

The predictive value of metabolic syndrome in the evaluation of pregnancy course and outcome

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Summary

Aim: Determining the prevalence of metabolic syndrome (MS) in the tested sample of pregnant women in the second and third trimesters of pregnancy, as well as the prognostic significance of MS in assessing the course and outcome of pregnancy. **Materials and Methods:** Prospective cohort study included 135 pregnant women after 24^{0/7} weeks of pregnancy, hospitalized in the period from the January 1st, 2014 until September 30th, 2014. Data analysis included descriptive and analytical methods. **Results:** After assessment of possible confounding effect of age the authors confirmed that women with MS were 1,685-fold more likely give birth by caesarean section (OR = 1.685, $p = 0.048$), that it was a statistically significant prognostic factor in the earlier weeks of delivery ($p = 0.001$), and that it was statistically significant prognostic factor of lower Apgar scores in infants ($p = 0.003$). **Conclusion:** The early detection of MS during pregnancy reduces perinatal morbidity and is an important factor for the pregnancy outcome.

Key words: Metabolic syndrome; Obesity; Cesarean section; Gestational diabetes; Gestational hypertension.

Introduction

The term metabolic syndrome (MS) formerly known as syndrome X, was specified and determined in 1970s to describe the association of various risk factors and diabetes. Today, the terms of MS, insulin resistance, and syndrome X are used for the precise definition of associated abnormalities which are an increased risk for developing diabetes mellitus type 2 and atherosclerotic cardiovascular disease.

The incidence of MS in the general population is estimated to be 17- 25%, while in the United States of America it reaches $34.5\% \pm 0.9\%$ according to the National Cholesterol Education Program (NCEP) [1]. Studies of MS in the population of pregnant women are not numerous, but it is known that the incidence of MS in early pregnancy is around 3.3% to 10%, while it increases with increasing of gestational weeks and BMI. The highest incidence of MS in pregnancy is recorded during the last trimester when there is the highest weight gain of pregnant women (30%), as well as during some pathological conditions, such as gestational diabetes, where the frequency of MS reaches up to 36.4% [2] or gestational hypertension, in which the incidence of MS is around 30% [3].

A uniform definition of MS still does not exist. In this study, the authors used the definition of the NCEP which defines MS in the circumstances when at least three of the

five proposed criteria are presented [4]: 1) central obesity (waist circumference ≥ 102 cm in men and ≥ 88 cm in the female population), 2) dyslipidemia (triglycerides ≥ 1.7 mmol/l and 150 mg/dl), 3) dyslipidemia (HDL < 40 mg/dl or 1.03 mmol/l for men and < 50 mg/dl or 1.29 mmol/l for women), 4) systolic blood pressure higher than 130 mm Hg and/or diastolic blood pressure higher than 85 mmHg, and 5) the value of glycemia higher than 6.1 mmol/l or 110 mg/dl.

Numerous studies showed that pregnancy represents a state of insulin resistance, which explains the effects of many reproductive hormones, of which the most important is human placental lactogen (HPL) [5]. Today it is known that cytokines, especially tumor necrotizing factor alpha (TNF-alpha) (probably of placental origin), can also be a significant factor of emerging insulin resistance during pregnancy [6]. Bearing in mind these scientific observations, the fact which is imposed is that the pregnancy could be the "trigger" for the development of MS.

The aim of this study was to investigate the incidence of MS in the population of pregnant women after completed 24^{0/7} weeks (168 days) of pregnancy in Belgrade (Serbia), as well the prognostic significance of MS in assessing the course and outcome of pregnancy.

Materials and Methods

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The study was designed as a prospective, cohort study and included 135 pregnant women hospitalized at the Department of Gynecology and Obstetrics, Clinical Center of Serbia in the period from the January 1st, 2014 to September 30th, 2014. The study included monofetal, vital pregnancies with gestational age after 24 ⁰/₇ weeks (168 days). The other relevant data in this survey were collected by means of a general questionnaire, composed on the basis of most relevant literature data concerning this issue [7]. BMI was calculated according to the method proposed in year 1985 by Garrow (originally called the Quetelet's index (QI)) and was determined by the formula: BMI = TM (kg) / TV² (m²) [8].

The complete study population was divided into two groups according to the presence of MS: cohort, consisting of exposed pregnant women with MS and non-exposed cohort, consisting of pregnant women without MS. In order to investigate the frequency of certain complications during pregnancy and childbirth, both cohorts of pregnant women were followed until the end of pregnancy.

Data analysis included descriptive and analytical methods (χ^2 test and Student *t*-test, Pearson correlation test for parametric, and Spearman correlation test for non-parametric data). In this study, for predictive value of MS in evaluation the pregnancy course and outcome, Cox. regression model was utilized.

All participants provided written informed consents. The study was approved by the Ethical Committee of the Faculty of Medicine of the University of Belgrade.

Results

The mean age of all women participating in this study was 32.16 (ranged 20- 45) years. The average age of pregnant women in the group without MS was 30.89 ± 4.77 years and in the group of pregnant women with MS it was 34.98 ± 4.65 years. This difference was highly statistically significant ($t = - 4.642$, $p = < 0.001$). Correlation analysis showed that older age of pregnant women was statistically significantly associated with the presence of MS ($\rho = 0.390$, $p < 0.001$).

The prevalence of MS in the population of pregnant women after 24 ⁰/₇ weeks of pregnancy, hospitalized at the Department of Gynecology and Obstetrics, Clinical Center of Serbia in the period from January 1st, 2014 September 30th, 2014, according to NCEP criteria was 31.1% (42 of pregnant women), in which there were primiparas 2.3% (1) and multiparas 97.7% (41).

The average body weight at the beginning of pregnancy, in pregnant women without MS was 69.08 ± 15.72 kg and in pregnant women with MS it was 76.00 ± 19.36 ($Z = -2.143$, $p = 0.032$). Higher body weight before pregnancy was associated with MS ($\rho = 0.185$, $p = 0.032$).

In the total sample, 68 (50.4%) patients gave birth vaginally and 67 (49.6%) had caesarean section. In the group without MS, 53 (57.0%) patients gave birth vaginally and 40 (43.0%) had a caesarean section. In the group with MS 15 (35.7%) patients gave birth vaginally and 27 (64.3%) had a caesarean section. There was a statistically significant difference in the way of delivery between the two study groups ($\chi^2 = 5.239$, $p = 0.022$). MS was significantly correlated with caesarean section ($\rho = 0.197$, $p = 0.022$).

Table 1. — Predictive value of MS for Apgar scores

Variables	Non standardized coefficient		Standardized coefficient		<i>t</i>	<i>p</i>
	B	Standard error	Beta	B		
Constant	8.940	0.554			16.151	0.000
Age	-0.005	0.018	-0.026		-0.285	0.776
MS	-0.574	0.193	-0.268		-2.978	0.003

Depended variable: Apgar score.

After age-related adjustment, the authors confirmed that pregnant women with MS had a 1,685-fold greater chance to have delivery by caesarean section compared to pregnant women without presence of MS. This value was statistically significant (OR = 1.685, $p = 0.048$).

In the total sample, there were 120 (88.9%) full term infants (newborns born after 37 NG) and 15 (11.1%) premature infants. In the group without MS were 5 (5.4%) premature infants and in the group with MS there were 10 (23.8%) premature infants. After controlling of possible confounding effect of age, the authors confirmed that MS was statistically significant prognostic factor in early weeks of gestation at delivery ($p = 0.001$).

There was a statistically significant difference in Apgar score between the two study groups ($\chi^2 = 14.723$, $p = 0.023$). The presence of MS was statistically significantly correlated with a lower value of Apgar scores ($\rho = -0.203$, $p = 0.018$). After age-related adjustment, the authors confirmed that MS was a statistically significant prognostic factor of lower Apgar score ($p = 0.003$) as shown in Table 1.

Discussion

During the past decades it has been recognized that excessive body weight and obesity become one of the most challenging issue in the field of perinatology and obstetrics [9]. Namely, it was observed that body weight during pregnancy could be a significant predictive factor for delivery mode, as well as for development of various pregnancy-related complications. In the present study, 32.59% of patients were older than 35 years and the majority of them were well-educated nulliparous who smoked during their pregnancy. Most of women (89.9%) had adequate prenatal care in pregnancy. It is important to highlighted that is well-recognized that in older women whose weight reached 67.5 kg, there was no significant complications during pregnancy and childbirth [10]. Older women with normal nutritional status and low parity, had an increased incidence for diabetes mellitus in pregnancy and cesarean section, and the most interesting fact is that their neonatal outcomes were not different from those in the group between 20 and 30 years of age [10].

The prevalence of MS syndrome during the second and third trimesters of pregnancy in this sample was 31.1%, but the incidence and prevalence of MS in early pregnancy

ranges from 2.9% to 3.5% [11, 12]. This discrepancy in the incidence and the prevalence of MS during the first and last trimesters of pregnancy could be explained by the highest weight gain which is certainly in the last trimester.

Multivariate prediction of MS and its components were associated with age, obesity, and gestational diabetes, as well as obesity and insulin resistance index surrogate and represents the best predictors of MS in monitoring study population [13].

The occurrence of MS components in pregnancy, individually or jointly, surely affect the course of pregnancy. Obesity is an independent risk factor for adverse obstetric outcome and is significantly associated with an increased cesarean delivery rate [14], and on the other hand, obesity is the component of MS as well, so it is expected that a cesarean section is more common in patients with MS.

It is well known that pre-gestational and gestational diabetes mellitus are associated with poor pregnancy outcomes; moreover many pre-diabetic risk conditions, such as obesity and age above 30 years, are also associated with low Apgar scores in newborns [15]. Gestational hypertension was associated with significantly increased morbidity and mortality rates. Women with chronic hypertension are at greater risk for adverse outcome than those with pregnancy-induced hypertension [16].

Conclusion

The early detection of MS during pregnancy reduces perinatal morbidity and is recognized as significant predictive factor for the pregnancy outcome. Therefore, the early identification of pregnant women belonging to this susceptible cohort and their continuous and more frequent monitoring, which offers opportunity to influence them to reduce exposure to risk factors, as well as offers the possibility for timely and efficient treatment. Keeping in mind the aforementioned, it can be concluded that early detection of MS during pregnancy could have crucial and beneficial impact for following pregnancy course and outcome.

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