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ORIGINAL RESEARCH

Medicine Science International Medical Journal

Medicine Science 2019;8(4):866-9

Evaluation of mean platelet volume / platelet count ratio in hyperemesis gravidarum

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Received 28 October 2018; Accepted 12 November 2018
Available online 29.10.2019 with doi:10.5455/medscience.2018.07.8965

Abstract

To investigate whether serum levels of inflammatory markers including high sensitive C-reactive protein (hs-CRP) and mean platelet volume (MPV) to platelet count ratio (MPR) were altered in patients with hyperemesis gravidarum (HEG) compared to asymptomatic pregnant women. Ninety pregnant women, 46 with HEG and the other 44 with healthy uncomplicated pregnancies were included the study. MPR was calculated as the MPV value to the platelet count obtained from the same blood sample. The clinical information and the laboratory results of the hematologic and biochemical parameters and hs-CRP levels of each participant were recorded. Platelet counts were didn't differ between the groups. MPV, MPR and hs-CRP values were significantly higher in HEG group than in the control (p=0.01, p=0.05 and p=0.03, respectively). The etiopathogenesis of HEG is still obscure and its likely multi-factorial. Although we could not demonstrate the statistically significant differences in terms of platelet counts between the groups we found elevated levels of MPV, MPR and hs-CRP which conclude inflammatory basis of the disease.

Keywords: C-reactive protein, hyperemesis gravidarum, inflammation, platelet

Introduction

Hyperemesis gravidarum (HEG) which occurs in 0.3-1% of pregnancies is characterized by severe nausea and persistent vomiting, weight loss of more than 5%, dehydration, electrolyte imbalance and nutritional deficits requiring hospitalization [1,2].

Although the causes of nausea and vomiting in pregnancy remain unclear inflammation is known to play a role in HEG [3]. Many inflammatory markers have been studied previously but results of the study are inconsistent [4-8].

Platelets are not only having roles in hemostasis and thrombosis but also have role in modulating inflammatory reactions. Therefore, platelet indices (platelet count, mean platelet volume (MPV), plateletcrit and platelet distribution width which are routinely determined by complete blood count (CBC) analyzers. Platelet indices that are biomarkers of platelet activation have been found to be associated with inflammatory diseases [9- 13].

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Increased MPV is reflected the reactivity of platelets, indirectly [9-11]. MPV to platelet count ratio (MPR) is a new and cheap a marker of systemic inflammation can be calculated easily using CBC [12-15].

The aim of the study was to investigate whether serum levels of inflammatory markers including high sensitive C-reactive protein (hs-CRP) and MPR, first time in the literature, were altered in patients with HEG compared to asymptomatic pregnant women.

Materials and Methods

This study was conducted at Zekai Tahir Burak Women's Health Education and Research Hospital, Ankara, Turkey, between March 2016 and June 2016. Study populations consisted of patients with singleton pregnancies in first trimester admitted to our perinatology unit with a diagnosis of HEG. The study was approved by the Institutional Review Board of Zekai Tahir Burak Women's Health Education and Research Hospital.

HEG was diagnosed previously described criteria's [2]. HEG was distinguished from other conditions which may cause severe vomiting during pregnancy gastrointestinal infections and other diseases (etc. hepatitis, biliary tract diseases). The pregnant who

had fever, abdominal pain or headache weren't include to the study. None of the patients and the controls had multiple pregnancy or any sign or symptom of infection or pre-existing chronic systemic, inflammatory, endocrine, gastrointestinal, psychiatric, immunologic, or oncologic disease.

Ninety pregnant women, 46 with HEG and the other 44 with healthy uncomplicated pregnancies, matched for maternal and gestational ages, were allocated consecutively to study (group 1) and control (group 2) groups, respectively.

The gestational age was determined based on the first day of the last menstrual period and/or first trimester ultrasonography measurements. Cases and controls were matched for gestational age at the time of blood sampling, gravida and parity (exactly if possible, otherwise nearest available), age and a BMI.

Laboratory testing were included urinary sample for ketones, blood samples for electrolytes, blood urea nitrogen(BUN), creatinine, aspartate and alanine aminotransferases (AST and ALT, respectively), thyrotropin (TSH) and free thyroxine (FT4), CBC and hs-CRP.

Serum concentrations of hs-CRP were determined by a Tinaquant CRP (Latex) high-sensitive particle-enhanced immune turbidimetric assay on a Roche Modular P analyzer (Roche kit, Roche Diagnostics, Mannheim, Germany) according to manufacturer instructions. Minimum detectable concentration was 1x10−5 mg/L for hs-CRP.

All of the other blood analyses were carried out within two hours of blood sampling, using a hematology analyzer (GEN-S; Beckman-Coulter Inc., Brea, CA) at the central laboratories of Zekai Tahir Burak Women's Hospital. MPV and PDW were automatically calculated by using the analyzer.

MPR was calculated as the MPV value to the platelet count obtained from the same blood sample. The clinical information and the laboratory results of the hematologic and biochemical parameters and hs-CRP levels of each participant were recorded.

Statistical analysis was performed using SPSS version 18 (Statistical Package for the Social Sciences, Chicago, IL). The Kolmogorov-Smirnov test was used to determine normal distribution. Student's t test was performed for parametric variables between groups that had a normal distribution. Mann Whitney U test was applied to compare continuous variables that did not distribute normally. A Chi-square test was performed for nominal or ordinal variables between groups. P values less than 0.05 were accepted as significant.

Results

Following the exclusion of 4 pregnant with HEG (twin pregnancies in one, active hepatitis in one, urinary system infection in two) from the study group and 2 normal pregnant women (symptoms of active infection in two) from the control group, 46 cases with HEG and 44 normal healthy asymptomatic pregnant women constituted the study and control groups, respectively.

The mean maternal age, parity, BMI were comparable between the two groups. The clinical and basic laboratory characteristics in the HEG and the control groups at the initial admission are shown in Table 1. Mean serum TSH levels were significantly higher in pregnant with HEG than in controls (p=0.03). There were no statistically significant differences between platelet count in the groups. MPV, MPR and hs-CRP values were significantly higher in HEG group than in the control (p=0.01, p=0.05 and p=0.03, respectively) (Table 2).

Table 1. Comparison of patient parameters in pregnant with hypermesis gravidarum (group 1) and control (Group 2) cases

Parameter	Group 1(n=46)	Group 2 (n=44)	p value
Maternal Age (years)	27.4 ± 3.1	26.6 ± 2.6	0.29
Parity (range)	2 (1-3)	2(1-4)	0.61
Gestational age at blood sampling (weeks)	10.6± 3	9± 2	0.12
BMI at assessment (kg/m2)	24.3±2.0	23.9±2.0	0.66
Blood urea nitrogen (mg/dl)	19± 0.19	12± 0.19	0.04
Creatinine (mg/dl)	0. 78± 0.2	0.69± 0.1	0.95
AST (U/L)	16± 5.3	11± 5.5	0.07
ALT (U/L)	15± 9	12± 6	0.11
TSH (mIU/ml)	0.46± 0.19	1.60± 0.07	0.03
FT4 (mIU/ml)	0.98± 0.11	0.75± 0.16	0.29

ALT: alanine aminotransferase; AST: aspartate aminotransferase; BMI: body mass index; TSH: thyrotropin; FT4: free thyroxine. Data expressed as mean ± SD. The mean difference is significant at the 0.05 level.

Table 2. Comparison of CBC parameters in pregnant with hypermesis gravidarum (group 1) and control (Group 2) cases

Parameter	Group 1(n=46)	Group 2 (n=44)	p value
Hemoglobin (g/dl)	12.1± 1.6	11.6±1.0	0.07
WBC	7300± 1.6	6800± 1.6	0.08
C-reactive protein (mg/L)	1.1(0.9- 3.2)	0.89 (0.4- 5)	0.05
Platelet count, (x103/mm3)	238 ± 47	236 ± 54	0.90
MPV	10.8 ± 1.18	9.9 ± 0.95	0.05
MPR	0.042± 0.11	0.036± 0.5	0.01
PCT (%)	0.24 ± 0.05	0.23 ± 0.06	0.09
PDW	13.1 ± 2.53	12.8 ± 2.21	0.03

MPV, Mean Platelet Volume; PDW, platelet distribution width; PLT, Platelet; PCT, Plateletcrit. WBC: white blood cell. Data expressed as mean ± SD. The mean difference is significant at the 0.05 level

Discussion

The etiopathogenesis of HEG is still obscure and its likely multi-factorial. High levels of pregnancy related hormones (hCG, progesteron, estrogen, prolactin and others), thyroxin, gastrointestinal dysmotility, Helicobacter pylori infection, environmental, biological and psychological factors have been associated with presence and severity of the disease [1-3]. The inflammation is suggested to have an important role in the pathophysiology of HEG and several different inflammatory markers have been researched before [4-8,16].

Tayfur et al. [4] investigated the platelet to lymphocyte ratio (PLR) which is another simple subclinical inflammatory marker obtained from CBC and PTC in HEG. They concluded that platelet to lymphocyte ratio and platecrit are effective markers for HEG.

Kurt et al. [6] showed increased levels of hs-CRP and neutrophil to lymphocyte ratio that is a systemic inflammatory marker [13] in women with HEG [6]. Beyazıt et al. [7] demonstrated altered values of PLR in pregnant with HEG compared pregnant without HEG, in their study. They didn't find any statistically significant differences in terms of MPV and PDW [7]. Ustun et al. also demonstrated evidence of inflammation in HEG [8] similar to our study.

Elevated levels of IL-6 that is one of the key regulator of the immune response has been shown in HEG by Kuscu et al [17]. They also concluded that beneficial effects of steroid treatment on resistant HEG cases may be due to their anti-inflammatory effects [17].

Platelets have many important physiological roles from thromboembolic processes to the inflmation. MPV which is measure of platelet reflects activity of platelets. Larger platelets excrete many different types of proinflammatory substances and cytokines [18]. It has been reported that MPV is associated with platelet count inversely in healthy person [16]. The elevated levels of MPR is suggested as a risk factor for different diseases [14-16].

Conclusion

In this study, we evaluated the CBC based some new inflammatory markers in a group of pregnant complicated with HEG and healthy pregnant. Although we didn't demonstrate the statistically significant differences in terms of platelet counts between the groups we find elevated levels of MPV, MPR and hs-CRP which may conclude inflammatory basis of the disease. We might not have been able to reach definite results because our study had a small number of patients. Further studies are needed to explore association between subclinical inflammation and HEG.

Competing interests
The authors declare that they have no competing interest.

Financial Disclosure
All authors declare no financial support.

Ethical approval
Consent of ethics was approved by the local ethics committee.

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