



Correlation between Serum Alanine Aminotransferase Activity and Immunologic Response and Body Mass Index in Obese Patients with Chronic Hepatitis B Virus Infection



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Abstract

Background & Objective: Chronic B viral hepatitis is a common medical problem all over the world. However, obesity is important risk factors altered immune system response. This study was to examine the correlation between body mass index, serum alanine aminotransferase activity and immunologic response in obese hepatitis B Saudi patients.

Subjects and Methods: One hundred fifty Saudi male patients with hepatitis B viral infection (HBV); their age ranged from 30 to 45 (38.64±7.12) years. Patients were divided in to two equal groups according to their body mass index:

Group (A): Included patients with HBV, their body mass index (BMI) was greater than 30kg/m² (the obese group).

Group (B): Included patients with HBV, their BMI between 20 and 24kg/m² (the normal-weight group).

Results: An elevation of serum alanine aminotransferase (ALT) activity was found to be associated with increased BMI, also we observed an elevation in white blood cells, neutrophils, monocytes, CD3, CD4 and CD8 for group A. CD3, CD4 and CD8 correlated with BMI only as a total amount, as well as with all measured parameters of blood count.

Conclusion: Obesity adversely affects the immunological response and rate of disease progression in HBeAg-negative chronic hepatitis B viral infection

Keywords: Immune system; Obesity; Body mass index; Chronic Hepatitis B virus Infection

Abbreviations: HBV: Hepatitis B Virus; HIV: Human Immuno-Deficiency Virus; ALT: Alanine Aminotransferase; BMI: Body Mass Index; HDL-C: High-Density Lipoprotein-Cholesterol.

Introduction

Hepatitis B virus (HBV) causes inflammation of the liver in humans and is a major public health problem worldwide. About a quarter of the world population (>2 billion) has been infected with HBV [1]. The risk of HBV is 50-100 times more than human immuno-deficiency virus (HIV) [2,3].

Obese subjects usually have abnormal results in liver function test than normal weight subjects [4-6] as obesity induce alterations in the hepatic histological structure as steatosis [7-9] associated with elevation of serum alanine aminotransferase (ALT) [8-9]. However, men with HBV infection have significantly high ALT level [10].

Hepatic cancer and cirrhosis that threaten life are commonly induced by HBV [11]. The Immune responses involved in viral clearance for HBV comprise both humoral and cellular immunity [12]. However, obesity, which is a risk factor in many chronic disorders [13], there is a close relationship between the nutritional status and the immune system performance as some studies reported poor immune system efficiency among obese subjects [14-16]. Hepatic disorders are more common among obese subjects and their response to anti-viral medications are poor among obese subjects with chronic hepatic diseases [17-21].

The purpose of this study was to examine the relationship between body mass index, serum alanine aminotransferase activity and immunologic response in obese patients with HBV infection.

Subjects and Methods

One hundred fifty non-hypertensive, non-cirrhotic Saudi male patients with chronic HBV infection; their age ranged from 30 to 45 (38.64±7.12) years, were randomly selected from Gastroenterology and Hepatology Department, King Abdulaziz University Teaching Hospital, Saudi Arabia between the period of March 2014 and December 2015. Only patients diagnosed with chronic HBV mono-infection and undergo Real-Time polymerase chain reaction who were negative for HBeAg for at least six months ago according to the standards of the American Association for the study of Liver Disease [22]. However, patients with alcoholic liver disease, hepatitis C virus and hepatitis Cirrhosis were excluded. Participants were enrolled according to their body mass index into:

Group (A): Included HBV patients with a BMI more than 25kg/m² (the obese group).

Group (B): Included HBV patients with a BMI between 18.5 and 23kg/m² (the normal-weight group).

Methods

Evaluated Parameters

Flow cytometry analysis: Flow cytometry using Cytomics FC500 and CXP software (Beckman Coulter) was used to measure the leukocyte differentiation antigens CD3, CD4 and CD8 (Beckman Coulter, Marseille, France) .

Analysis of peripheral blood cells: Beckman Coulter AcT 5diff hematology analyzer was used in analysis of peripheral blood cells.

Serum alanine aminotransferase and viral serology tests: Automatic spectrophotometer (Bioclin, Quibasa, Belo Horizonte, MG, Brazil) was used to measure serum alanine aminotransferase.

Body mass index (BMI): Weight and height scale (Metrotype - England) was used to measure weight and height to calculate the body mass index (BMI). Body mass index was calculated by dividing the weight in kilograms by the square of the height in meters (Kg/m²) [23].

Statistical analysis

Independent t-test was used to compare differences between both groups. Statistical analysis of data was performed using SPSS (Chicago, IL, USA) version 17. Pearson or Spearman rank correlation was used to detect the relationship between continuous variables and BMI (P<0.05).

Results

Regarding the demographic variables, the two groups were considered homogeneous (Table 1). The mean age of the obese

group was 39.16±7.33 years, and was 37.64±6.98 years in the normal weight group. There was no significant differences in fasting glucose, triglyceride, total cholesterol, high-density lipoprotein-cholesterol, systolic blood pressure and diastolic blood pressure between the obese and normal-weight groups. However, body weight, body mass index (BMI), alanine aminotransferase (ALT) and HBV viral load were significantly different between the obese and normal-weight groups.

Table 1: Comparison of clinical data between HBV patients in both groups.

	Group (A)	Group (B)
Age (year)	39.16±7.33	37.64±6.98
BMI (kg/m ²)	31.15±4.32*	20.36±4.67
ALT activity (IU/L)	80.78±6.84*	23.31±4.92
Fasting glucose (mg/dL)	103.23±15.63	98.43±16.54
Triglyceride (mg/dL)	132.62±17.54	129.37±12.38
Total cholesterol (mg/dL)	195.21±25.42	192.84±17.52
HDL-C (mg/dL)	50.44±12.60	47.11±14.28
Systolic blood pressure (mm Hg)	120.68±17.73	116.62±13.36
Diastolic blood pressure (mm Hg)	80.23±7.41	77.52±6.93
HBV DNA (IU/mL)	3.57±0.85×10 ⁶ *	5.14±0.64×10 ⁵

BMI: Body Mass Index; ALT: Alanine aminotransferase; HDL-C: High-density lipoprotein-cholesterol

(*) indicates a significant difference between the two groups, P<0.05.

Table 2: Mean value and significance of white blood cells, total neutrophil, monocytes, CD3, CD4 and CD8 count of group (A).

	Group (A)	Group (B)
White blood cells count (10 ⁹ /μL)	9.31±3.41*	5.87±3.11
Total neutrophil count (10 ⁹ /μL)	6.12±2.38*	4.15±2.16
Monocytes (10 ⁹ /μL)	0.58±0.16*	0.37±0.11
CD3 count(10 ⁹ /L)	1.86±0.93*	1.39±0.78
CD4 count(10 ⁹ /L)	1.41±0.85*	1.12±0.76
CD8 count(10 ⁹ /L)	0.82±0.34*	0.51±0.25

(*) indicates a significant difference between the two groups, P<0.05.

The number of white blood cells, total neutrophil count, monocytes, CD3, CD4 and CD8 were significantly elevated in obese individuals when compared with normal controls (Table

2). The Pearson's correlation coefficients test for the relationship between body mass index & ALT activity, white blood cells, total neutrophil count, monocytes, CD3, CD4 and CD8 in both groups showed a strong direct relationship in both groups (Table 3 & 4).

Table 3: Shows the Pearson's correlation coefficients test value and the relationship between the BMI & ALT activity, white blood cells, total neutrophil, monocytes, CD3, CD4 and CD8 count of group (A).

	Pearson's value (r)
ALT activity (IU/L)	0.42*
White blood cells count (10 ⁹ /μL)	0.46*
Total neutrophil count (10 ⁹ /μL)	0.35*
Monocytes (10 ⁹ /μL)	0.32*
CD3 count(10 ⁹ /L)	0.41*
CD4 count(10 ⁹ /L)	0.33*
CD8 count(10 ⁹ /L)	0.34*

ALT: Alanine aminotransferase; Significance was calculated by Spearman or Pearson correlation (2-tailed)

*p<0.05; r, correlation coefficient.

Table 4: Shows the Pearson's correlation coefficients test value and the relationship between the BMI & ALT activity, white blood cells, total neutrophil, monocytes, CD3, CD4 and CD8 count of group (B).

	Pearson's Value (r)
ALT activity (IU/L)	0.41*
White blood cells count (10 ⁹ /μL)	0.42*
Total neutrophil count (10 ⁹ /μL)	0.41*
Monocytes (10 ⁹ /μL)	0.35*
CD3 count(10 ⁹ /L)	0.34*
CD4 count(10 ⁹ /L)	0.31*
CD8 count(10 ⁹ /L)	0.32*

ALT: Alanine aminotransferase; Significance was calculated by Spearman or Pearson correlation (2-tailed), *p<0.05; r, correlation coefficient.

Discussion

As the influence of obesity on the immune system in the HBV Saudi patients is not well known, our study was conducted to explore the relationship between the obesity and immune system in obese HBV Saudi patients. In our study, obese HBV Saudi patients showed elevated ALT activity than HBV patients with normal body weight; our findings are in line with the results of many previous studies as in HBV patients, obesity is associated with elevated ALT activity [24]. Serum alanine aminotransferase (ALT) activity is a standard marker for the limit of hepatocellular damage [25]. Many researches proved that ALT activity is elevated among obese subjects [26-28]. In addition, our results proved that there is an association between BMI and ALT among patients HBV, these results agreed with some previous studies [29-32].

In our study, obese HBV Saudi patients showed increased number of white blood cells, total neutrophil count, monocytes, CD3, CD4 and CD8 than HBV patients with normal body weight

there was a strong direct relationship between body mass index and white blood cells, total neutrophil count, monocytes, CD3, CD4, and CD8 in both groups. Our findings are in line with the results of many previous studies as Moulin et al. [33] who showed in his study that obesity is associated with the altered parameters of immune system as there was elevation in the number of total WBC, monocyte, neutrophil and leukocyte associated with elevated inflammatory cytokines among obese subjects [34-39]. In addition, Kintscher et al [40] reported that there was an association between BMI and number of CD3 and CD4 lymphocytes among obese women. Moreover, Antuna-Puente et al. [41] found a positive correlation between the number of macrophages and BMI in adipose tissue.

Conclusion

Obesity adversely affects the immunological response and rate of HBV progression, therefore control of body weight is important in the management of among patients with HBV.

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