

IMPACT AND COMPARISON OF PREGNANCY INDUCED HYPERTENSION AND OBESITY ON FETAL AND MATERNAL OUTCOME

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ABSTRACT

Objective: To study the Impact and Comparison of Pregnancy Induced Hypertension and Obesity on Fetal and Maternal Outcome in our set up.

Study Design: Comparative cross sectional study.

Place and Duration of Study: Combined Military Hospital Kharian, from May 2017 to May 2018.

Methodology: A total of 210 pregnant women were divided into healthy, overweight and obese groups according to WHO classification and normal, mild to moderate and severe hypertensive groups on blood pressure basis. The maternal and neonatal morbidity including Disseminated Intravascular Coagulation, post prandial hemorrhage, eclampsia, acute renal failure, birth weight, small for gestation, admission to Neonatal Intensive Care Unit or neonatal death were recorded.

Results: The mean age was 26.15 ± 3.22 years, mean blood pressure $128.57 \pm 10.09/86.91 \pm 5.89$ mmHg, and mean BMI 21.33 ± 2.52 . Most female were between 25-30 years age, were house wife, and delivered by spontaneous vaginal delivery. Among severe pregnancy induced hypertension and obese women, eclampsia (16.7% vs. 13%), Disseminated Intravascular Coagulation (25% vs. 13%), and maternal mortality (5.6% vs. 8.6%) was seen respectively, while neonatal morbidity including Neonatal Intensive Care Unit admissions (38.9% vs. 52.2%), small for gestation (25% vs. 30.4%), low birth weight (13.9% vs. 13%), and death (11.1% vs. 13%) respectively.

Conclusion: The obese women showed a higher fetal (small for gestation, neonatal intensive care unit admission and neonatal death) and maternal risk (acute renal failure, post-partum hemorrhage, Critical Care Unit admission, and maternal mortality) than women with severe pregnancy induced hypertension.

Keywords: Arterial pressure, Body mass index, Feto-maternal outcome, Obesity, Pregnancy, Pregnancy induced hypertension.

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INTRODUCTION

The woman with pregnancy induced hypertension (PIH) is having diastolic pressure of >90 mmHg or systolic pressure of >140 mmHg at two readings 4 hours apart or a single reading of diastolic >110 mmHg after 20 weeks of pregnancy without the presence of protein in the urine or other signs of pre-eclampsia. PIH refers to pre-existing hypertension, gestational hypertension, preeclampsia, pre-existing hypertension plus superimposed gestational hypertension with proteinuria and unclassifiable hypertension. PIH is considered to be an independent and major risk factor for maternal, fetal and newborn morbidity

and mortality¹⁻³. Hypertension is the second largest cause of direct maternal death (192 deaths daily) with significant fetal morbidity and mortality⁴. The maternal morbidity related to PIH include abruptio placentae, cerebrovascular events, organ failure and disseminated intravascular coagulation; while the neonates are at risk of intrauterine growth retardation, prematurity and intrauterine death⁵.

Worldwide, 10% of all pregnancies are complicated by hypertension, resulting 14% maternal complication, while pregnancy induced hypertension (PIH), one of the hypertensive disorders of pregnancy, affects about 5-8% of all pregnant women worldwide⁶.

The metabolic and hemodynamic changes in the gestational period include an increased

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cardiac output and sodium and water retention as a result of certain biomarkers resulting long-term endothelial dysfunction contributing in increase in blood pressure. There is also reduction in vascular resistance due to increase release of nitric oxide and prostacyclin with decrease vascular sensitivity to norepinephrine and angiotensin¹.

Obesity is an abnormal accumulation of the body adipose tissue, due to excessive food intake and lack of physical activities and is associated with psychological and cultural factors. The adipose tissue have dysregulatory effects on metabolic, endocrine, vascular, and especially on inflammatory pathways in many organ systems⁷.

According to WHO recommendations, the Body Mass Index (BMI) is a measure of weight for-height (kg/m^2) independent of age, parity, smoking, race and ethnic background. A person with BMI of 18.5 to 24.9 is taken as healthy, 25 to 29.9 is overweight: while $\text{BMI} > 30$ is taken as obese⁸. A BMI of 30-35 kg/m^2 reduces life expectancy by two to four years, while severe obesity ($\text{BMI} > 40 \text{ kg}/\text{m}^2$) reduces life expectancy by ten years. Almost one in five (20%) pregnant women have a BMI of 30 or above at the beginning of their pregnancy. Maternal obesity causes labor and delivery complications, fetal and neonatal complications (birth defects, delivery of large-for gestational age infants and neonatal death), and maternal complications (Gestational diabetes mellitus, pregnancy induced hypertension)⁹.

The study was conducted to see the effect of pregnancy induced hypertension and obesity on fetal and maternal morbidity and mortality, so a plan can be made to minimize PIH, Obesity and their outcomes in future in our setup.

METHODOLOGY

This comparative cross sectional study was conducted at Combined Military Hospital Kharian, from 12th May 2017 to 19th May, 2018. Sample size calculated by using WHO sample size calculator. A total of 210 pregnant women were selected by non-probability consecutive sampling. An informed consent proforma was

taken from all the study participants after getting approval from the ethical committee of the institution. The pregnant women with gestational age > 24 weeks were included while the pregnant women with $\text{BMI} < 20$, history of hypertension, diabetes mellitus, cardiac disease, chronic renal disease or any other associated medical disorder or drug intake were excluded from the study.

The pregnant women were divided in groups on the basis of BMI into-normal healthy ($\text{BMI} < 25$, n-72), overweight ($\text{BMI} 25-29.9$, n-115) and obese ($\text{BMI} > 30$; n-23) groups. Blood pressure was recorded using mercury sphygmo-manometer with appropriate sized cuff. The patients with a blood pressure $\geq 140/90$ mmHg at two occasions 4 hours apart or a single reading of diastolic ≥ 110 mmHg after 20 weeks of gestation, without presence of protein in the urine or other signs of pre-eclampsia were taken as pregnancy induced hypertension (PIH). Any pressure $> 140/90$ mmHg, on two measurements at 6 hours apart with proteinuria > 300 mg in 24 hours urine was taken as preeclampsia. A blood pressure BP $\geq 140/90$ mmHg was taken as mild PIH; $\geq 160/100$ mmHg as moderate and a blood pressure $\geq 160/110$ mmHg was taken as severe PIH case.

A pre-structured proforma was filled by a duty Gynae registrar for female demographic. The maternal mortality and morbidity like disseminated intravascular coagulation (DIC), post prandial hemorrhage (PPH), eclampsia, acute renal failure and gestational diabetes, admission to critical care unit were recorded at time of delivery and during their admission in the hospital by the labor room team. The neonatal mode of delivery, small for gestation (birth below 37 weeks gestation) birth weight (birth weight < 2.5 kg) Apgar score at 1 and 5 minutes (to determine the prognosis of a new born infant) were recorded by labor room team and those who were admitted in NICU were under observation by NICU registrar to record any morbidity or mortality till their time of discharge. The recorded data was handed over to the labor room team.

The data was analyzed using SPSS version 17.0. Frequency and percentage were used for categorical variables. Chi-Square test was used to

Table-I: Demographic Variables of the study group.

Variables	Mean values
Mean age	26.15 ± 3.22
BMI	21.33 ± 2.52
Systolic pressure	128.57 ± 10.09
Diastolic pressure	86.91 ± 5.89
Gestational age	38.76 ± 0.68
Mean neonatal weight	1.72 ± 0.73
Abscore score 1 minute	6.96 ± 1.13
Abscore score 5 minute	8.51 ± 1.26

compare the variables between obese and non-obese women. Mean, standard deviation, 95%

Table-II: Percentage of demographic variables of study group.

Variables	Normal BP n-93 (44.2%)	Mild to Moderate PIH n-81 (38.6%)	Severe PIH n-36 (17.2%)	Total (N-210)	Like hood Ratio	p- value
Age (years)						
<25	27 (29.1%)	24 (29.6%)	07 (19.4%)	58 (27.6%)	16.616	0.001
25-30	53 (56.9%)	39 (48.1%)	11 (30.6%)	103 (49.1%)		
>30	13 (14.0%)	18 (22.2%)	18 (50%)	49 (23.3%)		
Body Mass Index						
Normal	56 (60.2%)	14 (17.3%)	02 (5.6%)	72 (34.3%)	117.884	0.014
Overweight	35 (37.6%)	65 (80.2%)	15 (41.7%)	115 (54.7%)		
Obese	02 (2.2%)	02 (2.5%)	19 (52.7%)	23 (11.0%)		
Parity						
Multi-parity	13 (13.9%)	68 (83.9%)	31 (86.1%)	31 (14.8%)	0.438	0.326
Nulliparous	80 (86.1%)	13 (16.1%)	05 (13.9%)	179 (85.2%)		
Mode of Delivery						
SVD	60 (64.5%)	46 (56.8%)	24 (66.7%)	130 (61.9%)	1.509	0.469
LSCS\Forceps	33 (35.5%)	35 (43.2%)	12 (33.3%)	80 (38.1%)		
Education						
Primary	05 (5.4%)	08 (9.9%)	05 (13.9%)	18 (8.6%)	105.651	0.468
Matric	50 (53.8%)	41 (50.6%)	13 (36.1%)	104 (49.0%)		
Graduation	31 (33.3%)	27 (33.3%)	17 (47.2%)	75 (35.7%)		
Post-graduation	07 (7.5%)	05 (6.2%)	01 (2.8%)	13 (6.7%)		
Socio-Economic						
Poor	23 (24.7%)	31 (38.3%)	14 (38.9%)	68 (32.4%)	83.896	0.331
Middle class	48 (51.6%)	35 (43.2%)	16 (44.4%)	99 (47.1%)		
Rich	22 (23.7%)	15 (18.5%)	06 (16.7%)	43 (20.5%)		
Job Description						
House wife	63 (67.7%)	42 (51.9%)	15 (41.7%)	84 (40%)	23.851	0.099
Government Job	30 (32.3%)	39 (48.1%)	21 (58.3%)	126 (60%)		

confidence interval were computed for quantitative variables. The t-test was used to compare mean difference between obese and non-obese

women. A *p*-value of <0.05 was considered significance.

RESULTS

A total of 210 pregnant women were included in the study. The mean age was 26.15 ± 3.22 years, mean systolic blood pressure 128.57 ± 10.09 mmHg, mean diastolic pressure 86.91 ± 5.89 mmHg, and BMI was 21.33 ± 2.52, while the mean gestational age was 38.76 ± 0.68 weeks. In the study group no female was divorced. The maximum number of female 103 (49%) were between 25 to 30 years of age, 68 (32%) women were belonging to poor family. Most of the females (49.5%) had passed their matric exam,

35.7% passed graduation while only 6.7% women were post-graduated. Most of the female were house wife (60%) and were nulliparous 179 (85%).

About 62% of female delivered by spontaneous vaginal delivery. A great number of patient 115 (54.8%) were found overweight with a BMI of 25-30, 72 (34%) female have normal BMI (18.5-24.9), while 23 (11%) females were obese with a BMI of >30. Regarding neonates the mean age was 1.72 ± 0.073 kg while the Apgor score in 1 minute 6.96 ± 1.13 and in 5 minutes was 8.51 ± 1.26. These data

of eclampsia, and 12% of gestational disease were seen only in PIH. DIC in 11.1%, and acute renal failure was noticed in 3.4% of cases having PIH. Among PIH cases, maternal mortality was noticed in 2.6% of cases. In our study, 50% babies needed NICU admissions and the common reason is small for gestation and low birth weight. In our study 15.7% neonates were small

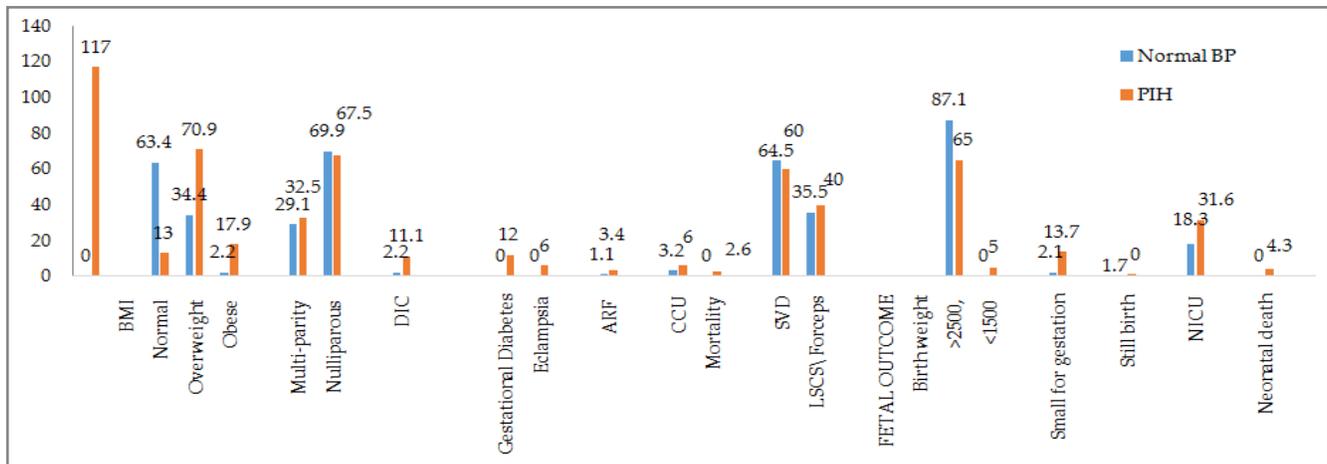


Figure-1: Percentage effect of pregnancy induced hypertension on Feto-Maternal Outcome (n=120).

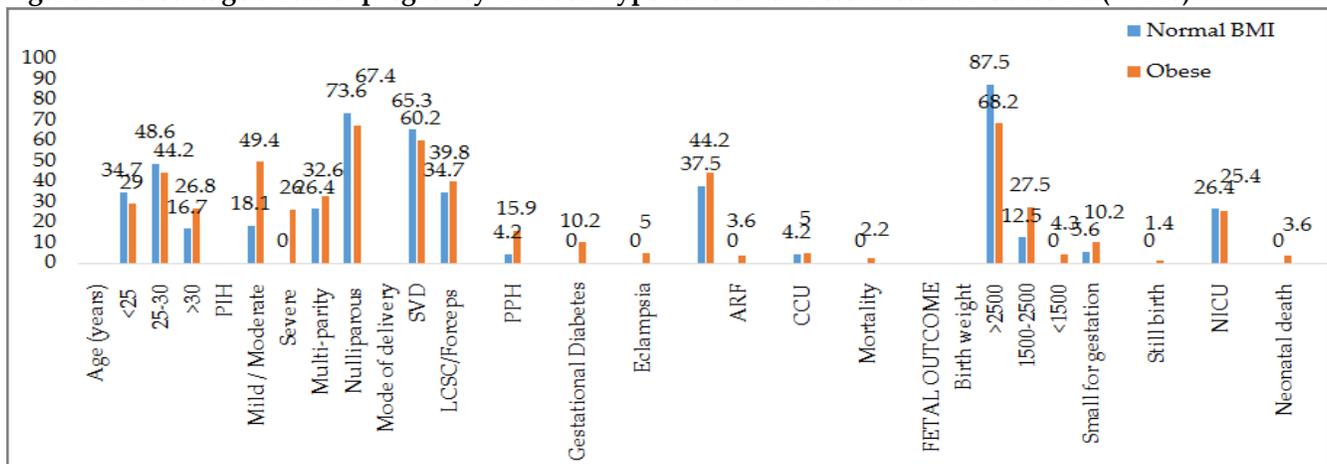


Figure-2: Percentage effect of BMI of Fet-Maternal outcome (n=120).

has been shown in table-I & II.

Figure-1 showed effects of PIH on maternal and fetal outcomes. There were 93 (44.3%) cases of normal BP, 55.7% of PIH. Among women with normal BMI, 59 (63%) have normal blood pressure (BP), 13 (16%) having PIH. More than 17% of hypertensive were obese. Among PIH cases, 24 (67.5%) were nulliparous and 12 (32.5%) were multipara. Out of 10 cases admitted in CCU, 6% cases were of PIH. There were a total of 6% cases

for gestation while 5% had low birth weight. There was 1.7% still birth and 4.3% neonatal death was noticed.

Figure-2 showed effects of BMI on maternal and fetal outcomes. Out of 210 study cases, 93 (44.3%) were of normal BP, 49.4% cases of mild to moderate and 26% cases of PIH were obese. About 29% obese patient were <25 years of age, 44% were between 25-30 years, while 27% patients were >30 years. About 67% obese were

nulliparous while 32% were multipara. Among obese, 5% were having eclampsia, 3.6% were having acute renal failure. About 5% got admission in CCU. Among obese, post-partum hemorrhage was seen in 16% cases, gestational diabetes was noticed in 10% cases while maternal mortality was seen in 2% of obese cases. In our study, about half of the babies needed NICU admissions out of which 24% belonging to obese women. About 5% of neonates were small for gestation and 4% cases of low birth weight were noticed among obese women. There were 0.4% still births in obese women.

DISCUSSION

Our study showed 55% cases of PIH at their extreme ages, as shown in multivariate analysis by Reeta *et al* who declared susceptibility of age spectrum to PIH¹⁰. Similar findings were also shown by Larry *et al* who showed age as an independent risk factors of PIH in the African population¹¹. PIH is a disease of young and nulliparous women as seen in our results and was in consistent with a number of studies^{11,12}. Early detection of PIH by regular antenatal visits can help identify such cases at the earliest and enable prompt intervention, and can improve pregnancy outcome. In our study, patients with severe PIH showed an increased incidence of eclampsia. The results were in consistent with by Tannia *et al*¹³ who stated that women with unilateral placental location had 2.8 fold risk of preeclampsia. Our results showed an increased frequency of PIH with higher BMI and were in accordance with Dorah *et al*¹⁴ who reported obesity as an independent risk factor for PIH and preeclampsia.

The extremes of maternal age, family history of pre-eclampsia, increased BMI and nulliparity are considered to be the major obstetric risk factors for the development of preeclampsia¹¹. The exact mechanisms of pre-eclampsia is unclear, however, it is thought that shallow trophoblast invasion and insufficient remodeling of uterine spiral arteries in the deep myometrial tissues, lead to placental hypoperfusion and

ischemia; along with autoantibody production by the placenta cause systemic endothelial dysfunction resulting systemic hypertension¹⁵.

Our results showed 40% frequency of cesarean section in patients with PIH. A retrospective cohort study was conducted in China demonstrated the importance of use of cesarean section during delivery among women with PIH. It was found that mild to moderate and severe PIH developed early during pregnancy could increase the risk of perinatal mortality so the cesarean delivery could decrease the risks in women with PIH¹⁶. Compared to the recommendations by the World Health Organization (WHO), the caesarean section delivery rate of 33% was above the recommended cut off, and rates should be between 5% and 10%; while cesarean section rates higher than the proposed 15% upper threshold are associated with increased morbidity and mortality for both mothers and babies¹⁷.

In our study, 9.2% patients were admitted in the critical care unit, 6% had eclampsia, 11.1% had disseminated intravascular coagulopathy and acute failure was seen in 3.4% case in cases of PIH in particular. Maternal mortality was seen in 2.6% of PIH cases.

In the present study, 80% babies had birth weight >2.5 kg, while 5% have less than 1.5 kg in women with PIH, overweight and obese. The results were in agreement with Lei *et al*¹⁸ who revealed that PIH and or obesity is an independent risk factor for low birth weight babies. A study done by Zu *et al*¹⁹ showed the incidence rates of low birth weights in mild, moderate, and severe PIH subgroups as 2.5% 4.9% and 11.9% respectively. The intra-uterine growth restrictions are increased in cases of PIH due to uteroplacental insufficiency, so there is an increased need of early induction associated with preterm births and low birth weights babies.

A major determinant of mortality, morbidity and disability in infancy and childhood is low birth weight. The low birth weight has a long-term impact on health outcomes in adulthood. The costs of low birth weight on the health

delivery system have also been documented thus preventing and/or managing PIH becomes a priority as one of the ways of reducing the risk of low birth weight and the associated consequences.

In our study, severe PIH and obese cases had more chances of the baby getting admitted in NICU, with an increased risk of perinatal mortality. These results are in agreement with Razak *et al*²⁰ who showed higher perinatal mortality rate in obese cases. Sudden vasospasm, chronic uteroplacental and fetoplacental insufficiency and abruptio placentae are considered to be the main reasoning for perinatal mortality.

The obesity, moderate to severe PIH can be reduced by conservative management, assessing fetal well-being, placental function with strict toxemia monitoring of the mother to decrease the risk of maternal and neonatal morbidity and mortality. If the PIH does not improve or it worsens, the maternal complications can be reduced by termination of pregnancy irrespective of the gestational age.

CONCLUSION

The obese women showed a higher fetal (small for gestation, NICU admission and neonatal death) and maternal risk (acute renal failure, post-partum hemorrhage, Critical Care Unit admission, and maternal mortality) than women with pregnancy induced hypertension.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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