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# IMPACT OF CHRONIC HBV INFECTION ON OUTCOMES OF ESR, SGPT AND IMPORTANT PARAMETERS OF CBC AMONG HBV INFECTED PATIENTS

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**Abstract:** Chronic hepatitis B virus (HBV) and chronic hepatitis C virus (HCV) infections remain one of the leading causes of chronic liver disease and hepatocellular carcinoma. Healthcare initiatives for chronic viral hepatitis to facilitate early diagnosis and linkage to care in an effort to reduce inpatient resource utilization associated with late diagnosis and end-stage liver disease have been partially successful (Cholankeril *et al*., 2016), The study population consisted of 50 patients (76.00 % male and 24.00 % were female). Our objective was to observe the impact of chronic HBV infections on ESR, SGPT and important parameters of CBC. This study examined the predominance of anemia (less RBC and hemoglobin), ESR and random blood sugar (RBS) in HBV infected patients. Along with anemia, ESR and RBS other blood related parameters such as WBC, neutrophils, lymphocytes, monocytes and eosinophils count were analyzed. Total WBC count was found significantly higher (male 42.10% and female 50.00%). Differential count of WBCs such as Neutrophils were found significantly associated with HBV positive individuals in both male (55.26%) and female (58.33%), Monocytes counts were found within the standard limit for 100.00% male and 100.00% female, lymphocytes counts were found normal for approximately 100.00% patients; and eosinophils counts were found mildly higher in both sexes (male 21.05%, female 25.00%) associated with HBV positive individuals. Platelets count found absolutely normal in both the sexes. HBV positive individuals had developed anemia in respect to RBC in male (65.79%) and female (50.00%) patients. Here it was found that 10.53% male and 75% female HBV patients suffer from anemia due to less hemoglobin content. Female patients number were very few for this reason it is very difficult to get the exact scenario regarding hemoglobin content. Female hemoglobin content may decrease due to menstrual cycle. The prevalence of high ESR was found in HBV infected patients examined. 57.90% male and 50.00% female HBV patients suffer high ESR, RBS level found mildly increase in both the sexes (male 10.53%, female 33.33%); and finally 39.47% male and 25.00% female were found with higher SGPT.

**Keywords:** HBV, ESR, SGPT, CBC, RBC, WBC, Hb, RBS.

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## Introduction

Hepatitis B is an infectious disease caused by the hepatitis B virus (HBV) that affects the liver. It can cause both acute and chronic infections. Many people have no symptoms during the initial infection. Some develop a rapid onset of sickness with vomiting, yellowish skin, tiredness, dark urine and abdominal pain. Often these symptoms last a few weeks and rarely does the initial infection result in death. It may take 30 to 180 days for symptoms to begin. In those who get infected around the time of birth 90% develop chronic hepatitis B while less than 10% of those infected after the age of five do. Most of those with chronic disease have no symptoms; however, cirrhosis and liver cancer may eventually develop. These complications result in the death of 15 to 25% of those with chronic disease (Hepatitis B, cited 2018 July 5**).**

The virus is transmitted by exposure to infectious blood or body fluids. Infection around the time of birth or from contact with other people's blood during childhood is the most frequent method by which hepatitis B is acquired in areas where the disease is common. In areas where the disease is rare, intravenous drug use and sexual intercourse are the most frequent routes of infection. Other risk factors include working in healthcare, blood transfusions, dialysis, living with an infected person, travel in countries where the infection rate is high, and living in an institution. Tattooing and acupuncture led to a significant number of cases in the 1980s; however, this has become less common with improved sterility. The hepatitis B viruses cannot be spread by holding hands, sharing eating utensils, kissing, hugging, coughing, sneezing, or breastfeeding. The infection can be diagnosed 30 to 60 days after exposure. The diagnosis is usually confirmed by testing the blood for parts of the virus and for antibodies against the virus. It is one of five main hepatitis viruses: A, B, C, D, and E (Hepatitis B, cited 2018 July 5**).**

## Red Blood Cell (RBC)

RBCs that carry oxygen. RBCs contain hemoglobin (Hb) and it is the Hb which permits them to transport oxygen (and carbon dioxide). Hb, aside from being a transport molecule, is a pigment. It gives the cells their red color (RBC, 2018 July 2).

Red cell distribution width (RDW) is an automated measure of the heterogeneity of RBC sizes (anisocytosis) and routinely performed as part of a complete blood cell counts. RDW is used in the differential diagnosis of anemia. Recently, a series of studies have demonstrated that RDW can serve as a novel, independent predictor of

prognosis in patients with cardiovascular diseases (e.g. heart failure, stable coronary diseases, acute myocardial infarction, strokes, and pulmonary hypertension). Elevated RDW values were also shown to be associated with increased risk of mortality in the general population. However, to our knowledge, the role of RDW values in persistent viral infection has not been well-defined. More importantly, whether RDW values are associated with different disease states of HBV infection such as acute hepatitis B (AHB), chronic hepatitis B (CHB) and chronic severe hepatitis B (CSHB) remains unknown (Lou *et al.*, 2012). An elevated RDW (RBCs of unequal sizes) is known as anisocytosis (Evans and Jehle, 1991). Anisocytosis is a medical term meaning that a patient's red blood cells are of unequal size. This is commonly found in anemia and other blood conditions. False diagnostic flagging may be triggered by an elevated WBC count, agglutinated RBCs, RBC fragments, giant platelets or platelet clumps. In addition, it is a characteristic feature of bovine blood (Anisocytosis, cited 2018 July 27).

## Hemoglobin (Hb)

Hb is a protein inside red blood cells that carries oxygen from the lungs to tissues and organs in the body and carries carbon dioxide back to the lungs.15 Protoporphyrin IX is the immediate precursor to heme. The enzyme ferrochelatase is able to insert ferrous iron to produce heme or zinc cation to form zinc protoporphyrin (ZPP) (Protoporphyrin-IX, cited 2018 July 27).

Hu *et al.* found that iron protoporphyrin IX (heme), an endogenous component of hemoglobin and a number of other cellular enzymes, as well as several related porphyrins, block protein priming in both HBV and DHBV cell models.5 No data found that HBV has any effect on hemoglobin synthesis. The present study was designed to investigate the association between hemoglobin values and hepatitis B virus (HBV)-infected patients.

## Random Blood Sugar (RBS)

The liver is one of principal organs involved in glucose metabolism together with skeletal muscle and adipose tissue. Chronic viral infections such as human immunodeficiency virus (HIV) and hepatitis C virus (HCV) have been linked with the derangement of glucose homeostasis and induction of insulin resistance. In addition, altered glucose tolerance has been described in both alcoholic and non-alcoholic fatty liver disease (NAFLD). Chronic hepatitis B virus (HBV) infection is an important public health problem worldwide, with more than 350 million people being chronic carriers of the virus. Furthermore, HBV carriers have an increased risk of developing cirrhosis and hepatocellular carcinoma (HCC) development in their lifetimes. However, the association of chronic HBV infection with the emergence of insulin resistance and altered glucose metabolism remains unclear (Chia-Chi Wang *et al.*, 2008).

Hepatitis B virus (HBV) infection has been shown by certain studies to be associated with diabetes mellitus (DM); however, the results of these studies were controversial. For that reason, a meta-analysis of the literature was performed in

order to determine the association between HBV infection and the prevalence of DM more accurately. The PubMed, Embase, Chinese National Knowledge Infrastructure and Wan Fang databases, as well as the Chinese Science and Technology Journal Database, were searched for literature published until June 2014. Compared with uninfected patients, the pooled results suggest that HBV-infected patients have a higher risk of developing DM (Cai *et al.*, 2015).

### White Blood Cells (WBC) (Neutrophils, Lymphocytes, Monocytes and Eosinophils)

WBCs, also called leukocytes, are an important part of the immune system. These cells help fight infections by attacking bacteria, viruses, and germs that invade the body. White blood cells originate in the bone marrow but circulate throughout the bloodstream. There are five major types of white blood cells: neutrophils, lymphocytes, eosinophils, monocytes and basophils.

Searched PubMed, Medline, RefSeek, Citeseer, Google Scholar, academia.edu, Wolfram Alpha, iSeek Education and ResearchGate up to June 2018 to find any relationship between HBV infection and WBC (Neutrophils, Lymphocytes, Monocytes and Eosinophils) count. No data were found regarding these issues.

### Erythrocyte Sedimentation Rate (ESR)

It has been established experimentally that there are two types of viral hepatitis: the short incubation period type, and the long incubation period type, in which the hepatitis-associated antigen (HAA) is found.' In sporadic viral hepatitis it is not usually possible to distinguish these clinically (Cossart and Vahrman, 1970).

In 1969 Vahrman noted that some patients suffering from viral hepatitis had a normal erythrocyte sedimentation rate (ESR) throughout their illness: others had, on admission, a high ESR, which gradually became normal. During 1970, 65 patients over the age of 12 years were studied. Five children under 12 years old of both sexes who were antigen-negative and had an ESR ranging from 45-68 mm/1hr were excluded from the statistical analysis. The first ESR result, obtained as soon after admission as possible, was used. This was usually within 14 days of the onset of the first symptoms (range 2-36 days). Blood for the double-diffusion antigen test was taken at the same time. Two standards were used for the analysis, as there is no general agreement as to what is normal (Cossart and Vahrman, 1970). Dacie and Lewis consider that the maximum should not exceed 5 mm/1 hr for males and 7 mm/i hr for females (Dacie and Lewis, 1968). Other authorities consider it should be 15 mm/1 hr for both sexes. These figures take into account the variations due to menstruation (Cossart and Vahrman, 1970).

### Serum Glutamate Pyruvate Transaminase (SGPT)

Response to HBV infection [HBV surface antigen (HBsAg) and antibody to HBsAg (anti-HBs)], serum iron, total iron-binding capacity, hematological status (erythrocytes, Hb, and hematocrit), and evidence of liver damage (serum glutamic pyruvic transaminase; aspartate aminotransferase, L-aspartate:2-oxoglutarate

aminotransferase, EC 2.6.1.1) were determined for 201 patients on chronic renal dialysis. Four factors-serum iron level, transminase level, sex, and HBV response [i.e., infected-HBsAg (+) (HBsAg positive), anti-HBs (+) (anti-HBs positive), or no response]-were analyzed simultaneously to test the hypothesis that serum iron is higher in those with HBsAg in their serum than in those without HBsAg, independent of the transaminase level. Four independent, statistically significant two-factor interactions were identified. (i) Serum iron is higher in those HBsAg (+). (ii) Serum iron is higher in those with increased transaminase. (iii) Transaminase is higher in those HBsAg (+). (iv) Males are more likely to be HbsAg (+) and females are more likely to be anti-HBs (+). Also, those who are HBsAg (+) have significantly higher percent iron saturation (serum iron/total iron-binding capacity). That is, the hypothesis was supported by the findings. Several additional biological hypotheses are suggested, including a possible role of increased iron levels in susceptibility and response to HBV infection and the possible relationship between higher iron levels and the likelihood of HBV infection progressing to primary hepatocellular carcinoma (Craig Felton *et al*., 1979).

## Platelet

Platelets play a central role in primary hemostasis. Quantitative abnormalities of platelets are known to occur in chronic liver disease. The study was carried out to determine the abnormalities of platelet count in various forms of Hepatitis B virus-related liver disease (Nwokediuko and Ibegbulam, 2009).

Abnormalities of platelet count occur in HBV-related liver disease. Patients with liver cirrhosis tend to have lower platelet count while patients with HCC tend to have higher counts. Thrombocytosis may be a paraneoplastic manifestation of HCC (Nwokediuko and Ibegbulam, 2009).

High IPF% (immature platelet fraction %) during the course of thrombocytopenia suggests that platelet destruction/sequestration due to hypersplenism is a major factor contributing to thrombocytopenia in patients with CHB (Dou *et al*., 2014).

## Materials and Methods

### Materials

**Study Population:** 50 Hepatitis B Virus infected patients.
**Study design:** Cross-sectional based study.
**Sample collection:** Samples were collected and analyzed in Dhaka Central International Medical College, Bangladesh.
**Duration:** March 2017 to June 2018.

### Methods

#### Red Blood Cell (RBC), White Blood Cell (WBC) and Platelet Count

The Sysmex XT-2000i Automated Hematology Analyzer is used to count RBC, WBC and PLT which utilizes the power of fluorescent flow cytometry and hydrodynamic focusing technologies. Using a unique, diode laser bench, Sysmex fluorescent flow cytometry provides the sensitivity needed for measuring and differentiating cell

types in whole blood and body fluid samples (Mohammad Asaduzzaman *et al*. 2017).

### a) RBC Count

Sysmex analyzer XT-2000i uses the DC sheath flow detection method to count red blood cells and platelets, RBC and PLT. A portion of blood is separated from the aspirated whole blood and mixed with the diluent in a pre-set ratio (Mohammad Asaduzzaman *et al*. 2017).

Of this dilution a defined amount is sent to the detection chamber and passed through a small opening, known as the aperture. There are also electrodes on each side of the aperture-and direct current passes through these electrodes. The direct current resistance between the electrodes changes as blood cells suspended in the diluent pass through the aperture. This resistance causes an electrical pulse change proportional to the size of the blood cell. These electrical data are converted into graphical displays of volume distribution curves, or histograms. Once the cells leave the sample nozzle exit they are surrounded by a sheath flow of diluent. Here, they are aligned and moved to the centre of the orifice. This reduces interference errors and the possibility of abnormal cell pulse detection, which could be caused by cells passing through the transducer off-centre. As soon as the cells have passed the orifice, they are seized by another, inverse flow and immediately led to the drain. This prevents renewed circulation and a change in the platelet count (Mohammad Asaduzzaman *et al*. 2017).

### b) WBC Count

Sysmex analyzer XT-2000i counts WBC by using the combination of side scatter (cell complexity), forward scatter (cell size) and fluorescence (DNA and RNA concentration) of nucleated cells provides a concise and precise image of each detected peripheral blood cell. This 3-dimensional blood cell analysis provides unique accuracy and precision. Fluorescence labeling of peripheral blood cells is a milestone for the routine leukocyte differential. Fluorescent technology enables the XT to reliably differentiate normal WBC populations from abnormal WBC populations. The sensitivity of the unique application of fluorescent flow cytometry gives the lab a high level of confidence in reporting accurate WBC differentials, even on critical patient samples when the WBC count is low (Mohammad Asaduzzaman *et al*. 2017).

### c) Hemoglobin Measurement

Sysmex analyzer XT-2000i uses the SLS detection method to measure the content of blood hemoglobin. Sodium Lauryl Sulphate (SLS) is a surfactant which both lyses erythrocytes and rapidly forms a complex with the released hemoglobin. The product SLS-MetHb (Methemoglobin) is stable for a few hours and has a characteristic spectrum with maximum absorbance at 539 nm. The complex obeys Beer-Lambert's law so there is precise linear correlation between Hb concentration and absorbance of SLS-MetHb.The method simply involves mixing 25 µL of blood with 5.0 mL of a 2.08-mmol/L solution of SLS (buffered to pH of 7.2), and reading

absorbance at 539 nm. The results of ctHb (total hemoglobin concentration) by the SLS-Hb method have been shown to correlate very closely (r=0.998) with the reference HiCN (hemoglobincyanide) method. The method has been adapted for automated hematology analyzers and is as reliable in terms of both accuracy and precision as automated HiCN methods. A major advantage is that the reagent is non-toxic. It is also less prone to interference by lipemia and increased concentration of leukocytes. The long-term instability of SDS-MetHb precludes its use as a standard so the method must be calibrated with blood whose ctHb has been determined using the reference HiCN method (Mohammad Asaduzzaman *et al*. 2017).

## Random Blood Sugar

For random blood sugar investigation blood was collected from a vein, typically from the inside of our elbow or from the back of our hand. This investigation was carried out by manual and automated methods. 2ml of Venus blood was collected into BD Vacutainer™ Plastic Blood Collection Tubes with a specific amount of Sodium Fluride/Na2 EDTA. Then wait for few minute. This blood sample was centrifuged for the separation of plasma from blood. Plasma was collected and put on the sample cup for test. For manual method 1 ml of (glucose oxide) sugar reagent was taken into a sample test tube and added 10µl blood plasma from the sample cup; and wait for 10 minutes. Absorbance was taken after 10 minutes by semi-auto analyzer. For automated method aliquot of the blood plasma in the sample cup was put into the analyzer to get the random blood sugar concentration (Mohammad Asaduzzaman *et al*. 2017).

## ESR Method

When anticoagulated whole blood was allowed to stand in a narrow vertical tube for a period of time, the RBCs- under the influence of gravity- settle out from the plasma. The rate at which they settle was measured as the number of millimeters of clear plasma present at the top of the column after one hour (mm/hr) (Erythrocyte sedimentation rate (ESR), cited 2018 July 27).

There are two main methods used to measure the ESR: the Westergren method and the Wintrobe Method. Each method produces slightly different results. Most laboratories use the Westergren method (Erythrocyte sedimentation rate (ESR), cited 2018 July 27).

## Westergren Method

The Westergren method requires collecting 2 ml of venous blood into a tube containing 0.5 ml of sodium citrate. It should be stored no longer than 2 hours at room temperature or 6 hours at 4 °C. The blood was drawn into a Westergren-Katz tube to the 200 mm mark. The tube was placed in a rack in a strictly vertical position for 1 hour at room temperature, at which time the distance from the lowest point of the surface meniscus to the upper limit of the red cell sediment was measured. The distance of fall of erythrocytes, expressed as millimeters in 1 hour, was the ESR (Erythrocyte sedimentation rate (ESR), cited 2018 July 27).

### SGPT Test Method

**Method:** IFCC method without pyridoxal phosphate (P-51 -P) Kinetic. UV (SGPT, 2018).

**Sample:** Serum

**Machine:** Dimension EXL with LM Integrated Chemistry System

### Data Analysis:

IBM's SPSS software PASW Statics 18 and Microsoft Office Excel 2007 were used for analyzing the data.

### Results

In this study 50 HBV infected patients participated and among them 38 participants were male and 12 patients were female. In the male subjects 2.63% (1) were in the 0-10 years age group. 10.53% (4), 44.74% (17), 21.05% (8), 7.89% (3), 10.53% (4) and 2.63% (1) male participants were in the 10-20, 20-30, 30-40, 40-50, 50-60 and 60-70 years age group consecutively. In the female subjects 0.00% (0) were in the 0-10years age group. 0.00% (0), 50.00% (6), 25.00% (3), 8.33% (1), 8.33% (1) and 8.33% (1) female participants were in the 10-20, 20-30, 30-40, 40-50, 50-60 and 60-70 years age group consecutively. For male highest number of patients found in the 20-30 years age group and then 30-40, 10-20/50-60 years age group. For female highest number of patients found in the 20-30 years age group and then 30-40 years age group (Table-1).

**Table 1. Sex distribution of HBV infected patients (n=50) among different age groups**

| | | Age (years) | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | |
| Sex | Male | 1 | 4 | 17 | 8 | 3 | 4 | 1 | 38 |
| | % | 2.63 | 10.53 | 44.74 | 21.05 | 7.89 | 10.53 | 2.63 | 100.00 |
| | Female | 0 | 0 | 6 | 3 | 1 | 1 | 1 | 12 |
| | % | 0.00 | 0.00 | 50.00 | 25.00 | 8.33 | 8.33 | 8.33 | 100.00 |
| Total | | 1 | 1 | 4 | 23 | 11 | 4 | 5 | 2 |
| % | | 2.00 | 2.00 | 8.00 | 46.00 | 22.00 | 8.00 | 10.00 | 4.00 |

In respect of the male subjects 60.53% (23) were with standard Hb content, 10.53% (15) with less than the standard content. Scenario was little bit same for female subjects. 52.00% (26) with the standard content; and 48.00% (24) with less than the standard content (Table-2).

Table 2. Hb level in the male (n=38) and female (n=12) participants

| Male | | | Female | | | Total |
|---|---|---|---|---|---|---|
| Hb (g/dl) | | Number | Hb (g/dl) | | Number | |
| Reference Range | 13-17 | 23 | Reference Range | 12-15 | 3 | 26 |
| | | 60.53% | | | 25.00% | 52.00% |
| <Reference Range | <13 | 15 | <Reference Range | <12 | 9 | 24 |
| | | 10.53% | | | 75.00% | 48.00% |
| Total | | 38 | | | 12 | 50 |
| | | 76.00% | | | 24.00% | 100.00% |

Among the male subjects 65.79% (25) were with less than standard RBC count, 23.68% (9) with standard and 10.53% (4) with above the standard count. Scenario was not same for female subjects. 50.00% (6) with less than the standard count; and 50.00% (6) with standard and 0.00% (0) with above the standard count (Table-3).

Table 3. RBC count in the male (n=38) and female (n=12) participants

| Male | | | Female | | | Total |
|---|---|---|---|---|---|---|
| RBC (millions cell/µL) | | Number | RBC (millions cell/µL) | | Number | |
| Reference Range | 4.5-5.5 | 9 | Reference Range | 4-5 | 6 | 15 |
| | | 23.68% | | | 50.00% | 30.00% |
| <Reference Range | <4.5 | 25 | <Reference Range | <4 | 6 | 31 |
| | | 65.79% | | | 50.00% | 62.00% |
| >Reference Range | >5.5 | 4 | >Reference Range | >5 | 0 | 4 |
| | | 10.53% | | | 0.00% | 8.00% |
| Total | | 38 | | | 12 | 50 |
| | | 76.00% | | | 24.00% | 100.00% |

68.42% (26) male participants were with standard RBC count, 21.05% (4) with less than the standard and 10.53% (4) were with above the standard count. Among the female subjects 41.67% (5) female were with standard RBC count; and 25.00% (3) with less than the standard and 33.33% (4) with above the standard count (Table-4).

Table 4. RBS level in the male (n=38) and female (n=12) participants

| RBS (4.4-7.8mmol/l) | | Sex | | Total |
|---|---|---|---|---|
| | | Male | Female | |
| Reference Range | 4.4-7.8 | 26 | 5 | 31 |
| | | 68.42% | 41.67% | 62.00% |
| <Reference Range | <4.4 | 8 | 3 | 11 |
| | | 21.05% | 25.00% | 22.00% |
| >Reference Range | >7.8 | 4 | 4 | 8 |
| | | 10.53% | 33.33% | 16.00% |
| Total | | 38 | 12 | 50 |
| % | | 76.00% | 24.00% | 100.00% |

In Fig-1 it was found that 57.90% male (22) and 50.00% female (6) patients count for WBC was normal. These counts were above the range for 42.10% male (16) and 50.00% female (6).

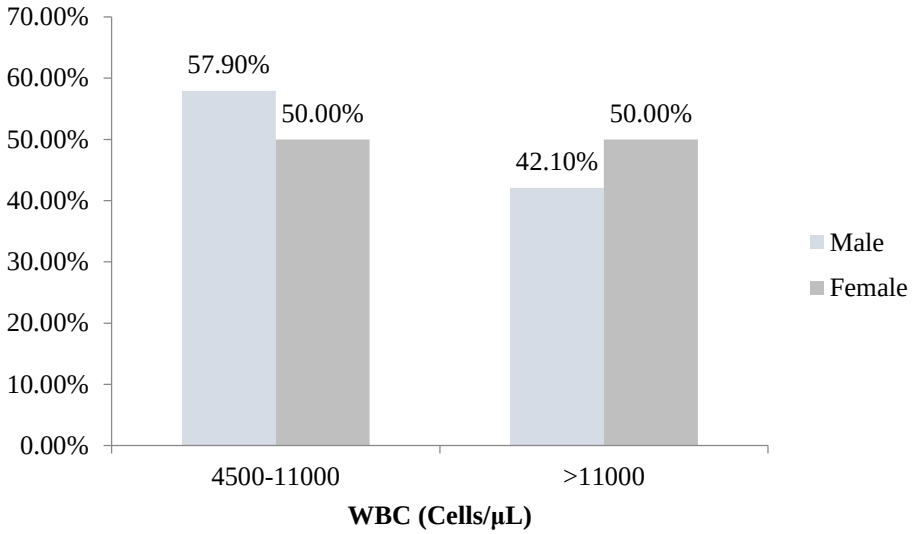


**Figure 1.** WBC count in the male (n=38) and female (n=12) participants

In the male subjects 44.74% (17) were with standard Neutrophils count, 0.00% (0) with less than standard and 55.26% (21) with above the standard count. Scenario was same for female subjects. 41.67% (5) with the standard count; and 56.00% (7) with more than the standard count (Table-5).

**Table 5. Neutrophils count in the male (n=38) and female (n=12) participants**

| Neutrophils | | Sex | | Total |
|---|---|---|---|---|
| | | Male | Female | |
| **Reference Range** | 40-60% | 17 | 5 | 22 |
| | | 44.74% | 41.67% | 44.89% |
| **<Reference Range** | <40% | 0 | 0 | 0 |
| | | 0.00% | 0.00% | 0.00% |
| **>Reference Range** | >60% | 21 | 7 | 28 |
| | | 55.26% | 58.33% | 56.00% |
| **Total** | | 38 | 12 | 50 |
| **%** | | 76.00% | 24.00% | 100.00% |

It was found that among the male subjects 89.47% (34) were with standard Lymphocytes count, 7.89% (3) with less than standard and 2.63% (1) with above the standard count. Scenario was same for female subjects. 83.33% (10) with the standard count; and 8.33% (1) with less than the standard and 8.33% (1) with more than the standard count (Table-6).

Table 6. Lymphocytes count in the male (n=38) and female (n=12) participants

| Lymphocytes | | Sex | | Total |
|---|---|---|---|---|
| | | Male | Female | |
| Reference Range | 20-40% | 34 | 10 | 44 |
| | | 89.47% | 83.33% | 88.00% |
| <Reference Range | <20% | 3 | 1 | 5 |
| | | 7.89% | 8.33% | 8.00% |
| >Reference Range | >60% | 1 | 1 | 2 |
| | | 2.63% | 8.33% | 4.00% |
| Total | | 38 | 12 | 50 |
| % | | 76.00% | 24.00% | 100.00% |

In our analyzed samples It was found that 100.00% male subjects (38) and 100.00% female subjects (12) were with standard monocytes count (Table-7).

Table 7. Monocytes count in the male (n=38) and female (n=12) participants

| Monocytes | | Sex | | Total |
|---|---|---|---|---|
| | | Male | Female | |
| Reference Range | 2-8% | 38 | 12 | 50 |
| | | 100.00% | 100.0% | 100.00% |
| <Reference Range | <2% | 0 | 0 | 0 |
| | | 0.00% | 0.00% | 0.00% |
| >Reference Range | >6% | 0 | 0 | 0 |
| | | 0.00% | 0.00% | 0.00% |
| Total | | 38 | 12 | 50 |
| % | | 76.00% | 24.00% | 100.00% |

Regarding eosinophils count among the male subjects 78.95% (30) were with standard count, 0.00% (0) with less than standard and 21.05% (8) with above the standard count. Scenario was same for female subjects. 75.00% (9) with the standard count; and 0.00% (0) with less than the standard and 25.00% (3) with more than the standard count (Table-8).

Table 8. Eosinophils count in the male (n=38) and female (n=12) participants

| Eosinophils | | Sex | | Total |
|---|---|---|---|---|
| | | Male | Female | |
| Reference Range | 1-4% | 30 | 9 | 39 |
| | | 78.95% | 75.00% | 78.00% |
| <Reference Range | <1% | 0 | 0 | 0 |
| | | 0.00% | 0.00% | 0.00% |
| >Reference Range | >4% | 8 | 3 | 11 |
| | | 21.05% | 25.00% | 22.00% |
| Total | | 38 | 12 | 50 |
| % | | 76.00% | 24.00% | 100.00% |

Normal platelet range is 150,000-450,000 cells/µl. Platelet count found normal for 100.00% male and female subjects (Table-9).

**Table 9. Platelet count in the male (n=38) and female (n=12) participants**

| Platelets | | Sex | | Total |
|---|---|---|---|---|
| | | Male | Female | |
| Reference Range | 150,000-450,000 | 38 | 12 | 50 |
| | | 100.00% | 100.00% | 100.00% |
| <Reference Range | <1% | 0 | 0 | 0 |
| | | 0.00% | 0.00% | 0.00% |
| >Reference Range | >4% | 0 | 0 | 0 |
| | | 0.00% | 0.00% | 0.00% |
| Total | | 38 | 12 | 50 |
| % | | 76.00% | 24.00% | 100.00% |

Normal range of ESR for male is 0-10mm/hr for male. It was found that among the male subjects 42.11% (16) were with standard ESR, 57.90% (22) with more than the standard. Scenario was 50-50 for female subjects. 50.00% (6) with the standard count 0-20mm/hr and 50.00% (6) with more than the standard count 0-20mm/hr (Table-10).

**Table 10. ESR in the male (n=38) and female (n=12) participants**

| Male | | | Female | | | Total |
|---|---|---|---|---|---|---|
| ESR (mm/hr) | | Number | ESR (mm/hr) | | Number | |
| Reference Range | 0-10 | 16 | Reference Range | 0-20 | 6 | 22 |
| | | 42.11% | | | 50.00% | 44.00% |
| >Reference Range | >10 | 22 | >Reference Range | >20 | 6 | 28 |
| | | 57.90% | | | 50.00% | 56.00% |
| Total | | 38 | | | 12 | 50 |
| | | 76.00% | | | 24.00% | 100.00% |

Normal range of SGPT for male and female is 0-42units/l. It was found that among the male subjects 60.53% (23) were with standard SGPT, 39.47% (15) with more than the standard. Scenario was same for female subjects. 75.00% (9) with the standard value and 25.00% (3) with more than the standard value (Table-11).

**Table 11. SGPT content in the male (n=38) and female (n=12) participants**

| SGPT (units/L) | | Sex | | Total |
|---|---|---|---|---|
| | | Male | Female | |
| Reference Range | 8-42 | 23 | 9 | 32 |
| | | 60.53% | 75.0% | 64.00% |
| >Reference Range | >42% | 15 | 3 | 18 |
| | | 39.47% | 25.00% | 36.00% |
| Total | | 38 | 12 | 50 |
| % | | 76.00% | 24.00% | 100.00% |

## Discussion

The influence of HBV infection on the blood parameters had been studied here by centering blood glucose, SGPT RBC, Hb, WBC, Neutrophils, Lymphocytes, Monocytes, Eosinophils and Platelets. Impaired glucose tolerance and insulin resistance are often observed in HIV-infected patients receiving highly active antiretroviral therapy. In addition, HCV by itself can induce insulin resistance through disturbing the insulin signaling pathway by HCV proteins and subsequent hepatic steatosis. However, the effects, if any, of chronic HBV infection on insulin sensitivity remain unclear. Ding-Shinn Chen *et al.* results showed that age, triglyceride, ALT level, BMI, and fasting plasma glucose were factors significantly correlated with insulin resistance, confirming the association of insulin resistance with obesity, dyslipidemia, and type II diabetes mellitus. Previous reports have shown that serum ALT levels were associated with insulin resistance in obesity and patients with HIV lipodystrophy. Ding-Shinn Chen *et al.* suggested the positive association between serum ALT level and insulin resistance, implying that insulin resistance not only induces lipid accumulation of liver cell, but also correlates with liver injury. In contrast, chronic HBV infection was not correlated with insulin resistance, differing from other viral infections such as HIV and HCV. However, further large-scale studies are needed to confirm these findings.1 In our study we found that 39.47% male and 25.00% female were with higher SGPT; and 10.53% male and 33.33% female were with higher RBS. Our sample size was small and here woman sample size was more small. By considering this small size it is very difficult to make a conclusion that HBV has it's role on RBS. Though the size was small male patients showed significant increase of SGPT in comparison with the female patients.

RDW reflects the variability in circulating RBC size. It is based on the width of the RBC volume distribution curve, with larger values indicating greater variability. RDW is elevated when there is increased red cell destruction, or, more commonly, ineffective red cell production. RDW may represent a nutritional deficiency (e.g. iron, vitamin B12, or folic acid), bone marrow depression, or chronic inflammation. These conditions are often present in patients with liver disease, correlate with the severity of the disease, and are associated with a worse prognosis. In our study, patients with hepatitis B had significantly higher RDW values compared with healthy subjects and CSHB patients had the highest RDW values among the patients. Thus, we speculate that this difference is an important factor that influences the disease progression, and may present an important marker for patients with HBV infection (Lou *et al.*, 2012). Our data reflected significantly decrease in the RBC count for both sexes (male 65.37%, female 50.00%). In case of Hb small fraction of male patients (10.53%) were found with low Hb content but 75.00% woman found with low Hb content though the sample size for woman was too small. Hb result for woman was different from man may due to menstrual cycle. Large sample size is required to get the complete scenario regarding the association between HBV infection and Hb content.

The elevation of inflammatory markers such as WBC/leukocyte, C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) can contribute to diagnose bacterial

infection, but it has few help for diagnose viral infection. The common markers used in clinical to judge the degree of HBV inflammation are alanine aminotransferase (ALT) and HBV-DNA, but those indicators cannot accurately describe the actual status, thus cause to some cases appeared hepatitis B-associated liver cirrhosis (HBV-LC) or hepatitis B-associated hepatocellular carcinoma (HBV-HCC) with the levels of normal ALT and undetected HBV-DNA (Feng *et al.*, 2015). As per Feng *et al.* we found elevated WBC/leucocytes in both sexes (male 42.10%, female 50.00%). From different published article (Nwokediuko *et al.*, 2009; Dou *et al.*, 2014) plate count found low for CHB patients but our result did not match with them. We found platelet count with in the normal range for 100.00% male and female patients. Association between HBV infection versus plate count can establish by following large sample size.

## Conclusion

This study had demonstrated a very mild association between HBV and high blood sugar level, importantly; anemia regarding RBC count largely common in HBV positive patients. Our study summarized that the prevalence of high blood sugar was found for very small no of patients and anemia regarding RBC count found higher in HBV infected patients but anemia regarding Hb content was found quiet normal. Prevalence of high ESR was found in HBV infected patients examined. Half of the HBV patients suffer with high ESR; RBS and SGPT level increased mildly in both the sexes. Elevated WBC, monocytes counts were associated with CHB infection. We find no association between CHB infection and platelet count.

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