

Metabolic Syndrome in Preeclampsia Women in Gorgan

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Abstract: The aim of study was to assess the metabolic syndrome in preeclampsia women. The study was performed on 50 women. The metabolic syndrome prevalence was 66%. Serum glucose, triglyceride and LDL-cholesterol levels significantly were increased and HDL-cholesterol level significantly was decreased in metabolic syndrome patients. These patients showed high prevalence of components of the syndrome. Our results show the importance of dyslipidemia in preeclampsia in overweight and obese women. Preeclampsia and cardiovascular disease are important problems for the health of women. It may be useful to give a treat to people with a high-normal blood pressure in early pregnancy.

Keywords: Gorgan, Metabolic Syndrome, Preeclampsia.

1. INTRODUCTION

Preeclampsia is a complicated disorder in pregnancy which occurs after 20 weeks of gestation. It affects 3%-5% of all pregnancies in the world [1]. It has been reported that the prevalence of preeclampsia has been altered between 1.8% and 16.7% in developing countries [2]. Women with preeclampsia seem to be at elevated risk for cardiovascular disease [3-5]. Studies have shown that women with preeclampsia disease show two times risk of cardiac disease, cardiovascular mortality, cerebrovascular and peripheral arterial disease [6]. It has been indicated that many risk factors such as diabetes mellitus [7], obesity [8] hypertension and heart disease [9] is often common in preeclampsia and cardiovascular disease patients. There are also another risk factors for preeclampsia include elevated body mass index (BMI) before or during pregnancy, pre-existing diabetes, multiple pregnancies, null parity, autoimmune disease, renal disease and maternal age greater than 40 years old [10, 11].

The metabolic syndrome is defined as a cluster of metabolic abnormalities such as hypertension, dyslipidaemia, obesity (particularly central obesity), insulin resistance and high fasting plasma glucose [12]. The Third Report of National Cholesterol Education Program Expert Panel on

Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) (ATP III) showed the importance of the metabolic syndrome for the first time [13]. Differences in genetic differences, diet, physical activity, age and sex influence the prevalence of metabolic syndrome and its components [14]. Studies of Marjani *et al.* showed that metabolic syndrome change in different ethnic and age groups and postmenopausal women [15-19]. 6%-8% and 3%-5% of pregnant women nearly develop gestational diabetes mellitus and pregnancy induced hypertension, respectively. Assessment of the metabolic syndrome may prevent some pregnancy complications [20]. It has been reported that dyslipidaemia and insulin resistance are more considerable in preeclampsia women when compared to normal pregnancy [21, 22]. Many studies have been shown that there are associations between pre pregnancy obesity [23-25], chronic hypertension [26-28], dyslipidemia, and inflammation in early pregnancy [29-30] and high risk of preterm birth and intrauterine growth restriction. Studies have indicated that people with metabolic syndrome reveal higher frequency of cardiovascular disease and more rate of death from cardiovascular disease [31]. Patients with high triglyceride show a higher incidence of preeclampsia [32]. Many studies have indicated high triglycerides, cholesterol, low density lipoprotein (LDL) and reduced high density lipoprotein (HDL) levels in preeclampsia [33]. Another study also revealed that obesity is a risk factor for the progression of placental endothelial dysfunction and preeclampsia [34]. The aim of this study was to assess the metabolic syndrome in women with preeclampsia in Gorgan.

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2. MATERIAL AND METHODS

The study was performed on 50 women with preeclampsia in the third trimester who were referred to the Sayyad shirazi educational Hospital, Gynecology Department of Golestan University of Medical Sciences, Gorgan, Iran, 2014. Preeclampsia was characterized as a blood pressure higher than 130/85 mmHg and proteinuria with 1+ or greater by dipstick. Severe preeclampsia was recognized from mild preeclampsia if blood pressure is higher than 160/110 mmHg or proteinuria for mild preeclampsia between 1+ and 3+ and for severe preeclampsia greater than 3+ on the dipstick [35]. Preeclampsia patients were diagnosed by a gynecologist. Histories of diabetes mellitus, renal, cardiovascular, liver disease, endocrine disorder, any chronic illness were exclusion criteria for these patients. Body mass index (BMI) was calculated when weight in kilograms divided by height in meters squared [36]. Blood samples were collected from preeclampsia patients. The samples were centrifuged for 10 minutes at 3000 rpm and the serum was separated. The serum concentration of glucose, triglycerides, total cholesterol and HDL-cholesterol was determined by a biochemical kit and using spectrophotometer techniques in the Metabolic Disorder Research Center, Faculty of Medicine. The Friedewald equation was used to calculate LDL cholesterol level. Systolic and diastolic blood pressure was measured by using a standard mercury manometer with women in sitting position, from their right hands. Subjects with systolic blood pressure (SBP) \geq 130 mm Hg and/or diastolic blood pressure (DSP) \geq 85 mm Hg was diagnosed as a hypertension subjects. Women were considered to have metabolic syndrome when each of them had 3 or more of the following criteria [13]. A pre-pregnancy body mass index higher than 30 kg/m², a serum triglycerides level of $>$ 150 mg/dl, a

HDL-cholesterol of $<$ 50 mg/dl, SBP of $>$ 130 mmHg and/or DBP of $>$ 85 mmHg or those who were on treatment for hypertension and a serum glucose level of \geq 100 mg/dl or on treatment for diabetes [37]. The results were expressed in mean \pm SD. Statistical data analysis was performed by SPSS- 16 version software. Comparison of different parameters between preeclampsia patients with and without metabolic syndrome was done by independent sample t test. Percentage distribution of the components of metabolic syndrome in preeclampsia women was done by using Pearson's chi-square test. Statistical significance was accepted at a p value of $<$ 0.05.

3. RESULTS AND DISCUSSION

Clinical and biochemical characteristic of preeclampsia women with and without metabolic syndrome are shown in Tables 1 and 2. Prevalence of metabolic syndrome and distribution of the components of metabolic syndrome in preeclampsia women are given in Table 3. The prevalence of metabolic syndrome in preeclampsia patients were 66%. Serum glucose, triglyceride and LDL-cholesterol levels significantly were increased and HDL- cholesterol level significantly was decreased in preeclampsia patients with metabolic syndrome when compared to subjects without metabolic syndrome (Table 1). Systolic and diastolic blood pressure was higher than normal range in both groups. In mild and severe preeclampsia women with metabolic syndrome, serum glucose, triglyceride, and LDL-cholesterol levels were significantly high and HDL- cholesterol level was low in comparison with subjects without metabolic syndrome (Table 2). Preeclampsia women with metabolic syndrome showed high prevalence of components of the syndrome compared to those without metabolic syndrome (Table 3).

Table 1. Clinical and biochemical characteristic of preeclampsia women with and without metabolic syndrome.

Parameters	Preeclampsia women with metabolic syndrome	Preeclampsia women without metabolic syndrome	P-value
No. (%)	33(66)	17(34)	
Maternal age(years)	26.54 \pm 3.74	26.47 \pm 4.50	0.484
Height (m)	1.61 \pm 0.06	1.62 \pm 0.04	0.752
Weight (Kg)	69.36 \pm 16.83	58.82 \pm 10.41	0.378
Pre-pregnant body mass index (kg/m ²)	26.58 \pm 6.43	22.17 \pm 3.93	0.264
Gestational age (weeks)	31.24 \pm 3.49	30.17 \pm 3.10	0.554
Systolic blood pressure (mmHg)	149.39 \pm 9.66	145.29 \pm 9.43	0.758
Diastolic blood pressure (mmHg)	100.0 \pm 10.0	95.88 \pm 11.21	0.844
Glucose (mg/dl)	128.15 \pm 45.63	89.94 \pm 12.25	0.011
Triglyceride(mg/dl)	286.0 \pm 70.12	228.76 \pm 65.39	0.01
Cholesterol(mg/dl)	230.06 \pm 59.99	212.18 \pm 55.81	0.594
HDL- Cholesterol(mg/dl)	59.58 \pm 26.77	82.45 \pm 23.76	0.033
LDL-Cholesterol(mg/dl)	113.28 \pm 62.35	83.96 \pm 56.09	0.045

Table 2. Clinical and biochemical characteristic of women with mild and severe preeclampsia with and without metabolic syndrome.

Parameters	Women with mild preeclampsia with metabolic syndrome	Women with mild preeclampsia without metabolic syndrome	P-value	Women with severe preeclampsia with metabolic syndrome	Women with severe preeclampsia without metabolic syndrome	P-value
No. (%)	21(60)	14(40)		12(80)	3(20)	
Maternal age(years)	26.80±4.11	27.28±4.19	0.843	25.91±2.90	22.66±4.61	0.434
Height (m)	1.62±0.07	1.61±0.03	0.958	1.59±0.05	1.67±0.02	0.897
Weight (Kg)	64.47±12.83	60.35±10.32	0.624	77.91±19.98	51.66±9.07	0.223
Pre-pregnant body mass index (kg/m ²)	24.38±5.22	22.97±3.59	0.256	30.41±6.76	18.44±3.76	0.001
Gestational age (weeks)	31.47±3.66	30.50±3.32	0.848	28.75±8.69	28.68±1.15	0.892
Systolic blood pressure (mmHg)	142.86±4.62	141.43±3.63	0.675	156.67±14.97	163.33±5.77	0.332
Diastolic blood pressure (mmHg)	93.80±6.60	91.42±3.63	0.577	116.67±20.15	116.67±11.54	0.895
Glucose (mg/dl)	137.95±47.47	87.71±10.81	0.001	123.08±70.89	100.33±15.63	0.045
Triglyceride(mg/dl)	299.67±69.45	237.0±61.67	0.001	261.67±67.08	190.33±82.43	0.001
Cholesterol(mg/dl)	230.05±57.69	228.0±59.66	0.425	231.30±76.41	228.67±32.92	0.385
HDL- Cholesterol(mg/dl)	57.85±23.01	79.56±23.71	0.025	54.10±50.88	95.94±23.07	0.048
LDL-Cholesterol(mg/dl)	112.26±60.44	81.03±58.53	0.01	101.19±67.15	97.65±50.65	0.040

Table 3. Prevalence of metabolic syndrome and distribution of the components of metabolic syndrome in preeclampsia women.

	With metabolic syndrome No. (%)	Without metabolic syndrome No. (%)	p-Value
metabolic syndrome	33 (66)	17(24)	
Fasting Blood Sugar >100 mg/dl	21(63.63)	3 (17.64)	< 0.001
High Density Lipoprotein-Cholesterol < 50 mg/dl	13(39.39)	0(0)	< 0.001
Triglyceride > 150 mg/dl	33(100)	15 (88.23)	< 0.001
Body Mass index pre pregnancy > 30 Kg/m ²	8(24.24)	0(0)	< 0.001
Systolic blood pressure > 130 mmHg/ Diastolic blood pressure> 85mmHg	33(100)	17(100)	< 0.001

The prevalence of preeclampsia changes in different regions of the world especially in developing countries. The present study shows that pregnant women with preeclampsia were more likely to have metabolic syndrome. The presence of high metabolic syndrome may be related to some risk factors like obesity, high blood pressure and dyslipidemia. The prevalence of metabolic syndrome components in preeclampsia women was high in our study subjects, which is in agreement with other findings [38-40]. Recent studies show that there is a relationship between blood pressure and cardiovascular disease risk [41, 42]. It has been shown that the progression of preeclampsia is associated with an elevated risk of cardiovascular disease and death [3,43-46]. In this study of 33 women with preeclampsia, the prevalence

of metabolic syndrome was 66%. This result is significantly higher than prevalence of metabolic syndrome of Chinese women (7.1%) [47]. Our findings are in agreement with study of Smith *et al.* [48] who showed a higher prevalence of metabolic syndrome among women with preeclampsia compared to healthy pregnant women. Our study has indicated that there is a relationship between preeclampsia and metabolic syndrome. Recent studies revealed that metabolic scores during pregnancy have a role in predicting of preeclampsia [49, 50]. This study showed that 33 of the 50 women with the metabolic syndrome had high blood pressure. In addition, preeclampsia women with overweight pre-pregnancy are in risk for metabolic syndrome. Obesity makes women susceptible to preeclampsia [8]. Many studies

have indicated that overweight cause insulin resistance [51], elevates inflammatory markers [52, 53] and the risk of developing cardiovascular diseases [54, 56]. Driul *et al.* [57] reported that obese women were five times more probably to develop preeclampsia. It has also indicated that there is an association between carbohydrate intolerance, hypertriglyceridemia [58] and low HDL [59] with development of preeclampsia in pregnant women. These factors are the components of metabolic syndrome which may show the association between metabolic syndrome and preeclampsia development. These may be a risk factor for the pregnant women for the subsequent progression of metabolic syndrome. Thus, it suggests that weight-control after pregnancy in preeclampsia women may be carried out. Our result indicated that increased blood pressure, triglyceride and glucose and decreased HDL were the most factors among preeclampsia women with metabolic syndrome. Studies on pregnant women have indicated that chronic sub-clinical inflammation [60] and metabolic variations [61] have influence on vascular endothelial function and elevate the risk of preeclampsia. Dane *et al.* [62] showed the presence of multiple components of metabolic syndrome in pregnant women with hypertension is a risk factor for the development of pregnancy-induced hypertension. The results of this study showed that the presence of the cluster of metabolic syndrome is a significant risk factor associated with the development of preeclampsia. Bellamy *et al.* [5] reported that the risk of hypertension, ischemic heart disease, stroke, Venous thromboembolism and mortality were elevated in women following preeclampsia. Thus, the control of the various components of the metabolic syndrome cluster during pregnancy may have a good effect for the prevention of preeclampsia and cardiovascular diseases. It suggested that preeclampsia may have a significant role in the prevalent of cardiovascular diseases and type-2 diabetes [63]. The results of this study showed that dyslipidemia is an important risk factor for preeclampsia in overweight pregnant women which is in agreement with the findings of other studies showing that women who develop preeclampsia have higher triglyceride, cholesterol and LDL-cholesterol and lower HDL-cholesterol concentrations than healthy pregnant women [64, 65]. It has been indicated that the incidence of obesity and preeclampsia are increasing [66]. Several studies have shown the association between pre-pregnancy overweight and metabolic pathways dysregulation during pregnancy [64, 66]. The levels of triglyceride and cholesterol are elevated to provide the developing fetus in normal pregnancy [67]. The serum lipids increase in women with preeclampsia [65]. The pathogenesis of preeclampsia may dependent on lipid synthesis alteration and lipid metabolism abnormality [68]. Many studies have been shown the association of high triglyceride and LDL-cholesterol with pathogenesis of preeclampsia [64, 65, 68, 69]. Some other studies have demonstrated the association between lipid levels and severity of preeclampsia [70-73]. The risk of severe preeclampsia is increased when BMI is the highest. As it has been shown the risk factors for severe preeclampsia depends on severe obesity (BMI \geq 32.2) for the development of severe preeclampsia [74]. Akhavan *et al.* have revealed the relationship between hyperlipidemia and severity of preeclampsia. Severe preeclampsia patients showed an

important elevation in plasma triglyceride, cholesterol, and LDL-cholesterol concentrations when compared to controls [71] which are in agreement with our study. Baker *et al.* demonstrated that women with the most severe form of preeclampsia had triglyceride levels similar to normotensive control [72].

CONCLUSION

Our results show the importance of dyslipidemia in preeclampsia in overweight and obese women. Preeclampsia and cardiovascular disease are important problems for the health of women. It may be useful to give a treat to people with a high-normal blood pressure in early pregnancy.

CONFLICT OF INTEREST

The author confirms that this article content has no conflict of interest.

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