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Original Research Article

Association of metabolic syndrome with gestational hypertension

Nowsheen Khan[1], Syed Basit[1]*, Danish Ahmed[2]

[1]Department of Obstetrics and Gynecology, SKIMS MCH Bemina, Jammu and Kashmir, India
[2]Department of Obstetrics and Gynecology, GMC Anantnag, Jammu and Kashmir, India

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***Correspondence:**
Dr. Syed Basit,
E-mail: Syedbasit63@gmail.com

ABSTRACT

Background: Metabolic syndrome is a group of clinical, metabolic and biochemical abnormalities with negative impact on global health. The aim of the study was to determine the association between metabolic syndrome and pregnancy induced hypertension, and incidence and effects of metabolic syndrome in pregnant patients.
Methods: Prospective observational study, performed in the Department of Obstetrics and Gynecology, Holy Family Hospital, New Delhi. Antenatal women before 20 weeks of gestation were enrolled in the study. Metabolic syndrome was diagnosed by utilizing the pregnancy adaptation of MeS criteria of NCEPATP III laboratory and clinical criteria. Cases were followed throughout pregnancy to observe their progression into hypertensive disorders of pregnancy i.e. gestational hypertension, pre-eclampsia and eclampsia.
Results: Out of 100 cases with metabolic syndrome 37% developed PIH, 21 developed pre-eclampsia and 14 developed gestational hypertension, 2 patients developed eclampsia as compared to controls in which only 10% developed PIH among which only 3% developed pre-eclampsia.
Conclusions: Our study demonstrates a higher rate of complicated pregnancy with higher incidence of PIH in association with metabolic syndrome compared to control group. Each component of metabolic syndrome increases the probability of PIH. The addition of components of metabolic syndrome exacerbates this probability, especially the combination of increased BMI, increased blood sugar levels and increased triglycerides.

Keywords: Eclampsia, Gestational hypertension, Metabolic syndrome, Pre-eclampsia

INTRODUCTION

Metabolic syndrome is a group of clinical, metabolic and biochemical abnormalities with negative impact on global health.[1] Based on the International Diabetes Federation (IDF) consensus statement, it is defined as the presence of body mass index >30 kg/m^2 with any two of the following: triglycerides ≥1.7 mmol/l, high-density lipoprotein <1.29 mmol/l, hypertension (systolic BP ≥130 or diastolic BP ≥85 mmHg) or fasting blood glucose ≥100 mg/dl or 5.6 mmol/l.[3]

Normal pregnancy adaptations to cater for nutritional needs of the growing foetus induces cardiometabolic stress reminiscent of metabolic syndrome with increased insulin resistance, hyperlipidaemias and changes in protein and amino acid metabolism.[4,5]

Gestational hypertension is defined per ACOG guidelines as blood pressure greater than or equal to 140 mmHg systolic or 90 mmHg diastolic on two separate occasions at least four hours apart after 20 weeks of pregnancy when previous blood pressure was normal.

Metabolic syndrome has been shown to be commoner among these women.[6-8] In addition, gestational hypertension without initial aberrations may begin to exhibit abnormal metabolic profiles postpartum, some of

which result in metabolic syndrome.[7] More than half of women who have metabolic syndrome in early pregnancy develop a pregnancy complication and assessment of the metabolic syndrome may prevent some pregnancy complications.[9]

The main aim of this study was to study the association between metabolic syndrome and pregnancy induced hypertension and to study the effects of metabolic syndrome in pregnant patients. By virtue of this study, we tried to observe the status of Indian pregnant women with regards to metabolic syndrome and PIH to improve antenatal care of such vulnerable population.

METHODS

This was a prospective observational study performed in the Department of Obstetrics and Gynecology, Holy Family Hospital New Delhi after obtaining institutional ethical clearance and written informed consent from the patients conducted from October 2020 to May 2021. Total 250 patients were included. All pregnant patients less than 20 weeks of gestation with metabolic syndrome.

Metabolic syndrome was diagnosed by utilizing the pregnancy adaptation of MeS criteria of NCEPATP III laboratory and clinical criteria and it included- (1) hypertension (BP≥140/90 mmHg), 2) diabetes (gestational or pre-gestational) sugar post prandial of ≥140 mg/dl, or IADPSG criteria for GDM which includes fasting blood sugar≥92 mg/dl or with 75 g glucose in fasting state (OGTT) i.e. 1 hr ≥180 mg/dl or 2 hr ≥153 mg/dl 33, 3) BMI ≥30 kg/m^2 at first antenatal visit, 4) HDL≤50, and 5) TG≥250. On basis of literature, the presence of metabolic syndrome was defined as having three of the five variables assessed 'present' using the clinical cut-offs defined above.

Control

All normal pregnant patients less than 20 weeks of gestation without any comorbidities.

Exclusion criteria

Multiple gestation, untreated hypothyroidism at first antenatal visit, cardiac disease, anaemia, autoimmune diseases- SLE were excluded.

RESULTS

Sample size taken was 100 cases of pregnant patients less than 20 weeks of gestation with metabolic syndrome and 100 controls of normal pregnant patients without any comorbidity less than 20 weeks of gestation. These patients were followed throughout pregnancy.

Table 1: Incidence of metabolic syndrome.

	Frequency	Percentage
Total no. of ANC patients observed	1140	100
Patients with metabolic syndrome	115	10.09
Patients without metabolic syndrome	1025	89.91

Out of total 1140 antenatal patients, incidence of metabolic syndrome was 10.09% (Table 1).

Table 2: Descriptive statistics of gestational age at diagnosis of metabolic syndrome (weeks) of cases.

Variable	Mean±SD	Median (25th-75th percentile)	Range
Gestational age at diagnosis of metabolic syndrome (weeks)	13.33±3.2	13 (11-16.25)	8-20

Table 3: Comparison of pregnancy induced hypertension between cases and controls.

Pregnancy induced hypertension	Cases (n=100) (%)	Controls (n=100) (%)	Total (%)	P value
Absent	63 (63)	90 (90)	153 (76.50)	
Present	37 (37)	10 (10)	47 (23.50)	<.0001§
Total	100 (100)	100 (100)	200 (100)	

Table 4: Comparison of type of pregnancy induced hypertension between cases and controls.

Type of hypertension	Cases (n=100) (%)	Controls (n=100) (%)	Total (%)	P value
Gestational hypertension	14 (14)	7 (7)	21 (10.50)	0.106§
Pre-eclampsia	17 (17)	3 (3)	20 (10)	0.002‡
Superimposed pre-eclampsia	4 (4)	0 (0)	4 (2)	0.121‡
Eclampsia	2 (2)	0 (0)	2 (1)	0.497‡

§Chi square test, ‡Fisher's exact test

Mean value of gestational age at diagnosis of metabolic syndrome (weeks) of cases was 13.33±3.2 with median (25th-75th percentile) of 13 (11-16.25) (Table 2).

Proportion of patients with pregnancy induced hypertension was significantly higher in cases as compared to controls (37% vs 10% respectively) (Table 3).

Pre-eclampsia was significantly higher in cases (17%) as compared to controls (3%) (p value=0.002). Distribution of other type of hypertension was comparable between cases and controls (gestational hypertension: 14% vs 7% respectively (p value=0.106), superimposed pre-eclampsia: 4% vs 0% respectively (p value=0.121), eclampsia: 2% vs 0% respectively (p value=0.497)) (Table 4).

Table 5: Comparison of gestational age at time of delivery (weeks) between cases and controls.

Gestational age at time of delivery (weeks)	Cases (n=100)	Controls (n=100)	Total	P value
Mean±SD	37.61±1.63	38.34±1.27	37.97±1.5	0.0006*
Median (25th-75th percentile)	38.14 (37.25-38.607)	38.29 (37.857-39.286)	38.29 (37.714-39.286)	
Range	32.86-39.43	33-39.29	32.86-39.43	

*Independent t test

Table 6: Comparison of mode of delivery between cases and controls.

Mode of delivery	Cases (n=98) (%)	Controls (n=100) (%)	Total (%)	P value
LSCS	69 (70.41)	24 (24)	93 (46.97)	<.0001§
NVD	29 (29.59)	76 (76)	105 (53.03)	
Total	98 (100)	100 (100)	198 (100)	

§Chi square test

Mean±SD of gestational age at time of delivery (weeks) in cases was 37.61±1.63 which was significantly lower as compared to controls (38.34±1.27) (p value=0.0006) (Table 5).

LSCS was significantly higher in cases as compared to controls. (LSCS:70.41% vs 24% respectively) (p value<0.0001) (Table 6).

DISCUSSION

There are several factors unique to women that can impact the prevalence and characteristics of the metabolic syndrome in women.[10]

Pregnancy is a significant contributor to weight gain in women. Given the established links between metabolic syndrome and chronic disease in adulthood as well as between pregnancy complications such as pre-eclampsia and GDM and later life T_2DM and CVD, pregnancy may offer a window of opportunity to identify women with metabolic syndrome and elevated risk of adverse pregnancy outcomes.

Our study demonstrates the association of all components of metabolic syndrome with PIH. It also gives us insight about association of metabolic syndrome with other pregnancy complications.

The incidence of metabolic syndrome in pregnant patients in our hospital was 10.09%.

Study conducted by Grieger et al showed an incidence rate of metabolic syndrome in pregnancy of about 12.3%.[2] Another study conducted by Maria do Carmo Pinto et al found an incidence of 3.0% metabolic syndrome in early pregnancy and 9.7% in postpartum.[11] Since our study also included metabolic syndrome cases in early pregnancy, our study shows comparable correlation with study by Grieger et al but not with study by Maria do Carmo.

The mean parity of cases in our study is 1.04. Our study was not in consonance with study conducted by Wani et al whose study had a mean parity of 2.[12]

High parity was associated with increased incidence of PIH in our study. Para 2 comprised of 40.54% of total PIH cases followed by P1 (37.84%) followed by Primi (21.62).

Our study was in consonance with study conducted by Vladntin et al whose study found that a dose-response effect between increased parity and abdominal obesity and low HDL levels that were most likely risk factors for PIH.[13]

The mean gestational age of cases at time of diagnosis of metabolic syndrome in our study was 13.33 weeks which was in consonance with study conducted by Wani et al where mean gestational age of patient at time of diagnosis of metabolic syndrome was 11.4.

All the components of metabolic syndrome were assessed and compared individually between cases and controls before 20 weeks of gestation.

Blood pressure measured was compared between cases and controls and didn't show much difference (p value systolic 0.25and diastolic 0.074). Blood sugar fasting compared between cases and controls show significant difference (P value <0.001).

BMI assessed between cases and controls showed significant difference (p value <0.001). Lipid profile measured included serum HDL and serum triglycerides

showed significant difference between cases and controls (p value <0.001).

Our study showed that metabolic syndrome had a great association with PIH. Out of 100 cases with metabolic syndrome 37% patient developed PIH among which 21 patients developed pre-eclampsia and 14 developed gestational hypertension, 2 patients developed eclampsia as compared to controls in which only 10% developed PIH among which only 3% developed pre-eclampsia (p value <0.001).

This study showed consonance with study carried out by Horvath et in which about 26.7% developed pre-eclampsia in cases as compared to controls in which 5.2% developed pre-eclampsia (p value <0.001).[14]

Mode of delivery in cases vs control was significantly comparable. 70.4% of cases delivered by LSCS vs 24% of controls (p value <0.003). 29.59% of cases delivered by NVD vs 76% of controls (p value <0.001). A study conducted by Musharaf et al concluded that the rate of caesarean section in GDM patients with increased BMI was 75% and only 25% had NVD.[15] Another study by Ledely et al concluded that the rate of caesarean section in obstetric patients with high BMI (obese) was 47.7% vs 20.7% controls.[16]

In this study gestational age at time of delivery is significantly lower in cases (37.61 weeks) vs controls 38.34 weeks (p value <0.001). Study conducted by Grieger et al to assess metabolic syndrome in pregnancy and risk of adverse pregnancy outcome concludes that the gestational age of patients with metabolic syndrome was 39.3 vs 39.6 in controls (p value <0.0027).[2] This study was in consonance with this study.

CONCLUSION

This study concludes that comprehensive lifestyle changes, including diet, exercise, to achieve pre pregnancy BMI less than 25 should be stressed upon to reduce the incidence of metabolic syndrome. Pre pregnancy is the time to optimize body weight and adopt healthy eating and exercise habits. Dyslipidemia should be evaluated and managed with diet and exercise prior to pregnancy. HbA1C should be evaluated to rule out pregestational diabetes.

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