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Relationship between Maternal Body Mass Index During Pregnancy and Perinatal Outcomes: A Longitudinal Study

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Abstract

Aims: To determine the relationship between pregnant women body mass index (BMI) and obstetrics outcomes, as well as the relationship between body mass index and perinatal outcomes in pregnant women.

Study design: Longitudinal study

Place and duration: Prenatal OPD between at Sindh Government Hospital Korangi Karachi, Pakistan from August 2020 to August 2021.

Methodology: A total of 100 women who visited the prenatal OPD for an antenatal checkup were included after providing written informed permission. The aforementioned individuals were assigned to conventional BMI categories, and their obstetric and perinatal outcomes were assessed.

Results: LSCS was related with a higher rate of 41.67 percent (n=20) in the high BMI group, compared to 16.67 percent (n=6) in the normal group, p=0.013. Hypothyroidism was related with a higher incidence of 12.5 percent (n=6) in the high BMI group, compared to 2.77 percent (n=1)

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in the normal group, p=0.109. GDM was related with a higher incidence of 20.83 percent (n=10) in the high BMI group, compared to 8.34 percent (n=3) in the normal group, p=0.058. GHTN was related with a higher incidence of 20.83 percent (n=10) in the high BMI group, compared to 8.34 percent (n=3) in the normal group, p=0.058. When compared to the typical 8.34 percent (n=3), the underweight group had a 37.5 percent (n=6) higher risk of NICU admission (p=0.000214). Anemia was related with an increased rate of 56.25 percent (n=10) in the underweight group, compared to 27.77 percent (n=10) in the normal group, p=0.04.

Conclusion: The BMI has a substantial effect in the risk of an unfavorable pregnancy outcome. A high body mass index is concerned to hypothyroidism, gestational hypertension and diabetes mellitus, assisted birth and caesarean delivery. There is a link between underweight BMI and anemia and low birth weight.

Keywords: Pregnancy, perinatal, maternal, body mass index,

Introduction

In all wealthy cultures, obesity is a serious health issue. Obesity is becoming more prevalent all around the world. Obesity is a global disease that is spreading at an alarming pace, affecting people of all ages, races, and genders. Indeed, it has become so frequent that it is displacing more conventional public health issues such as diet and infectious disease as one of the leading causes of illness.(1) Due to the increasing prevalence of obesity in pregnancy, the American College of Obstetricians and Gynecologists has recommended that all pregnant women have their body mass index measured at their first prenatal visit, as well as information about the risks of having a very high BMI during pregnancy. (2)

Obesity in pregnancy was identified by the World Health Organization (WHO) in 2009 as one of the major non-communicable illnesses threatening mother and child health. Obesity in the mother has been linked to poor perinatal outcomes. Pregnant women who are overweight are more likely to have gestational diabetes, pre-eclampsia, infections, surgical vaginal birth, and caesarean delivery. (3) They are also more likely to have wound infections and endometriosis. Their children are more likely to have birth abnormalities, macrosomia, and morbidity linked with childhood obesity. Malnutrition consequences linked to underweight include anemia, early rupture of membranes, poor APGAR score, low birth weight newborns, preterm delivery, and increased perinatal mortality in impoverished nations like India. (4) National health objectives by the end of the twentieth century, the declared objective of health policy 2000 was to decrease the percentage of overweight persons to 20% or less. Although this objective was not met, by the year 2000, more than half of the population was obese. There is a strong emphasis on the importance of the research. The goal of this research was to determine whether there is a link between BMI during pregnancy and maternal and perinatal outcomes.

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Methodology

Women who visited the prenatal outpatient department for an antenatal checkup at Sindh Government Hospital Korangi Karachi, Pakistan from August 2020 to August 2021. The study was included after providing informed written permission. Permission was taken from the ethical review committee of the institute. In this longitudinal study a total of 100 patients were included in the study. Women ages between 18-35 years, singleton pregnancy, spontaneous conception, and a first trimester visit for confirmation of pregnancy were included in the study. Women having repeated pregnancies, chronic conditions such as hypertension, diabetes, thyroid problems, bronchial asthma, past Caesarean sections, and uterine and fetal congenital defects were excluded.

Women were given detailed information about the research and its objectives. A comprehensive history was collected, including name, age, and obstetric score. Based on the remembered last menstrual cycle and 1st trimester ultrasound investigations, the estimated gestational age was computed. During the first trimester's first visit, the patient's weight and height recorded, and the basal BMI was determined using the formula weight in kilograms divided by height in meter square (kg/m2). The aforesaid women were classified according to their BMI, and the obstetric outcome factors were assessed. According to WHO categorization, the women were divided into four groups based on their BMI: BMI 18.5KG/M2 or less is considered underweight (group 1). BMI > 18.5-24.9 KG/M2 is considered normal (group 2). BMI 25-29.9 kg/m2 overweight (group 3) Obese people (group 4) have a BMI of 30-34.9 kg/m2. All women were exposed to regular prenatal tests in the first trimester, including an early scan between 10 and 13 weeks to rule out anomalies. OGCT was done at 24-28 weeks in the second trimester. At each appointment, blood pressure was taken and a full general examination was performed, which included an abdominal examination to check fundal height, fetal heart rate, and fetus position. Every four weeks, hematology and urine were examined. The patient were checked every four weeks until she was 28 weeks pregnant, then every two weeks until she was 36 weeks pregnant, and then weekly until she delivered. In the third trimester, a complete general and obstetrical checkup was performed. If the OGCT was normal in first two times, it was repeated at 32-34 weeks. At 38 weeks, a pelvic examination was performed. Any odd observations or problems that the patient had throughout the research were noted, and the difficulties were managed. The study's outcome variables were: 1. the onset of hypertensive problems during pregnancy 2. The onset of gestational diabetic mellitus 3. Hypothyroidism development 4. The onset of anemia, as well as any illnesses 5. Delivery method 6. The baby's birth weight, APGAR score at 5 minutes, and the necessity for NICU admission 7. Complications after childbirth.

With the help of SPSS version 22, statistical analysis was carried out, and classified variables were provided in the form of numbers and percentages. The connection between the BMI categories and the outcome variables was investigated using the chi-square test and the Fisher's exact test, respectively.

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Results

Table 1 reveals that n=21 of the women are between the ages of 18 and 22. 66 percent of women (n=66) are between the ages of 23 and 29. Thirteen percent of women (n=13) are between the ages of 30 and 35. The majority of the participants (n=66) were between the ages of 23 and 29. The average age of the women was 25.84 years. Table 2 demonstrates that 68 percent of women (n=68) are primigravida. Para 1 women account for 23% (n=23), whereas multiparous women account for 9% (n=9).

In the current study, 66 percent of women delivered vaginally, with underweight women accounting for 87.5 percent (n=14), normal women accounting for 80.55 percent (n=29), overweight women accounting for 57.89 percent (n=22), and obese women accounting for 10% (n=1). Underweight women accounted for 12.5 percent (n=2), normal women 16.66 percent (n=6), overweight women 36.84 percent (n=14), and obese women 60 percent (n=6) of the 28 percent of women with LSCS. 2.77 percent (n=1) of women who had an instrumental delivery had a normal BMI. Overweight people made up 5.26 percent of the population (n=2), whereas obese people made up 30% of the population (n=3). As BMI rises, there is a significant increase in instrumental delivery. As BMI rises, there is a statistically significant increase in surgical delivery (P-Value 0.013). Obese people had a 60 percent (n=6) higher risk of LSCS, whereas overweight people had a 36.84 percent (n=14) higher rate. 0.013 is the P value. As BMI rises, there are significant linear patterns in the increasing of LSCS rates. In the underweight group, the rate of vaginal delivery increased by 87.5 percent (n=14). 0.013 is the P value. As BMI rises, there is a significant linear trend in the reduction of normal delivery.

Table 4 reveals that among the 30 percent of kids born weighing less than 2.5 kg, 81.25 percent (n=13) were underweight, 30.55 percent (n=11) were normal, and 15.78 percent (n=6) were overweight. 40 percent of newborns weighing 2.6-3kg were underweight, while 18.75 percent (n=3) were obese. The normal group had 52.77 percent (n=19), the overweight group had 39.47 percent (n=15), while the obese group had 30 percent (n=3). 23 percent of kids born weighing 3.1-3.5kg were underweight, 13.88 percent (n=5) were normal, 36.84 percent (n=14) were overweight, and 40 percent (n=4) were obese. 7% of infants born weighing more than 3.6kg were underweight (n=0), 2.77 percent (n=1) were normal, 7.89 percent (n=3) were overweight, and 3% (n=3) were obese. The majority of newborns were born weighing between 2.6-3 kg (n=40). The average weight of the newborns in the studies was 2.80 kg. Also illustrates that the majority of underweight women have a low birth weight, and that when BMI rises, birth weight rises as well. Table 5 reveals that 17 percent (n=17) scored between 5-7 and 83 percent (n=83) scored >8, with an average APGAR score of 8.43 percent at 5 minutes.

Table 6 demonstrates that the High BMI group had a 41.67 percent (n=20) higher rate of LSCS than the typical 16.67 percent (n=6). Significant at P=0.013. When compared to the typical 2.77 percent (n=1), the High BMI group had a higher risk of hypothyroidism (12.5 percent (n=6). Significant at P=0.109. GDM was related with a higher incidence of 20.83 percent (n=10) in the

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High BMI group, compared to 8.34 percent (n=3) in the normal group, P=0.058, Significant. When compared to the typical 8.34 percent (n=3), the high BMI group had a higher risk of GHTN (20.83%) (n=10). Significant at P=0.058. When compared to the typical 8.34 percent (n=3), the underweight group had a 37.5 percent (n=6) higher risk of NICU admission. Significant at P=0.000214. Anemia was related with an increased incidence of 56.25 percent (n=10) in the underweight group, compared to 27.77 percent (n=10) in the normal group. P=0.04, which is significant.

Tables 1: Distribution of participants according to age

Age (Years)	**18-22**	**23-29**	**30-35**	**Total**
Over weight	9	25	4	38
Obesity	2	6	2	10
Under weight	3	9	4	16
Normal	7	26	3	36
Total	21	66	13	100

Table 2: Parity's distribution of study participants

Parity	Primi	PI	P2	Total
Normal	27	6	3	36
Under weight	6	8	2	16
Over weight	28	7	3	38
Obesity	7	2	1	10
Total	68	23	9	100

Table 3: Mode of delivery with BMI category

Mode of delivery	**VD**	**LSCS**	**INST**	**Total**
Normal	29	6	1	36
Under weight	14	2	-	16
Over weight	22	14	2	38
Obesity	1	6	3	10
Total	66	28	6	100

Table 4: Birth weight distribution of newborns delivered to study participants

Birth weight (Kg)	**<2.5**	**2.6-3.0**	**3.1-3.5**	**Total**
Normal	11	19	5	36

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Under weight	13	3	-	16
Over weight	6	15	14	38
Obesity	-	3	4	10
Total	30	40	23	100

Table 5: APGAR score of newborn with maternal BMI at 5 minutes

APGAR	**5-7**	**>8**	**Total**
Normal	1	35	36
Under weight	12	4	16
Over weight	2	36	38
Obesity	2	8	10
Total	17	83	100

Table 6: Various variables in different BMI groups

Variables	**Normal**	**Under weight**	**High-BMI**	**P-values**
Mode of delivery VD LSCD	 30 6	 14 2	 28 20	0.013
Hypothyroid No Yes	 33 3	 16 0	 38 10	0.109
Anemia Yes No	 10 26	 9 7	 7 41	0.04
GHTN YES NO	 3 33	 0 16	 10 38	0.058
Instrumental Yes No	 1 35	 0 16	 5 43	0.187
NICU Yes No	 3 33	 6 10	 1 47	0.000214

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Discussion

Out of 100 women in this study, 16 percent (n= 16) were in the underweight group, with a BMI less than 18.5 kg per meter square, and 36 percent (n= 36) were in the normal group, with a BMI of 18.5 to 24.9 kg per meter square. Overweight people (n=38) had a BMI of 25 to 29.9 kilograms per square meter, whereas obese people (n=10) had a BMI of 30 kilograms per square meter. According to the Anjana Sharma et al research, 14.79 percent of women were underweight and 51.78 percent were normal weight, while 21.04 percent and 10.71 percent of women were overweight and obese, respectively. According to the research by Yazdani et al, 12.8 percent of the participants were underweight, 41.2 percent were normal, 35.6 percent were overweight, and 9.8 percent were obese. Hypothyroidism was detected in 7% (n=13) of the participants in this research, which corresponds to 6.5 percent in Sahu et al, 7.4 percent in Taghari et al, and 9 percent in Sapna C Shah et al. Hypothyroidism increases statistically significantly (p=0.015) when BMI rises in the current research. (5) GDM was identified in 13 percent (n=13) of the participants in this research, which matches with 16.5 percent gestational diabetes in India (6).

In a study conducted in Tennessee, 17.8% of GDM was found in metropolitan regions, 13.8 percent in semi-urban areas, and 9.9% in rural areas. In the current investigation, GHTN was discovered in 13 percent (n=13) of obese people, 30 percent (n=3) of overweight people, 18.42 percent (n=7) of overweight people, and 8.34 percent (n=3) of people with a normal BMI. Kumari et al compared 28.8% of GHTN in obese people to 2.9 percent in non-obese people. High BMI is linked to GHTN in a significant way. Anemia was identified in 26% (n=26) of the participants in this investigation. (6) (7) The current research corresponds with 21.7 percent of the anaemia in the Emmanuel et al study in relation to BMI. Anemia was found in 56.25 percent (n=9) of underweight women, 15.78 percent (n=6) of overweight women, and 10% (n=1) of obese women in the current research. (8) According to a research by Qin Yu et al, there is an inverse relationship between being overweight, obese, and having anemia in Chinese women. In a group of 100 women, 66 percent (n=66) had a normal vaginal birth, 28 percent (n=28) experienced lSCS, and 6% (n=6) had an instrumental delivery. With a P value of 0.0131, there is a statistically significant increase in LSCS as BMI rises. In a Meta -analysis by Poobalon et al, it was shown that the risk of LSCS was greater in overweight or obese women than in women with a normal BMI. Obesity, according to Johnson et al, increases the risk of surgical vaginal delivery. (9) Lower BMI was strongly related with low birth weight in this research, and when BMI increased, so did the baby's birth weight, which was consistent with Fredrick et al findings. The current study demonstrated no significant relationship between BMI and APGAR score, which is consistent with Katie L Dickinson B S et al results that pre-pregnancy BMI was not associated with low APGAR. (9) (10) As BMI falls, there is a considerable rise in NICU admissions, which corresponds to Patricia Noorwood et al findings that low BMI is linked to an increased likelihood of NICU admission. The current research demonstrated no significant

increase in the risk of PPH with rising BMI, which is consistent with Bianco et al findings.(11, 12)

Conclusion

The BMI has a substantial effect in the risk of an unfavorable pregnancy outcome. In this study, we looked at the relationship between BMI and different pregnancy outcomes. The maternal BMI has been linked to pregnancy problems and outcomes in a recent research. Hypothyroidism, gestational diabetes mellitus, gestational hypertension, assisted delivery, and caesarean delivery are all linked to a high BMI. There is a link between anemia and low birth weight and an underweight BMI. The findings of this study, together with previous research, point to an independent role for aberrant BMI as a predictor of poor pregnancy outcomes.

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None

Conflict of interest

None

Permission

Permission was taken from the ethical review committee of the institute

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