Study of some physiological changes of blood in hepatitis B & C patients

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دراسة بعض التغييرات الوظيفية لدم المرضى المصابين بالتهاب الكبد الفايروسي C &B

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المستخلص

التهاب الكبد C & B من الامراض التي تسببها الفايروسات التي تنتقل عن طريق الدم .الكبد هو ثاني اكبر عضو في الجسم بعد الجلد واكبرغدة حيوية . شملت الدراسة 154 مريض منهم (79) مريض يعانون التهاب الكبد B بواقع (50) رجل و(29) إمراه (75) مريض مصاب بالتهاب الكبد C ينقسمون الى(50) رجل و(25) إمراه. بينما كانت عينة السيطرة (50) شخص بواقع (25) رجل و(25) إمراه. اظهرت النتائج الحالية انخفاضا معنويا ($P < 0.01$) في الهيموكلوبين وحجم الكرية المرصوص وكريات الدم البيض والصفيحات الدموية في رجال ونساء التهاب الكبد الفايروسي C مقارنة مع مجموعة السيطرة بينما في رجال ونساء التهاب الكبد الفايروسي B لم يظهر انخفاضا معنويا مقارنة مع مجموعة السيطرة, في حين اظهرت نتائج الاختبارات الكيموحيوية لانزيم الالنين الناقل للامين(ALT) وانزيم اسبارتات الناقل للامين (AST)وانزيم الفوسفاتيز القاعدي(ALP) والبيليروبين الكلي المباشر وغير المباشر ارتفاعا معنويا ($P < 0.01$) في رجال ونساء التهاب الكبد الفايروسي C & B مقارنة مع مجموعة السيطرة. اظهرت نتائج فعالية العدلات بواسطة صبغة N.B.T انخفاضا معنويا ($P < 0.01$) في رجال ونساء التهاب الكبد الفايروسي C & B مقارنة مع مجموعة السيطرة مايدلل إن هذا المرض له اثر على فعالية مناعة الجسم ضد الامراض .الهدف من الدراسة هو دراسة المعايير الكيموحيوية , معايير الدم ونشاط الفعالية البلعمية للعدلات باستخدام صبغة NBT في المرضى الذين يعانون من التهاب الكبد الفايروسي B و C مقارنة النتائج مع الأشخاص الأصحاء.

Abstract

Hepatitis B and hepatitis C was blood –borne viruses. The liver is the second-largest organ of the body (after the skin) and the largest vital gland in the body. One hundred fifty four patients were taken for this study 79 patients undergoing hepatitis B,50 males with age range(20-49)years and 29 females with age range(20-49)years, and 75 patients undergoing hepatitis C ,50 males with age range(20-59) years and25 females with age range(20-49)years and 50 healthy control,25 males with age range (20-45) years, and 25 females with age range (20-43) years. The present results appear significant decrease ($P < 0.01$) in the mean value Hb, PCV, WBCs and PLT in males and hepatitis C but non-significant in hepatitis B when compared with healthy control .Also the results appear significant decrease ($P < 0.01$) in the mean value Hb, PCV, WBCs and PLT in females hepatitis C but non-significant in females hepatitis B when compared with control group. Whereas the results of biochemical tests appear significant increase ($P < 0.01$) in the mean value ALT,AST,ALP,total bilirubin,direct and indirect in males hepatitis B and C compared with healthy control.Also the same biochemical parameters was significant increase ($P <$

0.01) in the mean value ALT, AST, ALP, total bilirubin ,direct and indirect in females hepatitis B and C compared with healthy control group.The of NBT appear significant decrease($P < 0.01$) in the mean value of neutrophils(+) in males and females hepatitis B and C compared with healthy control group. The aims of the study is to study of biochemical Parameters, Hematological Parameters and Phagocytic activity by using Nitroblue tetrazolium stain (NBT) in patients with hepatitis B and C compared the results with healthy people.

Introduction

Hepatitis means inflammation of the liver, there are many reasons for the liver to be inflamed by viral, toxic, metabolic, pharmacologic, or immune mediated attack on the liver. Viral hepatitis is a major global public health concern, it is a source of substantial morbidity and mortality around the world (1) .Several different viruses causes viral hepatitis, they are A, B, C, D, E, F and G. Hepatitis B and C are classified as a similar types of liver infection, which are mostly spread through blood and blood products (2,3) .Hepatitis B virus (HBV) infection is a global public health problem ,causes acute and Chronic hepatitis in humans. (4). Infection with the hepatitis B virus can lead to a range of clinical illnesses characterized by fever, nausea, abdominal pain, lack of appetite and yellowing of the skin, acute hepatitis can be severe with symptoms lasting for many weeks or months and is much less commonly life – threatening or fulminant in which the liver is so badly damaged that it can no longer function (5).All people who have chronic infection with hepatitis B are at increased risk of developing complications that include the development of liver cirrhosis and liver cancer (6). Hepatitis C virus (HCV) infection has become a major public health problem, about 170 million people considered to be infected worldwide the disease progresses slowly and a chronic infection develops in 85% of the cases. Among patients with chronic hepatitis, 20 to 30% develop cirrhosis that once established carries a poor prognosis, with a high risk of developing hepatocarcinoma (7). Structural studies of the HCV genome have shown that the virus have a positive-strand RNA virus related to flaviviruses family (8, 9). Hepatitis C viruses a blood-borne virus that is transmitted most efficiently by direct patients receiving organ transplants , blood product , or intravenous drug use , born to an infected mother , and sexual practices (10) . Infection with acute HCV is usually subclinical, but the likelihood of chronic is high, infection with HCV is most typically diagnosed in the chronic phase of infection(11).The mechanisms responsible for the HCV life cycle in the in the liver of infected individuals are only partially understood because it has not been possible to infect normal human hepatocytes in culture with naturally occurring HCV obtained from HCV-infected patients and because HCV is known to infect only humans and chimpanzees (12). The symptoms of acute hepatitis C infection include decreased appetite, fatigue,

abdominal pain, jaundice, itching and flu-like symptoms (13).Approximately 15-40% of persons infected with HCV clear the virus from their bodies during the acute phase as shown by normalization in liver function tests (LFTs) such as alanine transaminase (ALT) and aspartate transaminase (AST) normalization, as well as plasma HCV-RNA clearance, the remaining 60-85% of patients infected with HCV develops chronic hepatitis C (14) .The aims of the study is Study the physiology for Liver function , examine the blood parameters, and study the effectiveness of neutrophil cells by Nitroblu tetrazolum stain and their role in the formation of the Hepatitis B and C virus.

Material and Methods

Patients and Control Subjects

Subjects for this study included patients with hepatitis type B and C in the Public Health Laboratory, Blood Bank in Kut, Zahra Teaching Hospital, AL-Karama Teaching Hospital, Blood Bank in Azizia, blood bank in Suwayra, Fairuz Hospital in ALHay, in Wasit Province, Iraq; during the period from October, 2013 to May,2014.one hundered fifty- four - patients were taken for this study, The patients in this study were divided into two groups according to the type of hepatitis: 79 patients undergoing hepatitis B, 50 males with age range (20-49) years and 29 females with age range (20-49)years,75 patients undergoing hepatitis C ,50 males with age range (20-59) years and 25 females with age range (20-49) years. The subjects of control group in current study were 50 individuals Blood samples were collected from patients and the history was taken from patients and their parents including: name, age, sex and type of hepatitis. The subjects of control group in current study were 50 individuals non-undergoing hepatitis who were free from any signs and symptoms of chronic renal disease, liver disease, lipid disorders, diabetes mellitus, hypertension and other25 males with age range (20-45) years and 25 females with age range (20-43) years used control.

Blood Samples

Eight milliliters of venous blood were drawn from control subjects and patients with hepatitis B&C by using disposable syringe of 10 ml, One ml was added to EDTA (Ethylene Diamine Tetra-Acetic acid) for hematological tests, which involve determination of blood parameters such as Hemoglobin (Hb) , Packed Cell Volume (PCV) , White Blood Cell (WBCs) and Platelets count (PLT) .one ml for N.B.T. stain ,the remaining six ml of blood samples was put in disposable plane tubes, left at room temperature for 30 minutes for clot formation and then centrifuged for 10 minutes at 3000 run per minute transferred immediately into another tube and frezone at (-20 c) for subsequent analysis. The serum was separated and divided into three parts and kept in the eppendrof tube which is used to analyze of serum (ALT, AST , ALP T.TSB).

Biochemical and hematological Tests

To evaluate each one of the biochemical parameters (Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST), and alkaline phophatase (ALP)), using by Reflotron Kit specific for each parameter by Roche Diagnostic GmbH PCV (15,16,17) , for assay Serum bilirubin using Biolabo Lab kit by Spectrophotometer Instrument (18,19) .(Hb, , WBCs and PLT) Measuring by Coulter blood.

Nitroblue-Tetrazolium stain (NBT) Reduction by Neutrophils

The Nitroblue Tetrazolium (NBT) stain reduction is regarded as an index of the superoxide ion production. The quantity of reduced NBT, Formosan which accumulates in the cells, is correlated to its phagocytic activity (20).

Statistical analysis

The data of present study was made with using Genstat Program and analyzed by ANOVA (one way analysis). LSD was used for comparisons between hepatitis B and C patients and control group and between before and after dialysis. $P<0.01$ was considered to be statistically significant.

Results and Discussion

Hematological parameters

The results in **Table (1)** Results shows that there is significant (P <0.01) decrease in the mean value of Hb, PCV, PLT and WBCs for males hepatitis C patients but no significant in males hepatitis B compared with control groups **.**

Table (1): The mean value of the hematological parameters of males hepatitis B and hepatitis C patients and control groups

Group Hepatitis Patients			
Parameter	**Control** **n=25**	**Hepatitis B** **n=50**	**Hepatitis C** **n=50**
Hb (g / d l)	**13.2** A	**12.3** A	**11.1** **B**
PCV(%)	**41.9** **A**	**39.8** **A**	**34.4** B
WBCs(mm^3)	**6.3** **A**	**6.2** **A**	**5.1** **B**
PLT (%)	**128.6** **A**	**108.7** **A**	**80.1** **B**

*** The different capital letter refers to significant differences (P < 0. 01) between horizontal value with control.**

The result in Table (2) Results showes that there is significant(P < 0. 01) decrease in the mean value ofHb, PCV, WBCs and PLT for females hepatitis C patients but no significant in females hepatitis B compared with control group.

Table (2): The mean value of the hematological parameter of females' hepatitis B and hepatitis C patients and control groups

Group Hepatitis Patients			
Parameter	**Control** **n=25**	**Hepatitis B** **n=29**	**Hepatitis C** **n=25**
Hb (g / d l)	**12.3** A	**11.8** A	**10.8** **B**
PCV (%)	**37.8** A	**36.5** A	**32.6** **B**
WBCs(mm^3)	**7.5** A	**6.7** A	**5.4** **B**
PLT (%)	**141.2** A	**140.1** A	**91.5B**

*** The different capital letter refers to significant differences (P < 0. 01) between horizontal value with control.**

The statistical analysis for the parameter in the Table (3) results revealed significant difference (P < 0. 01) decrease, are found in the mean value of Hb, PCV, WBCs and PLT between males hepatitis B and males hepatitis C. Results revealed in this table significant difference, are found in the mean value of Hb, PCV, WBCs and PLT between females hepatitis B and females hepatitis C. .

Table (3): The mean value of the hematological parameters of males and females hepatitis B and hepatitis C

Parameter	Groups and Sexy of Hepatitis patients			
	Male HepatitisB	**Males HepatitisC**	**Females HepatitisB**	**Females Hepatitis C**
Hb (g / d l)	**12.3** A	**11.1** B	**11.8** A	**10.8** B
PCV (%)	**39.8 A**	**34.4 B**	**36.5** A	**32.6** B
WBCs(mm^3)	**6.2 A**	**5.1 B**	**6.7** A	**5.4** B
PLT (%)	**108.7 A**	**80.1 B**	**140.1** A	**91.5** B

***The different capital letter refers to significant differences (P< 0. 01) between the horizontal value in the same sex.**

Discussion of the hematological results

In our study, the Hb, WBCs, PCV and PLT parameters in Table (1)&(2) showed significant decrease of hepatitis C in both sex (males and females) patients compared with Hb, WBCs and PLT parameters in healthy group, these results agreed with pervious study (21,22,23,24,25,26,27,28,29,30). Various kinds of hematological abnormalities have been known to occur in liver diseases(22).In viral hepatitis, bone marrow hypoplasia and pancytopenia had developed(31) .In acute viral hepatitis observed anemia , thrombocytopenia , leucopenia, Aplastic anemia and decrease in Haematocrit during the first three weeks of illness. (31,32).

This is attributed to a temporary bone marrow suppression and autoimmune haemolytic anaemia which may accompany viral hepatitis. Shared epitopes of viral and human antigens presented by antigen presenting cells are known to be capable of causing an autoimmune trigger. Increased haemolysis has also been observed in many patients with acute hepatitis due to extravascular defect in thered cells which leads to shortened red cell life span (28). Dilutional anaemia is another possible explanation for this observation, as plasma volume is frequently increased in active hepatic disease. Haemolytic

disorder associated with viral hepatitis is often undetected because bilirubinaemia is usually attributed solely to liver disease and reticulocytosis does not occur until patient recovers from the acute symptom of hepatitis due to temporary bone marrow suppression (28).In chronic liver disease major causes of anemia are hemorrhage due to impaired blood coagulation caused by blood coagulation factors deficiency and or thrombocytopenia(33) .Thrombocytopenia in patients with chronic hepatitis C may be the result of several factors: bone marrow inhibition, the decrease of liver thrombopoietin production and an autoimmune mechanism. Clinical variables such as age, gender, severity of liver disease and degree of viremia could influence the severity of platelet reduction.The HCVinfection can exert its effects on thrombogenesis by either adirect suppressive effect on the bone marrow, reducing the megakaryocyte production, or it can have a direct effect on the megakaryocyte,leading to low platelet production(29).Evidence of HCV replication has been reported in peripheral blood cell, bone marrow and abnormal blood count have been noted in patients with HCV infection(34,23,35).The results of Hb, WBCs, PCV and PLT parameters in Table (1)&(2) showed no significant in hepatitis B in both sex (males and females) patients compared with Hb, WBCs, PCV and PLT parameters in healthy group, these results in lined with (32) and disagreed with study(21,22,36,27). Although the results of hematological parameters in the current study was lower in HBV patients than those in healthy group , statistical analysis revealed that there was no significant difference between HBV and healthy group. The results of hematological parameters (Hb, WBCs, PCV and PLT) in Table (3) between males hepatitis B & C were significant respectively, The same trend was observed between females hepatitis B & C, these results in line with(37,32) .Nevertheless the current results were consistent with the data reported by a study which concluded that regarding liver disease severity, chronic hepatitis B compared with chronic hepatitis C patients had significantly lower white blood cell and platelet counts (36,28) This variation may be due to the following factors, first patients in our study were younger than those in the other study. Second geographic variation in HBV genotypes in study population would influence the prevalence of chronic hepatitis B. Another factor is that the cause may also be nutritional or infectious, finally difference in sample size (32).

Biochemical parameters

the statistical analysis for biochemical characteristics are presented in (table 4) which appears that there is a significant($P < 0.01$) increase in the mean value of GPT , GOT , ALP , total bilirubin, direct bilirubin and indirect bilirubin in males hepatitis B and hepatitis C patients compared to the control group .

Table (4): The mean value of the biochemical parameter of male's hepatitis B and hepatitis C patients and control groups

Group Hepatitis Patients			
Parameter	**Control** **n=25**	**Hepatitis B** **n=50**	**Hepatitis C** **n=50**
GPT (U /L)	**27.2** **A**	**53.2** **B**	**70.5** **B**
GOT (U /L)	**23.6** **A**	**52.7** **B**	**62.9** **B**
ALP (U /L)	**85.7** **A**	**113.6** **B**	**114.9** **B**
Total Bilirubin (mg/dl)	**0.7** **A**	**1.8** **B**	**1.8** **B**
Direct Bilirubin (mg/dl)	**0.4** **A**	**1.1** **B**	**1.1** **B**
Indirect Bilirubin (mg/dl)	**0.3** **A**	**0.6** **B**	**0.8** **B**

***The different capital letter refers to significant differences (P < 0. 01) between horizontal value with control**

The results in Table (5) revealed that there was significant (P < 0. 01) increase in the mean value of GPT , GOT , ALP, total bilirubin, direct bilirubin and indirect bilirubin females hepatitis B and hepatitis C patients compared to the control group.

Table (5): The mean value of biochemical parameter in females hepatitis B and hepatitis C patients and control groups

Group Hepatitis Patients			
Parameter	**Control** **n=25**	**Hepatitis B** **n=29**	**Hepatitis C** **n=25**
GPT (U /L)	**25.9** **A**	**53.3** **B**	**59.8** **B**
GOT (U /L)	**25.2** **A**	**53.5** **B**	**56.8** **B**
ALP (U /L)	**95.5** **A**	**116.8** **B**	**118.5** **B**
Total Bilirubin (mg/dl)	**0.8** **A**	**1.7** **B**	**1.3** **B**
Direct Bilirubin (mg/dl)	**0.5** **A**	**1.1** **B**	**0.8** **B**
Indirect Bilirubin (mg/dl)	**0.3** **A**	**0.6** **B**	**0.5** **B**

The different capital letter refers to significant differences (P < 0. 01) between horizontal value with control

Results revealed no significant difference, were found in the mean value of GPT, GOT , ALP , total bilirubin, direct bilirubin , indirect bilirubin, in (table 6) between males hepatitis B and males hepatitis C, respectively , the same trend was observes for females hepatitis B as compared to females hepatitis C. Table 9.

Table (6) :The mean value of the biochemical parameters in males and females hepatitis B and hepatitis C

Parameter	Groups and Sexy of Hepatitis patients			
	Male Hepatitis B	Males Hepatitis C	Females Hepatitis B	Females Hepatitis C
GPT (U /L)	53.2 A	70.5 A	53.3 A	59.8 A
GOT (U /L)	52.7 A	62.9 A	53.5 A	56.8 A
ALP (U /L)	113.6 A	114.9 A	99.8 A	101.2 A
Total Bilirubin (mg/dl)	1.8 A	1.8 A	1.7 A	1.3 A
Direct Bilirubin (mg/dl)	1.1 A	1.1 A	1.1 A	0.8 A
Indirect Bilirubin (mg/dl)	0.8 A	0.6 A	0.6 A	0.5 A

*** The different capital letter refers to significant differences (P< 0. 01) between the horizontal value in the same sex**

Discussion of the biochemical results

The results of GPT , GOT,ALP, total Bilirubin, direct bilirubin and indirect bilirubin of this study of hepatitis B & C in both sex(males and females) in Table (4)&(5) were significant increased compared with control group, these results agreed with other studies(36,38,39,40,31,41,32,42,1). Viral hepatitis like A, B, C, D and E may be responsible for a marked increase in aminotransferase levels (43,44). In viral hepatitis, there was poor correlation between enzymatic magnitude elevation and liver injury degree, thus higher levels of liver enzymatic may refer to the existence of liver disease, but they cannot be used to predict degree of liver damage or disease species (45,46).

GPT enzyme is existent in hepatocyte cytosol, GOT is almost especially present in mitochondria and cytosol, so higher enzymatic levels might reflect the current activity of disease process (47,48).ALP enzyme is mostly common obtained in bones, intestine, liver and placenta. Lacking of bone disease and pregnancy, at higher levels of ALP enzyme usually reflect biliary tract functions impairment, activating

enzyme synthesis process by hepatocyte and biliary tract epithelium as a result of the obstructions (47).The higher levels of ALP activity may be involved in many parenchymal disorders of liver such as hepatitis (48). Highest T.S.B levels may be used as amarker for bile secretions faulty, biliary tract obstructions may also be caused by virus infection; the last may be accompanied with paranchymal dysfunction (47). The results of Biochemical parameters in Table (6) (GPT , GOT,ALP, total Bilirubin, direct bilirubin and indirect bilirubin) between males hepatitis B & C were no significant respectively, The same trend was observed between females hepatitis B & C, these results in line with(36,32) Although the results of liver function tests in the current study was higher in HCV patients than those in HBV patients, statistical analysis revealed that there was no significant difference between HBV and HCV patients concerning liver function test. These findings disagreed with those obtained in another study which reported that HCV-infected patients presented more liver inflammation (higher AST, ALT and ALP) than HBV-infected patients. This difference in liver inflammation can be attributed to the higher percentage of previous antiviral treatment and the higher response rate to therapy in the HBV group compared with the HCV group Also immunity ,nutrition, environmental factors, and genetic variation in the susceptibility of virus in the Iraqi patients (49) .It is well known that chronic hepatitis C is associated with a wide variation in ALT, from normal ALT to persistent elevation of ALT, although studies have shown that patients with persistently normal ALT usually have lower progression and lower prevalence of cirrhosis(50).

Neutrophils activity parameter

The results in Table (7) observes that there was significant ($P < 0.01$) decrease in neutrophil activity in males hepatitis B and hepatitis C patients compared to control group.

Table (7) :Neutrophil activity by using Nitroblue Tetrazolium stain in male's hepatitis B and hepatitis C patients and control groups

Group Hepatitis Patients			
Parameter	**Control** **n=25**	**Hepatitis B** **n=50**	**Hepatitis C** **n=50**
Neutrophil Activity %	**15** **A**	**9.1** **B**	**8.1** **B**

*** The different capital letter refers to significant differences (P< 0. 01) between horizontal value with control.**

The results in Table (8) revealed that there was significant ($P < 0.01$) decrease in neutrophil activity in the females hepatitis B and hepatitis C patients compared to the control group.

Table (8): Neutrophil activity by using Nitroblue Tetrazolium stain in females' hepatitis B and hepatitis C patients and control groups

Group Hepatitis Patients			
Parameter	**Control n=25**	**Hepatitis B n=29**	**Hepatitis C n=25**
Neutrophil Activity %	**13.2 A**	**10 B**	**9 B**

***The different capital letter refers to significant differences (P < 0. 01) between horizontal value with control**

The results in Table (9) revealed that there was no significant in neutrophil activity in males hepatitis B compared males hepatitis C, as well as no significant in neutrophil activity in females hepatitis B compared females hepatitis C.

Table (9): The mean value of the Neutrophil activity by using Nitroblue Tetrazolium stain in males and females hepatitis B and hepatitis C

Parameter	Groups and Sexy of Hepatitis patients				
	Male HepatitisB	**Males HepatitisC**		**Females HepatitisB**	**Females Hepatitis C**
Neutrophil Activity %	**9.1 A**	**8.1 A**		**10 A**	**9 A**

*** The different capital letter refers to significant differences (P< 0. 01) between the horizontal value in the same sex.**

Discussion of Neutrophil activity by using Nitroblue Tetrazolium stain (NBT)

The results of Neutrophil activity by using Nitroblue Tetrazolium stain in Table (7)&(8) observed significant decrease in hepatitis B& C in both sex (males and females) patients compared with healthy group, these results accordance with other studies(51,23,24,27).Neutrophils are the cellular hallmark of acute inflammation and rapidly accumulate in large numbers at sites of infection. During their short life span (hours to days) neutrophils perform many functions of host defense, including phagocytosis and killing of bacteria with reactive oxygen intermediates and other mechanisms. Although neutrophils have been viewed primarily in terms of their contributions to innate immunity, they also have the ability to influence adaptive immunity. (52).Neutrophils play an important role in non-specific immune response and organism resistance, specifically in anti-bacterial resistance as effectors, inducing and regulating cells. They reveal many features which are crucial in organism immunity: to produce and adhere towards vascular endothelial cells, migrate to inflammatory sites through the vessel walls, recognize and

phagocytize opsonized molecules, and degradate and release proteins from granules(53).Neutrophil chemotaxis occurs towards stimulus gradient, in response to chemotactic factors (chemotaxins) produced at the inflammatory site. Moreover, chemotaxins increase neutrophil metabolism, aggregation, and bactericidal abilities (54).

Phagocytosis by polymorphonuclear neutrophils and monocytes constitutes an essential arm of host defense against bacterial or fungal infections. The phagocytic process can be separated into several major stages: chemotaxis (migration of phagocytes to inflammatory sites), attachment of particles to the cell surface of phagocytes, ingestion (phagocytosis) and intracellular killing by oxygen-dependent (oxidative burst) and oxygen-independent mechanisms(55).Other studies were performed by Lazzarin *et al* (1984) who found that the phagocytosis activity was reduced in acute hepatitis B patients(AHB).The hypothesis that a serum inhibitory factors and circulating immune complexes which were found in the sera of AHB patients might play an important role in inhibitory effect on neutrophils phagocytosis activity in these patients(56).Other studies observed the phagocytic function and intracellular killing of microorganisms are lower in both acute and chronic viral hepatitis .This finding might be explained by the inhibitory effect of bilirubin on neutrophil function .Binding of bilirubin to cell membranes may significantly alter the cell membrane properties and functions and thereby altering phagocytosis. Moreover, bilirubin inhibits neutrophils hexose monophosphate shunt activity and nicotine amid diphosphate oxidase(NADPH),the producers of oxygen free radicals,resulting in depressed neutrophil lytic activities (57,51) .The results of Neutrophil activity by using Nitroblue Tetrazolium stain in Table (9) between males hepatitis B & C were no significant respectively, The same trend was observed between females hepatitis B & C, these results in line with(51). the results of Neutrophil activity in the current study was lower in HCV patients than those in HBV patients, statistical analysis observed that there was no significant difference between HBV and HCV patients concerning Neutrophil activity because the difference in liver inflammation between HBV and HCV ,virulence of the hepatitis C may effects on the immune system more than hepatitis B and HCV may localize in several tissue beside the liver such as immune tissue and might act as a reservoir for HCV (49,35).

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