8-9)	<0.001
Apgar score at 5 minutes, median (IQR)	10 (10-10)	10 (10-10)	10 (9-10)	<0.001

* MBMI: Mean BMI, OWBMI: Overweight BMI, OBMI: Obese BMI

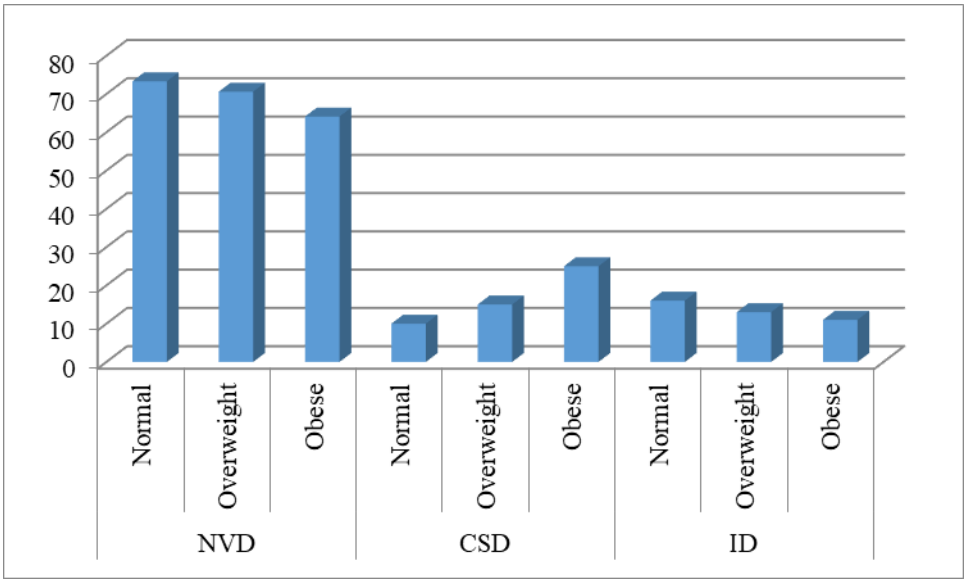

Figure 1. Percentage of mode of delivery

Table 2 shows the outcomes of univariate and multivariate analyses with the CSDas the dependent variable. According to the univariate analysis, a higher probability of CS is linked with increasing maternal and gestational age, and BMI. Elevated maternal BMI was independently related with the likelihood of a CS, according to multiple logistic regression analysis. Furthermore, women who were

overweight or obese were 1.58 and 2.75 times more likely to have a CS, respectively. However, newborns born to overweight or obese mothers had substantially lower Apgar ratings at 1 and 5 minutes than babies born to normal BMI mothers (p=0.001). During investigation with solely regular births, no significant differences were discovered.

Table 2
Analysis of maternal BMI on mode of delivery

Variables	Univariate regression		Multiple regression	
	OR (95% CI)	P	OR (95% CI)	P
Maternal age, mean years (SD)	1.05 (1.02-1.08)	0.004	1.04 (0.10-1.07)	0.059
Mean birth weight (g)	1.09 (1.02-1.12)	<0.001	1.03 (0.95-1.04)	0.554
NBMI	1		1	
OWBMI	1.68 (1.15-2.46)	0.013	1.60 (1.08-2.36)	0.026
OBMI	3.02 (2.06-4.27)	0.004	2.79 (1.91-4.07)	<0.001

Discussion

The current research discovered a unique association between the chances of a CSDand the maternal BMI measured at registration, with overweight and obese females showing a 1.60 and 2.79 times increased risk for a CSDbirth, respectively. These results are consistent with others which found that a rise in maternal BMI was also linked to an increase in the rate of emergency CSDs, which was 1.30 and 1.83 times higher with high maternal BMI (Sebire*et al.*, 2001) and 1.58 and 2.75 times higher (Angeliki*et al.*, 2018). The current results are consistent with those of Rodriguez-Mesa *et al.* (2019) in that high maternal BMI may increase the risk of health issues during pregnancy, as well as a higher incidence of complications during delivery (such as more inductions, CSD or ID). According to results from prior research, the obese group had a considerably greater occurrence of preeclampsia (Yang *et al.*, 2018)and gestational diabetes than the normoweight group (Mourad*et al.*, 2015; Martin *et al.*, 2015).

Additionally, the high maternal BMI, or obese group, had greater rates of CSs and instrumental deliveries, which is consistent with findings from several previous research (Carlhäll*et al.*, 2013; Bautista-Castao*et al.*, 2013; Ellekjaer*et al.*, 2017). According to Norman *et al.* (2012), Ferrazzi*et al.* (2019), and Polónia*et al.*, almost identical findings were obtained (2018). Obese women had lengthier initial stages of labour and were more likely to have induced deliveries than normoweight women (Rodrguez-Mesa *et al.*, 2019). Increased uterine dystocia, such as cephalopelvic disproportion, may be the cause of this increase in the time of dilatation in obese women (Nelson *et al.*, 2013; Zhang *et al.*, 2016 & Muir *et al.*, 2016).

The National Research Council (NRC) and the Institute of Medicine (IOM) in the United States published a recommendation in 2009 about the acceptable weight increase during pregnancy in proportion to the mother's pre-pregnancy BMI29. Pregnant women with a normal BMI should notincrease more than 35 lbs (16 kg), pregnant females with an excess of 25 lbs (11.5 kg), and pregnant women with an excess of 20 lbs (9 kg). There are currently no official, evidence-based

recommendations from professional organizations or the UK Government on what constitutes acceptable weight increase during pregnancy (NICE, 2010). In a September 2013 update, the IOM and NRC noted that many women continue to get little preconception or post conception counseling on pregnancy-weight gain (Angeliki*et al.*, 2018). A research in the UK discovered that pediatricians, the frontline practitioners when giving weight-related guidance, still are biased when give guidance to obese women due to their own beliefs about body issues. As a result, their guidance is not always based on empirical research (Foster and Hirst, 2014). Other research has revealed that UK health care providers do not educate women about the dangers of obesity and the significance of weight control before or during pregnancy (Heslehurst*et al.*, 2007).

All medical practitioners working in prenatal and postnatal care should encourage women to engage in physical and dietary treatments for weight control prior to pregnancy, according to the National Institute for Health and Care Excellence's 2010 recommendations (NICE, 2010; Angeliki*et al.*, 2018). There is presently no governmental advice for weight control following delivery for professionals in Pakistan. According to some theories, controlling a woman's weight in the first few years following childbirth may lower her chance of beginning her next pregnancy overweight or obese. Healthy eating, frequent exercise, and exclusive breastfeeding have all been recommended as strategies. Breastfeeding's increased energy needs may enable women to regain their pre-pregnancy weight (Antonakou*et al.*, 2017). Additionally, frequent exercising regularly will not impair an individual's right to nurse and may even help her control her weight.

Conclusion

In women who had undergone induction of labour, a rising BMI was linked to higher CSD mode and poorer Apgar ratings. A lengthier dilation phase, a higher chance of a birth weight greater than 4000 g, and a higher likelihood of a CSDare also linked to high maternal BMI. Prolonged dilation and ejection times are related to fetal weight. An older mother age is linked to a longer ejection time.

Suggestions

Due to the impact of high BMI on delivery, it's crucial to pay attention to weight management during the whole pregnancy in order to decrease difficulties, shorten delivery durations, and ease recovery.

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