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A Correlative Study Between Haematological and Biochemical Parameters in Hepatitis B

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Abstract

Hepatitis-B (HBV) is a viral disease cause liver damage, cirrhosis, fibrosis and hepatocellular carcinoma. Present study attempted to elucidate the biochemical and haematological markers other than Australia antigen, of hepatitis, B, vairusV (HBsAg) for better assessment of HBV infection. The present study was conducted on 76 men, 50 of them were found to be HBeAg positive and 26 were negative, mean age was53±5.7years. Haematological parameters such as Absolute Erythrocyte(Abs Eryt), Absolute Leukocyte (Abs Leuk), Haemoglobin (Hb), Packed Cell Volume(PCV),Mean Corpuscular Volume (MCV), Red Cell Distribution Width (RDW), Mean Corpuscular Haemoglobin (MCH), MCH Concentration (MCHC), Neutrophils (Neut), Lymphocyte (Lymph), Monocyte (Mono), Eosinophil (Eosin), Basophil (Baso), Absolut platelet (Abs.Plt), Red Blood Distribution (RBD) and biochemical markers such as Alanine aminotransferase (ALT), Aspartate aminotransferase (AST), Alkaline phosphatase (ALP), Gamma glutamyl transpeptidase (GGT), Total Bilirubin (T.Bil), Albumin (Alb), C- reactive protein (CRP), Amylase (Amy), Creatinine (Crea), Sodium (Na), Potassium (K), were estimated for HBV patients and healthy groups. Statically at ($P \leq 0.05$) Abs Plt was highly significant elevated, Hb, Abs Leuk, Neut%, Lymph% and Eosin% were significant increases while other haematological parameters showed no differences in HBV patients compared with controls. Liver enzymes (ALT, AST, GGT) and T. Bil were highly significant increased, Alb, CRP and Amyl were moderately increased, niether Crea, Na nor K levels have differences in HBV patients compared with controls. ALT has strong positive correlation with Leuk and with Abs Plt in HBV patients. liver enzymes ALT, AST, ALP, GGT, T. Bil and Abs Plt can be used as monitoring markers with the strong correlation between ALT and Abs Plt as an assessment tools for HBV infection.

Keywords: Hepatitis B, Haematological parameters, Hepatic enzymes, liver function tests, Electrolytes.

1. Introduction

Hepatitis-B Virus (HBV) infection is a continuous global health problem that infected about 2 billion people worldwide. HBV infection describes a form of disease characterized by the presence of detectable HbsAg in the blood or serum [1]. the infection accompanied with serious complication include inflammation, hepatofibrosis, cirrhosis and hepatocellular carcinoma [2-4]. Hepatic infection is assessed directly via liver biopsy specimens, but since it is invasive procedure and companied by poor patient compliance, clinical experience suggested that blood parameters provide valuable information for the manifestation of HBV[5] . Liver disease is accompanied by derangement of hepatocyte function including the synthesis of haemostatic factors [6]. HBV infection may result in abnormal haematological parameters such as Plt [7]. PCV, Hb and white blood cell [8]. disorders which include: absolute changes in Leuk numbers, involving Neut, Lym and Eosin in response to bacterial, viral, or parasitic infections, tissue injury, and inflammation [9]. Viral infections that disrupt liver function also can be accompanied by changes of liver enzymes level, although it is not specific for HBV only. Liver enzymes such as amino transferases i.e. AST, ALT, ALP and GGT, are sensitive and one of the widely used blood tests for evaluating patients with HBV. These enzymes are usually contained within the hepatocytes and are spilled into the blood stream when the liver is infected [10]. Amino transferase, levels usually, fall rapidly before jaundice appearance and have a more gradual, decline in cases, of HBV, and there is a greater increase in serum Bili level [11]. Since HBV may be detected in the pancreas, it may impair the clearance of pancreatic enzymes (such as amylase) by the liver reticulo-endothelial system in proceeded liver diseases [12]. Alb and CRP are synthesized in liver and secreted in extracellular fluids [13]. Alb has been shown to be a multifunctional protein with transports Bili besides antioxidant, immune modulatory and oncotic functions, therefore hypoalbuminemia is one of the characteristic features of certain forms of liver disease such as HBV [14-15]. The marked increase of acute-phase CRP occurs with inflammations, viral infections and tissue necrosis [16]. Nemours studies have performed on the relationship of CRP with the severity of inflammation in liver diseases, such HBV [13], [16-18]. An increase of pancreatic enzymes is generally an expression of inflammatory disease or pancreatic cancer. Hyperamylasemia was also indicated in patients diagnosed with acute viral hepatitis infection without any pancreatic disease [19]. During HBV infection, serum Crea and some electrolytes are usually elevated, these effectsare signals of on-going kidney disease particularly glomerulonephritis [20]. This study was performed for the determination of the relationship between biochemical and haematological alternations, and whether this could provide a reliable method for a better assessment of liver destruction in patients with HBV.

2. Materials and Methods

The study was executed on 76 men, 50 of them were infected with HBV and 26 healthy individuals as a control (with no, clinical or laboratory, evidence of liver diseases) mean age was53±5.7years. None of the 76 subjects had received medications. The duration of this study, was from October 2017 to April 2018. The study was achieved in the Tikrit Teaching Hospital. Specimens were collected by withdraw almost 10 mL of, venous blood, 3 mL was used for Haematological tests that performed by Auto Haematology Analyzer (BC-3000 plus). The remaining amount of blood samples, were left for half an hour at room, temperature. The serum was separated then frozen at about -20C° until analysis. Both patients and healthy groups were screened, for HBsAg using (HBsAg ELISA test kit (Plasmatecal

laboratory products). All cases were tested for Amy using Biolabo kits, serum levels of Bil, ALT, AST, GGT and TSB by Randox kit, ALP by bioMerieuxR kit, Alb by Spinrct kit. CRP, Na and K by Vitro Scient Company.

3. Statistical Analysis

Statistical analysis of quantitative variables was obtained by calculation of mean and standard deviation (Mean± SD). Sample T test was performed for the comparisons of ALT with some biochemical and haematological parameters. Statistical software was SPSS version 11. Significance grade was conceder when $p \leq 0.05$.

4. Results

The study included 76 men, 50 of them with HBV and 26 healthy individuals with mean age 53±5.7 years. There were significant ($p<0.05$) increase in Hb, Neut, lymp, Baso, Abs.Neut, AST, Amy, Alb, T.Bil and CRP , highly significant increase in Abs.Plt, ALT and ALP while no significant ($P>0.05$) difference in Abs. Leuk, Abs. Eryt, PCV, MCV, MCH, MCHC, Mono, Eosin, Abs Lym, Abs. Mono, Abs. Esino, Abs. Baso, Crea, Na and K compared with controls as seen in **Table 1**.

Table 1. Mean±SD of patients with HBV compared with control.

Variables	**Controls**	**HBV**
Abs.Eryt ($x10^9$/L)	4.09± 0.887	5.0616±0.1327
Hb (g/L)	141.76±2.95	156.03±3.68*
PCV (%)	43.112±3.051	45.919±1.120
MCV(Fl)	85.32±7.1	89.59±9.08
RDW(%)	13.2±1.67	13.110±0.488
MCH (pg)	29.638±1.43	30.897±0.641
MCHC (g/L)	340±17.3	340.90±5.15
Abs.Leuk ($x10^9$/L)	6.41±1.029	5.76 ± 0.8360
Abs.Neut ($x10^9$/L)	3.0459±1.2496	2.3840±0.5846*
Abs.Lymp ($x10^9$/L)	2.1468±0.752	2.299±0.499
Abs.Mono ($x10^9$/L)	0.432±0.2041	0.5327±0.1313
Abs.Esin ($x10^9$/L)	0.15249±0.091	0.2586±0.0887
Abs.Baso ($x10^9$/L)	0.0331±0.00773	0.02429±0.00811
Neut (%)	56.3±7.9	47.17±6.55*
Lymp (%)	53.92±8.2	37.76±5.55*
Mono(%)	7.1±0.96	8.952±1.627
Eosin(%)	4.6±2.88	4.429±4.429
Baso (%)	0.71±0.21	0.444±0.511*
Abs.Plt ($x10^9$/L)	216.8±76.38	72.04±19.62**
ALT(U/L)	22.85±8.78	106.49±55.41**
AST(U/L)	27.43±11.09	59.39±8.97**
ALP (U/L)	62.75±14.433	139.94±26.28**
GGT (U/L)	78.45±2.7	327.4±49.7**
T. Bil (µmol/L)	7.2±2.02	14.438±2.816**
Alb (g/L)	42.35±7.93	34.580±2.010*
CRP(mg/L)	5.1±0.84	6.47 ±5.51*
Amy (U/L)	31.82±5.63	42.444±2.455*
Crea(µmol/L)	85.7±14.33	96.238±6.805
Na(mmol/L)	139.21±2.77	141.58±2.55
K (mmol/L)	3.514±0.127	3.9962±0.2163

Abs.: Absolute, Eryt: Erythrocyte, Leuk: Leukocyte Hb: Haemoglobin, PCV: Packed Cell Volume, MCV: Mean Corpuscular Volume, RDW: Read Cell Distribution Width, MCH: Mean Corpuscular Haemoglobin, MCHC: MCH Concentration , Neut: Neutrophiles, Lymp: Lymphocyte, Mono: Monocyte, Eosin: Eosinophile , Baso: Basophile , Plt: platelet, RBD:Read BloodDistribution, ALT: alanine aminotransferase, AST: aspartate aminotransferase, GGT: gamma glutamyl transpeptidase, ALP: alkaline phosphatase, Amy:Amylase, Alb: Albomine, Crea: Creatinine, T.Bil:Total Bilirubin, Na:Sodium ,K:Potassium,CRP:C- reactive protein.
(*: significant difference, **: highly significant difference).

ALT was strongly positive correlated with Leuk (*r* 0.420) and with Plt (*r* 0.592), weak positive correlation was observed with Hb (*r* 0.282), AST (*r* 0.336), ALP (*r* 0.288), GGT (*r* 0.169), Alb (*r* 0.278), Bil (*r* 0.240) and Crea (*r* 0.026) while week negative correlation was observed with CRP (*r* -0.277) as shown in **Table 2,** and **Figures 1-10.**

Table 2. Correlation Analysis between ALT and some studied variables.

ALT / Variables	r-Value	P-Value
Abs. Leuk	0.420	0.065
Abs.Plt	0.592	0.006
Hb	0.282	0.228
AST	0.336	0.148
ALP	0.288	0.219
GGT	0.169	0.476
Alb	0.278	0.235
T.Bil	0.240	0.308
Crea	0.026	0.912
CRP	-0.277	0.238

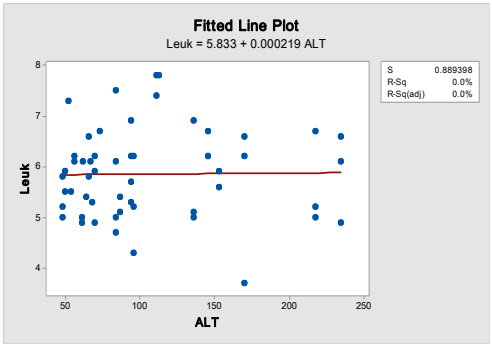

Figure 1. Correlation between ALT and Leuk in HBV patients.

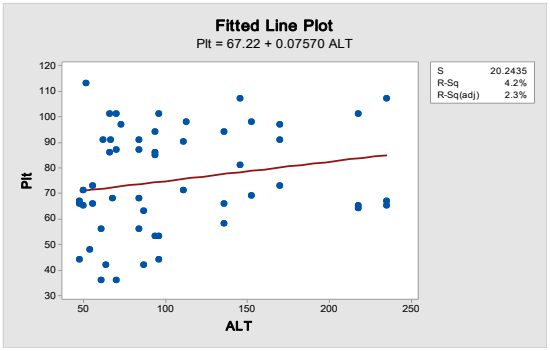

Figure 2. Correlation between ALT and Abs.Plt in HBV patients.

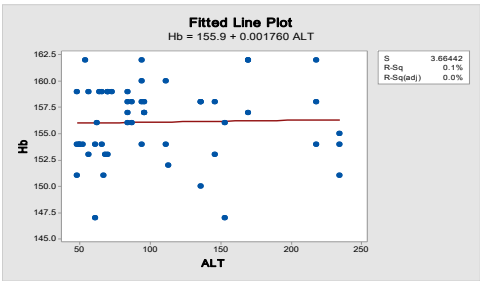

Figure 3. Correlation between ALT and Hb in HBV patients.

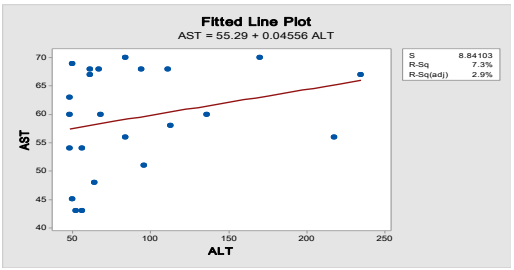

Figure 4. Correlation between ALT and AST in HBV patients.

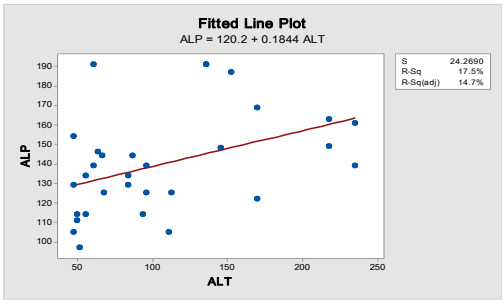

Figure 5. Correlation between ALT and ALP in HBV patients.

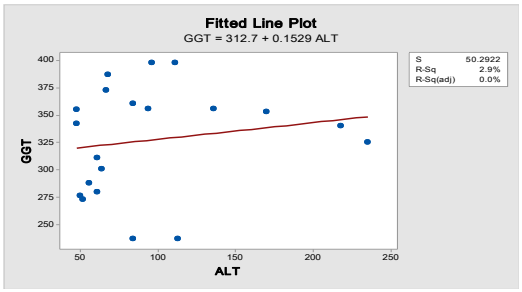

Figure 6. Correlation between ALT and GGT in HBV patients.

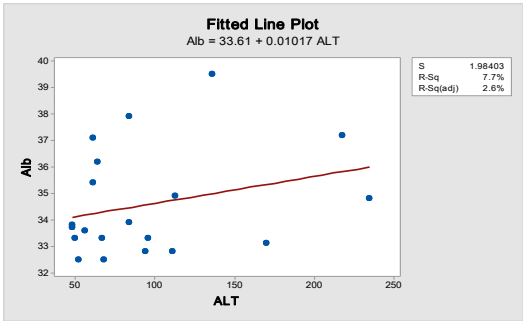

Figure 7. Correlation between ALT and Alb in HBV patients.

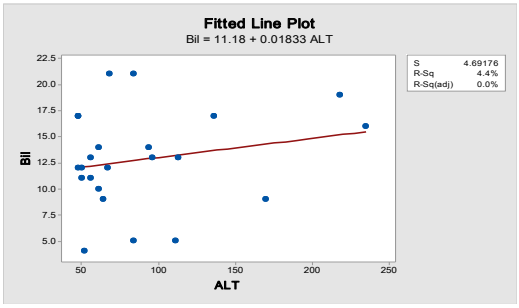

Figure 8. Correlation between ALT and T.Bil in HBV patients.

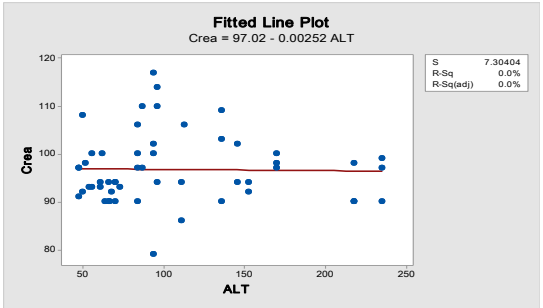

Figure 9. Correlation between ALT and Crea in HBV patients.

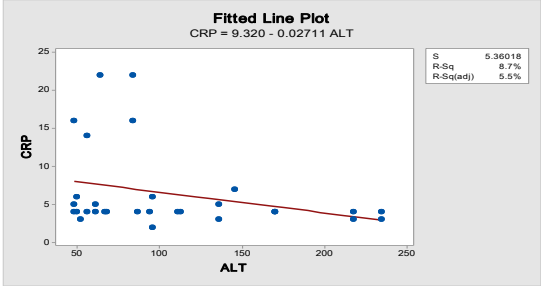

Figure 10. Correlation between ALT and CRP in HBV patients.

5. Discussion

It has been well established that many haematological and biochemical abnormalities occur in HBV infection [21]. In the present study, out of 50 HBsAg positive and 26 HBsAg negative males with age (53±5.7) years were included. **Table 1,** shows the statistical difference in haemoglobin concentration of HBV positive subjects was significantly higher ($p \leq 0.05$) when compared with HBV negative subjects, this result in line with work done by Xue-hua, *et al*. [22]. The possible explanation is that HBV associated with alternation in iron metabolism [23]. Interestingly, no differences in Abs. Eryt., PCV, MCV, RDW, MCH and MCHC were observed. In conclusion, inflammation caused by HBV infection has effects on the production of haematological precursor cells and on red blood cell morphology, these findings are in tune with the study by Das S K, *et al* [24]. In the liver, the innate, immune system is driven by a complex series of Leukocytes (granulocytes such as Neut, Eosin and Baso and non-granulocytes such as Lymp and Mono) [24-25]. of these cell subsets, Neut which accumulate in the liver have special role in the defence against viral infections [26]. Significant difference existed ($P \leq 0.05$) in Abs Neut HBV in positive male subjects when compared with negative control group, while no differences were observed in Luk, Lym, Mono ,Eosin and Baso. Recently, there has been evidence that the, functional defect in Neut take place in liver cirrhosis [25]. Another study showed that the Lym will increase while the Neut will decrease but no changes in total Leuk count was observed [27]. The positive decreases in Neut (%), Lymp (%) and Baso (%), may, reflect the severity and progression of, liver, injury [28]. our results are in agree with Francisca, *et al*., [29]. Abs Plt was highly significant related to liver infection in the present study compared with non-infected liver, this result is in agreement with the fact stated by others that Plt is a good indicator for liver inflammation and advanced liver fibrosis and strongly related with the HBV status [30-31]. Biomarkers are equally valuable for the estimation and assessment of hepatic disease severity due to HBV infection may alter the levels of certain liver enzymes as a result of hepatocellular damage [32]. High significant increases were observed in ALT, AST, ALP and GGT at ($p \leq 0.05$) in HBV compared with control, these results are in agreement with others [22], [33-34]. ALT and GGT showed the highest increments in HBV infection, it has been stated that moderate elevation (3-20 times) of ALT level usually observed in acute hepatitis, neonatal hepatitis, chronic hepatitis, autoimmune hepatitis, drug induced hepatitis, alcoholic hepatitis [30], [33]. other study deduced that the GGT increment that reflects inflammation in, the liver is superior than ALT ,and that GGT may have a significant role in the clinical, evaluation of HBV [34]. T.Bil was significantly elevated in HBV patients compared with controls as indicated in **Table 1.** the agreement of this result with other studies [21-22]. Reflect the use of T.Bil as one of the markers of liver injury [35]. Also very high increment in both ALT and/or GGT obtained in this study can provide a valuable information through the assessment of hepatic inflammation and fibrosis and beside Plt no other biochemical tests have been shown to be a better indicators of liver injury. Another important mediator of host immune defence CRP and Alb showed level increment in sera of HBV individuals compared with controls at ($P \leq 0.05$) , our finding is in agreement with other studies [16, 30], these findings sound not unusual since liver is the target, organ for the replication of HBV , leading to the demolition of hepatocytes and, consequently increase the releasing of these molecules [18]. The effect of HBV infection on liver's clearance of pancreatic enzymes was followed by evaluation of Amy activity, **Table 1,** revealed significant increase($p \leq 0.05$) in Amy activity in HBV patients compared with control group, our results are in agreement with Katakura Y*et al* [36], and Kaur N et al [19]. For investigating renal abnormalities associated with HBV infection, serum Crea and some electrolytes have been estimated, as showed in **Table 1,** non significant increase in Crea., Na and K levels in HBV group compared with controls at ($P \leq 0.01$), Ayelagbe and Oladipo found no significant differences in serum concentrations of Crea, and Na while K was significantly, increased in HBV compared with the control subjects [37]. however, in a preliminary study conducted by Shahid *et al* Hypokalaemia was found in 37%

cirrhotics liver [38]. It could be concluded from the current study that there is no renal complications of viral hepatitis B infection. In hepatitis, ALT become elevated may be 100 times normal with the progression of liver disease, likely as a result of direct hepatocellular damage and membrane leakage, and no other biochemical test has been shown to be a better indicator [39- 40]. for this, we attempted to find the correlation between ALT and parameters in **Table 1,** that showed highest increments in HBV compared with controls Pearson correlation analysis in **Table 2,** showed that ALT was strongly positive correlate with Abs Leuk and Abs Plt (r = 0.420 and 0.592 resp.), moderately positive correlate with AST (r = 0.336), weakly positive correlate with Hb, ALP, Alb and T. Bil (r = 0.282, 0.288,0.278 and 0.240 resp.) both GGT and Crea showed no correlation (r = 0.169 and 0.026 resp.) while weak negative correlation was observed between ALT and CRP (r = -0.277) .

6.Cconclusion

liver enzymes ALT,AST,ALP,GGT ,T.Bil and Abs Pltcan be used as monitoring markers with the strong correlation between ALTand Abs Plt as an assessment tools for HBV infection

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