Maternal Body Mass Index And Pregnancy Outcome: An Observational Study

[1]Dr. Ankita Goyal, [2]Dr. Shaifali K Patil, [3]Dr. Harshitha BN
[1]Junior Resident, [2]Professor, [3]Senior Resident,
Department of Obstetrics & Gynecology,
MGM Hospital, Kalamboli, Navi Mumbai

*Corresponding Author:
Dr. Ankita Goyal
Junior Resident, Department of Obstetrics & Gynecology,
MGM Hospital, Kalamboli, Navi Mumbai

Abstract
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Introduction

Obesity has increased alarmingly during the last two decades all throughout the world. India is currently grappling with a two-fold health challenge. On one side, there's the issue of undernutrition and underweight, while on the other, there's a noticeable surge in obesity and overweight problems, especially in urban regions.

Roughly 153.8 million women within the reproductive age bracket are globally experiencing underweight conditions, according to estimates. South Asia, particularly Bangladesh, India, and Pakistan, is home to over half of these women. The rate of maternal underweight has decreased globally, from 11.6 percent in 2000 to 9.7% in 2016.Although data indicates a notable reduction in prevalence, the existing burden remains substantial in comparison to various low and middle-income nations. 1-4

According to the National Family Health Surveys (NFHS) in India, obesity increased from 10.6% in 1998–1999 to 14.8 percent in 2005–2006, whereas underweight prevalence decreased marginally from 36.2 percent in 1998–1999 to 33.0 percent in 2005–2006. 5

In each report, the terms overweight, obesity, and underweight are defined differently. In the past, scientists studied how maternal height and weight relate to pregnancy issues. But nowadays, the Body Mass Index (BMI) is more commonly used to tell if someone is underweight or overweight. The waist-hip ratio has also emerged as a recent method for studying the impacts of obesity during pregnancy, although there is limited available data on this measure. 6-8 Therefore, the current research was carried out to assess and quantify the portion of pregnancy outcomes that can be attributed to a maternal body mass index at a tertiary healthcare centre.

Aims And Objectives

Aim

To assess and determine the percentage of the pregnancy outcomes attributable to maternal body mass index.

Objectives

1. Calculate the BMI(kg/m2) at 1st antenatal visit and at the time of delivery
2. To record the co morbid medical conditions in pregnancy.
3. To assess the length of gestation, Initiation of labour (spontaneous/induced), Method of delivery (normal vaginal delivery, instrumental vaginal delivery, caesarean section)
4. To assess wound healing.
5. To record the neonatal outcome such as birth weight and NICU admission

Material And Methods

Study Method :

The current research is a Prospective observational study carried out in the obstetrics and gynecology department of MGM Hospital, located in Kalamboli, Navi Mumbai. The study spanned a duration of 2 years, from September 2019 to August 2021.

Source Of Data:

Patients admitted in the obstetrics and gynecology department at MGM Hospital

located in Kalamboli.

Sample Size:

According to the article published by Imran Kutchi et al, on Considering the New Asian Indian Guidelines, the Impact of Maternal Obesity on Pregnancy Outcome. They mentioned maternal obesity was observed among 31% mothers. Considering the reference prevalence form Indian study, The sample size was determined using the subsequent formula :

$N=z2*p*(1-p) / d$

Where:

P: Your guess of Population P (any value<1): 0.31

1-α : Confidence level set by you : 0.95 Z : Z value associated with confidence: 1.959 d : Absolute precision (Value less than P) : 0.09

N : Minimum sample size : 102

After adjusting the attrition rate, total 120 sample size was taken for the present study as follows:

1.   Study group   Sample size
2.   Normal BMI   40
3.   Overweight BMI   40
4.   Obese BMI   40
5.   Total sample size   120

Selection Of Study Subjects:

Inclusion Criteria's :

Pregnancy involving a single fetus in cephalic presentation.

Exclusion Criteria's :

1. Multiple pregnancy
2. Malpresentation
3. Previous cesarean section
4. Congenital anomalies
5. Spontaneous preterm(premature rupture of membrane)
6. Stillbirth
7. Chronic medical comorbidities such as chronic hypertension, pre-gestational diabetes, chronic renal diseases, cardiac conditions, etc.

Methodology:

This is a two-year observational study conducted on pregnant women. Body mass index was calculated during 1st antenatal visit and during the time of delivery . After delivery maternal and fetal outcomes were evaluated.

Maternal BMI (kg/m2) was grouped into the following categories:

BMI Categories:

1. BMI 18.5 - 24.9: Considered as normal weight.
2. BMI 25 - 29.9: Classified as overweight.
3. BMI ≥ 30: Indicated as obese.

Pregnancy outcomes were documented based on factors such as the onset of labor (whether labor was induced or occurred spontaneously), the method of delivery (whether it was a cesarean section, normal vaginal delivery, or instrumental vaginal delivery), the infants' birth weights, and whether the infants were admitted to the Neonatal Intensive Care Unit (NICU).

Maternal health status during the antenatal period that influences perinatal outcomes, such as conditions like preeclampsia and gestational diabetes mellitus, post term delivery, injuries to birth canal (cervix, vagina, perineum), postpartum hemorrhage, wound gape (episiotomy/ LSCS wound) were documented.

Fetal conditions during delivery like fetal macrosomia , NICU admissions were documented.

Maternal and fetal outcomes of 120 women delivering at our institution were recorded after taking written informed consent.. Weight, height, Age, BMI and Previous preganancies were documented at the time of 1st ANC visit and on admission to the labour ward.

On abdominal examination - fetal lie and presentation was noted. Per vaginal examination was done in the labour ward.

Investigations such as hemoglobin percentage , renal function tests , liver function tests , blood sugars , urine routine microscopy and blood grouping were

done. Auscultation of fetal heart sound was done for fetal monitoring.

The main focus of the pregnancy's outcome, which includes the initiation of labor (whether it occurred spontaneously or was induced) and the method of delivery (whether it was a normal vaginal delivery, instrumental delivery, or cesarean section) and fetal outcome that is neonatal ICU admission were noted.

Secondary outcomes were gestational diabetes, pregnancy induced hypertension, post term pregnancy, stillbirth, postpartum hemorrhage and wound healing were noted.

Results

Statistical Analysis

1. A pre-validated, semi-structured, standardized case record form was employed to capture demographic data, clinical history, clinical examination findings, and investigation reports.

2. The information was inputted using Microsoft Excel worksheets.
3. The data was subjected to analysis which was represented in the form of tables and charts.
4. SPSS version 22 software was used for data analysis.
5. Statistical tests which were appropriate were applied for the data analysis.
6. Statistically significant, P value < 0.05 was considered for analysis.

Age Distribution

In the present study, a significant proportion of our participants fell within the age range of 26 to 35 years across the normal BMI group (47.5%), overweight group (52.5%), and obese group (50%). There was no statistically significant distinction observed in the age distribution between the study groups. (The chi-square statistic value is 3.0167. The corresponding p-value is 0.55504. The outcome is statistically insignificant at a significance level of $p < 0.05$.)

Table 1 :- Age Distribution

Age distribution (in years)	BMI group (Normal)		BMI group (Overweight)		BMI group (Obese)	
	No. of subjects	%	No. of subjects	%	No. of subjects	%
< 25	10	25	9	22.5	5	12.5
26 - 35	19	47.5	21	52.5	20	50
>35	11	27.5	10	25	15	37.5
Total	40	100	40	100	40	100
Significance	The calculated chi-square statistic value is 3.0167. P - value is 0.55504. Result is not statistically significant at $p < 0.05$.					

Parity

Within the current study, a notable proportion of the study subjects were identified as multigravida (60%, 67.5%, and 72.5% in groups 1, 2, and 3 respectively). No statistically significant variation in parity was observed among the study participants across the groups. (The chi-square statistic value is 1.425. The corresponding p-value is 0.490417. The outcome is not statistically significant at a significance level of $p < 0.05$.)

Table 2 :- Parity

Parity	BMI group (Normal)		BMI group (Overweight)		BMI group (Obese)	
	No. of subjects	%	No. of subjects	%	No. of subjects	%
Primigravida	16	40	13	32.5	11	27.5
Multigravida	24	60	27	67.5	29	72.5
Total	40	100	40	100	40	100
Significance	The chi-square value obtained is 1.425, and the corresponding p-value is 0.490417. Based on these values, the result is not statistically significant at a significance level of $p < 0.05$.					

Pih

In this present study we assessed for Pregnancy Induced Hypertension (PIH) among the study subjects and it was comparatively greater among obese group subjects (22.5%), as compared to normal (7.5%, and overweight (12.5%), however statistical significance could not be established. (The calculated chi-square statistic value is 3.8378, and the associated p-value is 0.146768. According to these results, the outcome is not statistically significant at a significance level of $p < 0.05$.)

Table 3:- Pih

PIH	BMI group (Normal)		BMI group (Overweight)		BMI group (Obese)	
	No. of subjects	%	No. of subjects	%	No. of subjects	%
Yes	3	7.5	5	12.5	9	22.5
No	37	92.5	35	87.5	31	77.5
Total	40	100	40	100	40	100
Significance	The chi-square statistic value is determined as 3.8378, with a corresponding p-value of 0.146768. Based on these findings, the result is deemed not statistically significant at a significance level of $p < 0.05$.					

Gdm

We observed that the occurrence of GDM was significantly greater among obese group subjects (20%), as compared to normal group (2.5%). (The chi-square statistical value is

6.3839. With a p-value of 0.041092, the result is considered statistically significant at a significance level of $p < 0.05$..)

Table 4 :- Gdm

GDM	BMI group (Normal)		BMI group (Overweight)		BMI group (Obese)	
	No. of subjects	%	No. of subjects	%	No. of subjects	%
Yes	1	2.5	4	10	8	20
No	39	97.5	36	90	32	80
Total	40	100	40	100	40	100
Significance	The chi-square statistic value calculated is 6.3839, accompanied by a p-value of 0.041092. This outcome is considered statistically significant at a significance level of $p < 0.05$.					

Onset Of Labor And Method Of Delivery

In the current study, it was observed that there was a notable increase in spontaneous onset of labor, which was statistically significant for normal BMI subjects, whereas induced labour and elective LSCS was observed among overweight and obese subjects. (With a chi-square statistic value of 12.5847 and a p-value of 0.013494, the outcome is considered statistically significant at a significance level of $p < 0.05$.)

We observed that vaginal delivery was significantly common among normal BMI groups whereas instrumental and cesarean delivery was significantly common among overweight and obese group subjects. The observations were found to be statistically significant. (The chi-square statistic value is calculated as 11.7974, and the associated p-value is 0.018923. This result is considered statistically significant at a significance level of $p < 0.05$.)

Table 5:- Onset Of Labour

Variables		BMI group (Normal)		BMI group (Overweight)		BMI group (Obese)		Significance
		No.	%	No.	%	No.	%	
Onset of labour	**Spontaneous labour**	27	67.5	17	42.5	12	30	chi-square value is 12.5847. p-value is 0.013494.
	Induced labour	11	27.5	18	45	20	50	
	Elective LSCS	2	5	5	12.5	8	20	
	Vaginal	31	77.5	23	57.5	16	40	
	Cesarean	6	15	13	32.5	18	45	chi-square value is 11.7974. p-value is 0.018923.
Mode of delivery	**Instrumental delivery**	3	7.5	4	10	6	15	

	Total	40	100	40	100	40	100	

Pph

In this study we observed that the occurrence of PPH was significantly greater among obese group subjects (30%), as compared to normal group (5%). (The calculated chi-square value is 8.658, with a corresponding p-value of 0.013181. This finding is regarded as statistically significant at a significance level of $p < 0.05$.)

Table 6:- Pph

PPH	BMI group (Normal)		BMI group (Overweight)		BMI group (Obese)	
	No. of subjects	%	No. of subjects	%	No. of subjects	%
Yes	2	5	7	17.5	12	30
No	38	95	33	82.5	28	70
Total	40	100	40	100	40	100
Significance	The chi-square statistic value is determined to be 8.658, and the associated p-value is 0.013181. According to these results, the outcome is statistically significant at a significance level of $p < 0.05$.					

Post Term Delivery

We observed that post term delivery was comparatively more among obese group subjects (27.5%), as compared to normal BMI group subjects. (With a chi-square statistic value of 4.5022 and a p-value of 0.105285, the outcome is not considered statistically significant at a significance level of $p < 0.05$.)

TABLE 7:- Post Term Delivery

Post term delivery	BMI group (Normal)	BMI group (Overweight)	BMI group (Obese)

	No. of subjects	%	No. of subjects	%	No. of subjects	%
Yes	4	10	6	15	11	27.5
No	36	90	34	85	29	72.5
Total	40	100	40	100	40	100
Significance	The chi-square statistic value is calculated as 4.5022, and the corresponding p-value is 0.105285. As per these results, the outcome is not statistically significant at a significance level of $p < 0.05$.					

Birth Weight

In the current study majority of the neonates with macrosomia belonged to obese BMI study group (The chi-square statistic is 7.2222 with a p-value of 0.027022. On the other hand, the majority of low birth weight (LBW) neonates were observed within the normal BMI group, where the chi-square statistic value is 5.045 and the p-value is 0.080257.)

Table 8: Birth Weight

Birth weight	BMI group (Normal)		BMI group (Overweight)		BMI group (Obese)		Significance
	No.	%	No.	%	No.	%	
Low birth weight (<2.5 kg)	6	15	2	5	1	2.5	The chi-square statistic value is 5.045, and the corresponding p-value is 0.080257.
Normal weight (2.5-4kg)	33	82.5	35	87.5	31	77.5	--

Macrosomia (>4kg)	1	2.5	3	7.5	8	20	The chi-square statistic value is 7.2222, and the associated p-value is 0.027022.
Total	40	100	40	100	40	100	

NICU Admission

In the current study requirement for NICU admission was comparatively more among obese group subjects (20%), as compared to normal BMI group (10%), and overweight group (10%). Statistical significance was not found. (The chi-square statistic value is 2.3077, and the corresponding p-value is 0.315421. Based on these results, the outcome is not statistically significant at a significance level of $p < 0.05$.)

TABLE 9:- NICU Admission

NICU admission	BMI group (Normal)		BMI group (Overweight)		BMI group (Obese)	
	Number of subjects	%	Number of subjects	%	Number of subjects	%
Yes	4	10	4	10	8	20
No	36	90	36	90	32	80
Total	40	100	40	100	40	100
Significance	The chi-square statistic value is 2.3077, and the accompanying p-value is 0.315421. According to these findings, the result is not considered statistically significant at a significance level of $p < 0.05$.					

Fetal Outcome

In the present study we assessed fetal outcome among neonates. We observed stillbirths among 2.5% subjects in normal BMI group and obese group subjects.

Table 10: Fetal Outcome

Fetal outcome	BMI group (Normal)	BMI group (Overweight)	BMI group (Obese)

	No. of subjects	%	No. of subjects	%	No. of subjects	%
Live birth	39	97.5	40	100	39	97.5
Still birth	1	2.5	0	0	1	2.5

Wound Healing

In the present study, we evaluated wound healing among the study participants. Our observations indicated that within the normal BMI group wound healing occurred by primary healing among 92.5% subjects, whereas wound re-suturing was required among 7.5% subjects. In overweight subjects wound re-suturing was required among 17.5% subjects, while among obese group subjects wound re-suturing was required among 20% study subjects.

Table 11: Wound Healing

Wound healing	BMI group (Normal)		BMI group (Overweight)		BMI group (Obese)	
	No. of subjects	%	No. of subjects	%	No. of subjects	%
Primary healing	37	92.5	32	80	28	70
Secondary healing	0	0	1	2.5	4	10
Wound resuturing	3	7.5	7	17.5	8	20
Total	40	100	40	100	40	100

Significance	The chi-square statistic value is 2.7451, and the corresponding p-value is 0.25346. As per these results, the outcome is not statistically significant at a significance level of $p < 0.05$.

Discussion

In the current study, it was observed that the majority of the study participants fell within the age range of 26 to 35 years in the normal BMI group (47.5%), overweight group (52.5%), and 50% in obese group. Statistical significance between the age of the study participants in either group was not found.

Parity among our study subjects was assessed , the majority of the study subjects were multigravida (60%, 67.5% and 72.5% ... in groups 1, 2, and 3, respectively). No statistically significant difference in parity was found among the participants in either group. PIH was comparatively greater among obese group subjects (22.5%), as compared to normal (7.5%), and overweight (12.5%), however statistical significance could not be established.

Occurrence of GDM was significantly greater among obese group subjects (20%), as compared to normal group (2.5%).

In our study spontaneous onset of labour was significantly observed in normal BMI subjects, whereas induced labour and LSCS was observed among overweight and obese subjects. Vaginal delivery was significantly common among normal BMI groups whereas instrumental and cesarean delivery was significantly common among overweight and obese group subjects.

PPH was significantly greater among obese group subjects (30%) as compared to normal group (5%). Post term delivery was seen comparatively more among obese group subjects (27.5%) as compared to normal BMI group subjects.

We assessed the birth weight of neonates among the study subjects. Majority of the neonates with macrosomia belonged to obese BMI study group, whereas majority of the

LBW neonates belonged to the normal BMI group.

NICU admissions were required comparatively more among obese group subjects (20%), as compared to normal BMI group (10%), and overweight group (10%). These observations were not statistically significant.In the current study, we examined fetal outcomes among neonates. It was noted that stillbirths were observed in 2.5% of subjects in both the normal BMI group and the obese group.

We observed that in normal BMI group wound healing occurred by primary healing among 92.5% subjects, whereas wound re-suturing was required among 7.5% subjects. In overweight subjects wound re-suturing was required among 17.5% subjects, while among obese group subjects wound re-suturing was required among 20% study subjects.

Conclusion

The present study concludes that:

Maternal and fetal complications are more among overweight and obese mothers. The present study found an association between presence of maternal obesity and GDM, PIH, also adverse fetal outcomes. Maternal obesity is identified as an autonomous risk factor contributing to unfavourable pregnancy outcomes, as well as increased perinatal mortality and morbidity.

Awareness regarding the need for maintaining normal BMI among mothers, and hence enforcing balanced diet inclusion of good amount of protein, exercises like yoga, walk and lifestyle modification should be incorporated among women in reproductive age to reduce the incidence of overweight and obesity in the younger generation.

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