

Evaluation of Hematological Parameters In Patients With Hepatitis B virus

GINAN Kareem Al-mammory¹, Najat Mohammed Flyyih² and Doaa Abd Alzahra Deli³

^{1,2,3} Collage of Health and Medical Techniques, Kufa, University of Al-Furat Al-Awsat Technical, Najaf, Iraq.

*E-mail: ginan.eysaa@atu.edu.iq, najatmohammed19901990@gmail.com, doaa.deli@atu.edu.iq

ABSTRACT

Background: Hepatitis refers to an inflammation of the liver and caused by numerous factors, such as alcohol, obesity also can be occurred by viruses such as hepatitis viruses (A,B,C,D). **To determine** of some haematology parameters of hepatitis B-virus in patients is the purpose of this study. All data was collected from 100 persons, divided into two groups: patients and control. The medical information about the patients includes age, gender and duration in hospital. The HbsAg for all participants persons is detecting by using the enzymes-linked immune sorbent assay (ELISA) and divided the positive group into an acute stage and chronic stage by special doctors. All parameters indicate by complete blood count in Haematology Analyzer, including white blood cells (WBC), lymphocyte cells (LYM), red blood cells (RBC) hemoglobin (HGB), platelets (PLT) and mean platelet volume (MPV) . The Results show patients with hepatitis B-virus infection show changing in the levels of parameters that using in this study compared with healthy controls.

Keywords: Hepatitis B-Virus, WBC, LYM, RBC, HGB, PLT and MPV.

Article Information

Received: October 3, 2023; Revised: October 26, 2023; Online: January 15, 2024

INTRODUCTION

The term "hepatitis" refers to an inflammation of the liver, caused by numerous factors, such as pharmaceutical, alcohol, pollutants, and certain disease. On the other words, hepatitis is an infectious can be occur by some viruses. [1] A,B,C,D and E are five virus kinds that cause viral hepatitis disease; Hepatitis B-virus is most common and is more lethal of all. Whereby, 1.34 million infection of HBV were reported globally in 2015 [2,3].

And about 57 million people worldwide have HBV infection, human who has the HBV can develop both acute and chronic disease. [4,5]. HBV infections in people can range from an unclear form to clinically condition, which can development from an acute state to improving, with permanent immunity, or to the chronic form. The symptoms and signs of infection development ranging according to age

group, practically absent in newborns, but in grownups are lightly more notable (33-50%) for states, with the severity varying from mild to fulminant [6]. The infection is spread through contaminated Blood vessels, mucous membranes, or other body fluids and skin. The virus can be present in all fluids of humans body, but the concentrations of the virus are greatest in serous exudate and blood, while comparatively low in sperm, vaginal secretions and saliva [7]. In general, general, Clinical symptoms for the disease can range from mild signs like malaise, jaundice and diarrhea to sever signs like liver failure or death for up six months through this period [8]. The complete blood count (CBC) that have unique for determent of haematological parameters such as white blood cells, lymphocyte, red blood

cells, hemoglobin, Platelets and mean cell volume [9]

Due to the prevalence of viral hepatitis, especially HBV in various age groups, severity of disease and some liver illnesses accompany with HBV stages, including the acute stage and chronic stage. Therefore, different levels of haematological markers may result. Consequently, the purpose of the study is detecting quantities of white blood cells, lymphocyte, red blood cells, hemoglobin, Platelets and means Platelets volume.

METHODS

Participants

Blood samples were obtained for 100 persons. 50 sample for people having acute and chronic HBV infection have been diagnosed by a hepatologist based on their symptoms of infection (for more than six months) and 50 samples are collected as control.

Detection of HBSAg by ELISA

Used ELISA technique to detect the surface antigen for hepatitis B virus for all specimens in the study.

Evaluation of Haematological parameters

All CBC analyses were performed in the hematology laboratories in the transfer diseases unit/AL-Sadr Hospital in Najaf district/Iraq. The determination of WBC, LYM, RBC, HGB, PLT and MPV in blood were done by (Abacus 380 hematology analyzer) within 2 hours after collecting the blood .

Statistical analysis

All study parameters were reported as mean and standard deviation (SD) with lower and higher 95% confidence interval for all data .The t-test was used to determine if there was a significant difference between the two groups hepatitis viral patients and controls and the probability values were less than 0.05. All results of the statistical analysis has been done by using the statistical package for software's version (26) (SPSS).

RESULTS

Participants: The medical information collected for the persons from whom samples were taken are shown in (Tables 1,2) including age , gender , duration of hospitalization.

Table 1: Information for infecting and health people.

Participants	Controls (mean $\pm$ SD.)	patients (mean $\pm$ SD.)
Age	33.64 $\pm$ 12.87	36.22 $\pm$ 14.64
Gender	24 males / 26 females	26 males/ 24 females
Duration Of Hospitalization	Not found.	4.58 $\pm$ 2.87

Table 2: Distribution of patients according to gender and age group.

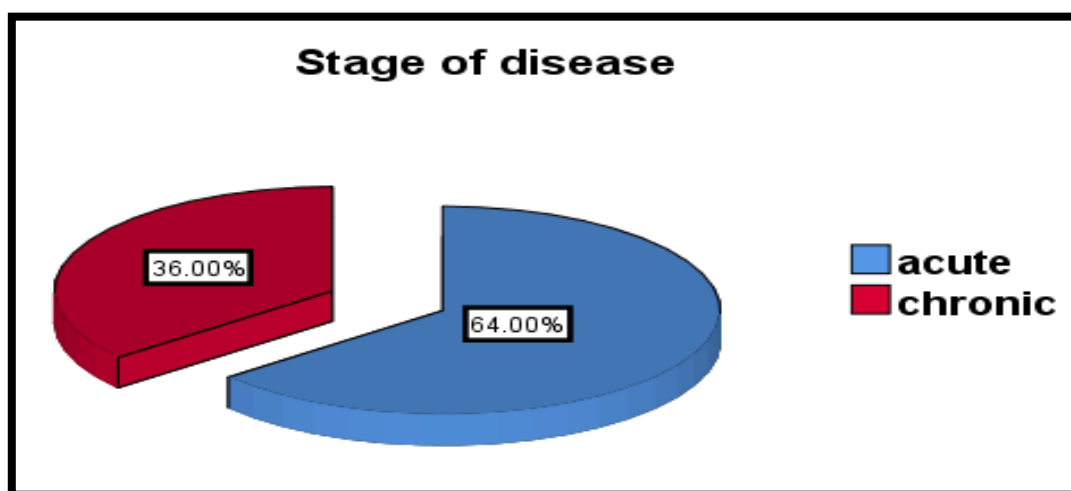
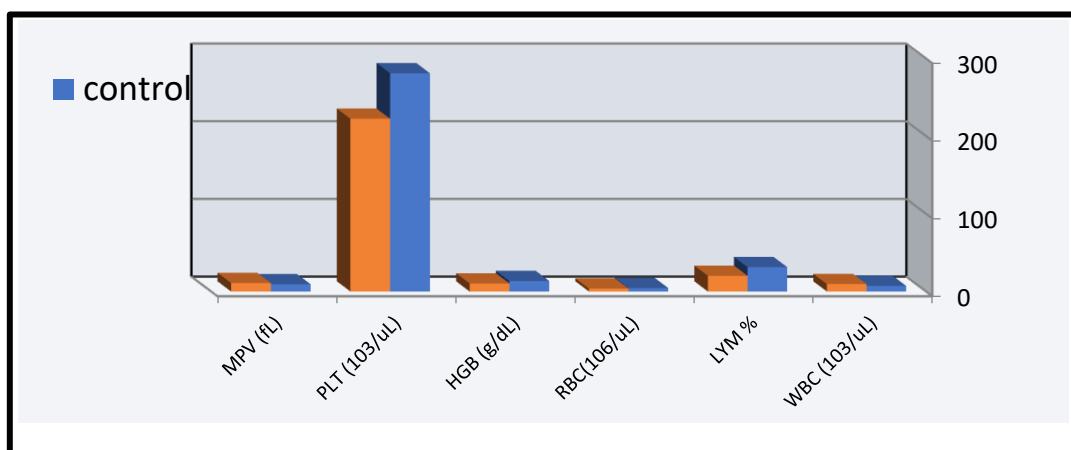
Age groups (years)	Male			Female	
	Total	n	%	N	%
< 30	18	9	50 %	9	50 %
30-70	32	17	53 %	15	46 %
Total N.	50	26	52 %	24	48 %

The severity of disease that was divided by specialized doctors into tow stages, which are an acute and chronic. The results show acute stage of disease in 32- patients (64%) and chronic stage in 18-pateint (36%) figure (1) also

show changing in the levels of all parameters between acute and chronic stages of the disease (Table 3).

Table 3: Hematology parameters according to stage of disease.

Parameters	Acute (mean $\pm$ SD.)	Chronic (mean $\pm$ SD.)
WBC ($10^3/\mu\text{L}$)	8.47 $\pm$ 1.94	11.62 $\pm$ 1.26
LYM %	21.59 $\pm$ 5.25	17.71 $\pm$ 3.35
RBC($10^6/\mu\text{L}$)	4.03 $\pm$ 1.23	3.42 $\pm$ 0.60
HGB (g/dL)	11.39 $\pm$ 2.49	8.48 $\pm$ 1.41
PLT ($10^3/\mu\text{L}$)	214.59 $\pm$ 123.37	236.17 $\pm$ 166.76
MPV (fL)	10.00 $\pm$ 1.35	12.56 $\pm$ 0.99

**Figure 1: Stages of hepatitis B virus.****Figure 2: The levels between the control and patients groups.****Hematological parameters**

The results show changing in the levels of all parameters when compared between patients hepatitis B-virus and control group. Notice the increase in the levels of WBC (9.60 ± 2.29) and MPV (10.92 ± 1.74) whereas, show decrease in the values of LYM (20.19 ± 4.99),

RBC (3.81 ± 1.08), HGB (10.35 ± 2.57) and PLT (222.360 ± 139.23).Table (4)

Table 4: Haematology parameters for control and patients groups.

Parameters		(mean $\pm$ SD)	p-value
WBC ($10^3/\mu\text{L}$)	Control	7.21 $\pm$ 1.61	0.002
	Patients	9.60 $\pm$ 2.29	
LYM %	Control	31.36 $\pm$ 7.03	0.010
	Patient	20.19 $\pm$ 4.99	
RBC($10^6/\mu\text{L}$)	Control	4.43 $\pm$ 0.64	0.001
	Patients	3.81 $\pm$ 1.08	
HGB (g/dL)	Control	13.52 $\pm$ 1.37	0.003
	Patients	10.35 $\pm$ 2.57	
PLT ($10^3/\mu\text{L}$)	Control	280.90 $\pm$ 92.41	0.020
	Patients	222.360 $\pm$ 139.23	
MPV (fL)	Control	9.35 $\pm$ 1.09	0.007
	Patients	10.92 $\pm$ 1.74	

*The significance results when P-Value ≤ 0.05 .

** WBC:white blood cells, LYM: lymphocyte , RBC: Red blood cells, HGB: Hemoglobin, PLT: Platelets , MPV : Mean Platelets volume

DISCUSSION

The infection of hepatitis B virus (HBV) continue to be a hazard for world health, thus , the hematological parameters have specific purpose, and studies have appear demonstrated viral hepatitis influence on these parameters [10,11]. The results show the stages of disease are divided into two stages acute and chronic , according to the mention in the [7] who reported HBV infections are a serious worldwide disease that can lead to acute and chronic infections in people. In the current study, HBV- patients group showed different levels with control groups : the results show increase in the levels of WBC and MPV whereas, decreased in the levels of LYM, HGB , RBC count and PLT count .

Several studies support the results of the current study, highly significant in total WBC and low in the levels of RBC, HGB,PLT and LYM in the acute and chronic patients-HBV when compared with the control group [12].

Also, the result of study by [13] showed increase in WBC in the infected patients ($8.73 \times 10^8/\text{l}$) when compared with the healthy persons ($6.37 \times 10^8/\text{l}$). And lower HGB (10.48g/dL) in patients when compared with control (11.54g/dL).

According to several studies the inflammation and tissue infection lead to abnormal results in hematological parameters . Whereby, gives information about of HBV disease and this may cause changes in the values of haemostatic parameter such as, haemoglobin, platelets and white blood cells disruptions which include changes in numbers of Lymphocyte , Eosinophile and Neutrophil as immune response to inflammation and viral infection [14,15].

White blood cells have an important in the immune system, during surprised the outbreaks of epidemic, hence an higher levels in the WBC among the infected patients are not sudden as the white blood cells are likelihood released to

killing the foreign objects , in other words, when the antigen penetrates the host cells to create disease [16]. This could explain the rise of these cells in HBV infection.

The decrease of haemoglobin can be caused by autoimmune hemolytic anemia and temporary bone marrow inhibition which may comorbidities viral hepatitis [14]. Decrease of RBC can be caused by hemolytic anemia that may occur immediately after infect with HBV disease or during or after an incidence of hepatitis in acute stage [17]. Also, Rarely, particularly after HBV infections, can acute stage of hepatitis show extrahepatic signs including hemolytic anemia [18]. The average of mean platelets volume is increased, it is known that HBV and platelets interact together. Hepatitis B- virus can infect the bone marrow directly, inhibition the synthesis of platelets and quicken platelets disrupted by stimulating the immune cells and macrophage-monocyte system [19].

REFERENCES

1. **Waheed K, Butt MA & Mubarak B.** (2021). Prevalence of Hepatitis B surface Antigen in Pregnant Women. Asian Journal of Allied Health Sciences. AJAHS.
2. **Ajugwo AO, Ukaji DC, Erhabor TA & Adias TC** .(2015). Some Haematological Parameters of Symptomatic and Asymptomatic Hepatitis B Positive Patients Attending a Nigerian Tertiary Hospital. British Journal of Medicine & Medical Research 7: 219-223.
3. **Chan M.** (2017) World Health Organization (2017). Global Hepatitis Report.
4. **World Health Organization.** New hepatitis data highlight need for urgent global response. Geneva (CH): World Health Organization; 2017. Available at: <http://www.who.int/mediacentre/news/releases/2017/global-hepatitis-report/en/>
5. **Spahr, L., Rubbia-Brandt, L., Genevay, M., Hadengue, A., & Giostra, E.** (2011). Early liver biopsy, intraparenchymal cholestasis, and prognosis in patients with alcoholic steatohepatitis. *BMC gastroenterology*, 11(1), 115. <https://doi.org/10.1186/1471-230X-11-115>
6. **Indolfi G, Easterbrook P, Dusheiko G, Siberry G, Chang MH, Thorne C, Ulterys M, Chan PL, El-Sayed MH, Giaquinto C, Jonas MM, Meyers T, Walsh N, Wirth**
7. **S, Penazzato M.** (2019) Hepatitis B virus infection in children and adolescents. *Lancet Gastroenterol Hepatol* 4(6):466–476. [https://doi.org/10.1016/S2468-1253\(19\)30042-1](https://doi.org/10.1016/S2468-1253(19)30042-1) Erratum in: *Lancet Gastroenterol Hepatol*.2020 May;5(5):e4. PMID: 30982722
8. **Kwon SY, Lee CH.** (2011). Epidemiology and prevention of hepatitis B virus infection. *The Korean Journal of Hepatology*;17(2):87–95. PMID: 21757978. Available from: 10.3350/kjhep.2011.17.2.87.
9. **Akhter, M. S., Rizwan, A. S. M., & Wahiduzzaman, M.** (2016). Vaccination status and awareness of Hepatitis B among undergraduate medical students of two medical colleges in Bangladesh. *Medicine Today*, 28(1), 27-29. <https://doi.org/10.3329/medtoday.v28i1.30968>
10. **Dacie JV, Lewis SM.**(1999). Practical Hematology. 8th Ed. ELBS with church Livingstone educational lowpriced book Scheme funded by the British overnment.
11. **European Association for the Study of the Liver. EASL 2017 Clinical Practice Guidelines on the management of hepatitis B virus infection.** *Journal of Hepatology*. 2017, 67, 370–398.
12. **Ajugwo, A. O. and Ukaji, D. C.**(2015). Some Haematological Parameters of

Several studies appears the abnormal levels of MPV is indicated the severity , fibrosis and inflammation in HBV- disease [20]. in the current study we have found that highly in the levels of MPV in HBV-patients compared with control. Also agrees with the study by [21] who reported the highly significant in MPV in the patients with chronic hepatitis B- virus and correlate with severity .

CONCLUSION

The results of the current study showed that HBV infection affects on haematological parameters include WBC, LYM, RBC , HGB, PLT and MPV. As such these markers could be used as helper parameters for diagnose the viral infection.

- Symptomatic and Asymptomatic Hepatitis B Positive Patients Attending a Nigerian Tertiary Hospital. *British Journal of Medicine and Medical Research*; 7 (3): 219-223.
12. **Shuaib, B. I., Mohammed, M., Usman, A. R., Bola, B. T., Audu, O., Hamid, M. A., ... & Adeiza, M. A.** (2023). Evaluation of some Haematological and Immunologic Parameters as Adjunct marker to Viral Load in HBV Management in a Resource-Constrained Setting.
 13. **Azuonwu, O., Frank-Peterside, N., & Azuonwu, T. C.** (2020). Investigation of the Impact and Spatial Hematological Variations among Subjects infected with Hepatitis B Virus in some Niger Delta Communities. *J Hematol Hemother* 5: 009.
 14. **Nwokediuko SC, Ibegbulam O.** (2009). Quantitative platelet, abnormalities in patients with hepatitis, B virus-related, liver disease. *Gastroenterology Research*; 2(6):344-9
 15. **Ali SJ.** (2019). A correlative study between haematological and biochemical parameters in hepatitis B. *Ibn Al Haitham Journal for Pure and Applied Science*; 32(2):21-9
 16. **Onwuasoanya UF, Ihongbe JC, Obeagu EI, Ifeanyichukwu MO, Nwachukwu PE, et al.** (2017) Evaluation of Some Immunological and Haematological Indices of Hepatitis B Infected Subjects in Nnamdi Azikiwe University Teaching Hospital, Nnewi, Anambra State, Nigeria. *Journal of Biomedical Sciences* 6:17
 17. **Suzuki, T., Okamoto, T., Kawai, F., Okuyama, S., & Fukuda, K.** (2022). Hemolytic Anemia after Acute Hepatitis B Virus Infection: A Case Report and Systematic Review. *Internal Medicine*, 61(4), 481-488
 18. **Phillips J, Henderson AC.** (2018). Hemolytic anemia: evaluation and differential diagnosis. *American Family Physician*; 98(6):354–61. PMID: 30215915
 19. **Jiang H, Li Y, Sheng Q, Dou X.** (2022). Relationship between Hepatitis B virus infection and platelet production and dysfunction. *Platelets*. 2022;33(2):212–8. PMID: 34806523. Available from: 10.1080/09537104.2021.2002836
 20. **Mao, W., & Wu, J.** (2020). Haematologic indices in hepatitis B virus-related liver disease. *Clinica Chimica Acta*, 500, 135-142.
 21. **Y. Hu, Y. Lou, Y. Chen, W. Mao,** (2014). Evaluation of mean platelet volume in patients with hepatitis B virus infection. *Int. J. Clin. Exp. Med.* 7- 4207-4213