

CORRELATION OF PSYCHOLOGICAL SYMPTOMS WITH CORTISOL AND CRP LEVELS IN PREGNANT WOMEN WITH METABOLIC SYNDROME

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SUMMARY

Background: In pregnancy occurs series of physiological, organic and psychological changes in the female organism. Particularly are significant hormonal and metabolic changes. Elevated cortisol levels are reduced by linking the transport of globulin (transcortin). Triglycerides were increased 50% and other lipids from 20 to 30%. The values of CRP were slightly elevated in the third trimester of pregnancy (10-15 mg / L). To investigate the association of psychological symptoms with the level of cortisol and CRP in women with metabolic syndrome.

Subjects and methods: From 1646 pregnant women cross-sectional, prospective study included 180 pregnant women divided into three groups by applying the inclusion and exclusion criteria. Research methods are laboratory and clinical tests and questionnaires. Every pregnant woman have been made complete laboratory findings and determined cortisol in 8 and 17 hours using the chemiluminescent immunoassay method. All pregnant women filled in several questionnaires: socio-demographic, obstetrical-gynecological, standardized psychometric questionnaire (SCL 90-R), a questionnaire syndrome of depression according to ICD 10 and Beck self depression scale. The study was conducted from August 2011 to mid-November 2012.

Results: From the total of 1646 hospitalized pregnant women, 176 pregnant women had a BMI > 30 and 120 of them were tested, but 60 had criteria for MS. The concentration of morning and afternoon cortisol is increased in pregnant women with the metabolic syndrome. Obese pregnant women have a statistically higher level and morning and afternoon cortisol levels than women with normal body weight and without the metabolic syndrome, but these differences are smaller than in the case of pregnant women with the metabolic syndrome. CRP is significantly higher in women with metabolic syndrome. CRP concentration is significantly higher in obese pregnant women compared to pregnant women with normal weight and without the metabolic syndrome, but it is lower than in pregnant women with the metabolic syndrome. The incidence of psychological symptoms as somatization, obsessive-compulsive symptoms, depression, anxiety, phobia, and nonspecific symptoms is statistically increased in pregnant women with elevated morning cortisol, but in women with elevated afternoon cortisol also occurring aggressiveness and paranoia. In pregnant women with elevated CRP is statistically higher incidence of psychological symptoms such as somatization, obsessive-compulsive symptoms, depression, anxiety, and nonspecific symptoms.

Conclusion: There is a statistically significantly higher levels of cortisol and C-reactive protein in obese pregnant women and pregnant women with the criteria of MS. Morning cortisol has a specific predictive value for the diagnosis of MS, but the values of CRP are changing in numerous physiological and pathological conditions and cannot be taken as a predictive factor in the diagnosis of MS. Pregnant women with MS and elevated morning and evening levels of cortisol and CRP shows a statistically significant higher number of complications in pregnancy and psychological symptoms.

Key words: pregnancy - metabolic syndrome - cortisol, glucose - psychological symptoms

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INTRODUCTION

Early recognition and prevention of complications in pregnancy is extremely actual issue, both in research and in routine gynecological practice. Adjustment disorder of metabolism, cardio-circulatory, endocrine and immune pregnant women may be associated with a variety of somatic and mental symptoms and clinical-obstetric complications. Will there be a distress with pregnancy complications and adverse outcomes or eustress with appropriate and happy ending depends on a variety of different factors. A better understanding of

the occurrence of obesity metabolic syndrome and its relationship to cortisol and inflammation on the one hand, as well as psychological and somatic symptoms on the other hand can significantly contribute to the prevention of pregnancy complications. Monitoring the reactants of acute phase inflammation such as C-reactive protein (CRP) and fibrinogen, and concentrations of the most important stress hormone cortisol with the usual parameters of the metabolic syndrome is an attractive research topic with a very real application that could improve clinical practice. The work methodology is also monitoring of psychological symptoms in

pregnancy. Pregnancy is a physiological condition and a great event for every woman. During normal pregnancy in addition to the physiological and organic changes, also comes to different psychological changes. They are dependent on the basic personality structure, socio-economic status, physiological development of pregnancy and the changes that it entails. In pregnancy occurs adjustment of all vital organs, the endocrine system and metabolic adjustments. CRP is slightly elevated in the third trimester of pregnancy. All adjustments to far exceed the needs and almost all are reversible and retreat during puerperium without sequels. Most of that can be explained by changes in the efficiency of the endocrine system or as a simple consequence of the mother's body physical adaptations to the fetal growth. During pregnancy increases the concentration of cortisol, but the one related to the transmission globulin, transcortin, while the value of free cortisol is low. Already, in the 15th week of pregnancy, maternal adrenal glands secrete large amounts of aldosterone (at the end of the third quarter of approximately 1 mg/day). In the case of reduced dietary salt excretion is even greater. The concentration of renin and angiotensin II increases, especially during the second half of pregnancy (Ouzounian & Elkayam 2012, Cunningham et al. 2003). Pregnancy is a special period in a woman's life where she experiences a series of biological and psychological changes. Most mentally healthy women experiencing pregnancy like something positive as well as the form of self-fulfillment. Fears of women in pregnancy are most focused on the possible fetal malformations, pregnancy and delivery complications and the care of the newborn. Pregnancy in women brings new insights. One of them is the physical realization that her body is something that changes are taking place that will result in new life. In the later stages of pregnancy, her physical and mental condition is changing and it is becoming aware of a child who develops it. It affects her identity and her feelings to become a mother. Normal pregnancy can be a period with a substantially lower risk of development of psychiatric disorders compared with other stages of life of women. The explanation lies in the increased level of progesterone during pregnancy it has a calming and mildly euphoric effect, an elevated level of tolerance environment towards the mother and in psychology "to wear something good within myself." However, up to two-thirds of pregnant women show some psychological symptoms, especially in the first and third trimester of pregnancy, in the form of anxiety, irritability, labile mood and tendency to depression. This may appear a big concern because of possible fetal malformations, delivery of a stillborn child and painful or complicated labor. The pregnancy is changing the overall hormonal status in the female organism in terms of increased levels of estrogen, the

hormone of pituitary and thyroid hormones, all of which affects the appearance of some mental disorders as described in numerous papers and studies by foreign authors (Abduljalil et al. 2012, Vulink et al. 2006, Mancuso et al. 2004). The metabolic syndrome is a complex multisystem disorder consisting of several components which consist of: abdominal obesity, lipid metabolism disorder, high blood pressure and disorders of glucose metabolism (Ford et al. 2002). These components more often than show grouping overlap between them, which cannot be accidentally (Eckel et al. 2005). Metabolic syndrome is associated with proinflammatory and prothrombotic states for secretory activity of adipose tissue. They cause elevated levels of inflammatory mediators, endothelial dysfunction, hyperfibrinogenemia, increased platelet aggregation and the concentration of the inhibitor of plasminogen activation, increased level of uric acid and microalbuminuria. Results of the Interheart study conducted in 52 countries showed a prevalence of the metabolic syndrome of 26% (Yusuf et al. 2005).

SUBJECTS AND METHODS

The investigation was cross-sectional study and was conducted in the Perinatal Unit and Maternity Unit of Department of Gynecology and Obstetrics of the University Clinical Hospital Mostar.

Subjects

The study included 180 pregnant women who were divided into three groups. In the first group we included 60 pregnant women with normal weight and normal during pregnancy (may have fewer complications, e.g. anemia, urinary tract infections, imminent preterm labor, etc.) without MS criteria. The second group consisted of 60 obese women ($BMI > 30 \text{ kg/m}^2$). There pregnant women did not have morning value of blood glucose greater than 6.1 mmol/L, but they had more criteria and laboratory parameters for the diagnosis of MS. Pregnant women cannot measure waist circumference as a criterion for MS. In the third group we included 60 pregnant women with the criteria of the metabolic syndrome according to the WHO criteria. They include the resistance of tissues to insulin, manifested by at least one of the following parameters: type II diabetes, abnormal morning glucose or glucose intolerance (morning glucose greater than 6.1 mmol/l). Also include increased systolic and diastolic blood pressure and a reduced level of HDL. The criteria included general obesity (Body Mass Index $BMI > 30 \text{ kg/m}^2$), central obesity and proteinuria. Every pregnant woman we calculate BMI refusing increment of body weight of the fetus, placenta, amniotic fluid and the fluid retained in pregnancy.

Inclusion Criteria in the study

The test pregnant women hospitalized in Perinatal Unit in the third trimester of pregnancy and no later than 48 hours after delivery. We have included pregnant women with minor complications of pregnancy, except for those with the criteria of exclusion. Test and control group were pregnant women older than 18 and younger than 40, regardless of the parity (number of pregnancies), who were mentally and physically healthy. Exclusion criteria: adolescents under 18, pregnant women in the first and second trimester of pregnancy, pregnant women who have had doctor-confirmed mental illness and mental disorder before pregnancy, mental retardation, pregnant women, pregnant women in whom the early pregnancy diagnosis of fetal anomaly, pregnant women with severe complications during pregnancy and delivery (eclampsia, placental abruption, increased bleeding during pregnancy and / or childbirth).

Clinical and laboratory tests

Physical examination: measurement of body weight and determination of BMI, blood pressure, twice a day, if necessary, several times. Ultrasound examinations: Every pregnant woman underwent ultrasound examination and measurement of flows through the umbilical and fetal cerebral artery (Color Doppler). In detail is estimated fetal weight, the amount of amniotic fluid, placental maturity and characteristics and fetal biophysical profile which are mutually compared between the both groups. CTG was recorded twice a day and more times in the risk pregnancies. CTG patterns were compared in the both groups. Radiological examinations were made depending on the indication. Laboratory tests: Every pregnant woman examined blood sample was taken to determine: complete blood count, differentiated blood count, urea, creatinine, uric acid, blood glucose, CRP, glucose tolerance test (OGTT), the profile of blood glucose and coagulation, mineralogram, proteinogram, lipido-gram and urine sample (Tomić 2010). Cortisol was measured at 8 am and 17 hours using chemiluminescent method enzyme immunoassay. Device is the Architect 1000 by the company ABBOTT. C-reactive protein was measured using device Olympus 640, 680 by turbidimetry method.

Questionnaires

Questionnaires were used: socio-biographical, obstetrical-gynecological, standardized psychometric questionnaire (SCL 90-R), the symptoms of depression by the tenth revision of the International Classification of Diseases and Causes of Death (ICD-10) and Beck self depression scale. Socio-biographical questionnaire

provides data on age, education level, marital and employment status, economic status, dietary habits, place of residence, standard, lifestyle (stress), alcohol consumption and smoking, previous diseases which can cause MS, illness in the family and other general information (Desai et al. 2012). Obstetrical-gynecological questionnaire contains information on previous pregnancies and abortions, surgical procedures, state of the current pregnancy, obstetric examination, CTG records, ultrasound findings, laboratory findings, diagnosis and treatment that is applied. It was used psychometric questionnaire Scala di autovalutazione SCL 90-R. It consists of 90 questions that pregnant women voluntarily in peace fulfills putting the cross hairs on the intensity of the problems that feels (not at all - 0, bit - 1, medium - 2, very - 3, very strong - 4). The questionnaire is valid if pregnant women respond to more than 80% of questions. Analysis shows that approximately 20% of the questions can be omitted without significant effect on the results (<18). Interpretation of the questionnaire carried out by Management Manual, abbreviations and procedure. The manual is added to the test. The initialing of the SCL 90-R is a simple procedure. Initialing it seeks to use the correct key and worksheet. From the four standard groups that complete the questionnaire, we took adult non- patients (standard B) and adult patients in the hospital (standard C). Pregnant women in whom is diagnosed with some of the anomalies in pregnancy are also not included in the study because they are already doing so burdened and psychologically vulnerable. One of the main advantages of the SCL 90-R is that although requires 12-15 minutes to complete, according to symptomatic multidimensional profile (Derogatis 1977). Symptoms of depression were recorded according to oral and written statement pregnant women (e.g. reduced mood, decreased activity), (mild, moderate, and severe depression). Beck self depression scale: contains 21 questions with offered four answers of which pregnant women could choose the only one.

Statistical Methods

Data were stored in MS Excel 2003 database and for statistical analysis we used SPSS statistical software (SPSS for Windows 11.0, SPSS, Chicago, IL, USA). In data processing, we used descriptive statistical methods and the distribution of the sample we tested with the Kolmogorov-Smirnov test. To estimate the differences between the both groups in demographic data, we used chi-square test, while we test differences in parametric variables using Student's t-test and one-way analysis of variance. To establish the correlation between the variables we used the tests of correlation and the corresponding regression analysis. The level of probability of $p < 0.05$ was taken as statistically significant.

RESULTS

The most important factors for MS in pregnancy are hypertension ($p < 0.001$), obesity ($p < 0.001$), hyperglycemia and insulin resistance ($p < 0.001^*$). Hypertriglyceridemia is present in the majority of pregnant women ($p < 0.079$). Low HDL level was found in two pregnant women, which was not statistically significant (Table 1).

The average value obtained cortisol at 8 am, when the values of cortisol are usually highest, in the group with MS was 578.9 nmol/L, in the BMI 30+ group was 501.8 and in the control group was 443.1 nmol/L as represents a statistically significant difference ($p < 0.001$). Average value of cortisol in 17 hours was highest in the group with MS (433.3 nmol/L), then in the group BMI 30+ (375.8 nmol/L) and in the control group (318.6 nmol/L), ($p < 0.001$). The average value of C-reactive protein in a group of pregnant women with MS was 39.52 nmol/L, then in the group BMI 30+ 24.91 nmol/L and in the control group 13.69 nmol/L ($p < 0.001$). CRP was determined by several times

during the stay of pregnant women in the hospital, but it is changing due to a number of inflammatory and other conditions in the body pregnant women, and cannot be taken as specific laboratory indicator in MS (Table 2).

Triglycerides are up to 50% increase in pregnancy and can range from 2.40 to 2.88 in the two groups, but are still the highest in the group with MS (2.88), ($p > 0.015$). Cholesterol is approximately the same in all tested groups, as well as LDL and HDL, and show no significant statistical differences. Systolic and diastolic blood pressure on average is higher in obese pregnant women and pregnant women with MS compared to the control group (systolic pressure: MSY - 148.83±12.39, BMI 30+ - 131.67±13.73, control group - 125.25±10.59, diastolic pressure: MSY - 98.67±8.73, BMI 30+ - 82±10.34, control group 77.33±9.27), ($p < 0.001$). There are significant differences in the frequency of psychological symptoms in pregnant women with MS and BMI 30+ group than in the control group ($p < 0.001$), except psychotic features which are practically found in the two groups ($p < 0.177$) (Table 3).

Table 1. Results of studies of risk factors for MS and statistical differences between the two groups of pregnant women

Risk factors for MS	Groups			χ^2	p
	BMI 30+	MSY	Control		
Hypertension	20 (33.3)	54 (90)	11 (18.3)	68.790	<0.001
Hypertriglyceridemia	52 (86.7)	57 (95)	49 (81.7)	5.075	0.079
Hypo HDL	0 (0)	1 (1.7)	1 (1.7)	1.011	0.603*
Obesity	60 (100)	59 (98.3)	0 (0)	175.611	<0.001
Hyperglycemia	2 (3.3)	60 (100)	1 (1.7)	158.352	<0.001*
MSY	2 (3.3)	60 (100)	0 (0)	161.506	<0.001*

*Fisher's exact test

Table 2. Predictive values of laboratory variables for diagnosis MSY

MSY dg	B	S.E.	Wald	p	OR (95% CI)
Cortisol 8h	0.006	0.001	17.254	<0.001	1.006 (1.003-1.009)
CRP	0.025	0.007	13.051	<0.001	1.025 (1.011-1.039)

Table 3. The frequency of psychological symptoms in the two groups of pregnant women

Psychological symptoms	Groups			F	p*
	BMI 30+	MSY	Control		
Somatization	0.91±0.59	1.37±0.58	0.61±0.41	30.904	<0.001
Obsessive compulsive symptoms	0.59±0.57	0.94±0.46	0.42±0.45	17.599	<0.001
Interpersonal vulnerability	0.48±0.50	0.70±0.38	0.33±0.32	12.647	<0.001
Depression	0.81±0.51	1.03±0.37	0.52±0.39	21.573	<0.001
Anxiety	0.81±0.50	1.16±0.46	0.60±0.43	22.223	<0.001
Aggressiveness	0.44±0.50	0.69±0.44	0.27±0.31	14.556	<0.001
Phobias	0.27±0.42	0.51±0.41	0.14±0.24	16.079	<0.001
Paranoia	0.36±0.44	0.64±0.45	0.27±0.37	12.575	<0.001
Psychotic features	0.32±0.38	0.42±0.27	0.29±0.53	1.750	0.177
Non-specific symptoms	0.87±0.55	1.19±0.51	0.58±0.43	22.794	<0.001
Number of depressive symptoms	4.23±2.35	5.45±2.21	3.10±2.21	16.280	<0.001
BDI	12.65±3.46	17.25±2.82	7.38±3.23	144.527	<0.001

* One-way analysis of variance

Table 4. Correlation between psychological symptoms in women with elevated cortisol and CRP

	Cortisol 8h		Cortisol 17h		CRP	
	r	p	r	p	r	p
Somatization	0.240	0.001	0.143	0.055	0.201	0.007
Obsessive compulsive symptoms	0.195	0.009	0.193	0.009	0.204	0.006
Interpersonal vulnerability	0.161	0.031	0.149	0.046	0.198	0.008
Depression	0.239	0.001	0.206	0.005	0.241	0.001
Anxiety	0.254	0.001	0.210	0.005	0.215	0.004
Aggressiveness	0.175	0.019	0.173	0.020	0.139	0.064
Phobias	0.223	0.003	0.162	0.030	0.176	0.019
Paranoia	0.134	0.074	0.174	0.019	0.245	0.001
Psychotic features	0.152	0.041	0.101	0.177	0.094	0.210
Non-specific symptoms	0.236	0.001	0.180	0.016	0.159	0.033
Number of depressive symptoms	0.040	0.596	0.110	0.141	0.241	0.001
Beck score	0.350	<0.001	0.296	<0.001	0.288	<0.001

There was a positive correlation between elevated levels of cortisol and CRP and almost all psychological symptoms in the observed pregnant women (Table 4).

There was a positive correlation between elevated morning and evening cortisol and individual psychological symptoms (somatization, obsessive compulsive symptoms, depression, anxiety, phobias, nonspecific symptoms and Beck score of depressive symptoms).

DISCUSSION

Mental disorders associated with chronic stress and metabolic syndrome were studied in several countries of the world in the last decade, including Croatia and Bosnia and Herzegovina (Jakovljević et al. 2007, Maslov et al. 2008, Babić et al. 2007), but only in recent years in pregnancy (Bjelanović et al. 2009, Bjelanović et al. 2012). Pregnancy, as described in the introduction, has a positive effect on the psychological state of pregnant women due to several factors (progesterone, psychosocial factors, etc.). Cholesterol, HDL and LDL are elevated or 20 to 30% during pregnancy and are not to be used for the diagnosis of MS. In the introduction, it was emphasized that the values of triglycerides in pregnancy increased to 50% and can reach five times higher level. In this study, triglyceride levels were significantly elevated in all groups of pregnant women (MSY- 2.88 ± 0.92 , BMI 30 + -2.55 ± 0.89 , $2.4 \pm$ control group- 0.97) (p 0.015). Cholesterol and lipoproteins HDL and LDL are at the beginning of pregnancy increased about 20%, and in late pregnancy may be increased up to 50% (Ouzounian & Elkayam 2012, Abduljalil et al. 2012, Hansen et al. 2011, Ghio et al. 2011). Cholesterol is approximately the same in all experimental groups as well as HDL and LDL, which is explained by physiological events in pregnancy due to changes in metabolism in the body of pregnant women and the fetal nutritional needs. Longer duration of triglyceridemia, if it takes longer, leading to increased

tendency in the development of cardiovascular disease and diabetes (Dayspring 2011, Tam et al. 2012). Lipid profile has not been taken as a criterion for MS by the WHO. Blood glucose of pregnant women is determined regularly and repeatedly during pregnancy and if two consecutive measurements have increased the value ≥ 6.1 mmol/L, use of oral antiglycemics, glucose intolerance (diabetes type I and II), it is the criteria for MS. In the group of pregnant women with MS diabetes existed in one pregnant woman before pregnancy, and 19 had abnormal OGTT, what we have, with hypertension, considered as a criteria for MS. In the control group were 2 pregnant women with diabetes mellitus type II, or without hypertension and obesity, and did not meet criteria for the diagnosis of MS (Castro Dufourny et al. 2009, Motte et al. 2010, McIntyre et al. 2009, Iijima et al. 2012, Metzger et al. 2008). Elevated triglycerides, lipoprotein, cholesterol, glucose during pregnancy and insulin resistance lead to the occurrence of the metabolic syndrome and its complications in pregnancy even a few years later (McIntyre et al. 2009, Iijima et al. 2012, Clausen et al. 2009). In this study, we found a significantly higher statistical difference in the incidence of psychological symptoms in pregnant women with MS and pregnant women with a BMI 30+ compared to the control group, except psychotic features which are otherwise rare in pregnancy ($p < 0.001$). After exclusion criteria pregnant women with mental diseases in history have not been studied. In particular, they expressed somatization (MSY= 1.37 ± 0.58), obsessive compulsive symptoms (MSY= 0.94 ± 0.46), depression (MSY= 1.03 ± 0.37), anxiety (MSY= 1.16 ± 0.46) and non-specific symptoms (MSY= 1.19 ± 0.51). Of psychosomatic symptoms, the most common is insomnia and sleep disorders. The most common mental disorder is depression and the symptoms of depression (ten symptoms of depression according to ICD-10). These are sleep disturbance, lack of attention and interest, inability to concentrate, fatigue, poor appetite and other

severe disorders. Several researches deal with sleep disorders in pregnancy caused by the various complications (Champagne et al. 2010). Lifestyle and habits such as long and hard work, excessive internet use, late going and the like can cause sleep apnea or even insomnia (Japan, 2012) (Rutskova et al. 2011, Shimizu et al. 2012). Analyzing Beck self depression scale with 21 questions, the largest Beck score had pregnant women with MS (statistically significantly higher than the control group) (Manber et al. 2008). Elevated levels of maternal cortisol during pregnancy and stress often cause the appearance of psychological symptoms, especially depression. More research shows the correlation between levels of maternal cortisol with psychological symptoms and depression (Hungary, Japan, USA), (Buss et al. 2012, Salacz et al. 2012, Tsubouchi et al. 2011, Katz et al. 2012).

Stress causes increased secretion of mediators of inflammation (CRP, IL-6, IL-10, IL-1- β and TNF- α), which enhances the psychological symptoms of pregnancy (Cassidy-Bushrow et al. 2012). In a study published in 2011 (Rochester, USA) 145 pregnant women with high psychosocial risks before pregnancy also had elevated inflammatory mediators (TNF- α) (Blackmore et al. 2011). Metabolic syndrome and stress at an early age leads to an increase in the value of fibrinogen, which later leads to depressive symptoms (Zeugmann et al. 2012). Environmental factors, lifestyle, stressful events and economic status also significantly contribute to the occurrence of psychological symptoms in pregnancy (Williams 2003, Lavalley et al. 2011, Nasreen et al. 2011, Zerkowitz et al. 2004). Lifestyle before pregnancy can cause symptoms of depression during pregnancy because maladaptation of the organism of women in pregnancy (study 312 women in Brazil, private clinics Sao Paulo) (Faisal-Cury et al. 2012). From numerous studies, including this study we can conclude that psychiatric symptoms, especially symptoms of depression are more common in pregnant women with MS and vice versa. Patients with depression are often criteria for the diagnosis of MS, as well as organic and psychological complications related to MS (research in Germany and Poland) (Kahl et al. 2012, Kamrowska & Kamrowski 2012).

The most common mental disorders in pregnancy with MS are anxiety and depression. The treatment with antidepressants in pregnancy can lead to hypertension, and consequently other complications. Serotonin reuptake inhibitors and paroxetine are associated with the risk of hypertension in pregnancy (45 pregnant women who took antidepressants during pregnancy, Montreal, Canada, 2012) (De Vera et al. 2012). Since the code of the MS in pregnant women often suffer from depression symptoms, the uncontrolled use

of antidepressants can lead to risk of congenital malformations and perinatal complications. Research in Seattle (USA, 2007) showed that in 182 newborns whose mothers took paroxetine, was not observed a higher risk of cardiac septal defects, if the medication was taken in prescribed dose. Taking inhibitors of serotonin in newborns can result in respiratory distress syndrome, endocrine and metabolic disorders, hypoglycemia, convulsions and temperature (46). In the treatment of depressive symptoms during pregnancy importantly adhere to the prescribed dose of the drug (Davis et al. 2007). Depressive symptoms during pregnancy are often associated with somatic symptoms (headache, sleep disturbance) (Giesbrecht et al. 2012). In the present study in the Department of Gynecology and Obstetrics of UCH Mostar in pregnant women with MS there was statistically significantly higher number of organic, somatic and psychological complications of pregnancy. Metabolic syndrome, diabetes, mental symptoms and diseases often lead to the occurrence of coronary heart disease (Weber et al. 2012).

CONCLUSION

Concentration and morning and afternoon cortisol was statistically higher in pregnant women with metabolic syndrome. Obese pregnant women also have a higher level of both morning and afternoon cortisol levels than women with normal body weight and without the metabolic syndrome, but these differences are smaller than in the case of pregnant women with the metabolic syndrome. CRP concentrations were significantly higher in women with metabolic syndrome. CRP was significantly higher in obese pregnant women compared to pregnant women with normal weight and without the metabolic syndrome, but it is lower than in pregnant women with the metabolic syndrome. Almost all examined psychological symptoms, such as somatization, obsessive-compulsive symptoms, depression, anxiety, aggression, phobias, paranoia and interpersonal vulnerability are also more common in women with metabolic syndrome. In pregnant women with elevated morning cortisol was significantly higher incidence of psychological symptoms in the form of somatization, obsessive-compulsive symptoms, depression, anxiety, phobias, and non-specific symptoms, and in women at high afternoon cortisol and more aggression and paranoia.

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