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Original Article

Evaluation of hematological parameters in migraine attack in emergency room

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Abstract

Aim: Migraine headaches are one of the serious complaints of patients seeking emergency department (ED) with symptoms of many health problems. In this study, we aimed to examine predictive values of hematological parameters on chronic migraine.

Material and Methods: The files of patients admitted to ED of Ufuk University Hospital between January 2016 and November 2016 with a headache and who underwent hematological analyses at emergency admission were analyzed retrospectively. After exclusion criteria were applied, 55 patients with migraine attacks who were previously diagnosed with migraine by a neurologist included in this study.

Results: There was not a statistically significant difference between age and sex distribution of groups ($p>0.05$), whereas a statistically significant difference was found for family history between patient and control groups ($p<0.05$). Attack frequency was above 3 in most patients (74.5%), and mean migraine duration was 9.00±9.49 years. Red blood cell count (RBC), hemoglobin and hematocrit levels of patient groups were significantly higher than the control groups ($p<0.05$). Receiver operating characteristic (ROC) analysis showed that hematocrit was the most important parameter for migraine, followed by RBC and hemoglobin. In binary logistic regression analysis, high hematocrit level is an effective factor for migraine with controlled multi-parameter regression analysis (OR=0.601; $p<0.05$).

Conclusion: The results of this study show that hematocrit levels of patients can be used to predict or distinguish migraine attack in ED in order to provide fast and correct treatment.

Keywords: Migraine; pain; headache; hematocrit; emergency.

INTRODUCTION

Headaches are one of the most common causes of emergency admissions (1). Migraine is a type of headache and chronic pain affecting 16.2% - 22.7% of individuals aged 18 years or older (2). Migraine is defined as intermittent headache episodes with phono phobia and/or photopia and nausea (3). A migraine is commonly thought of as a headache that is unilateral, causing pain behind the neck, eyes and cranium (4). Its rate of severity has been reported as 17% of women and 5.6% of men (5). It has been reported that migraine affect 15% of the general population with disabling medical conditions (6). Migraine is the third most common pain condition among specific pain conditions (7). Migraine is also a socioeconomic burden and the sixth most common reason for years of life lost (8). Migraine or tension-type headache cause medication overuses (9). They not only affect quality of life but also have a serious impact on healthcare resource use (9). Although a comprehensive cause of migraine is not known, some researchers have reported that some medical cases such as fibromyalgia cause migraine-type headache (10). The treatment of migraine includes some alternatives with medical agents, psychiatric or psychological sessions or a combination of various methods. However, only triptans have been shown to be effective in the limited area of treatment of acute migraine (10). To successfully treat a migraine, it is important to determine whether it is a migraine or a comorbid headache pain.

There are few studies on the relationship between headaches and hematological parameters. It has been claimed that the relationship between headaches and high hemoglobin levels may be due to high-altitude disease and polycythemia (11). In this study, we aimed to

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investigate predictive values of hematological parameters on migraine attacks.

MATERIAL and METHODS

The files of patients admitted to Emergency Department (ED) of Ufuk University Hospital between January 2016 and November 2016 with a headache and who underwent hematological analyses at emergency admission were analyzed retrospectively. After exclusion criteria were applied, 55 patients with migraine attacks who were previously diagnosed with migraine by a neurologist according to the International Classification of Headache Disorders criteria and 29 healthy controls matched for age and sex were included in this study (12). Malignity, diabetes, cardiovascular disease, renal and hepatic failure, hematological disease, active infection, cigarette/alcohol dependence, autoimmune disease, cerebrovascular event, pulmonary embolism and pregnancy were selected as exclusion criteria. Age, gender, height, weight, body mass index (BMI), metabolic syndrome status, family history, migraine type, attack frequency and duration, aura status, Visual Analogue Scale (VAS) and Migraine Disability Assessment (MIDAS) scores, and hematological parameters were obtained from patients' files.

In statistical analysis, frequency and means with standard deviations were used to describe parameters. The Kolmogorov-Smirnov test was used for normality of parameters. An independent samples t-test was used for normally distributed parameters, and the Mann Whitney-U test was used for non-normally distributed parameters. Receiver operating characteristic (ROC) analysis was used for predictive value of parameters. Binary logistic regression analysis was used to define multilevel effects of significant parameters. All analyses were performed using SPSS 22.0 for Windows, with a 95-99% confidence interval (CI).

RESULTS

The baseline characteristics of patient groups are given in Table 1.

Table 1. The Baseline characteristics of study groups

	Control group (n=29)	Migraine (n=55)	p
Gender			0.256[a]
Male	12 (41.4)	16 (29.1)	
Female	17 (58.6)	39 (70.9)	
Family history			0.003[a]
No	27 (93.1)	35 (63.6)	
Yes	2 (6.9)	20 (36.4)	
Age	32.59±10.18	34.40±10.52	0.450[b]
BMI	23.82±3.33	25.73±4.93	0.059[b]

[a]. Chi-Square Test. [b]. Independent Samples T-Test
BMI: Body mass index. Bolded data are statistically significant

In the control group, 41.4% of patients were male and 58.6% were female. In the study group, 29.1% of patients were male and 70.9% were female. There was not a statistically significant difference according to age, BMI, or sex between the two groups (p>0.05). Only two patients in the control group stated that they had a family history of migraine, while 36.4% of study group had a family history of migraine, with a statistically significant difference (p<0.05).

The migraine characteristics of the study group are given in Table 2. In the study group, 50.9% of patients had migraine with auras, and 49.1% of patients had migraine without auras. Attack frequency was above 3 in most patients (74.5%) and mean migraine duration was 9.00±9.49 years. VAS and MIDAS scores showed that the patient group had mild to severe migraine.

Table 2. The migraine characteristics of the study group

	Migraine (n=55)
Migraine Type	
With Aura	28 (50.9)
Without Aura	27 (49.1)
Attack Frequency	
3<	14 (25.5)
3>	41 (74.5)
Migraine Duration (years)	9.00±9.49
Attack Duration (minutes)	18.56±21.78
VAS	7.80±1.41
MIDAS	14.47±16.48

VAS: Visual Analogue Scale MIDAS (Migraine Disability Assessment Score)

The laboratory results of the patient groups and difference analysis results are given in Table 3. Red blood cell (RBC), hemoglobin, and hematocrit levels showed statistically significant differences between the patient and control groups (p<0.05). RBC, hemoglobin, and hematocrit levels were higher in the patient group. ROC analysis results showed that RBC, hemoglobin, and hematocrit levels of patient groups have statistically significant predictive values. To compare predictive value powers, areas under the curve are given in Table 4. According to the areas under ROC curves, hematocrit was the most effective parameter for migraine, followed by RBC and hemoglobin. (Figure 1). Binary logistic regression results for significantly effective parameters are given in Table 5. In binary logistic regression analysis, only hematocrit was found to be a statistically significant parameter for migraine. In comparison of the effect, hematocrit was shown to be an effective factor for migraine with controlled multi-parameter regression analysis (OR=0.601; p<0.05). ROC analysis results showed elevated RBC, hemoglobin, and hematocrit to be significantly related to migraine.

Table 3. The laboratory results of the patient groups and difference analysis results

Groups	Control (n=29)	Migraine (n=55)	p
WBC (x10³)	8.00±1.93	8.15±1.88	0.733a
RBC (x10⁶)	4.84±0.50	5.15±0.47	0.006a
Hemoglobin	13.98±1.76	14.88±1.40	0.020a
Platelet (x10³)	260.30±51.18	246.96±64.32	0.302a
Hematocrit (%)	41.52±4.42	44.69±4.10	0.002a
MCV (fL)	85.82±4.94	86.76±2.71	0.264a
MPV (fL)	8.07±1.09	8.15±1.35	0.772a
hs-CRP, mg/dL	2.33±4.61	1.96±2.63	0.479b

[a] Independent Samples T-Test. [b] Mann Whitney-U Test
WBC: White blood cell RBC: Red blood cell MCV: mean corpuscular volume; MPV: Mean platelet volume
hs-CRP: high-sensitive C-reactive protein
Bolded data are statistically significant

Table 4. Receiver operating characteristic (ROC) analysis of hematologic parameters

Variables	Area	Std. Error[a]	Asymptomatic Sig.[b]	Asymptomatic 95% Confidence Interval Lower Bound	Upper Bound
RBC (x10⁶)	.694	.059	.004	.578	.811
Hemoglobin	.663	.061	.015	.543	.782
Hematocrit (%)	.711	.059	.002	.595	.826

[a] Independent Samples T-Test. [b] Mann Whitney-U Test
RBC: Red blood cell. Bolded data are statistically significant

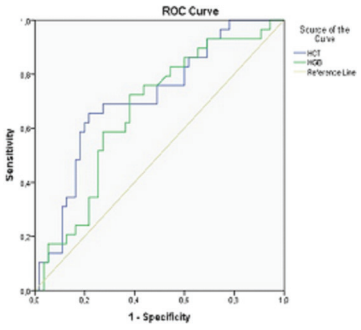

Figure 1. Receiver operating characteristics (ROC) curve analysis of Hemoglobin (Hgb) and Hematocrit (Hct)

Table 5. Binary logistic regression results for significantly effective parameters

Variables	B	S.E.	Wald	df	Sig.	OR
RBC (x10⁶)	.906	1.215	.555	1	.456	2.473
Hemoglobin	.714	.484	2.177	1	.140	2.042
Hematocrit (%)	-.510	.243	4.393	1	.036	.601

RBC: Red blood cell OR: Odds Ratio. Bolded data are statistically significant

DISCUSSION

In ED, headaches are one of the serious admission complaints of patients. In some cases, it is easy to predict reasons for headaches. On the other hand, patients with migraine may be misdiagnosed in some cases. In addition, correct diagnosis in ED has a vital role for both patient treatment and usage of public resources. In the case of misdiagnosis, the efficiency of the services may be reduced. Thus, in this study, we aimed to increase correct diagnosis of migraine in ED.

In the literature, there are many studies reporting that migraine prevalence is two or three times more common in female patients than male patients (2). In our study, 70.9% of migraine patients were female.

Although the causes and risk factors for migraine have not been highlighted comprehensively, some risk factors such as family history, gender and working conditions have been described. Coenders et al. reported that individual history of migraine is positively correlated with 36%-49% of variance in chronic pain (13). In our study, 36.4% of the migraine group had a family history of migraine.

Migraine is a significant health problem involving intermittent headache episodes (4). Thus, changes on the severity of migraine based on conditions and episodes. In a study on a Turkish population with the same age interval as in our study, the VAS score of migraine patients was found to be 0.44 to 0.88 as a monthly mean (14). In our study, the VAS and MIDAS scores of our patients were higher with a 7.80±1.41 mean value. The main reason for this difference could be differences in attempted services. In our service, emergency patients had mild to severe migraine headaches. We believe that the severity of migraine caused the patients to seek ED.

ROC analysis results showed that hematocrit was the most effective parameter for migraine, followed by RBC and hemoglobin. On the other hand, these indicators are not isolated and must be evaluated together. In other words, effective factors are co-integrated with each other. The results of binary logistic analysis, which was performed to minimize the interaction effects of indicators, showed that hematocrit is an effective factor for migraine with controlled multi-parameter regression analysis. To our knowledge, there has been no previous study about the relationship between the level of hematocrit and migraine. Previously, Stanzani reported one case of polycythemia with migraine, for which vascular and neural pathology was the etiology (15). Erythrocytosis and high viscosity are thought to play an important role in the pathology of migraine (16).

Our study has some limitations. First, this study was retrospective and all data were analysed from patients' files. Only patients who underwent hematological analyses at admission were included in the study. Biochemical parameters were not included in the analysis. The second limitation is that the number of patients and controls was not sufficient to conduct a powerful analysis.

CONCLUSION

There has been no study on the relationship between chronic migraine attack admitted to ED and hematocrit level. Elevated RBC, hemoglobin and hematocrit levels may be the cause of migraine or increased migraine-related emergency admissions. The results of this study showed that patients' hematocrit levels can be used to predict or distinguish migraine in ED in order to provide fast and correct treatment.

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