

## Feto-Maternal Outcome in Preeclampsia and its Association with Maternal Body Mass Index (BMI) in a Tertiary Care Hospital in Rajshahi

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## Abstract

## Original Research Article

**Background:** Obesity is associated with profound metabolic and physiological changes and an established risk factor for the adverse feto-maternal outcome for pregnant women. As the prevalence of obesity increasing day by day among pregnant women and there is a scarcity of related studies in Bangladesh context, this study aimed to find out the fetomaternal outcome in preeclamptic women and its association with maternal body mass index (BMI) in a tertiary care hospital in Rajshahi. **Objectives:** The aim of the study was to associate the fetomaternal outcome in preeclampsia and its association with maternal body mass index (BMI) in a tertiary care hospital in Rajshahi. **Methods:** This cross-sectional type of analytical study was conducted in the Department of Obstetrics & Gynaecology, Rajshahi Medical College Hospital (RMCH). Singleton pregnant women with preeclampsia who delivered a baby in this Hospital were approached for this study. After ethical clearance, a total of 120 patients were taken as study samples according to selection criteria. Informed written consent was obtained from each patient. All patients were subjected to detailed history taking and thorough physical examination. A structured questionnaire was designed including all the variables of interest. Data were collected through direct interview of the patients at the respective departments by the researcher. Collected data were checked, edited and analyzed using the SPSS-24. **Results:** The observed maternal outcome was PIH (33%), Gestational diabetes mellitus (20%), Caesarean section (46.7%), prolonged labour (13.3%), wound infection (5%) and 5% had postpartum hemorrhage (5%). PIH, Gestational diabetes mellitus and Caesarean section were significantly higher among overweight or obese patients with preeclampsia ( $p < .05$ ). So, association of maternal BMI with PIH, gestational diabetes mellitus and Caesarean section was significant ( $P < .05$ ) but not significant in prolonged labour, wound infection, postpartum hemorrhage ( $P > .05$ ). Adverse fetal outcome observed among patients with normal BMI were stillbirth (1.7%), early neonatal death (1.7%), shoulder dystocia (1.7%) and NICU (6.7%). Stillbirth and early neonatal death were significantly higher among overweight or obesity preeclamptic patients ( $p < .05$ ). So, association of maternal BMI with still birth, early neonatal death was significant ( $p < .05$ ). But not significant in shoulder dystocia, NICU admission ( $> .05$ ). **Conclusion:** Higher frequency of adverse maternal and fetal outcomes was observed among preeclamptic patients with increased BMI than that of normal BMI. However, further extensive study with appropriate design is recommended. My study revealed that there was strong association of maternal BMI with adverse fetomaternal outcome in a preeclamptic patient.

**Keywords:** Fetomaternal, Preeclampsia, Body Mass Index (BMI).

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## INTRODUCTION

A high BMI or obesity is a major epidemic in developed countries that is now extending to developing countries. The incidence of obesity is increasing at an alarming rate. There is compelling evidence that obesity increases the risk of preeclampsia about 3-fold, and in developed countries is the leading attributable risk for the

disorder [1]. Preeclampsia is a disorder that appears after 20 weeks of pregnancy, characterized by new onset of hypertension and proteinuria. Abnormal placentation and reduced placental perfusion associated to impaired trophoblast invasion and alteration in the compliance of uterine spiral arteries are the early pathological findings that are present before the clinical manifestations of

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preeclampsia. Later on, the endothelial and vascular dysfunction responsible of the characteristic vasoconstriction of preeclampsia appear [2]. Maternal obesity adversely impacts pregnancy outcome through increased rates of hypertensive disease, diabetes, cesarean section and delivery of a macrosomic infant [3].

Different nutritional risk factors such as a maternal deficit in the intake of calcium, protein, vitamins and essential fatty acids, have been shown to play a role in the genesis of preeclampsia, but also an excess of weight gain during pregnancy or a pre-pregnancy state of obesity and overweight, which are associated to hyperinsulinism, insulin resistance and maternal systemic inflammation, are proposed as one of the mechanism that conduce to endothelial dysfunction, hypertension, proteinuria, thrombotic responses, multi-organ damage, and high maternal mortality and morbidity [2]. Obesity is considered a risk factor for preeclampsia and there are many common mechanisms that link obesity with a higher risk of developing preeclampsia. Many different mechanisms have been proposed as explanations of the physiopathology of preeclampsia, at a point that it is called the “disease of the theories” [4].

The initial phase in the development of preeclampsia is an altered invasion of the cytotrophoblast cells of fetal origin into the uterus and the spiral arterioles, situation that results in a decreased remodeling of these arterioles with a consequent lower blood flow to the [5]. The placenta in hypoxic conditions releases different substances into the maternal circulation, these include anti-angiogenic soluble fms-like tyrosine kinase 1 (sFlt-1) factors, and pro-inflammatory factors like tumor necrosis factor alpha (TNF- $\alpha$ ), [6] which are associated to maternal endothelial dysfunction. As we have demonstrated, these factors are increased in the plasma of preeclamptic women [7]. This sequence of alterations is one of the proposed mechanisms linking obesity to the risk of preeclampsia, clinical and experimental evidence suggests that obesity may affect placental function and perfusion, through some of the metabolic alterations that are associated to obesity as hyperlipidemia, hyperinsulinemia, or hyperleptinemia; however, the exact mechanisms are not well-known [8]. These metabolic markers are known to be elevated in plasma of obese pregnant women and even higher in women with preeclampsia. Moreover, it has been reported that the levels of total serum cholesterol in the first and second trimesters of gestation predict the onset of preeclampsia and we have reported a lipid profile alteration consisting of increased levels of low-density lipoproteins (LDLs), low high-density lipoproteins levels (HDLs), and increased levels of triglycerides in women with

preeclampsia [6]. It has been reported that LDL reduces extravillous cytotrophoblast migration and promotes trophoblast apoptosis. Also, high levels of triglycerides and free fatty acids, which are increased in obesity, increase the risk of preeclampsia and are elevated in preeclampsia. These two conditions are known to stimulate the nuclear receptor peroxisome proliferator-activated receptor- $\gamma$  (PPAR- $\gamma$ ). PPAR- $\gamma$  expression is increased in placentas from preeclamptic pregnancies, and increased levels of this receptor inhibit the invasiveness of trophoblast cells [9].

High maternal body mass index (BMI) is related to adverse maternal pregnancy outcomes such as pre-eclampsia, eclampsia, pre- and post-term delivery, induction of labor, macrosomia, caesarean section, and postpartum hemorrhage. Previous study shows that compared with normal weight women, both overweight and obese women had a significantly increased risk (p-value-<0.05) for gestational diabetes, preeclampsia, cesarean delivery, and delivery of a macrosomic infant. All maternal complications increased in frequency directly in proportion to the increase in BMI with significant difference between study & control groups. Similarly, all fetal complications & PNM also increased in direct proportion to the increase in BMI [3]. Another study reported that women with an above-normal Body Mass Index had a higher incidence of pre-eclampsia, induction of labor, caesarean section, pre-term labor, and macrosomia than women with a normal Body Mass Index. Increased BMI increases the incidence of induction of labor, caesarean section, pre-term labor and macrosomia. The BMI of women in the first trimester of pregnancy is associated with the risk of adverse pregnancy outcome [10]. The aim of this study was to determine the fetomaternal outcome in preeclampsia and its association with maternal body mass index (BMI) in patients admitted at RMCH.

## METHODOLOGY

This cross-sectional study was carried out in the Department of Obstetrics & Gynaecology, Rajshahi Medical College Hospital (RMCH) during January 2020 to December 2020. A total of 120 patients were participated in the study. The study population included all preeclamptic women attended in above mentioned hospital for further management in the in-patient’s department after giving informed written consent. After taking consent and matching eligibility criteria, data were collected from patients on variables of interest using the predesigned structured questionnaire by interview, observation. Statistical analyses of the results were be obtained by using window-based Microsoft Excel and Statistical Packages for Social Sciences (SPSS-24).

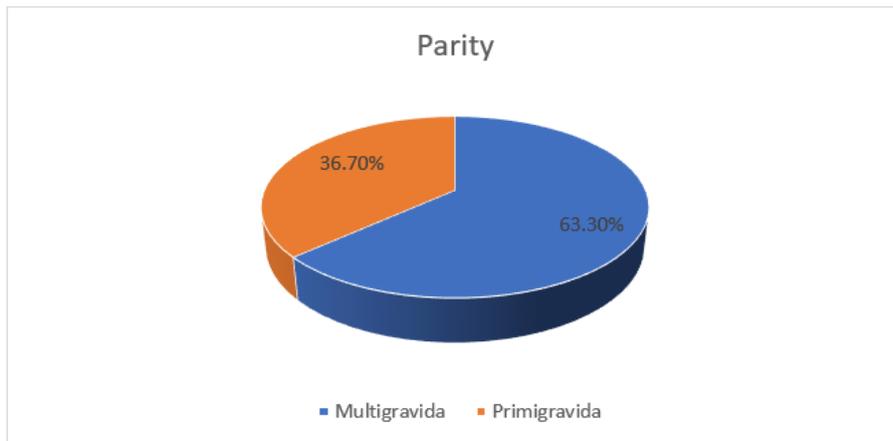
## RESULTS

**Table-I: Distribution of the respondents by Age group (n=120)**

Age group	Frequency (n)	Percentage (%)	Mean±SD
<20 years	16	13.3	29.03±5.65
20 to 30 years	56	46.7	
>30 years	48	40	
Total	120	100	

Table I shows that 46.7% respondents were aged between 20 to 30 years, 40% were more than 30

years and 13.3% were less than 20 years. Mean age of the respondents was 29.03±5.65 years of SD.



**Figure I: Distribution of the respondents by Parity (n=120)**

Pie chart shows that 63.3% respondents had multigravida and 36.7% had primigravida.

**Table II: Distribution of the respondents by BMI (n=120)**

BMI of the respondents	Frequency (n)	Percentage (%)	Mean±SD
Normal BMI (18.5 to 23)	60	50.0	24.28±3.59
Overweight and obesity (23.1 to 30)	60	50	
Total	120	100	

Table II shows that 50% respondents had normal BMI beside 50% respondents had overweight

and obesity. Mean BMI of the respondents was 24.28±3.59 kg/m<sup>2</sup>.

**Table III: Comparison of Age group with BMI (n=120)**

Age group	Normal BMI (18.5 to 23)	Overweight or obesity	P value*	Significant Status
	n (%)	n (%)		
<20 years	8 (13.3)	8 (13.3)	0.290	NS
20 to 30 years	32 (53.3)	24 (40)		
>30 years	20 (33.3)	28 (46.7)		

Table III shows the comparison between age group and BMI. P-value of all age group was (>0.05) so

it is clear that there is statistically no significant relation between age and BMI.

**Table IV: Comparison of Socioeconomic status with BMI (n=120)**

Socioeconomic status	Normal BMI (18.5 to 23)	Overweight or obesity	P value*	Significant Status
	n (%)	n (%)		
Solvent class	16 (26.7)	8 (13.3)	0.160	NS
Non-poor class	28 (46.6)	36 (60)		

Poor class	16 (26.7)	16 (26.7)		
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Table IV shows the comparison between socioeconomic status and BMI. P-value of all class were (>0.05) so it is clear that there is statistically no

significant relation between socioeconomic status and BMI.

**Table V: Comparison of BMI with Occupation (n=120)**

Occupation	Normal BMI (18.5 to 23)	Overweight or obesity	P value*
	n (%)	n (%)	
Housewife	54 (90)	52 (86.7)	0.389 <sup>NS</sup>
Service holder	6 (10)	8 (13.3)	

Table V shows the comparison between occupational status and BMI. P-value of all class were (>0.05) so it is clear that there is statistically no

significant relation between occupational status and BMI.

**Table VI: Comparison of BMI with Parity (n=120)**

Parity	Normal BMI (18.5 to 23)	Overweight or obesity	P value*
	n (%)	n (%)	
Primigravid	28 (46.7)	16 (26.7)	0.018 <sup>S</sup>
Multigravida	32 (53.3)	44 (73.3)	

Table VI shows the comparison between parity and BMI. P-value was (<0.05) so it is clear that there is statistically significant relation between parity and BMI.

**Table VII: Pregnancy induced Hypertension according to BMI (n=120)**

Pregnancy induced Hypertension	Normal BMI (18.5 to 23)	Overweight or obesity	P value*
	n(%)	n(%)	
Present	8 (13.3)	20 (33.3)	0.01 <sup>S</sup>
Absent	42 (86.7)	40 (66.7)	

Table VII shows that 13.3% had Pregnancy induced Hypertension those who had normal BMI with preeclampsia beside those who had overweight or obesity with preeclampsia among them 33.3% had

Pregnancy induced Hypertension. Number of Pregnancy induced Hypertension was significantly higher in those who had overweight or obesity with preeclampsia.

**Table VIII: Gestational diabetes mellitus according to BMI (n=120)**

Gestational diabetes mellitus	Normal BMI	Overweight or obesity	P value*
	n (%)	n (%)	
Present	4 (6.7)	12 (20)	0.03 <sup>S</sup>
Absent	56 (93.3)	48 (80)	

Table VIII shows that 6.7% had Gestational diabetes mellitus those who had normal BMI with preeclampsia beside those who had overweight or obesity with preeclampsia among them 20% had

Gestational diabetes mellitus. Gestational diabetes mellitus was significantly higher in those who had overweight or obesity with preeclampsia.

**Table IX: Caesarean section needed according to BMI (n=120)**

Caesarean section needed	Normal BMI	Overweight or obesity	P value*	Significant Status
	n (%)	n (%)		
Needed	12 (20)	28 (46.7)	<0.01	S
Non needed	48 (80)	32 (53.3)		

Table IX shows that 20% needed Caesarean section those who had normal BMI with preeclampsia beside those who had overweight or obesity with

preeclampsia among them 46.7% needed Caesarean section. Caesarean section was significantly higher in those who had overweight or obesity with preeclampsia.

**Table X: Wound Infection according to BMI (n=120)**

Wound infection	Normal BMI n (%)	Overweight or obesity n (%)	P value*	Significant Status
Present	1 (1.7)	3 (5)	0.31	NS
Absent	59 (98.3)	57 (95)		

Table X shows that 1.7% had wound infection those who had normal BMI with preeclampsia beside those who had overweight or obesity with preeclampsia

among them 5% had wound infection. No significant difference found between both groups.

**Table XII: Postpartum hemorrhage according to BMI (n=120)**

Postpartum hemorrhage	Normal BMI n (%)	Overweight or obesity n (%)	P value*	Significant Status
Present	2 (3.3)	3 (5)	0.50	NS
Absent	58 (96.7)	57 (95)		

Table XII shows that 3.3% had Postpartum hemorrhage those who had normal BMI with preeclampsia beside those who had overweight or obesity with preeclampsia among them 5% had Postpartum hemorrhage. No significant difference found between both groups.

aged between 25 to 29 years and 164 were more than or equal 30 years [11]. Another study by Sekhvat *et al.*, mean age of the respondents was  $28.1 \pm 3.4$  years of SD [12].

In this study 63.3% respondents had multigravida and 36.7% had primigravida. Majority of the respondents had multigravida. Previous study by Subki *et al.*, also observed 70 multigravida and 53 primigravida among 123 pregnant women with preeclampsia. [13] But Rakshit *et al.*, found 66.6% primigravida and 33.4% multigravida in the study [14].

## DISCUSSION

Preeclampsia is a disorder that appears after 20 weeks of pregnancy, characterized by new onset of hypertension and proteinuria. A high body mass index (BMI) or obesity is considered a risk factor for preeclampsia and there are many common mechanisms that link obesity with a higher risk of developing preeclampsia. Moreover, preeclampsia, similar to obesity, is associated with an increased risk of adverse fetomaternal outcome. The pregnancy complications associated with maternal obesity can be broadly grouped into those primarily affecting the mother and those primarily affecting the fetus, neonate or older child. Obesity increases the risk of miscarriage, congenital anomalies as well as pregnancy complications like pregnancy induced hypertension, cesarean delivery, macrosomia and infections in addition to potential adverse effects on long term health of both mother and infant. The aim of the study was to find the fetomaternal outcome in preeclampsia and its association with maternal body mass index (BMI) in a Tertiary Care Hospital in Rajshah. Total 120 pregnant women was enrolled in this study where 60 had normal BMI with preeclampsia and 60 had overweight or obesity with preeclampsia.

In this study majority (46.7%) of the respondents were aged between 20 to 30 years, 40% were more than 30 years and 13.3% were less than 20 years. In the study of Shao *et al.*, among the preeclamptic pregnant women 131 were less than 25 years, 52 were

In this study 13.3% had Pregnancy induced Hypertension, 6.7% had Gestational diabetes mellitus, 20% needed Caesarean section, 1.7% had wound infection and 3.3% had Postpartum hemorrhage those who had normal BMI with preeclampsia beside those who had overweight or obesity with preeclampsia among them 33.3% had Pregnancy induced Hypertension, 20% had Gestational diabetes mellitus, 46.7% needed Caesarean section, 5% had wound infection and 5% had Postpartum hemorrhage. Number of Pregnancy induced Hypertension, Gestational diabetes mellitus and Caesarean section were significantly higher in those who had overweight or obesity with preeclampsia. In the study of Awan *et al.*, 24% of cases were related to Pregnancy Induced Hypertension due to overweight; and relatively 8% cases of normal weight (P Value=0.0146) beside 22% cases were related to Gestational diabetes mellitus due to overweight; and relatively 5% cases of normal weight (P Value=0.0041) also observed that number of Caesarean sections was significantly higher in those who had overweight (P value=0.0024) [15].

BMI itself is a risk factor for preeclampsia. Preeclampsia increases the chance of pregnancy induced hypertension, diabetes, caesarian delivery, still birth, early neonatal death etc. but in this study, it was observed that maternal and fetal outcome were riskier in

overweight or obesity having preeclampsia than normal BMI having preeclampsia.

### Limitations of the study

The present study was conducted in a very short period due to time constraints and funding limitations. The small sample size was also a limitation of the present study.

## CONCLUSION

Preeclampsia is a leading cause of both maternal and fetal mortality and morbidity in the developing countries. When preeclampsia associates with high maternal BMI the consequence is more adverse. In this study the average age of the pre-eclamptic women was 29 years. The adverse outcome (PIH, gestational diabetes mellitus and caesarean section) was significantly frequent among the study patients with increased BMI. Similarly, adverse fetal outcome (stillbirth and early neonatal death) was also significantly frequent among them. So, adverse pregnancy outcome was significantly associated with increased BMI among the patients with pre-eclampsia. The inference from this study is that counselling women about pre-pregnancy loss of weight, healthy food and healthy lifestyle during pregnancy is beneficial for better maternal and fetal outcome. Hence, before concluding further study with appropriate design recommended.

## RECOMMENDATION

This study can serve as a pilot to much larger research involving multiple centers that can provide a nationwide picture, validate regression models proposed in this study for future use and emphasize points to ensure better management and adherence.

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