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ORIGINAL RESEARCH

Study the association between maternal Body Mass Index (BMI) and obstetric & perinatal outcome in singleton pregnancies

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ABSTRACT

Background: High BMI is associated with an increased risk of preeclampsia, gestational hypertension, macrosomia, induction of labour, caesarean deliveries and poor perinatal outcomes. Low BMI has been shown to be associated with an increased risk of preterm deliveries, low birth weight and anemia and a decreased risk of preeclampsia, gestational diabetes, obstetric intervention and postpartum haemorrhage. Aim & Objective: 1. To assess correlation between maternal Body Mass Index (BMI) and perinatal outcome. Methods: Study design: Prospective observational Study. Study setting: Department of Obstetrics and Gynaecology, Nowrosjee Wadia Maternity Hospital, Mumbai (NWMH), (Tertiary Health Centre). Study population: patients who delivered / underwent completion of pregnancy at the institute such cases were included in the study. Sample size: 100 Results: The highest number of patients belonged to the age group of 23-28 yr (61%%), followed closely by the age group of 29-35 yr (33%). Patient between age group 18-22 yr was only 6%. LSCS was performed in 48%, out of which Emergency LSCS constituted 40% & Elective LSCS constituted 8%. P-value for LSCS was 0.001 & for Emergency LSCS was 0.003 suggesting these are more common in BMI Group III & IV. Instrumental Deliveries were performed in 4% of patients out of which Forceps applied in 2% & Vacuum extraction done in 2% patients. Out of 90 patients, in 7 (7.78%) patients second stage of labour was prolonged. Meconium-stained liquor was found more commonly in BMI Group III with P-value for 0.028. Total of 25 patients were diagnosed to be suffering from gestational hypertension. 5 (20%) of them had postpartum haemorrhage & Blood Transfusion was needed in 3 (12%) them. Foetal Distress was found to be the most common complications affecting 18% of patients who participated in this study. P-value for Foetal Distress is 0.011 suggesting significant association being more common in BMI Group IV. Neonatal complications respiratory distress syndrome & Meconium Aspiration Syndrome were found in 4 % & 3% babies without any significant association in any of the BMI group. Conclusion: Vaginal Delivery was the most common obstetric outcome, Neonatal outcome was Live Birth among all the patients.

Keywords: BMI, Obesity, Antepartam complication, maternal outcome, perinatal outcome

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INTRODUCTION

During the last two decades, there has been an alarming rise in the incidence of malnutrition all over the world. India is now facing a double burden of this disease with undernutrition and underweight on one side and a rapid upsurge in obesity and overweight, particularly in the urban settings on the other side.

The National Family Health Surveys (NFHS) in India indicated an increase in the obesity from 10.6% in 1998–1999 to 14.8% in 2005–2006, while there was only a marginal decrease in the incidence of underweight from 36.2% (1998–1999) to 33.0% (2005–2006)[1].

Both lean and obese women carry a risk for adverse pregnancy outcomes[2]. BMI is a simple index of the weight-for-height and it is calculated by dividing a person's weight in kilograms by the square of their height in meters (kg/m^2) BMI is one of the simplest method of defining malnutrition.

High BMI is associated with an increased risk of preeclampsia, gestational hypertension, macrosomia, induction of labour, caesarean deliveries and poor perinatal outcomes[3]. Low BMI has been shown to be associated with an increased risk of preterm deliveries, low birth weight and anemia and a decreased risk of preeclampsia, gestational diabetes, obstetric intervention and postpartum haemorrhage[4].

AIM & OBJECTIVE

1. To assess correlation between maternal Body Mass Index (BMI) and perinatal outcome.
2. To study the various risk factors which affects maternal and perinatal outcome

MATERIAL METHODS

Study design: Prospective observational Study.

Study setting: Department of Obstetrics and Gynaecology, Nowrosjee Wadia Maternity Hospital, Mumbai (NWMH),

Study population: patients who delivered / underwent completion of pregnancy at the institute such cases were included in the study.

Sample size: 100

Inclusion criteria:

1. Age 18-35 years.
2. Gestational age – Registered before 12 weeks of gestation (based on LMP if dates are reliable and based on earliest USG if dates are not reliable)
3. Singleton Intrauterine Live pregnancy

Exclusion Criteria

1. Multiple Pregnancies
2. Preexisting Hypertension
3. Preexisting Diabetes
4. Preexisting Medical illness like Cardiovascular, Pulmonary, Renal, Hepatic & 5. 5. endocrine diseases

Approval for the study:

Written approval from Institutional Ethics committee was obtained beforehand. Written approval of OBGY department was obtained. After obtaining informed verbal consent from all study participants such cases were included in the study.

Source of study population:

Present study was conducted on patients coming to obstetrics and gynecology Ward at Tertiary Care Centre.

Sample size: 100

Study procedure: All patients fulfilling the inclusion criteria were enrolled in the study after obtaining written informed consent.

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History: Detailed history was taken including onset, duration, and progress of the chief complaints. Demographic details of the patients were tabulated. Any significant past history details were recorded.

General Examination: The vital signs- pulse rate, respiratory rate, blood pressure, and temperature were recorded. Other signs like pallor, cyanosis, icterus, lymphadenopathy, edema, were looked for, by standard clinical examination techniques.

Systemic Examination: A detailed examination of abdomen, respiratory, cardiovascular and central nervous system was carried out and recorded in detail.

Methods

Women fulfilling the inclusion criteria will be assessed as follows.

The women were categorized into four groups according to their BMI as follows

A) Underweight (Group I): Less than or equal to BMI 19 kg/m^2

B) Normal (Group II): BMI 19.1 - 25 kg/m^2

C) Overweight (Group III): BMI 25.1 - 30 kg/m^2

D) Obese (Group IV): BMI Greater than 30.1 kg/m^2

The group with the BMI in the range (19.1-25 kg/m^2) is considered normal.

Only those patients who delivered / underwent completion of pregnancy at the institute were included.

Patients were included irrespective of parity status.

Pregnant patients seeking obstetric antenatal outpatient department services and those referred seeking emergency services, who were less than 12 weeks of gestation were identified and checked if they matched the study criteria.

Patients belonged to two broad groups:

1. Those identified in the OPD (Registered patients)
2. Those come to emergency services (Referred patients)

Registered patients: Patients fulfilling inclusion criteria were enrolled into the study, and valid consent was taken. Patients were followed up once monthly till 28 weeks, once fortnightly till 36 weeks and weekly there after till term (up to its termination) and details were entered in the Case Record Format.

Referred patients: Those identified less than 12 weeks of gestation in emergency services were also included and relevant details were entered in the Case Record Format.

For both groups of patients, at the time of admission for completion of pregnancy, complete history, physical examination and obstetric outcome of the patient were documented in the Case Record Format (as attached in the annexure).

The following parameters were included:

- Patients Name, Age, OPD & IPD number, LMP, EDD, Gravida, Parity status. (Patients name had been kept confidential)
- Past medical or surgical history if any noted
- Obstetrical outcomes

Data Analysis:

Data was analyzed and presented in frequency tables and graphs using Microsoft word and Excel. Chi-square test was applied to test statistical significance wherever necessary. Significance is assessed at 5% level of significance.

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RESULT AND OBSERVATIONS

Table 1: Correlation of BMI with Age Distribution

BMI AGE	I	II	III	IV	Total (%)	P-Value
Age 18-22 yrs	0	1	1	4	7	0.094
Age 23-28 yrs	16	13	16	16	61	0.534
Age 29-35 yrs	9	11	8	5	33	0.335
Total	25	25	25	25	100	

As shown above, The highest number of patients belonged to the age group of 23-28 yr (61%%), followed closely by the age group of 29-35 yr (33%). Patient between age group 18-22 yr was only 6%.

Table 2: Correlation of BMI with Antenatal obstetric problems

BMI Antepartum Outcome	I	II	III	IV	Total
Gestational Hypertension	2	5	8	10	25
Antepartum Haemorrhage	0	0	0	0	0
Anaemia	11	1	0	0	12
Gestational Diabetes	1	3	6	11	21
Thyroid Disorder	2	3	2	1	8
Autoimmune Disorder	0	0	0	0	0
Any other(Thallasemia)	0	1	0	0	1
BMI Antepartum Outcome	**I**	**II**	**III**	**IV**	**P-value**
Gestational Hypertension	2 (8%)	5 (20%)	8 (32%)	10 (40%)	0.0578
Gestational Diabetes	1(4.7%)	3(14.3%)	6(28.6%)	11(52.4%)	0.0034*
Anaemia	11(91.6%)	1(8.4%)	0(0%)	0(0%)	0.0001*

As shown in above table, Gestational Hypertension & Gestational Diabetes found in all the groups but it is more in groups with higher BMI Group III & IV. P-Value for gestational diabetes is 0.0034 which is statistically significant. Anaemia is predominantly found in Group I BMI, with 91.6%. P-value for Anaemia is 0.0001 which is highly significant. Thyroid disorder is found in all the groups without any definite predominance in any group. Antepartum haemorrhage & Autoimmune disorders were not found in any patient included in this study.

Table 3: Correlation of BMI with Type of Delivery

BMI Delivery	I	II	III	IV	Total (%)	P-Value
Normal	18	18	7	5	48	<0.001*
Forceps	0	0	1	1	2	0.564
Vacuum	0	0	1	1	2	0.564
Elective LSCS	1	2	2	3	8	0.780
Emergency LSCS	6	5	14	15	40	0.003*
Total (%)	25	25	25	25	100	

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BMI Delivery	I	II	III	IV	P-Value
Normal	18 (37.5%)	18 (37.5%)	7 (14.58%)	5 (10.41%)	<0.0001*
LSCS	7 (14.58%)	7 (14.58%)	16(33.33%)	18 (37.5%)	0.001*

Vaginal Delivery was the most common obstetric outcome, which constituted 54% of all the patients studied, Out of which Normal deliveries were 48%. P-value for the Normal deliveries was < 0.0001 suggesting highly significant association as these are more common in BMI Group I & II. LSCS was performed in 48%, out of which Emergency LSCS constituted 40% & Elective LSCS constituted 8%. P-value for LSCS was 0.001 & for Emergency LSCS was 0.003 suggesting these are more common in BMI Group III & IV. Instrumental Deliveries were performed in 4% of patients out of which Forceps applied in 2% & Vacuum extraction done in 2% patients.

Table 4: Correlation of BMI with Foetal Complications

BMI Complication	I	II	III	IV	Total	P-Value
Foetal Distress	2	1	6	9	18	0.011*

Among foetal complications, Foetal Distress was found to be the most common complications affecting 18% of patients who participated in this study. P-value for Foetal Distress is 0.011 suggesting significant association being more common in BMI Group IV.

Table 5: Correlation of BMI with Neonatal Complications

BMI Complications	I	II	III	IV	Total	P-Value
Asphyxia Neonatorum	0	2	0	0	2	0.105
Respiratory Distress Syndrome	1	1	1	1	4	1.000
Meconium Aspiration Syndrome	0	1	2	0	3	0.286
Convulsions	0	0	0	0	0	
Bleeding disorder	0	0	0	0	0	
Hypocalcemia	0	1	0	0	1	0.387
Hypoglycemia	0	1	0	0	1	0.387

Among the Neonatal complications respiratory distress syndrome & Meconium Aspiration Syndrome were found in 4 % & 3% babies without any significant association in any of the BMI group.

DISCUSSION

According to the literature, there is a strong association between increasing BMI and Gestational hypertension. Obesity is another risk factor for preeclampsia[12-16, 17-19]. Gestational Hypertension noted in all groups of BMI but particularly more predominant in groups with higher BMI (Group III & IV). Risk of Gestational Hypertension doubles from 20% in Group II to 40% in Group IV.

Obesity and gestational hypertension share many common features. For instance, obesity is associated with oxidative stress[6, 7], as well as circulating inflammation markers. On the other hand, plasma level of C-reactive protein, which is another significant marker of

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inflammation, is elevated in obese individuals, as are plasma levels of inflammatory cytokines, tumor necrosis factor-α (TNF-α), interleukin-6 (IL-6), and interleukin-8 (IL-8)[8]. Similarly, gestational hypertension is associated with oxidative stress[19] and circulating markers of inflammation[9]. This can lead to progression of gestational hypertension into preeclampsia. Moreover, the risk of preeclampsia rises dramatically with an increase in BMI. Several studies[10] investigating the relationship between maternal obesity and fetal growth have indicated that obese women have an 18-26% increased risk of delivering LGA infants, even after GDM management. It is also suggested that rapid fetal growth, induced by maternal hyperinsulinaemia, along with placental insufficiency, may result in antepartum fetal death in obese pregnant women; this hypothesis has been corroborated by several epidemiological studies[11].

In another study, Krishnamoorthy[12] recommended that all pregnancies in obese women be regarded as high risk and be managed according to strict guidelines. The management of such pregnancies should consist of pre-pregnancy counseling for weight loss and antenatal care for the management of possible complications.

Recently, there is mounting evidence confirming obesity as a significant complication of pregnancy. Thus, further research is required to incorporate evidence-based practice. A meta-analysis[13] on the risk of preeclampsia, associated with maternal BMI, indicated that the risk of preeclampsia doubled with each 5-7 kg/m2 increase in pre-pregnancy BMI.

Furthermore, the risk of preeclampsia during pregnancy was 4 times in overweight women (32%), while it was 5 times higher in obese women (40%) compared to underweight women (8%). A meta-analysis[14] performed during 1996-2007 indicated that the rate of cesarean section was higher in overweight and obese women. Moreover, the risk of emergency cesarean section was higher than elective cesarean section in these women.

In our study, Normal Deliveries & Caesarean Section were done in equal number of patients (48%) (P-value <0.0001 & 0.001 respectively). The rate of emergency cesarean section was significantly higher in the overweight (14%) and obese (15%) groups, compared to the normal (5%) group BMI (P-value 0.003). Most common indication for Emergency LSCS was foetal distress (P-value 0.011).

According to the literature, the high rate of cesarean section in obese women is associated with frequent pregnancy complications, such as gestational hypertension progressing to preeclampsia and large weight babies.

According to another study[15], in addition to large weight babies, increased soft tissues may lead to the constriction of the pelvic outlet, which has adverse effects on the pelvic floor and abdominal muscles, causing difficulty in fetal positioning[15].

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