



Correlation between Hepatitis B Viral Load and Liver Function Test among Hepatitis B Virus Patients in Khartoum State, Sudan

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ABSTRACT

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Abstract:

Hepatitis B virus (HBV) infection is a global public health problem. Sudan is classified among the countries with high hepatitis B virus seroprevalence. The purpose of this study was to study the correlation between the hepatitis B viral load and the liver function test in hepatitis BV patients. Descriptive cross-sectional hospital based study conducted at the hepatology clinic Ibn Sinaa teaching hospital, covering all the patients who presented to the clinic from March-April 2018, primary data was collected from the patients and/or their care giver, a specifically designed questionnaire was used, and then the data was re-entered into a predesigned data collection form. A P value of 0.05 or less was considered statistically significant. The Data was analyzed using Social Package Statistical Analysis version (24). A total of 83 patients, 19 (22.9%) have viral load level less than 20 IU/ml, 33(39.8%) have viral ranging between (20-2000IU\ML), 13 (15.6%) have viral load between (2000-20,000IU\ML) and 18(21.7%) have viral load more than 20,000IU\ML). The study showed a significant correlation between hepatitis B viral load and alanine aminotransferase level (ALT) with a P value of 0.027. The study showed a significant correlation between hepatitis B viral load and aspartate aminotransferase level (AST) with a P value of 0.009. The study also showed there was a significant relation between hepatitis B viral load and serum albumin level with a P value of 0.007. Hepatitis B viral load was not affected by the age, gender or the duration of the disease. The liver function tests is recommended to be used as an indicator for the hepatitis B viral load and the degree of liver inflammation.

1.0 Introduction

Hepatitis B virus (HBV) is a species of the genus Orthohepadnavirus which is a member of the hepadnaviridae family of small enveloped, primarily hepatotropic DNA viruses. The virus particle, called Dane particle (virion), consists of an outer lipid envelope and an icosahedral nucleocapsid core composed of protein. The nucleocapsid encloses the viral DNA and a DNA polymerase that has reverse transcriptase activity similar to retroviruses. Hepatitis B virus replicates by reverse transcription. The outer envelope contains embedded proteins which are involved in viral binding, and entry into susceptible cells. The virus is one of the smallest enveloped animal's viruses with a virion diameter of 42 nm, however pleomorphic forms exist as filamentous and spherical bodies that lack a core. These particles are not infectious and are composed of the lipid and protein that

forms part of the surface of the virion, which is called the surface antigen (HBsAg), which is produced in excess during the life cycle of the virus. The viral DNA is partially double-stranded (incomplete and complete circle). The long strand encodes seven proteins from four overlapping reading frames (S, surface (Pre-S1, Pre-S2, S); c, core (Pre-C, C) P, polymerase (P) and X gene (X) (Seeger and Mason, 2015; Tong and Reville, 2016).

Hepatitis B virus (HBV) infection is a global public health problem. Approximately 240 million people are chronic HBV surface antigen(HBsAg) carriers, with a large regional variation in the prevalence of HBV carriers which varies from 0.1 percent to 2 percent in low prevalence areas (United States and Canada, Western Europe, Australia and New Zealand)(Schweitzer *etal.*,2013) to 3 to 5 percent in intermediate prevalence areas (Mediterranean countries,

Japan, Central Asia, Middle East, and Latin and South America) and to 10 to 20 percent in high prevalence areas (southeast Asia, China, sub-Saharan Africa)(Ott *et al.*,2012). WHO estimates that hepatitis B virus infection results in 1–2 million deaths every year. The number of hepatitis B related deaths due to liver cirrhosis and/or hepatocellular carcinoma (HCC) increased between 1990 and 2013 by 33% worldwide (Stanaway *et al.*, 2013).

Sudan is classified among the highest countries with hepatitis B virus seroprevalence (Mudawi, 2008). The exposure to the virus varied from 47%-78%, with a hepatitis B surface antigen prevalence that varies from 6.8% in central Sudan to 26% in southern Sudan. The pervuous studies pointed that in southern Sudan the infection occurs at early age while there is a trend of increasing infection rate with increasing age in northern Sudan. Hepatitis B virus was the commonest cause of chronic liver disease and hepatocellular carcinoma , also it was the second commonest cause of acute liver failure in the Sudan. The studies of hepatitis C virus showed a low seroprevalence of 2.2%-4.8% and no association with schistosomiasis or with parenteral antischistosomal therapy. Hepatitis B virus was the commonest cause of acute hepatitis among pediatric, adult, and displaced populations. There has been a recent introduction of screening of blood and blood products for hepatitis B virus and hepatitis C virus infections and hepatitis B virus vaccine as part of the extended program of immunization. This is expected to reduce the infection rate of these viruses in the Sudan (Mudawi, 2008).

This study was done to correlate between hepatitis B viral load and liver function test in hepatitis BV patients in hepatology clinic Ibn Sinaa teaching hospital.

2.0 Materals and Mehtods

Study design, period and area: A descriptive cross-sectional hospital-based study was conducted in a period from March to April 2018 at the Hepatology Referral Clinic in Ibn Sina Specialized Hospital, Khartoum, Sudan. The study population were the hepatitis B infected individuals attended referral clinic in the study area during the period of the study.

Inclusion and exclusion criteria: All patients who were known to have hepatitis B virus infection who attended the hepatology referral clinic at Ibn sinaa specialized hospital during the study period were included in this study . Alcoholic liver disease and hepatitis C infected patients were excluded.

Data collection: The eligible patients with HBV infection were concented then interviewed by taking their clinical history and doing their physical examination. The concent was a signed Informed and written consent, which was obtained from the patients and or their legal guardians for minors. The data was collected from the patient’s interviews and patients records in especially designed questionnaires.

Data analysis: Data was analyzed using statistical package for social science (SPSS) software version 24. The analysis was done for the dependant and independent variables with Chi-square test. The P value of less than 0.05 is considered statistically significant (Confidence Interval: CI 95%). The results were expressed in tables and figures.

Ethical considerations: This was obtained from the SUMASRI International Review Board (SIRB). The

permission to conduct the study was obtained from the study area while the written consents were taken from all participants.

3.0 Results:

Eighty-three (83) proven participants with hepatitis B infection from heptology clinic , Ibn sinaa teaching hospital were included in this study. The age of the study participant ranges between 14 and 87 years. The commonest age group affected is between 41 to 60, who represent 43% of the study participant. Figure(1).

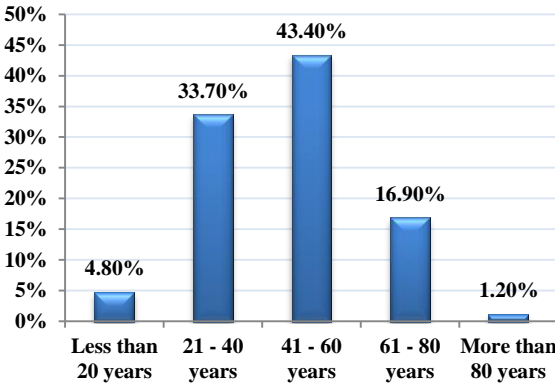


Figure 1 : Distribution of study population according to age

Fifty seven patients are males (68.6%) and twenty six patients are females (31.3%), with a ratio of 2.2:1. Figure (2).

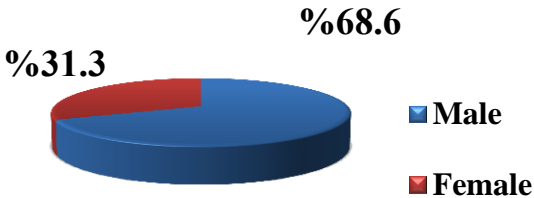


Figure 2: Distribution of study population according to the gender

Among the study participants 44(53%) have had the disease for less than a year, 33(39.8%) have had it for 1-5 years , (6%) have had it for 6-10 year and only 1(1.2%) has had virus for more than 10 years .Table (1).

Table 1: Duration of infection among patients

Duration	Frequency	Percent
Less than 1 year	44	53.0%
1 - 5 years	33	39.8%
6 - 10 years	5	6.0%
More than 10 years	1	1.2%
Total	83	100%

26 (31.3%) of the study participant are on treatment for the infection and 57(68.7%) are not on treatment. Table(2).

Table 2: Description of the participant on treatment

On treatment	Frequency	Percent
Yes	26	31.3%
No	57	68.7%
Total	83	100%

11(42.3%) of the participant are on treatment for less one year , 9 (34.6%) are on treatment for (1-3) years and 6 (23.1%) are on treatment for more than 3 years. Table (3).

Table 3: Description of participant duration of treatment

long used treatment	Frequency	Percent
0 - < 1 years	11	42.3%
1 - < 3 years	9	34.6%
3 years and more	6	23.1%
Total	26	100%

The commonest drug used is lamivudine(19 (73%) of the participant). Also only 5 (19.2%) of the participant are on Entecavir. While 2 (7.7%) are on tenofovir. Table(4).

Table 4: Description type of the Drug received

Drug received	Frequency	Percent
Tenofovir	2	7.7%
Entecavir	5	19.2%
Lamivudine 100mg	19	73.1%
Total	26	100%

In this study 19 (22.9%) have a viral load of less than 20 IU\ml, 33(39.8%) have a viral load of 20-2000IU\ML , 13 (15.6%) have a viral load between 2000-20,000IU\ML, 18 (21.7%) have a viral load of more than 20,000IU\ML. Table (5).

Table 5: Distribution of hepatitis B viral load

Hepatitis B viral load level	Frequency	Percent
Less than20	19	22.9%
20-2000	33	39.8%
2000-20,000	13	15.6%
More than 20,000	18	21.7%
Total	83	100%

There is no statistically significant differences in hepatitis B viral load level in the different age groups , gender , and duration of treatment with a p value of 0.386 for age , 0.551 for gender ,0.455 for residence and 0.113 for duration of treatment .Table (6,7,8)respectively.

Table 6: Cross tabulation between Hepatitis B viral load & Age

Age	Hepatitis B viral load				Total	P value
	Less than 20	20 - < 2,000	2,000 - < 20,000	More than 20,000		
Less than 20 years	0 (0.0%)	3 (75.0%)	0 (0.0%)	1 (25.0%)	4 (100%)	0.386
21 - 40 years	6 (21.4%)	11 (39.3%)	4 (14.3%)	7 (25.0%)	28 (100%)	
41 - 60 years	6 (16.7%)	13 (36.1%)	8 (22.2%)	9 (25.0%)	36 (100%)	
61 - 80 years	6 (42.9%)	6 (42.9%)	1 (7.1%)	1 (7.1%)	14 (100%)	
More than 80 years	1 (100%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (100%)	
Total	19 (22.9%)	33 (39.8%)	13 (15.7%)	18 (21.7%)	83 (100%)	

Table 7 : Cross tabulation between Hepatitis B viral load & Sex

Sex	Hepatitis B viral load				Total	P value
	Less than 20	20 - < 2000	2,000 - < 20,000	More than 20,000		
Male	13 (22.8%)	20 (35.1%)	10 (17.5%)	14 (24.6%)	57 (100%)	0.551
Female	6 (23.1%)	13 (50.0%)	3 (11.5%)	4 (15.4%)	26 (100%)	
Total	19 (22.9%)	33 (39.8%)	13 (15.7%)	18 (21.7%)	83 (100%)	

43.5% of the participants who have elevated ALT levels have a viral load more 20,000IU/ml compared to 43.3% of those with normal ALT whose viral load is between 20-2000IU/ml with a p- value of 0.027. Table (9).

Table 9 : Cross tabulation between hepatitis B viral load &ALT elevated

ALT elevated	Hepatitis B viral load				Total	P value
	Less than 20	20 - <2000	2,000 - < 20,000	More than 20,000		
No	16 (26.7%)	26 (43.3%)	10 (16.7%)	8 (13.3%)	60 (100%)	0.027
Yes	3 (13.0%)	7 (30.4%)	3 (13.0%)	10 (43.5%)	23 (100%)	
Total	19 (22.9%)	33 (39.8%)	13 (15.7%)	18 (21.7%)	83 (100%)	

42.3% of the participants who have elevated AST level have a viral load of more than 20,000IU/ml compared to 40.4% of those with normal ALT levels whose viral load is between 20-2000IU/ml with a p- value of 0.009. Table (10).

Table 10: Cross tabulation between hepatitis B viral load & AST elevated

AST elevated	hepatitis B viral load				Total	P value
	Less than 20	20 - <2000	2,000 - < 20,000	More than 20,000		
No	17 (29.8%)	23 (40.4%)	10 (17.5%)	7 (12.3%)	57 (100%)	0.009
Yes	2 (7.7%)	10 (38.5%)	3 (11.5%)	11 (42.3%)	26 (100%)	
Total	19 (22.9%)	33 (39.8%)	13 (15.7%)	18 (21.7%)	83 (100%)	

There is no statistically significant differences in hepatitis B viral load level in ALP level with p value (0.227) .Table (11).

Table 11 : Cross tabulation between hepatitis B viral load &ALP elevated

ALP elevated	Hepatitis B viral load				Total	P value
	Less than 20	20 - < 1000	2,000 - < 20,000	More than 20,000		
Yes	1 (7.7%)	6 (46.2%)	1 (7.7%)	5 (38.5%)	13 (100%)	0.227
No	18 (25.7%)	27 (38.6%)	12 (17.1%)	13 (18.6%)	70 (100%)	
Total	19 (22.9%)	33 (39.8%)	13 (15.7%)	18 (21.7%)	83 (100%)	

39.3% of the participant who have low albumin levels have a viral load of more than 20,000IU/ml compared to those with normal albumin levels . 30.9% have a viral load of less than 20IU /ml and 43.6% have a viral load varies between 20-20000IU/ml with a p- value of 0.007.Table (12).

Table 12: Cross tabulation between hepatitis B viral load & albumin

Albumin	Hepatitis B viral load				Total	P value
	Less than 20	20 - <2000	2,000 - < 20,000	More than 20,000		
Abnormal(LOW)	2 (7.1%)	9 (32.1%)	6 (21.4%)	11 (39.3%)	28 (100%)	0.007
Normal	17 (30.9%)	24 (43.6%)	7 (12.7%)	7 (12.7%)	55 (100%)	
Total	19 (22.9%)	33 (39.8%)	13 (15.7%)	18 (21.7%)	83 (100%)	

There is no statistically significant difference in hepatitis B viral load levels in relation to the bilirubin levels (total and direct), alpha fetoprotein levels and liver status in the US scan of with a p value of 0.833 for the total bilirubin , 0.937 for the direct bilirubin , 0.35 for the alpha fetoprotein and 0.465 for the liver status in the US scans.Table (13,14,)

Table 13: Cross tabulation between Hepatitis B viral load and bilirubin (total)

Bilirubin	Hepatitis B viral load				Total	P value
	Less than 20	20 - < 1000	2,000 - < 20,000	More than 20,000		
Normal	11 (20.8%)	23 (43.4%)	8 (15.1%)	11 (20.8%)	53 (100%)	0.833
Abnormal	8 (26.7%)	10 (33.3%)	5 (16.7%)	7 (23.3%)	30 (100%)	
Total	19 (22.9%)	33 (39.8%)	13 (15.7%)	18 (21.7%)	83 (100%)	

Table 14: Cross tabulation between hepatitis B viral load and bilirubin (direct)

bilirubin	Hepatitis B viral load				Total	P value
	Less than 20	20 - < 1000	2,000 - < 20,000	More than 20,000		
Normal	15 (23.1%)	25 (38.5%)	10 (15.4%)	15 (23.1%)	65 (100%)	0.937
Abnormal	4 (22.2%)	8 (44.4%)	3 (16.7%)	3 (16.7%)	18 (100%)	
Total	19 (22.9%)	33 (39.8%)	13 (15.7%)	18 (21.7%)	83 (100%)	

4. Discussion

This study aimed to determine the correlation between hepatitis B viral load and liver function tests including the liver aminotransferase, alkaline phosphatase, albumin level and bilirubin. In addition the study determine hepatitis B viral load in a correlation to the ultrasound finding of liver status, alpha fetoprotein levels, age, sex, residency and duration of the disease. The study was conducted at Ibn sinaa specialized hospital in hepatology refer clinic from March to April 2018. The study covered 83 participants. On the available National studies none of the previous studies correlated these variables to hepatitis B viral load. In our study the gender distribution was male dominance, Males were 57(68.7%) and females were 26 (31.3%) with male to female ratio of 2.2: 1. Most of the participants (36(43.4%)) were age between 41-60 years and 28(33.7%) aged between 21-40 years. The youngest age was 14 years and oldest was 87 years. These results were similar to a study done by (Biazar *et al.*, 2015), which showed the mean age of the patients was 32.8±10 years and 24 (80%) patients were males. In this study, 19 participants (22.9%) have less than 20 IU/ml, 33 participants (39.8%) have a viral load between 20-2000IU/ml, 13 participants (15.6%) have a viral load between 2000-20,000IU/ml and 18 participants (21.7%) have viral a load of more than 20,000IU/ml. This study showed a significant correlation between the hepatitis B viral load and the alanine aminotransferase level (ALT) with a P value 0.027. In a comparison to study conducted at the sixth Hospital Affiliated to Zhejiang Chinese Medicine University, Hangzhou 310015, China and published in (Zhonghua and Bing, 2015). The later showed a significant positive correlation with P value of less than 0.01. This study showed a significant correlation between hepatitis B viral load and aspartate aminotransferase level (AST) with a P value 0.009 in a comparison to study conducted in Cameroon conducted by (Maini and Gehring, 2016). The later showed a significant positive correlation with a P value of less than 0.001. This study showed there was a significant relation between the hepatitis B viral load and the serum albumin level with a P value of 0.007, while there was no correlation with the alkaline phosphatase, the conjugated bilirubin and the ultrasound finding of the liver status with P values of 0.227, 0.937 and 0.465 respectively.

5. Conclusion

The liver function tests especially the aminotransferase enzyme levels and the serum albumin levels are significantly associated with the hepatitis B viral load and they are better predictors of liver inflammation. The age and gender could be independent predictors of hepatitis B infection

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Refereces

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