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VARIATION IN HAEMATOLOGICAL PARAMETERS IN PATIENTS WITH CHRONIC HEPATITIS B AND HEPATITIS C IN LIBYA

Kamal E. Alshebani[1], Jbireal J. M.[2], Fawzia Shawesh[3] and Altayeb Elazomi*[3]

[1]El-Ajylat Reference Laboratory, Libya.
[2]Physiology Dept, Faculty of Medicine, University of Sabratha, Libya.
[3]Medical Laboratories Dept. Faculty of Medical Technology, University of Zawia, Libya.

***Corresponding Author: Dr. Altayeb Elazomi**

Medical Laboratories Dept. Faculty of Medical Technology, University of Zawia, Libya.

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ABSTRACT

Chronic viral hepatitis is an important health problem in the world, where hepatitis B virus (HBV) and hepatitis C virus (HCV) infections are the main causes of liver insufficiency. This study was a comparative case control study. It aimed to assess the variations in haematological parameters in patients infected with HCV and HBV viruses in the western region of Libya. A total of 120 blood samples from patients with chronic viral hepatitis were collected; 60 with HCV and 60 with HBV infection. Twenty healthy individuals were included as a control group. Out of the 60 patients with HBV, 43 (36%) were males and 17 (14%) were females, while 38 (32%) patients with HCV were males and 22 (18%) were females. The mean age for HBV patients was 36.9 ± 15.8 years and for HCV patients the mean was 39.9 ±14.2 year. Though the mean concentration and count of haematological profile (total white blood cell count and haemoglobin estimation of infected patients), showed low significant difference in HCV patients (WBC 5.98 ± 0.29 cell/mm3, Hb 12.96 ± 0.20g/dl) as compared with control group (WBC 7.48 ± 0.42 cell /mm3, Hb 13.75 ± 0.30g/dl) with P value 0.027 and 0.005, respectively. However, there was no significant difference between HBV patients and control group regarding haemoglobin concentration. Additionally, platelets count revealed low significant difference in HCV and HBV patients (193.2 ± 9.73 ×10(9)/L) (177.2 ± 6.57×10(9)/L), respectively, in comparison with control group (242.0 ± 13.53×10(9)/L, P value (0.001)). In conclusion, there were significant difference in haematological profile.

KEYWORDS: Viral hepatitis, haematological profile, Libyan's patients.

INTRODUCTION

Chronic hepatitis B and C are progressive diseases linked to the development of cirrhosis and hepatocellular carcinoma. Chronic liver disease is accompanied by derangement of hepatocyte function including the synthesis of haemostatic factors.[1] HBV, a DNA virus, cause a potentially life-threatening liver infection. It can cause chronic liver disease and chronic infection makes people at a higher risk of death from liver cirrhosis and liver cancer. While HCV, an RNA virus, causes both acute and chronic infection. Acute HCV infection is usually asymptomatic, and is only very rarely associated with life-threatening disease. Hepatitis B and C are transmitted primarily through the parenteral route. Nosocomial infections are common. The risk of transmission of these two viruses has been considerably reduced in developed countries due to increased screening procedures.[2-3]

A recent study in Iraq has been done by Hussein[4], found that out of the 50 patients with HBV, 36(72%) were males and 14 (28%) were females, while of those with HCV, 32 (64%) were males and 18(36%) were females. The mean age for HBV patients was 36.9 ± 15.8 years and for HCV patients it was 39.9 ±14.2 years. Liver function tests showed no significant difference between HBV and HCV patients, however, a significant difference regarding liver function tests was found among both sets of patients and the control group. Total WBC count and haemoglobin concentration were significantly lower (4296± 1050.9 cell/mm3 and 10.9 ± 2.2g/dl respectively) in HCV patients than those in HBV patients (6224 ±1749.1 cell/mm3 and 13.4 ±1.3 g/dl). Yet there was no significant difference between HBV patients and control group in terms of total WBC count and haemoglobin concentration.

Kolawole *et al.*[5], in Nigeria carried out a descriptive seroepidemiological study of hepatitis B virus and its effects on haematological parameters. The study targeted pregnant women attending the antenatal clinic of LAUTECH Teaching Hospital, Osogbo, Nigeria. A prevalence rate of 16.5% was obtained for hepatitis B surface antigen in pregnant women. The highest HBsAg prevalence rate recorded was 23.3% for pregnant women aged between 30–34 years while the lowest recorded

prevalence rate was zero percent for those aged greater than 40 years. RBC, WBC, neutrophil, haemoglobin lymphocyte and platelet counts have no significant effects on HBsAg positivity of pregnant women (P = 0.801).

Another study in Nigeria conducted by Ajugwo, *et al*.[6], included 25 Hepatitis B positive patients attending Madonna University Teaching Hospital Elele Nigeria were used as subjects while another twenty five Hepatitis B negative apparently healthy individuals (males and females) served as controls. The positive patients were further divided into symptomatic and non-symptomatic groups. Verbal consent was obtained prior to sample collection. The samples were analysed using standard manual methods. The research was approved by Madonna University Ethical Committee (MUEC). There was significant (P<0.05) decrease in PCV and Hb and while ESR had significant increase. Most of the Hepatitis B positive patients were asymptomatic[7], while others showed symptoms.[8] When the asymptomatic and symptomatic groups were compared, there was no significant (P>0.05) difference in all the parameters.[6]

However, very few studies have been accomplished in Arabic countries particularly in Libya. Therefore, the aim of this study is to assess the variation in haematological parameters in patients infected with HCV and HBV virus in western region of Libya. As well as, to compare between the results of haematology parameters obtained from healthy (control group) and infected patients with (HCV) and (HBV).

MATERIALS AND METHODS

Study Population and Design

This study is a comparative case control study. Samples were collected from those infected with HCV and/or HBV as well as healthy individuals (as a control group) in the western region of Libya. We collected all samples from the Department of Communicable Diseases at Tripoli Central Hospital, and all tests were conducted at Sabratha Teaching Hospital.120 samples were included in this study – 20 control samples from healthy individuals, and 60 from HBV and/or HCV infected patients.

Sample Collection

Three millilitres of venous blood were collected from each participant in plain tube. After coagulation, samples were centrifuged at 3500 RPM for 5 minute. Serum was then collected. For haematological parameters, 2 ml venous blood were collected in EDTA tubes from each participant. HBsAg and anti-HCV antibodies were detected by using commercially available enzyme linked immune-sorbent assay (ELISA) according to the manufacture instruction. The haematological parameters: haemoglobin, red blood cells, white blood cells, platelets and red blood indices, were detected by using Sysmex (KX-21N) instrument.

Data Analysis

Collected data were analysed using the application of statistical package of social science (SPSS) V. 25. Association between hemoglobin concentration and biochemical parameters tested by Pearson's correlation test. Comparison of mean value of continuous data was tested by t-test and ANOVA test. Chi-square statistical analysis were done to detect significant value. P value of <0.05 and P value < 0.01were used to establish statistical significance.

RESULTS

This study included 120 blood samples from patients with chronic viral hepatitis, 60 of them with HBV infection, 60 with HCV infection and 20 apparently healthy age and gender matched subjects were included as a control group. Out of the 60 patients with HBV, 43(36%) were males and 17(14%) were females. Whereas, 38 (32%) patients with HCV were males and 22(18%) were females (figure 1).

Duration of HBV and HCV infection was widely distributed between 2 and 17 years. Figure 2, show the duration of HCV and HBV infection within study group.

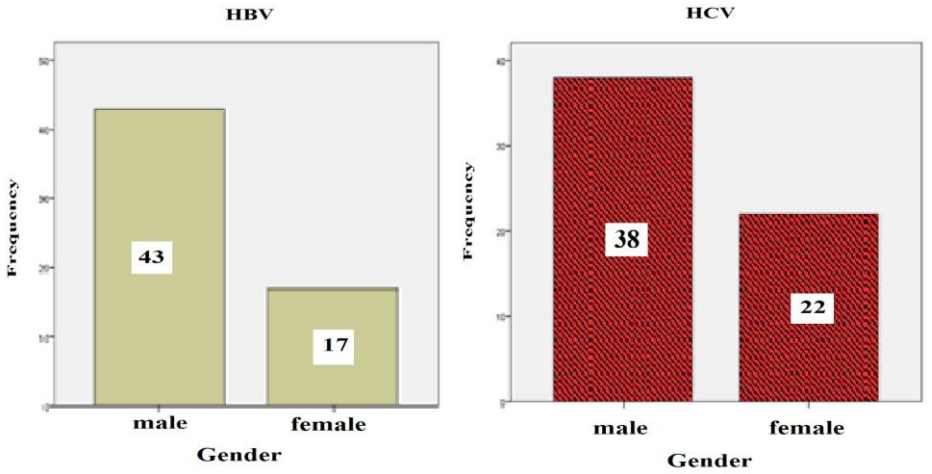

Figure 1: Distribution of Gender Among HBV and HCV Patients.

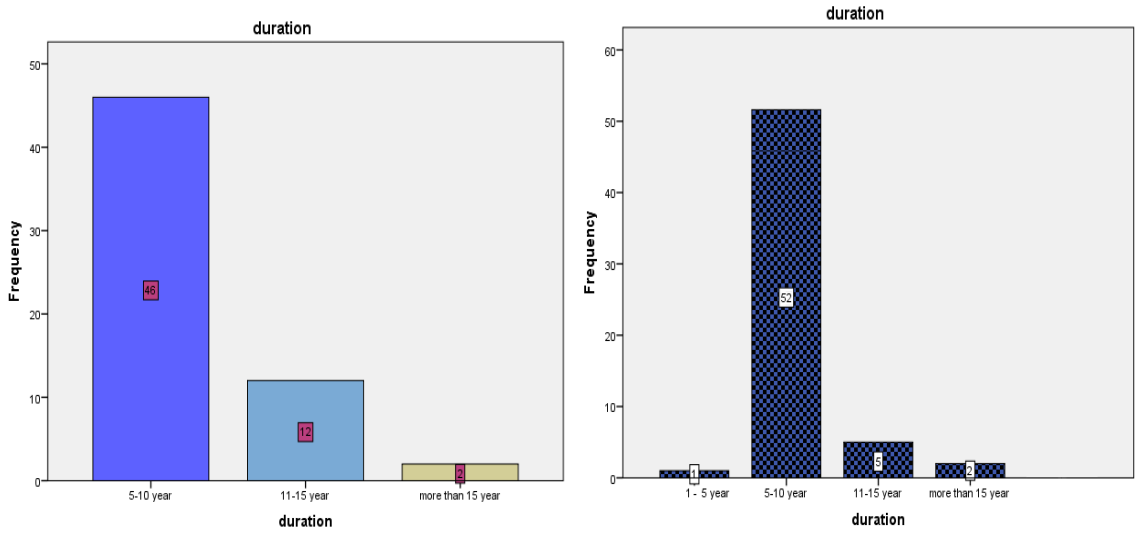

Figure 2: Duration of HCV & HBV Infections Among Studied Groups.

The mean age for HBV patients was 36.9 ± 15.8 year and for HCV patients was 39.9 ±14.2 year. However there was no significant difference between male control group, HCV, and HBV patients, the hemoglobin concentration were (14.85 ± 0.23), (13.48 ± 0.25), and (14.53 ± 0.13), respectively. As shown in table 1.

The results of the liver function tests showed no significant difference between HBV and HCV patients. Both of HBV and HCV patients showed a significant difference regarding liver function tests as compared with the control group.

RBCs ($x10^6$/µl) count were (4.75 ± 0.07),(4.46 ± 0.09), and (4.90±0.06)respectively, whereas WBCs ($x10^3$/µl) count were (8.59 ± 0.45), (6.04 ± 0.30), and (6.82 ± 0.33) respectively. In female; control group, HCV, and HBV patients the hemoglobin concentration Hb (g/dl) were (12.65±0.24), (12.06±0.25), and(12.01 ± 0.28) respectively whereas RBCs ($x10^6$/µl) count were (4.23 ± 0.08), (4.10 ± 0.11), and (4.40±.09) respectively. Similarly, WBCs ($x10^3$/µl) count were (6.37 ± 0.51), (5.90 ± 0.62),(6.69 ± 0.78) respectively.

Table 1 - Haematological profile of males and females patients infected with HCV.

Groups / Parameters	Males Patients Mean ± SE	Females Patients Mean ± SE
RBCs($x10^6$/ µl)	4.46 ± 0.09	4.10 ± 0.11*
Hb(g/dl)	13.47 ± 0.25	12.06 ± 0.25**
Hct **%**	40.48 ± 0.71	36.26 ± 0.68**
MCV(μ^3)	89.87 ± 1.07	88.2 ± 1.82
MCH(pg)	30.30 ± 0.38	29.74 ± 0.74
MCHC(g/dl)	33.31 ± 0.30	33.26 ± 0.31
RDW	46.884 ± 0.88	45.76 ± 1.35
WBCs($x10^3$/µl)	6.035 ± 0.30	5.90 ± 0.62
Platelets($X10^3$/µL)	181.74 ± 10.01	212.91 ± 19.78

(*) significant difference compared to male patients infected with HCV group (P < 0.05).
(**) highly significant compared to male patients infected with HCV group (P < 0.01).

Table 2: Haematological Profile of Males and Females Patients Infected With HBV.

Groups / Parameters	Males Patients Mean ± SE	Females Patients Mean ± SE
RBCs(x106/ µl)	4.9042 ± 0.05568	6.3547 ± 1.91675**
Hb(g/dl)	14.528 ± 0.126	12.006 ± 0.279**
Hct **%**	43.477 ± 0.3852	36.982 ± 0.7116**
MCV(µ3)	88.653 ± 0.6749	83.865 ± 1.7866**
MCH(pg)	29.713 ± 0.2865	25.972 ± 1.6138**
MCHC(g/dl)	33.448 ± 0.2172	32.479 ± 0.5139*
RDW	43.74 ± 0.4132	43.682 ± 0.7737
WBCs(x103/µl)	6.821 ± 0.334	6.688 ± 0.7818
Platelets(X103/µL)	170.19 ± 7.025	194.88 ± 14.349

(*) significant difference compared to male patients infected with HBV group (P < 0.05).
(**) highly significant difference compared to male patients infected with HBV group (P < 0.01).

Table 3: Haematological profile of male patients infected with HCV and HBV.

Parameters \ Groups	Control n= 10 Mean ± SE	HCV n=38 Mean ± SE	HBV n=43 Mean ± SE	F	P Value
RBCs(x10^6/ µl)	4.75 ± 0.07	4.46 ± 0.09^c	4.90 ± 0.06^b	10.30	0.000
Hb(g/dl)	14.85 ± 0.23^b	13.48 ± 0.25^{ac}	14.53 ± 0.13^b	10.50	0.000
Hct %	43.06 ± 0.59^b	40.48 ± 0.71^{ac}	43.48 ± 0.39^b	8.29	0.001
MCV(µ^3)	90.59 ± 1.03	89.87 ± 1.07	88.65 ± 0.68	0.80	0.451
MCH(pg)	31.26 ± 0.40^c	30.30 ± 0.38	29.71 ± 0.29^a	2.56	0.083
MCHC(g/dl)	34.49 ± 0.26^b	33.31 ± 0.30^a	33.45 ± 0.22	2.25	0.112
RDW	45.58 ± 1.18	46.88 ± 0.88^c	43.74 ± 0.41^b	5.77	0.004
WBCs(x10^3/µl)	8.59 ± 0.45^b	6.04 ± 0.30^a	6.82 ± 0.33^a	6.83	0.002
Platelets(X10^3/µL)	235.8 ± 15.9^b	181.7 ± 10.0^a	170.2 ± 7.0^a	6.08	0.003

^{a} = Refers to the relation of control group with other groups, ^{b} = Refers to the relation of HCV group with other groups, ^{c} = Refers to the relation of HBV group with other groups. Variation between similar single letters in each components is significant at P <0.05 (Duncan's test).

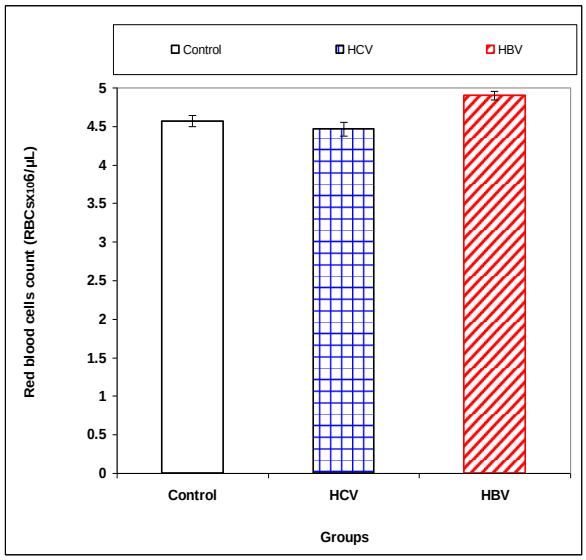

Figure 3. Red Blood cells Count of Male Patients Infected with HCV and HBV.

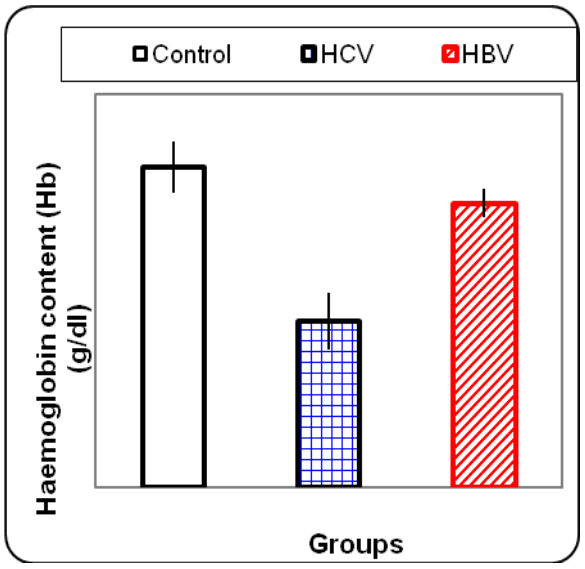

Figure 4. Haemoglobin Concentration of Male Patients Infected with HCV and HBV.

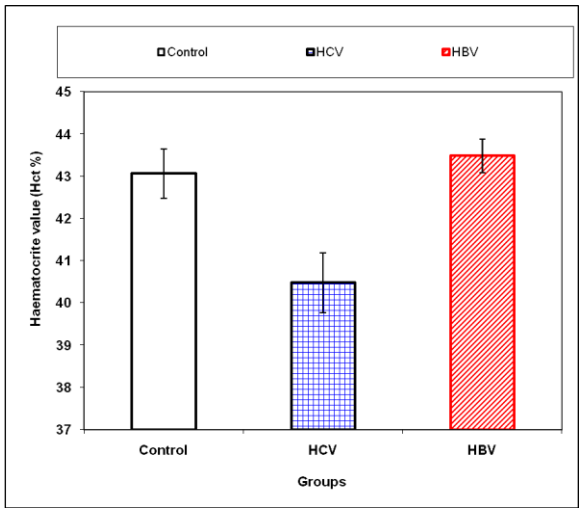

Figure 5: Haematocrite value of male patients infected with HCV and HBV.

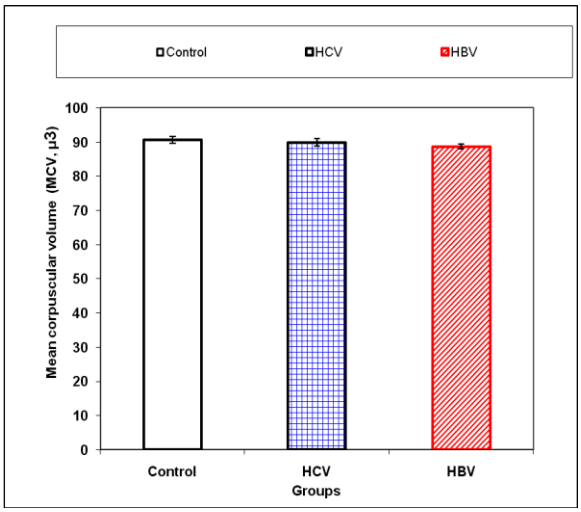

Figure 6: Mean corpuscular volume of male patients infected with HCV and HBV.

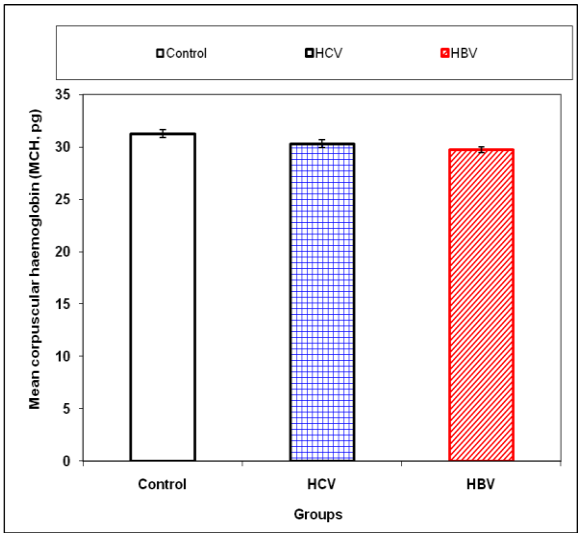

Figure 7: Mean Corpuscular Haemoglobin of Male Patients Infected With Hcv And Hbv.

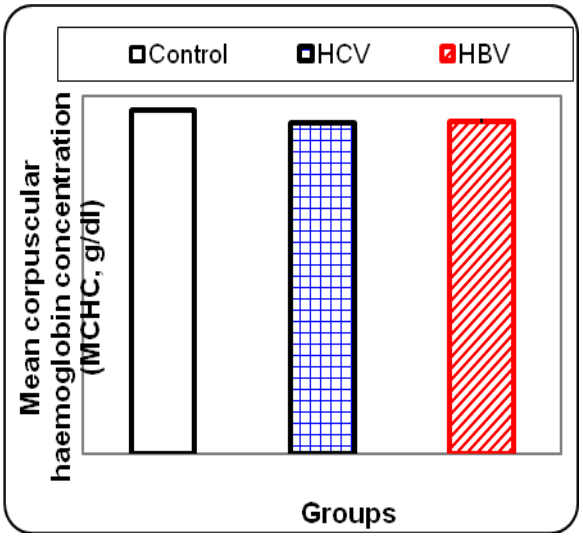

Figure 8: Mean Corpuscular Haemoglobin Concentration of Male Patients Infected With Hcv And Hbv.

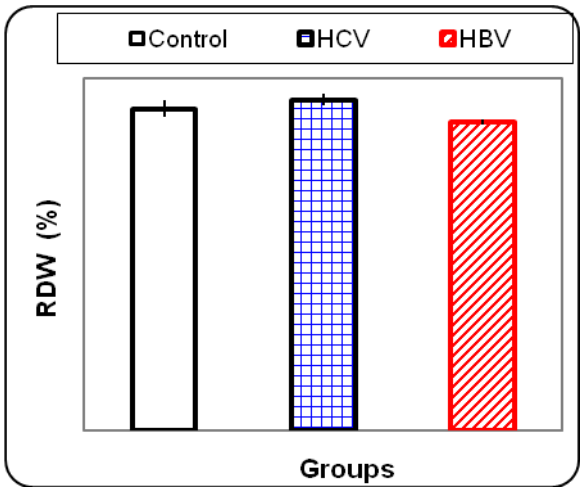

Figure9 - Red blood cell distribution width of male patients infected with HCV and HBV.

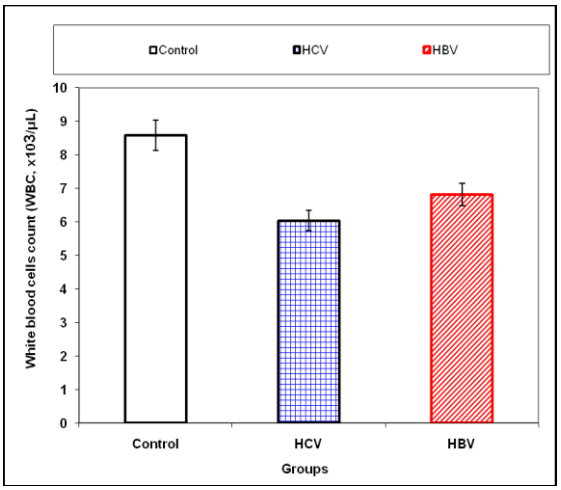

Figure 10 - White blood cells count of male patients infected with HCV and HBV.

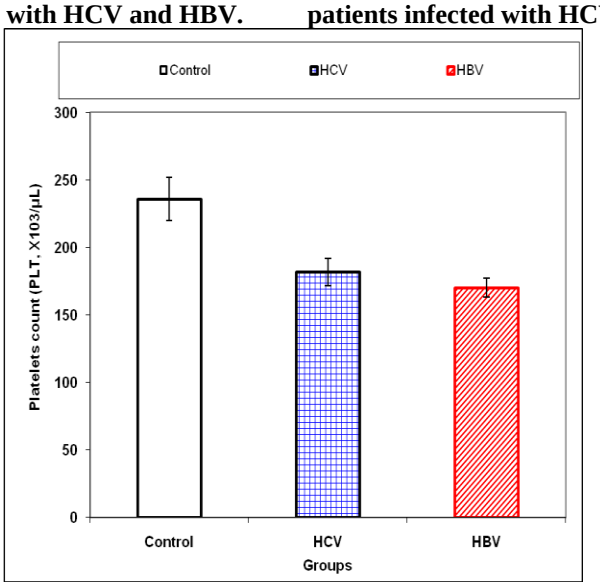

Figure 11: Platelets count of male patients infected with HCV and HBV.

Table 4: Haematological Profile of Female Patients Infected With Hcv And Hbv.

Groups / Parameters	Control n= 10 Mean ± SE	HCV n=22 Mean ± SE	HBV n=17 Mean ± SE	F	*P* Value
RBCs(x106/ µl)	4.23 ± 0.08	4.10 ± 0.11[c]	4.40±.09[b]	2.34	0.107
Hb(g/dl)	12.65 ± 0.24	12.06± 0.25	12.01 ± 0.28	1.26	0.295
Hct **%**	37.34 ± 0.70	36.26 ± 0.68	36.98 ± 0.71	0.57	0.568
MCV(µ3)	88.25 ± 0.55	88.20 ± 1.82	83.87 ± 1.79	2.00	0.147
MCH(pg)	29.93 ± 0.33[c]	29.74 ± 0.74[c]	25.97 ± 1.61a[b]	3.86	0.028
MCHC(g/dl)	33.89 ± 0.31[c]	33.26 ± 0.31	32.48 ± 0.51[a]	2.44	0.099
RDW	44.75 ± 0.91	45.76 ± 1.34	43.68 ± 0.77	0.894	0.416
WBCs(x103/µl)	6.37 ± 0.51	5.90 ± 0.62	6.69 ± 0.78	0.387	0.681
Platelets(X103/µL)	248.2 ± 22.61	212.9 ± 19.78	194.9 ± 14.35	1.459	0.243

[a]= Refers to the relation of control group with other groups, [b] = Refers to the relation of HCV group with other groups, [c] = Refers to the relation of HBV group with other groups. Variation between similar single letters in each components is significant at P < 0.05 (Duncan' s test).

Table 5: Haematological profile of male and female patients infected with HCV and HBV.

Groups / Parameters	Control n= 20 Mean ± SE	HCV n=60 Mean ± SE	HBV n=60 Mean ± SE	F	P Value
RBCs(x106/ µl)	4.49 ± 0.08	4.33 ± 0.07	5.32 ± 0.54	2.03	0.136
Hb(g/dl)	13.75 ± 0.30[b]	12.96 ± 0.20[ac]	13.81 ± 0.19[b]	5.50	0.005
Hct **%**	40.20 ± 0.79	38.93 ± 0.58[c]	41.64 ± 0.51[b]	6.48	0.002
MCV(µ3)	89.42 ± 0.63	89.26 ± 0.95	87.30 ± 0.75	1.78	0.173
MCH(pg)	30.60 ± 0.29[c]	30.09 ± 0.36[c]	28.65 ± 0.54[ab]	3.95	0.021
MCHC(g/dl)	34.19 ± 0.21[bc]	33.29 ± 0.22[a]	33.17 ± 0.22[a]	3.06	0.050
RDW	45.17 ± 0.73	46.47 ± 0.74[c]	43.72 ± 0.37[b]	5.93	0.003
WBCs(x103/µl)	7.48 ± 0.42[b]	5.98 ± 0.29[ac]	6.78 ± 0.32[b]	3.71	0.027
Platelets(X103/µL)	242.0 ± 13.53[bc]	193.2 ± 9.73[a]	177.2 ± 6.57[a]	7.74	0.001

[a] = Refers to the relation of control group with other groups, [b] = Refers to the relation of HCV group with other groups, [c] = Refers to the relation of HBV group with other groups. Variation between similar single letters in each components is significant at P <0.05 (Duncan's test).

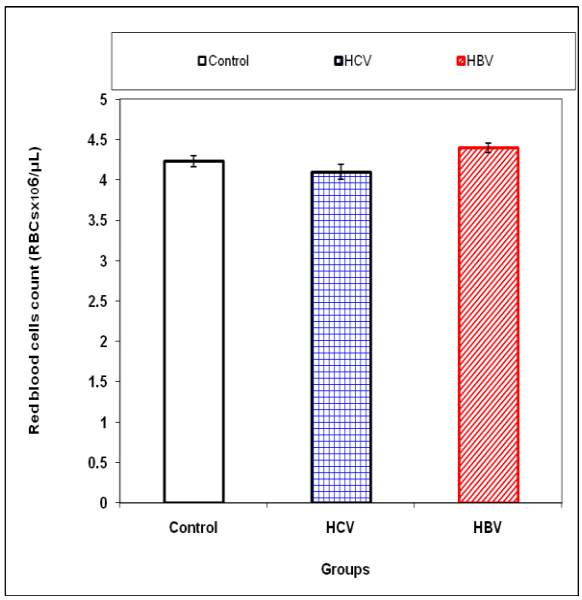

Figure 12: Red Blood Cells Count Of Female Patients Infected With Hcv And Hbv.

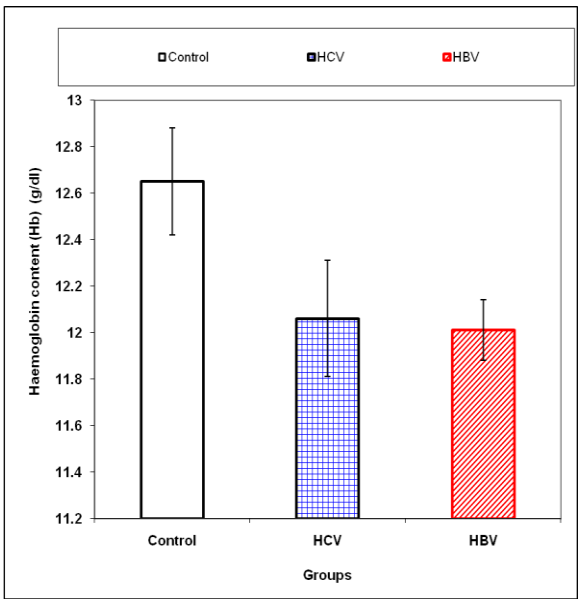

Figure 13: Haemoglobin concentration of female patients infected with HCV and HBV.

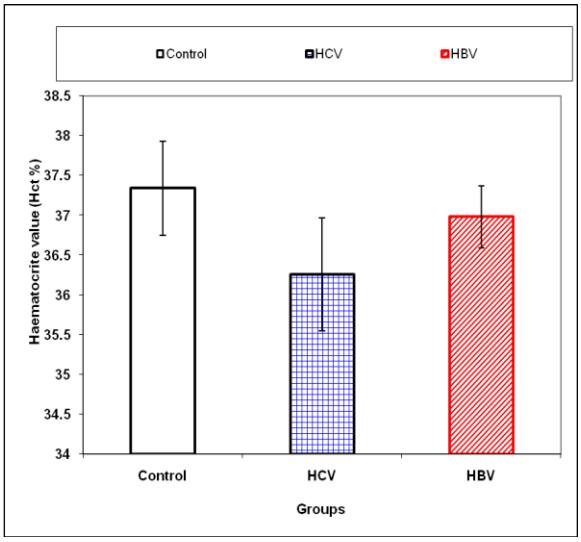

Figure 14 - Haematocrite value of female patients infected with HCV and HBV.

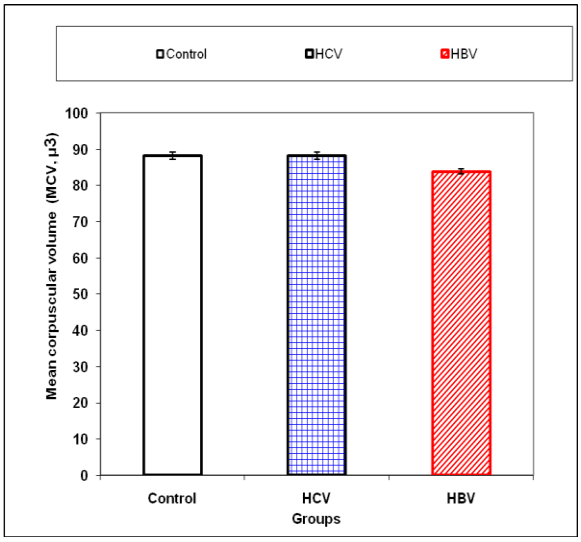

Figure 15 - Mean corpuscular volume of female patients infected with HCV and HBV.

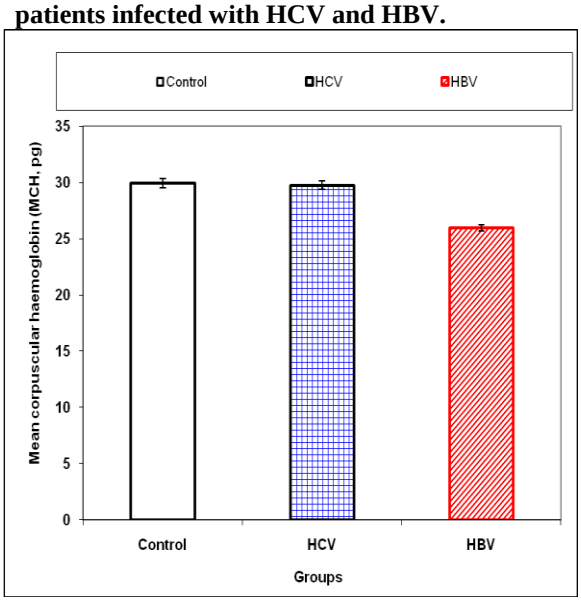

Figure 16: Mean Corpuscular Haemoglobin of Female Patients Infected With Hcv And Hbv.

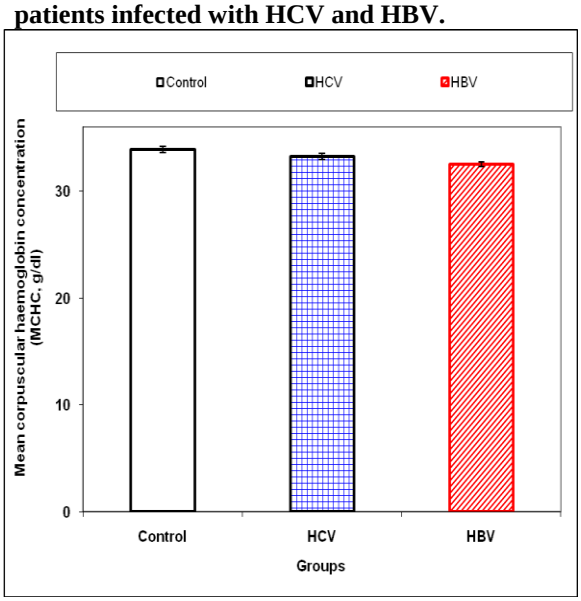

Figure 17: Mean Corpuscular Haemoglobin Concentration of Female Patients Infected With Hcv And Hbv.

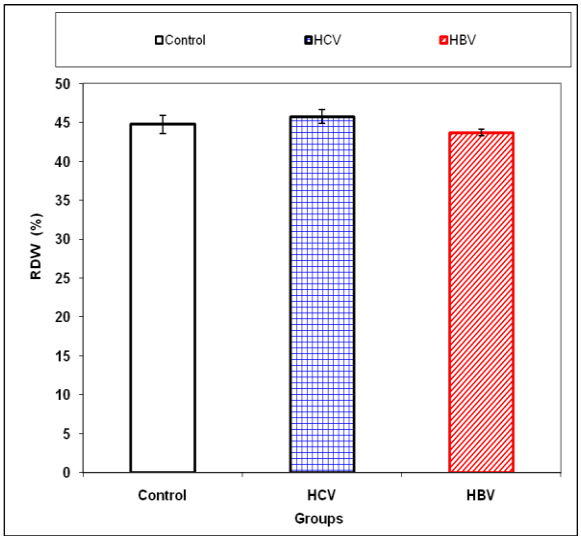

Figure 18- Red Blood Cell Distribution Width of Female Patients Infected with HCV and HBV.

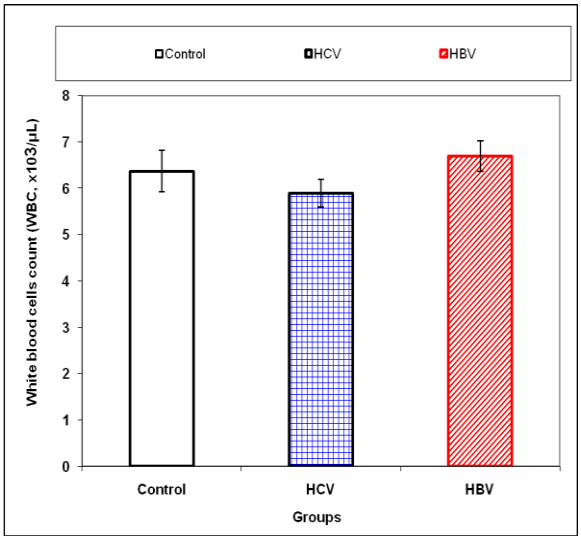

Figure 19: White Blood Cells Count of Female Patients Infected with HCV and HBV.

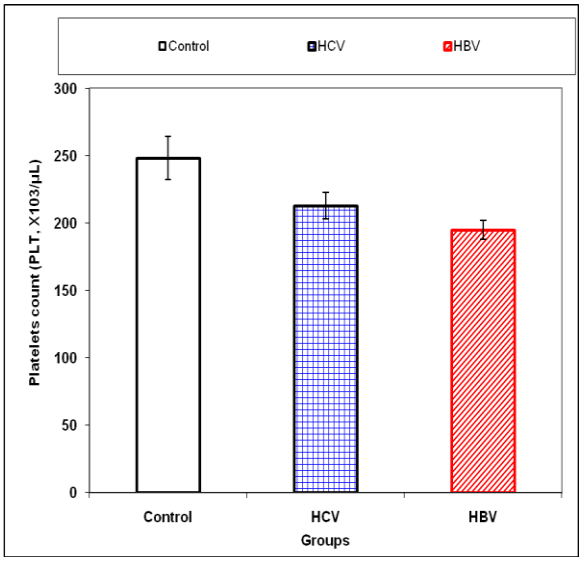

Figure 20: Platelets count of female patients infected with HCV and HBV.

DISCUSSION

In general, hepatitis means inflammation of the liver. Chronic viral hepatitis is a significant health problem in the world. HBV or HCV infections are the chief causes of liver insufficiency. These progressive diseases are linked to the development of cirrhosis and hepatocellular carcinoma. Hence, chronic liver disease is accompanied by derangement of hepatocyte function, including the synthesis of haemostatic factors.[2]

To understand the effect of HCV and HBV infection in this study, variations in different hematological and biochemical parameters in both genders were assessed. Males appeared to be more susceptible to infection than females. Likewise, the mean age was also almost the same among patients with the two infections. This is similar to what has been reported by many of other studies.[9,10]

From the investigation of the liver function tests, no significant difference was shown between the blood samples extracted from the patients infected with HBV and HCV. Contrarily, both of HBV and HCV infected patients showed a significant difference regarding liver function tests when compared with the control group.

Regarding patients infected with HBV, this study found that most of the hematological parameters results were greater in males than in females. The only exception to this was RBCs count, where the results were higher in females than males (Table 3). *P* value between both genders was less than 0.01 in RBC, Hct, MCV and MCH, while the *P* value was of less than 0.05 in the case of MCHC. Even though it was found that HB, RDW, WBCs and PLT were higher in females when compared with males, statistical analysis revealed that there was no significant difference between them (Table 3).

Contrariwise, patients with HCV showed no significant differences between the two sexes in terms of hematological parameters. There was a high Hb concentration among both males and females, with a mean concentration of 13. 47±0.25. The same was also interpreted for Hct where the mean concentration was 12.06 ± 0.25. Additionally, both of these parameters showed a high *P* value of < 0.01. As for RBC count, the *P* value was < 0.05 (Table 2). These results reflect those of previous research that also reported that the results of Hb and Hct were higher in males than females infected with HCV.[11]

There are a number of hypotheses proposed that suggest a relationship between HCV infection and RBC production. These include secretion of erythropoietin from regenerating liver cells[12], endogenous thrombopoietin (TPO) secretion (secondary to thrombocytopenia)[13], and alternations in iron metabolism.[14]

In view of the impact of gender on the results of hematological parameters in those infected with HCV or HBV, a significant difference was established between the results in comparison with the control group (*P* value < 0.01). This is applicable to the majority of the parameters excluding MCV and MCHC (Table 4). Surprisingly, this was not the case in females. A note of caution is due here since these findings are almost the same as those obtained from the control group (Table 5).

With regard to the difference between the male results of the hematological parameters who are infected with HCV or HBV we found a high significant difference between those results as compared with the results of control group (P value < 0.01) in most of the hematological investigated parameters except of MCV and MCHC (Table 4) whereas in females the picture was different. These results as compared with the control group were relatively the same with no significant difference (Table 5).

Contrary to expectations, this study did not find a correlation between Hb concentration and the other biochemical parameters (0.196 Pearson and 0.134 two-tailed). However, the observed correlation between AST activity and total bilirubin, indirect bilirubin, and ALT ($P < 0.01$) was high. Moreover, a slightly low correlation was also perceived between AST activity and direct bilirubin ($P < 0.05$). Adversely, no statistical correlation between the parameters, Hb concentration and ALP was contemplated.

CONCLUSION

In conclusion, both HCV and HBV infections do affect biochemical and haematological parameters. Undeniably, variations of haematological profile and liver function tests in infected patients with chronic HCV and HBV will adversely affect certain organs in the body. Thus, management and treatment of the diseases should be executed very soon, even before the onset of symptoms.

Recommendations

Despite these promising results, questions remain. Further studies, which take these variables into account, will need to be undertaken on a much larger scale to evaluate and determine connections. Also, this study recommends that all HBV and HCV patients must be routinely tested for liver function test. Hematological and biochemical parameters should be regularly investigated, too, to determine the variations and to recognize the prognosis of the disease development. All laboratories' staff should be vaccinated before commencing work, to prevent and limit transmission.

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