Orijinal Araştırma / Original Investigation
Aegean J Med Sci 2022;3:92 -96

Evaluation of Platelet Indexes of HBsAg Positive Patients

HBsAg Pozitif Hastaların Trombosit İndekslerinin Değerlendirilmesi

Arzu Şahin Berberoğlu[1], Filiz Bayar[2]

1 Departments of Physiology Medical Faculty of Uşak University, Uşak/ Turkey

2 Department of Infectious Diseases and Clinical Microbiology, Medical Faculty of Bandırma Onyedi Eylül University, Bandırma/Balıkesir/Turkey

ÖZET

AMAÇ: Hepatit B virüsü, kronik karaciğer inflamasyonunun en önemli nedenidir. Trombositlerin, kronik inflamasyon durumlarında inflamatuvar tetikleyici olarak önemli fonksiyonlarının olduğunu gösteren çalışmalar son yıllarda artmıştır. Trombosit (PLT) indeksleri olarak ifade edilen; trombosit hacmi (MPV), trombosit dağılım genişliği (PDW) ve trombosit yüzdesi (PCT) değerleri; trombositlerin fonksiyonu ve aktivasyonu hakkında bilgi veren önemli belirteçlerdendir. Bu çalışmada; HBsAg pozitif ve HBsAg negatif hastalarda; PLT, MPV, PDW, PCT parametrelerinin değerlendirilmesi amaçlanmıştır.

GEREÇ VE YÖNTEM: Bu retrospektif çalışmada; Uşak Üniversitesi Tıp Fakültesi Eğitim ve Araştırma Hastanesi Enfeksiyon hastalıkları polikliniğine başvurmuş olan 193 HBsAg pozitif ve 193 HBsAg negatif hastanın sonuçları değerlendirilmiştir. PLT, PDW, PCT ve MPV parametrelerinin değerleri hemogram cihazıyla kullanılarak belirlenmiştir. Gruplar arası karşılaştırmada, student t-testi ve one-way ANOVA testi kullanılmıştır. P<0.05 değeri istatistiksel olarak anlamlı kabul edilmiştir.

BULGULAR: Çalışmamız; HBsAg pozitif hasta grubunda; PLT, PDW, PCT ve MPV değerleri sırası ile 227.36±69.98 103/mm3, % 16.34±1.52, % 0.22±0.62 ve 9.74±1.10 fl olarak belirlenirken, HBsAg negatif hasta grubunda ise değerler sırasıyla; 224.95±67.48 103/mm3, %16.16±1.08, % 0.22±0.62, 9.82±1.20 fl olarak tespit edildi (sırasıyla; p>0.05, p>0.05, p>0.05 ve p>0.05). Bu değerler yönünden HBsAg pozitif ve HBsAg negatif hasta grubu arasında istatistiki olarak anlamlı fark tespit edilememiştir.

Tüm olgularda (n=386) yapılan korelasyon analizinde PLT ile yaş, MPV, PDW arasında oldukça güçlü negatif korelasyon (sırası ile, r=-0.156 p=0.006, r=-0.394 p<0.001, r=-0.467 p< 0.001) belirlenmiş olup, PLT ile PCT arasında ise güçlü bir pozitif korelasyonun (r=0.915 p<0.001) olduğu saptanmıştır.

SONUÇ: Bu çalışmada; trombosit indeksleri yönünden HBsAg pozitif hastalar ile HBsAg negatif hastalar arasında anlamlı fark tespit edilememiştir. Bu konuyla ilgili çalışmaların hepatit B hastalarını farklı klinik evrelere göre gruplandırarak yapılmasını önermekteyiz.

Anahtar Kelimeler: Hepatit B, MPV, PCT, PDW, PLT

ABSTRACT

OBJECTIVE: Hepatitis B virus is the most important cause of chronic liver inflammation. Studies showing that platelets have important functions as an inflammatory trigger in cases of chronic inflammation have increased in recent years. Expressed as platelet (PLT) indices; platelet volume (MPV), platelet distribution width (PDW), and platelet percentage (PCT) values; it is one of the important markers that provide information about the function and activation of platelets. In this study, in HBsAg positive and HBsAg negative patients, it is aimed to evaluate the parameters of PLT, MPV, PDW and PCT.

MATERIALS AND METHODS: In this retrospective study, the results of 193 HBsAg positive and 193 HBsAg negative patients who applied to Infectious Diseases Outpatient Clinic of Uşak University Faculty of Medicine Training and Research Hospital were evaluated. The values of PLT, PDW, PCT and MPV parameters were determined using a hemogram device. Student t-test and one-way ANOVA test were used for comparison between the groups. A value of P<0.05 was considered as statistically significant.

RESULTS: In our study, while PLT, PDW, PCT and MPV values were determined as 227.36±69.98 103/mm3, 16.34±1.52%, 0.22±0.62% and 9.74±1.10 fl, respectively, in the HBsAg positive patient group, the same values were determined as 224.95±67.48 103/mm3, 16.16±1.08%, 0.22±0.62%, 9.82±1.20 fl, respectively, (p>0.05, p>0.05, p>0.05 and p>0.05, respectively) in the HBsAg negative patient group. In terms of these values, no statistically significant difference was found between the HBsAg positive patient group and the HBsAg negative patient group. In the correlation analysis performed in all cases (n=386), it can be said that there is a very strong negative correlation between PLT and age, MPV, and PDW (respectively, r=-0.156 p=0.06, r=-0.394 p<0.01, r=-0.467 p< 0.01). It was also determined that there was a strong positive correlation (r=0.915 p<0.01) between PLT and PCT.

CONCLUSION: In this study, there was no significant difference between HBsAg positive patients and HBsAg negative patients in terms of platelet indices. We recommend that studies on this subject be conducted by grouping hepatitis B patients according to different clinical stages.

Keywords: Hepatitis B, MPV, PCT, PDW, PLT

Yazışma Adresi/Address for Correspondence: Arzu Sahin Phd, Usak University, Faculty of Medicine, Department of Physiology, Usak/Turkey
E-Posta/E-Mail: arzu.sahin@usak.edu.tr || Tel: +90 276 2212121
Received/Geliş Tarihi: 10.11.2022 || **Accepted/Kabul Tarihi:** 07.12.2022

INTRODUCTION

Hepatitis B virus (HBV) is a member of the Hepadnaviridae family, known as the smallest enveloped DNA viruses. In addition to its high tissue and species specificity, its unique genomic organization and asymmetric replication mechanism stand out as the characteristic features (1). HBV infections are a global public health problem. It has been reported that 2 billion people worldwide are infected with HBV, approximately 248 million HBV carriers are detected every year, and HBV is among the most important causes of cirrhosis and hepatocellular cancer, with approximately 600,000 people per year (2,3). Chronic hepatitis B is characterized by inflammation and HBV is the main cause of chronic liver inflammation worldwide. Chronic inflammation of the liver occurs through the immune system. Continuous cell death and cell proliferation may increase the frequency of genetic changes and the risk of hepatocellular carcinoma (4).

Platelets, one of the main components of blood, play a role in systemic inflammation, immune modulation, angiogenesis and wound healing, in addition to their well-known roles in hemostasis and thrombosis pathways (5-8). Platelets have an important role in the pathogenesis of disorders associated with local and systemic inflammation. Thrombotic and inflammatory agents released from platelets can trigger disease-specific complications (9). The clinical importance of platelets in HBV-related liver diseases has been demonstrated in many studies. As a result of the close relationship between blood and liver cells in the sinusoids, platelets have been held responsible for the primary contributor to liver inflammation (10). In HBV-related liver diseases, different mechanisms leading to thrombocytopenia have been revealed, including abnormal platelet production and destruction, and platelet-specific glycoprotein levels (11). Recent findings suggest that platelets have both beneficial and harmful effects for the liver. While platelets play an important role in liver regeneration with the critical effect of platelet-derived serotonin, they can also increase liver damage through immune-mediated damage (10).

Platelet indices (TIN) are biological markers that provide information about the morphology and functions of platelets. There are few studies that associate TIN with disease severity and prognosis in critically ill patients (12). Platelet indices consist of mean platelet volume (MPV), platelet distribution width (PDW) and “plateletcrit” (PCT), which is the percentage of platelets in the blood (9). MPV, which reflects platelet size and platelet production rate in the bone marrow, is a frequently-used parameter to evaluate platelet activation and function (13,14). PDW is an another platelet function marker that reflects changes in platelet activation and platelet function. PDW shows the difference in platelet volume and the degree of variation in platelet size (15). In this study, platelet count and platelet indices MPV, PDW and PCT parameters were evaluated in HBsAg positive patients.

MATERIAL & METHODS

In this retrospective study, 193 patients with HBsAg positivity who applied to the infectious diseases outpatient clinic of Uşak Training and Research Hospital between January 2018 and December 2018, and 193 patients with negative HBsAg results, whose complete blood count parameters were examined, were included in this retrospective study. Patients with acute and chronic renal failure, malignancy, hemorrhagic stroke, cerebrovascular disease, diabetes mellitus, sepsis and ischemic stroke were excluded from the study. The data of the individuals included in the study were analyzed retrospectively from the hospital electronic database and the laboratory values at the last admission were recorded. Approval for the study was obtained from the Uşak University Faculty of Medicine Clinical Research Ethics Committee with the document dated 20.03.2019 and numbered 163-04. Hemoglobin, hematocrit, leukocyte count, platelet count, MPV, PDW and PCT parameters values were recorded from whole blood.

The HBsAg test (Abbott Alinity –i System) was studied with the microELISA method. Samples with an absorbance value less than the limit value were considered as negative, and samples with an absorbance value equal to or greater than the limit value were considered as positive. Complete blood count was studied by electrical impedance method in Mindray BC 6800 (MindrayBio-Medical ElectronicsCo. China) after regular daily blood samples were given.

Statistical Analysis

Statistical analyzes were performed using SPSS (Statistics Package for Social Sciences) version 22 software. Data are given as mean ± standard deviation. The conformity of the variables to the normal distribution was examined using visual (histograms and probability graphs) and analytical methods (Kolmogorov-Smirnov / Shapiro Wilk tests). In comparison between groups, Student's t-test for normally

distributed parameters and Mann-Whitney U test for non-normally distributed variables were applied. Spearman correlation test was used when examining the correlations. Cases with a P value below 0.05 were considered as statistically significant.

RESULTS

The study was conducted with a total of 386 individuals aged between 18 and 60 years. The average age of the groups was determined as 47.93±14.02 years in HBsAg positive patients and 45.10±15.92 years in HBsAg negative patients. Demographic characteristics and laboratory data of the patients are shown in Table 1. There was no significant difference between the HBsAg-positive and HBsAg-negative patients in terms of age and gender (p>0.05).

Table 1. *Demographic and laboratory characteristics of HBsAg positive and negative patients.*

	HBsAg positive patients (n=193)	HBsAg negative patients (n=193)	p
Age (year)	47.93±14.02	45.10±15.92	0.380
Gender (f/m)	83/110	99/94	0.213
PLT (10^3/mm^3)	227.36±69.98	224.95±67.48	0.731
PDW (%)	16.34±1.52	16.16±1.08	0.181
PCT (%)	0.22±0.62	0.22±0.62	0.965
MPV (fl)	9.74±1.10	9.82±1.20	0.538
WBC (10^3/mm^3)	6.87±1.90	6.89±1.95	0.947
RBC (10^6/mm^3)	4.86±0.53	4.81±0.54	0.261
HGB (g/dl)	14.33±1.74	14.12±1.71	0.221
HCT (%)	42.84±4.51	42.06±4.6	0.096

PLT*: Platelets* ***PDW****: Platelet distribution width,* ***PCT****: platelet percentage,* ***MPV****: Mean platelet volume* ***WBC****: White blood cell,* ***RBC****: Red blood cell* ***HGB****: Hemoglobin,* ***HCT****: Hematocrit,* ***f/m****: female/male*

In the HBsAg positive patient group, the PLT, PDW, PCT and MPV values were determined as 227.36±69.98 103/mm3, 16.34±1.52 %, 0.22±0.62% and 9.74±1.10 fl, respectively. In the control group, these values were determined as 224.95±67.48 103/mm3, 16.16±1.08%, 0.22±0.62% and 9.82±1.20 fl, respectively with the p>0.05, p>0.05, p>0.05 and p>0.05, in the same order. In terms of these values, no statistically significant difference was found between the HBsAg positive patient group and HBsAg negative patient group.

DISCUSSION

It is known that about two billion people in the world have encountered hepatitis B virus (HBV), and about 400 million people have chronic hepatitis B. It is estimated that 500,000-700,000 people die each year due to HBV infection and/or related complications (16). Hepatitis B virus infection is one of the important causes of mortality and morbidity in terms of the picture and results it creates in our country as well as all over the world (17, 18). The shortening of platelet lifespan in chronic liver diseases increases platelet production in the bone marrow and the release of young platelets into the circulation. It has been reported that interleukin-6, which increases due to inflammation in HBV-infected patients, increases platelet production by stimulating the bone marrow (19). In a study conducted in 11 cases of chronic hepatitis B, it was suggested that MPV and PDW are independent variables that determine the severity of liver fibrosis (20).

In their study where Turhan et al. evaluated MPV in 260 inactive chronic hepatitis B patients, they obtained statistically higher MPV values compared to the control group (21). Similarly, in a study conducted by Ceylan et al.(19), chronic in hepatitis B infection, high MPV values have been detected due to the presence of newly produced platelets, which are larger than the old ones (19).

In their retrospective study conducted with 108 patients in 2019, Çoşkun and Özmen reported that they found an increase in MPV levels and a decrease in PLT levels in the HBsAg positive patient group (22). In a study conducted in Korean hepatitis B patients, they found the MPV level to be higher in patients with chronic hepatitis B and hepatocarcinoma compared to the control group (23).

Karabulut and Namlı in their study conducted with a total of 320 patients in 2015 reported that platelet count and PCT values were statistically lower in the HBsAg positive group than the ones in the HBsAg negative group, but the PDW value was higher in the HBsAg positive group and this difference was statistically significant. In the same study, they stated that there was no statistically significant difference in terms of MPV values in parallel with our study (24).

In hepatitis B virus infections, a strong immune system is very important for an effective fight against the virus. Weak immunity can cause the virus to spread easily and thus develop chronic hepatitis, liver fibrosis and cirrhosis. Determining the level of inflammation in people infected with HBV is important for the follow-up of patients. Therefore, it is important to develop simple, inexpensive

and non-invasive methods to determine the level of chronicity in these patients. PLT, PDW, PCT and MPV parameters are easy and fast methods that can be used for this purpose.

CONCLUSION

In this study, it was determined that there was no significant difference between HBsAg positive patients and HBsAg negative patients in terms of platelet indices. In addition, no significant difference was found in terms of demographic data such as age and gender.

In addition to the retrospective and single-centered nature of our study, the limiting factor is that the parameters showing the acute and chronic infection status of the patients included in the study could not be analyzed. Another limiting factor is the fact that the drugs used by the patients could not be evaluated, since the study was retrospective.

Etik: Bu çalışmanın etik kurulu alınmıştır. 20.03.2019; 163-04

Ethics committee approval had been taken. 20.03.2019; 163-04

Yazar katkı durumu; Çalışmanın konsepti; AŞB, FB, dizaynı; AŞB, FB, Literatür taraması; AŞB, FB, verilerin toplanması ve işlenmesi; AŞB, FB, istatistik; AŞB, FB, yazım aşaması; AŞB, FB,

Author contribution status; The concept of the study; AŞB, FB, design; AŞB, FB, literature review; AŞB, FB, collecting and processing data; AŞB, FB, statistics; AŞB, FB, writing phase; AŞB, FB,

Yazarlar arasında çıkar çatışması yoktur.

The author declares no conflict of interest.

Finansal Destek: yoktur / Funding: none

doi: https://doi.org/10.33713/egetbd.1202058

REFERENCES

1. Nassal M. Hepatitis B viruses: reverse transcription a different way. Virus Res. 2008; 134:235-49.

2. Zafrin N, Sarkar MAS, Rahman M, Salma U, Mahbub T, Azhar MA. Hepatitis B virus infection: knowledge and awareness among the patients admitted in a tertiary care hospital in Bangladesh. Viral Hepatit Dergisi. 2019; 25(1):6-13.

3. Perz JF, Armstrong GL, Farrington LA, Hutin YJ, Bell BP. The contributions of hepatitis B virus and hepatitis C virus infections to cirrhosis and primary liver cancer worldwide. J Hepatol. 2006; 4:529-38.

4. Lupberger J, Hildt E. Hepatitis B virus-induced oncogenesis, World J Gastroenterol. 2007;13(1):74-81.

5. Yuri GA, Ayvazyan L, Mikhailidis PD, et al. Mean platelet volume: a link between thrombosis and inflammation? Current pharmaceutical design. 2011;17(1):47-58.

6. Golebiewska EM, Poole AW. Platelet secretion: From haemostasis to wound healing and beyond. Blood reviews. 2015; 29(3):153-62.

7. Öztürk Z, Dag M, Kuyumcu M, et al. Could platelet indices be new biomarkers for inflammatory bowel diseases. Eur Rev Med Pharmacol Sci. 2013;17(3):334-41.

8. Budak YU, Polat M, Huysal K. The use of platelet indices, plateletcrit, mean platelet volume and platelet distribution width in emergency non-traumatic abdominal surgery: a systematic review. Biochemia medica. 2016;26(2):178-93.

9. Celik T, Güler E, Atas Berksoy E, Arslan N. Mean platelet volume as a negative marker of inflammation in children with rotavirus gastroenteritis. Iran J Pediatr. 2014;24(5):617-22.

10. Ripoche J. Blood platelets and inflammation: their relationship with liver and digestive diseases. Clin Res Hepatol Gastroenterol. 2011;35(5):353-7.

11. Tong H, Song L, Hoan N et al. Soluble MICB protein levels and platelet counts during hepatitis B virus infection and response to hepatocellular carcinoma treatment. BMC Infect Dis 2015;15(1):25.

12. Efe S, Asker İ, İnal V. Prognostic significance of critical patients' platelet indexes in mixed type critical care unit. Yoğun Bakım Derg. 2019;10(1):13−17

13. Oncel MY, Ozdemir R, Yurttutan S et al. Mean platelet volume in neonatal sepsis, J Clin Lab Anal. 2012;26(6):493-6.

14. Ozdemir R, Karadeniz C, Doksoz O et al. Are mean platelet volume and platelet distribution width useful parameters in children with acute rheumatic carditis? Pediatr Cardiol. 2014;35(1):53-6.

15. Akbal A, Gokmen F, Gencer M, Inceer BS, Komurcu E. Mean platelet volume and platelet distribution width can be related to bone mineralization, Osteoporos Int. 2014;25(9): 2291-5.

16. World Health Organization. Hepatitis B vaccines. Weekly Epidemiological Record. 2004; 79: 255-263

17. European Association for the Study of the Liver. Clinical Practice Guidelines on the management of hepatitis B virüs infection. J Hepatol. 2017; 67:370-98.

18. World Health Organization. Guidelines for The Prevention, Care and Treatment of Persons with Chronic Hepatitis B Infection. WHO, Geneva, 2015:1-134.

19. Ceylan B, Fincanci M, Yardimci C et al. Can mean platelet volume determine the severity of liver fibrosis or inflammation in patients with chronic hepatitis B? Eur J Gastroenterol Hepatol. 2013;25(5):606-12.

20. Ceylan B, Mete B, Fincanci M et al. A new model using platelet indices to predict liver fibrosis in patients with chronic hepatitis B infection, Wien Klin Wochenschr. 2013;125:453-60.

21. Turhan O, Coban E, Inan D, Yalcin AN. Increased mean platelet volume in chronic hepatitis B patients with inactive disease, Med Sci Monit. 2010;16(4):202-5

22. Şay Coşkun US, Özmen ZC. Evaluation of Platelet İndex and

Biochemical Parameters in Patients with Hepatitis B Virus. F.U.Med. J. Health Sci. 2019; 33 (1): 43-46.

23. Cho SY, Lee A, Lee HJ, Suh J-T, Park TS. Mean platelet volume in Korean patients with hepatic diseases, Platelets. 2012;23(8):648-649.

24. Karabulut N, Mustafa N. Namlı MN. HBsAg pozitif hastaların trombosit indekslerinin değerlendirilmesi. ANKEM Derg. 2015;29(2):73-78.