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Araştırma Makalesi / Research Article

The Relationship Between Impulsivity Level and Neutrophil / Lymphocyte Ratio, Platelet/ Lymphocyte Ratio and Mean Platelet Volume in Individuals Diagnosed with Gambling Disorder

Kumar Oynama Bozukluğu Tanısı Olan Bireylerde Dürtüsellik Düzeyi Ile Nötrofil/Lenfosit Oranı, Platelet/ Lenfosit Oranı Ve Ortalama Trombosit Hacmi Arasındaki Ilişki

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Abstract

Aim: Gambling disorder (GD) is a mental illness with an increasing frequency in society that characterized by the urge to gamble despite negative consequences and desire to quit. In this study, we aimed to examine the mean platelet volume (MPV), neutrophil/ lymphocyte ratio (NLR), platelet/lymphocyte ratio (PLR) and the relationship between these values and impulsivity in patients with GD.

Material and Method: 42 patients diagnosed with gambling disorder and 42 healthy controls were included in this study. Sociodemographic data form, Barratt Impulsivity Scale Short Form (BIS-11-SF) were administered to all participants, and then a complete blood count was requested from these individuals. NLR, PLR and MPV were measured according to complete blood count.

Results: The mean BSI-11-SF total score of the patient group was found to be statistically significantly higher than the control group ($p < 0.05$). It was found that while the motor impulsivity scores of GD patients increased, the MPV values significantly decreased ($r=-0.33$, $p = 0.03$). There was no significant difference between the patient and control groups in terms of NLR ($p = 0.288$), PLR ($p = 0.377$) and MPV ($p = 0.883$) values. In addition, in the patient group, there was a weak negative correlation between age and motor impulsivity score and a weak negative correlation between motor impulsivity score and MPV ($r=-0.33$, $p=0.03$), ($r=-0.31$, $p=0.04$).

Conclusion: It was concluded that an individual's diagnosis with gambling disorder had a high level of impulsivity, but there was no relationship between gambling and complete blood count parameters. Further studies are needed to explain the etiopathogenesis of gambling disorder.

Keywords: Gambling Disorder; neutrophil/lymphocyte; platelet/lymphocyte; platelet volume; impulsivity; blood parameter

Öz

Amaç: Kumar Oynama Bozukluğu (KOB), olumsuz sonuçlarına ve bırakma arzusuna rağmen sürekli kumar oynama dürtüsünün görüldüğü toplumda sıklığı giderek artan ruhsal bir hastalıktır. Bu çalışmada KOB tanılı hastalarda ortalama trombosit hacmi (OTH), nötrofil/lenfosit oranı (NLO), trombosit/ lenfosit oranı (TLO) ve bu değerlerin dürtüsellik ile olan ilişkisini incelemeyi amaçladık.

Materyal ve Metot: Bu çalışmaya KOB tanılı 42 hasta ve 42 sağlıklı kontrol grubu dahil edildi. Tüm katılımcılara sosyodemografik veri formu, Barratt Dürtüsellik Ölçeği Kısa Formu (BIS-11-KF) uygulandı ve ardından bu kişilerden tam kan sayımı istendi. NLO, TLO ve OTH değerleri tam kan sayımına göre ölçüldü.

Bulgular: Hasta grubunun BSI-11-KF toplam puan ortalaması kontrol grubuna göre istatistiksel olarak anlamlı derece yüksek bulundu ($p<0,05$). KOB hastalarının motor dürtüsellik puanları arttıkça OTH değerlerinin anlamlı olarak azaldığı tespit edildi ($r=-0,33$, $p=0.03$). Hasta ve kontrol grubu arasında NLO ($p=0,288$), TLO ($p=0,377$) ve OTH ($p=0,883$) değerleri arasında anlamlı farklılık saptanmadı. Ayrıca hasta grubunda yaş ile motor dürtüsellik puanı arasında negatif yönde zayıf ilişki, motor dürtüsellik puanı ile OTH arasında negatif yönde zayıf ilişki saptandı ($r= -0,33$, $p=0,03$), ($r= -0,31$, $p=0,04$).

Sonuç: Kumar oynama bozukluğu tanısı mevcut kişilerin dürtüsellik düzeyinin yüksek olduğu ancak incelenen tam kan sayımı parametreleri ile kumar oynama arasında ilişkinin olmadığı sonucuna varıldı. Kumar oynama bozukluğunun etiyopatogenezi için daha ileri çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Kumar oynama bozukluğu; nötrofil/ lenfosit; trombosit/ lenfosit; trombosit hacmi; dürtüsellik; kan parametresi

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INTRODUCTION

Gambling disorder (GD) is a behavioral addiction that brings with it problems such as needing to gamble with more and more money in order to provide the desired pleasure, having difficulty quitting the gambling habit, borrowing to obtain money, lying (1). It is estimated that between 0.12% and 5.8% of adults experience problems due to gambling (2). Although an increasing number of neuroimaging and neurobiological studies have been carried out in recent years, the etiopathogenesis of gambling has not yet been fully elucidated (3). Since it is accompanied by impulsivity, pathological gambling disorder which manifests itself with features such as inattention, risk taking, novelty seeking, excitement and pleasure seeking, defined as not being able to prevent responding to an action is classified under the title of "Impulse-Control Disorders Not Elsewhere Classified" in DSM-IV-TR (4,5). It is known that inflammation is important in the pathogenesis of many psychiatric disorders accompanied by impulsivity (6, 7). Leukocyte counts and subtypes are some of the determinants of chronic inflammation (8, 9). NLR obtained by the ratio of neutrophil and lymphocyte counts to each other, is thought to be an important parameter that can be used in the follow-up of psychiatric disorders, as it is easy to obtain and inexpensive. It is known that suicide attempts are common in individuals with impulsive and aggressive behavior patterns and their NLR values are higher than healthy controls (10-12).

Platelets play a role in the inflammation process together with leukocytes and progenitor cells (13). The platelet/lymphocyte ratio (PLR) is calculated as the ratio of platelet to lymphocyte count and is a simple indicator commonly used in inflammation-related conditions such as cardiovascular diseases and chronic diseases (14). Avcil et al. investigated this rate in children with impulsivity and attention deficit, and suggested that inflammation may play a role in the pathogenesis of the disease, and therefore PLR can be used as a biomarker (15). Mean platelet volume (MPV) is used as a measure of platelet size and is known to be an indicator of platelet activity (16). MPV was found to be higher in patients with depression compared to the healthy control group (17), and lower in manic patients (18).

Recently, hematological parameters have also been investigated in substance addictions often accompanied by impulsive behaviors (19, 20). Neurobiological findings show that pathological gambling and drug addiction share common etiopathological pathways (21, 22). In our literature review, we could not find any studies examining NLR, PLR and MPV parameters in individuals diagnosed with gambling disorder, which is a behavioral addiction and whose etiopathogenesis has not been clarified yet. In the light of the studies we have given above, we investigated whether NLR, PLR and MPV values, which are easy and inexpensive options that can be suitable for routine use due to the possible relationship of the inflammation system with impulsivity, can be useful as a biomarker that can be used in early diagnosis and follow-up in patients with gambling disorder.

MATERIAL AND METHOD

E-97132852-050.01.04-10880 numbered ethics committee approval was obtained for this study from the Fırat University Non-Interventional Research Ethics Committee and all stages were carried out in accordance with the Declaration of Helsinki. In this cross-sectional study, 55 patients diagnosed with applied to the Fırat University psychiatry outpatient clinic and were treated as outpatients or inpatients and 42 healthy volunteer hospital employees who had not received psychiatric treatment before and had no history of systemic disease were included. After obtaining the approval of the ethics committee, the patients who were followed up with the diagnosis of gambling disorder from the Fırat University psychiatry clinic were called to the psychiatry outpatient clinic between 15.01.2021 and 05.02.2021, after written consent was obtained, the patients completed the scale and blood tests were taken. Persons who were unable to answer the questions asked, had a history of neurological disease, had hearing and speech impairment, had a history of alcohol and substance use in the last 6 months, and had additional psychiatric diagnoses other than GD and adjustment disorder in the past were not included in the study. In addition, a detailed history was taken and the patient registry system was reviewed to exclude systemic diseases that may affect hemogram values. Individuals with additional systemic disease were not included in the study. An interview was made by the psychiatrist in the psychiatry outpatient clinic. Eight of the participants did not accept to participate in the study afterwards, and 5 of them were excluded from the study because they filled the scale incompletely. Our sample group consisted of 42 male patients and 42 male healthy controls with similar sociodemographic characteristics as the patient group. Since male gender is a risk factor for GD and the lifetime prevalence of this disorder was found to be higher in males in gender studies, the sample group consisted entirely of male patients (23). Interviews were conducted in the psychiatry outpatient clinic in a structured manner according to DSM-5, with a duration of at least 30 minutes. Written consent was obtained from all participants before the evaluation. Sociodemographic data form prepared by us, Barratt Impulsivity Scale Short Form (BIS-11-SF) was applied to all participants. Afterwards, 5 cc venous blood samples were taken from the antecubital vein in a biochemistry tube for hemogram analysis from all of the participants and the samples were evaluated in the biochemistry laboratory of our hospital. The samples were studied with the "CELL-DYN 3700 SL analyzer (Abbott Diagnostics, Chicago, U.S.A.)" device within half an hour and the results of the patients were uploaded to the patient registration system within two hours at the latest. According to this device, reference ranges are

2.1–6.1 (10e3/uL) for neutrophil, 1.3–3.5 (10e3/uL) for lymphocyte, 140-360 (10e3/uL) for platelet and 7- 9 fl for mean platelet volume (MPV).

Scales Used in the Study

1) Sociodemographic and Clinical Data Form: A sociodemographic and clinical data form prepared by us considering the aims of the study was used, in accordance with the information obtained through clinical experience and literature review. This form is a semi-structured form that includes sociodemographic information such as age, gender, marital status, educational status, occupation, place of residence, economic status, family structure.

2) Barratt Impulsivity Scale Short Form (BIS-11-SF): It was developed by Barratt in 1959 and its latest form, BIS-11, was developed in 1995. It is a 30-item self-report scale evaluated on a 4-point likert scale, with items 1=rarely/never; 2=sometimes; 3=often; 4=almost always/always. There are 3 subscales that do not overlap with each other: Attention Impulsivity (A), Non-Planning (NP), and Motor Impulsivity (M) (24). BIS-11-SF scores were found to be related to behavior and personality traits in studies conducted in normal populations. It is frequently used in psychiatric studies due to its simplicity and practicality. The Turkish validity and reliability study was performed by Tamam et al. (25) in 2008. In our study, the Cronbach alpha value was found to be 0.80.

Statistical analysis

Statistical analyzes were performed using the SPSS 16.0 (SPSS Inc., Chicago) package program. A p value below 0.05 was considered statistically significant. Whether the data showed normal distribution or not was examined with the Kolmogorov-Smirnov test. Student-t test was used for normally distributed continuous data, and chi-square test was used to evaluate categorical data. Pearson correlation analysis was performed to determine the relationship between the measurements.

RESULTS

While the mean age of the people included in the study was 34.35±10.25 in the patient group, it was 33.35±7.47 in the control group. Statistically significant differences were found in parameters such as economic status, occupation, presence of additional psychiatric disease, previous psychiatric treatment, smoking and alcohol use when the patient group and the control group were compared in terms of sociodemographic ($p<0.05$). There was no difference in terms of age, gender, marital status, educational status, place of residence and drug use. The comparison of the sociodemographic data of the patient group and control group is summarized in Table 1.

Table 1. Comparison of sociodemographic data

	Case group (n:42) n (%)	Control group (n:42) n (%)	P
Age	34.35 ± 10.25	33.35 ± 7.47	0.611
Gender			
Male	42 (%100)	42 (%100)	
Marital status			
Married	25 (%59.5)	22 (%52.4)	0.510
Single	17 (%40.5)	20 (%47.6)	
Education status			
Middle school and below	17 (%40.5)	9 (%21.4)	0.590
High school and above	25 (%59.5)	33 (%78.6)	
Residential area			
Village / District	14 (%33.3)	9 (%21.4)	0.221
City center	28 (%66.7)	33 (%78.6)	
Economical situation			
Low	33 (%78.6)	16 (%38.1)	0.001
Middle	9 (%21.4)	23 (%54.8)	
High	0	3 (%7.1)	
Occupation			
Not working	15 (%35.7)	6 (%14.3)	0.023
working	27 (%64.3)	36 (%85.7)	
Organic disease			
None	42 (%100)	42 (%100)	
Drug use			
None	42 (%100)	42 (%100)	

Presence of additional psychiatric disorder			
Available	9 (%21.4)	0	0.002
None	33 (%78.6)	42 (%100)	
History of previous psychiatric treatment			
Available	11 (%26.2)	3 (%7.1)	0.019
None	31 (%73.8)	39 (%92.9)	
Smoking			
Yes	40 (%95.2)	11 (%26.2)	0.000
No	2 (%4.8)	31 (%73.8)	
Alcohol and substance use			
Yes	8 (%19)	0	0.005
No	34 (%81)	42 (%100)	
Number of games played			
None	0	42 (%100)	
1	21 (%50)	0	
More than 1	21 (%50)	0	

Mean±SD= Mean±Standard Deviation. n (%)= Number and percent

BIS-11-SF scale and subscale scores are given in Table 2, and the BIS-11-SF total score of the patient group was found to be statistically significantly higher than the control group ($p<0.05$). All BIS-11-SF subscale mean scores were higher in the patient group than in the control group, and this difference was statistically significant ($p<0.05$).

No statistically significant difference was observed between the patient and control groups in terms of MPV, NLR and PLR values given in Table 3 ($p=0.833$, $p= 0.288$, $p=0.377$).

The correlation values between scale scores and parameters are given in Table 4. The relationship of the variables with each other was analyzed separately in both groups with the Pearson correlation test. In the patient group, there was a weak negative correlation between age and motor impulsivity score, a weak negative correlation between motor impulsivity score and MPV, and a strong positive correlation between NLR and PLR ($r= -0.33$, $p=0.03$), ($r= -0.31$, $p=0.04$), ($r=0.80$, $p<0.001$). In the control group, a weak positive correlation was found between motor impulsivity score and NLR ($r=0.34$, $p=0.02$).

Table 2. BIS-11-SF scale and subscale scores

	Hasta (n:42) Ort.±ss	Kontrol (n:42) Ort.±ss	P
Attention impulsivity score	26.42 ± 8.49	17.78 ± 5.51	0.000
Motor impulsivity score	29.07 ± 5.80	18.26 ± 4.65	0.000
Non-planning score	27.59 ± 8.47	20.21 ± 5.84	0.000
BIS-11-SF total score	83.09 ± 15.14	56.26 ± 9.64	0.000

Mean±SD= Mean±Standard Deviation

Table 3. Comparison of blood parameters

	Hasta (n:42) Ort.±ss	Kontrol (n:42) Ort.±ss	P
Ortalama trombosit volümü (OTH)	9.83 ± 1.38	9.77 ± 1.29	0.833
Nötrofil / Lenfosit oranı	1.72 ± 1.21	1.99 ± 1.10	0.288
Trombosit / Lenfosit oranı	98.07 ± 55.09	107.29 ± 38.64	0.377

Mean±SD= Mean±Standard Deviation

Table 4. Correlation values between scale scores and parameters

		Case group (n:42)				Control group (n:42)			
		Age	MPV	NLR	PLR	Age	MPV	NLR	PLR
Motor impulsivity	r	-0.330	-0.313	-0.234	0.021	0.021	0.192	0.340	0.100
	p	0.033	0.043	0.136	0.895	0.895	0.222	0.028	0.528
Non-planning	r	-0.120	-0.281	-0.249	0.255	0.255	-0.071	0.156	0.008
	p	0.449	0.072	0.112	0.103	0.103	0.656	0.325	0.960
Attention impulsivity	r	0.150	0.170	0.014	-0.260	-0.260	0.133	0.051	-0.090
	p	0.344	0.282	0.928	0.096	0.096	0.400	0.751	0.571
BIS-11-SF total score	r	-0.110	-0.182	-0.221	0.016	0.016	0.126	0.287	0.002
		0.489	0.249	0.160	0.920	0.920	0.426	0.065	0.991

MPV: Mean Platelet Volume, NLR: Neutrophil / Lymphocyte Ratio, PLR: Platelet / Lymphocyte Ratio

DISCUSSION

In this study, the level of impulsivity and some hemogram parameters were compared between patients diagnosed with GD and a healthy control group. In our study, we found that impulsivity was high in individuals diagnosed with GD, and mean platelet volumes decreased as motor impulsivity increased in this patient group. Chowdhury et al. (26) mentioned in a meta-analysis study that motor impulsivity may play a role in the pathogenesis of this disease in individuals diagnosed with gambling disorder. Altintas et al. (27) found no difference in the total score of impulsivity in 30 people diagnosed with GD compared to the control group. Again in 2015, the attention, motor and planlessness subgroup mean scores of the same scale in 51 men and 53 women diagnosed with GD were found to be similar to the control group (28). It has been shown that GD patients are less successful than healthy controls in providing impulse control due to the deterioration in the behavioral inhibition control system (29, 30). Although our sample group is small, it is in line with the studies in the literature that predominantly show the relationship between gambling disorder and impulsivity, supporting that impulsive behaviors are at the forefront in the clinic of these patients. In our study, NLR, PLR, and MPV values were also compared between patients diagnosed with GD and healthy controls. Although the impulsivity scores of the patients were significantly higher than the controls, we did not find a significant difference between the patient and control groups in terms of MPV, NLR and PLR ratios. Variable results have been reported in studies examining the relationship between impulsivity and hemogram parameters. In a study including male and female patients who showed impulsive personality traits and attempted suicide, the NLR value was found to be higher in the case group than in the control group (12). However, both NLR and PLR values in children diagnosed with attention deficit hyperactivity disorder (ADHD) were found to be similar to healthy controls (31). While an increased NLR level was found in patients with bipolar disorder with a history of suicide attempt, it was reported that NLR levels were not different in patients with bipolar disorder who did not attempt suicide compared to the healthy control group (32). In another study, PLR values were found to be lower in individuals diagnosed with opiate addiction compared to the control group, while in a study conducted in individuals diagnosed with alcohol use disorder, no difference was found between the patient and control groups in terms of PLR (33, 34). In a study that included patients diagnosed with autism, ADHD, and a control group, MPV values were compared between the groups and no significant difference was found (35). In another study, MPV values were found to be significantly higher in adults diagnosed with ADHD compared to the control group (36). In our study, we found that MPV values decreased significantly as the motor impulsivity scores of GD patients increased, in contrast to the diseases in which impulsivity was seen in the clinic. These inconsistent results suggest that it may vary due to the characteristics of the participants (eg, the effects of substances such as alcohol and opiates on blood parameters, the age of the patients, etc.). There are studies reporting that gambling disorder is not associated with education period and marital status (24, 37). In our study, no difference was found between the patients diagnosed with GD and the control group in terms of marital status and education period. This shows that the sociocultural level may not be protective in the occurrence of this disorder. It is known that pathological gambling is more common at younger ages (38). In our study, consecutive patients diagnosed with GD were young adults, consistent with the literature, and it was observed that motor impulsivity increased with decreasing age in the patient group (39). It has been found that gambling is more common in people with low

economic status in the USA (40). In this study, it was observed that the economic status of the patients was low. Smoking and gambling are often seen together (41). In the study, 95.2% of the patient group was smoking. We included patients who did not have a history of alcohol and substance use in the last 6 months, but 19% of the patients had a history of alcohol and substance use more than 6 months ago. The comorbidity of alcohol and substance use in individuals diagnosed with GD was found to be 19-50% (28). Our findings support other studies in this respect and remind us that other habits of patients should be questioned.

The most important limitation of our study is that the number of patients is relatively small and only hemogram parameters (not checking the testosterone level, lipid level, etc. that may be related to impulsivity) were examined. In addition, the patient group consists of patients who voluntarily applied to the psychiatry clinic for treatment. There is a need to identify patients with gambling disorder who do not apply for treatment and to conduct more extensive studies.

CONCLUSION

We think that this study will contribute to the development of new ideas about the relationship of GD with hematological parameters. However, more studies based on the cause-effect relationship are needed to fully explain this relationship and to develop new approaches on the follow-up and treatment of GD.

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Conflict of Interest: *There is no conflict of interest between the authors.*

Ethical Approval: *E-97132852-050.01.04-10880 numbered ethics committee approval was obtained for this study from the Fırat University Non-Interventional Research Ethics Committee and the study was conducted in accordance with the Declaration of Helsinki.*

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