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Correlation of MCP-1 And E-Selectin with Liver Inflammation In Chronic Hepatitis B

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Abstract
Hepatitis B Virus (HBV) infection is a major global health problem as it often progresses to chronic liver diseases both cirrhosis and hepatocellular carcinoma. The viral agent infection in the liver brings about complex interactions concerning inflammation where immune cells, cytokines, and adhesion molecules have critical roles in the evolution of the disease.
The work monitors pertinent applications of Monocyte Chemoattractant Protein-1 and E-selectin in HBV patients through serum levels evaluation and correlation analysis with clinical parameters. Raised levels of MCP- 1 (˜ 0.1690 ± 0.0971 pg/mL) and E-selectin (˜ 0.2569 ± 0.1051 pg/mL) in HBV patients, active hepatic inflammation.
A large positive correlation between MCP-1 and E-selectin ($r = 0.467$, $p < 0.001$) points to a concerted inflammatory reaction in monocyte recruitment and endothelial sticking. No significant correlations with these markers were demographic or renal function parameters, which underscores their specificity in regard to liver inflammation. From these results, it is implied that MCP-1 and E-selectin are useful as biomarkers for monitoring inflammatory activity in chronic HBV infection as well possible therapeutic targets.
Keywords: *Hepatitis B Virus, MCP-1, E-selectin, Liver Inflammation, Biomarkers, Immune Response, Chronic Hepatitis, patients with hepatitis B (HB)*

INTRODUCTION

Hepatitis B Virus (HBV) belongs to the family of Hepadnaviridae, a DNA virus with a partially double-stranded circular genome about 3.2 kb in length(1)(19). The major global health problem is HBV due to high prevalence and potential progression to chronic hepatitis, cirrhosis of the liver, and hepatocellular carcinoma(3). Unique in its replication strategy, it uses reverse transcription; plus, its ability to elude immune responses targeting it in the host leads to persistence of infection(20)(2).
Of the immune mediators, monocyte chemoattractant protein-1 (MCP-1) and E-selectin have previously been reported to play significant roles in the inflammatory response and cellular recruitment to the liver. MCP-1 is a chemokine that attracts monocytes at the site of inflammation (9) (21). E-selectin is one of the adhesion molecules expressed by activated endothelial cells which allow leukocyte rolling and entry into inflamed tissues (7). This study was therefore initiated with the aim to assess MCP-1, and E-selectin levels in HBV infected patients as well as their correlation and association with clinical parameters.

Methods

Study Design and Setting

This study was done at the General Hospitals in Najaf City, Iraq. It was a cross-sectional study to evaluate the level of serum MCP-1 and E-selectin levels in patients with chronic Hepatitis B Virus (HBV) infection. The hospital ethics committee approved this study, and informed consent was taken from all participants before enrollment.

Participants Selection

Fifty patients with true chronic HBV infection were included. Chronicity was defined by the presence of HBsAg for more than six months. The study excluded patients with co-infections (like HCV or HIV), autoimmune liver diseases, malignancies, and immunosuppressive or anti-inflammatory therapies to ensure a focused HBV-only study population

Sample Collection and Handling

A volume of 5 mil of blood was obtained from each participant considering the sterile conditions. Samples were left to clot, centrifuged, and the serum was collected. Aliquots of the serum were stored at –80°C until use.

Biomarker Analysis

Serum levels of MCP-1 and E-selectin were measured using ELISA kits purchased from Sunlong Biotech Co., Ltd., China. The tests were performed accomplished following to the manufacturer's instructions,

and all samples were performed in duplicate to secure accuracy and reproducibility.

Data analysis

Results were illustrated as mean ± standard deviation. Pearson's correlation coefficient was employed to assess the relationships between MCP-1 and E- selectin levels, as well as their associations with clinical variables. A p-value less than 0.05 was recorded as statistically significant (5) .

Results

1. Demographic Characteristics

A total of 50 patients with chronic Hepatitis B Virus (HBV) infection were included in the study. The mean age of participants was 38.2 ± 10.82 years. The largest percentage of patients (46%) were within the 33–48 year age group, followed by 32% in the 16–32 year range, 20% in the 49–64 year group, and only 2% were aged 65 years or older. Results of sex distribution, a noticeable male rate was observed, with 98% (n = 49) of the patients being male and only 2% (n = 1) being female **table 1.**

Table 1. Demographic Characteristics of Patients with Chronic Hepatitis B (n = 50).

Characteristic		Hepatitis B n=50
Age, mean ±SD (years)		38.2±10.82
Age groups (n,%)	16-32 y	16 (32%)
	33-48 y	23 (46%)
	49-64 y	10 (20%)
	65-80 y	1 (2%)
Sex (n,%)	Male	49(98%)
	Female	1(2%)

glomerular filtration rate (GFR) was within the normal range, with a mean value of 127.10 mL/min/1.73m², indicating preserved kidney function in the study population. The standard deviation for GFR showed wider variability compared to urea and creatinine, suggesting individual differences in filtration capacity **Figure**

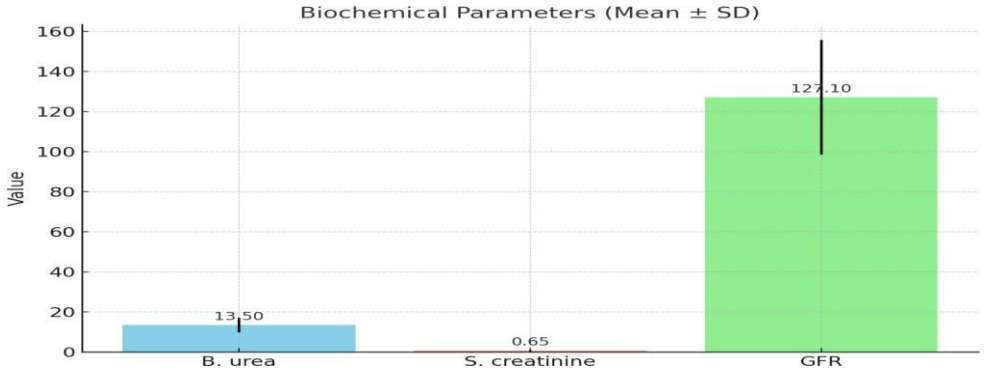

Figure1 biochemical parameters on group HBV.

2- Inflammatory markers

The serum levels of inflammatory markers were quantified in 50 patients with chronic Hepatitis B

infection. The mean concentration of Monocyte Chemoattractant Protein-1 (MCP-1) was 0.1690 ± 0.0971 pg/mL, while the mean level of E-selectin was 0.2569 ± 0.1051 pg/mL. Both markers showed statistically significant elevations ($p < 0.001$), indicating an active inflammatory response in these patients **table 2**.

Characteristic	N	Mean	Std. Deviation	Significance p. value
Mcp1	50	0.1690	0.09714	0.000
E.Selectine	50	0.2569	0.10506	0.000

Table 2. Serum Levels of MCP-1 and E-selectin in Patients with Chronic Hepatitis B.

As shown in Figure 2, a positive correlation was observed between serum levels of Monocyte Chemoattractant Protein-1 (MCP-1) and E-selectin among patients with chronic Hepatitis B infection. The scatter plot illustrates a consistent upward trend, indicating that higher levels of E-selectin are associated with increased MCP-1 levels. Statistical analysis confirmed a significant positive correlation ($r = 0.467$, $p < 0.001$), suggesting a coordinated inflammatory response.

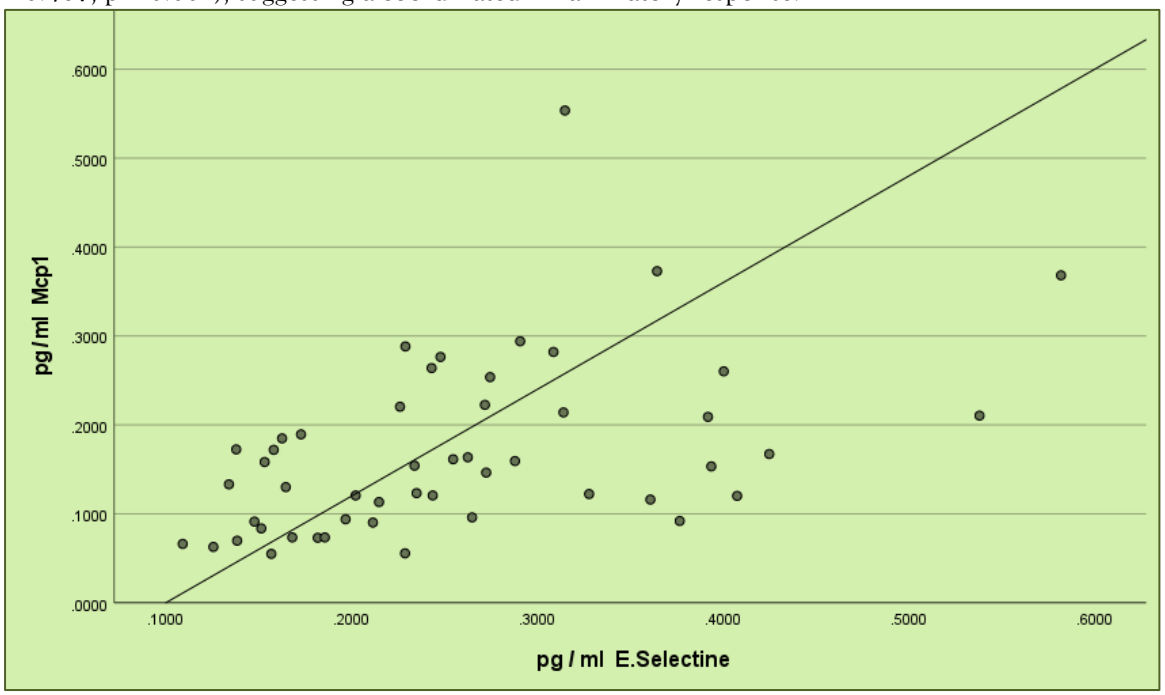

Figure 4.7: Correlation between E-selectine and MCP-1 in Patients with Hepatitis B

Correlation analysis revealed that neither Monocyte Chemoattractant Protein-1 (MCP-1) nor E-selectin levels were significantly associated with key clinico-demographic parameters in the HBV-infected group **table 3**. Specifically, there was no significant correlation between MCP-1 and age (r= –0.060, , sex (r = 0.046, p = 0.625), or history of hypertension (r = 0.012, p = 0.934). Similarly, E-selectin levels showed no significant association with age (r = –0.180, p = 0.212), sex (r = 0.042, p = 0.668), or hypertension (r = 0.073, p = 0.614).

Table 3. Correlation of MCP-1 and E-selectin with Clinico- Demographic Characteristics in Chronic HBV Patients

Characteristic	MCP-1		E-selectine	
	r	p value	r	p value
Age	-0.060	0.679 ns	-0.180	0.212

Sex	0.046	0.625	0.042	0.668
Hypertension	0.012	0.934	0.073	0.614
DM	-0.114	0.429	0.042	0.771
B.Urea	0.175	0.224	0.263	0.065
S.Creatinine	-0.158	0.273	0.055	0.706
GFR	0.137	0.341	0.010	0.945

DISCUSSION

The levels of MCP-1 and E-selectin, both markers of inflammation and endothelial activation, were significantly higher in the HBV-only group compared to healthy controls. The increased levels of MCP-1 suggest a pro- inflammatory state, which is characteristic of HBV infection (11) (12). MCP-1 plays a key role in recruiting monocytes to sites of infection and inflammation, and its elevated levels have been linked to increased disease severity in liver diseases (4) (13). Another major adhesive molecule is E-selectin which mediates migration of leukocytes on inflamed endothelium
(10). Raised E-selectin in the HBV-only group shows endothelial activation since this is a component of the body's immune response to viral infection (14).

This study looked at blood levels of E-selectin and Monocyte Chemoattractant Protein-1 (MCP-1) in people with long-term Hepatitis B Virus (HBV) infection. Their likely role in the disease process of HBV linked liver inflammation is shown by the noted increases in these indicators and their strong positive link (11). Our results of higher MCP-1 levels in HBV-infected patients agree with earlier work showing that chronic liver diseases increase it . (6).

Elevated levels of MCP-1, In this study, it was found that higher MCP-1 levels were associated with increased inflammatory activity in the liver. It may be used as a predictive marker for response to antiviral therapy.. Further demonstrating MCP-1's contributing role to hepatic inflammation, pharmacological inhibition of the protein in murine models of chronic hepatic injury reduced liver macrophage infiltration and improved steatohepatitis(6).

The higher E-selectin levels in HBV patients that our study found are in line with results from other liver diseases. For instance, hepatic steatosis and inflammation have been linked to increased soluble E-selectin levels in patients with non-alcoholic fatty liver disease (NAFLD). Moreover, E-selectin expression has been demonstrated in liver injury; thus, it may also be an inflammatory mediator in hepatic inflammation (9). The work implies that a significant positive correlation exists between MCP-1 and E-selectin levels; therefore, both factors participate in a concerted inflammatory response during HBV infection with endothelial activation and monocyte recruitment(9). Such interaction may further promote evolution toward more pronounced hepatic disease and perpetuation of liver inflammation. Similar correlations have been found in other chronic liver diseases. Cooperation between adhesion molecules and chemokines provides an added strength severely to amplify hepatic damage(8)(16).

It was amazing that no parameters of renal function and demographic characteristics, such as age and sex, could significantly correlate with the levels of MCP-1 or E-selectin in the present analysis. Specificity like this implies more directly the hepatic inflammation rather than systemic factors being responsible for the elevations in these biomarkers (17) (1). Their specificity raises the possibility that they may be useful as non-invasive indicators for monitoring inflammatory activity specifically at the liver in HBV-infected individuals. There is clinical importance since this study discovered MCP-1 and E-selectin as potential biomarkers of hepatic inflammation in HBV infection. It may help guide therapeutic decisions and track treatment responses by helping non-invasively assess disease activity. (18). To confirm their prognostic value and investigate their roles in the development of cirrhosis or fibrosis, more longitudinal research is necessary

CONCLUSION

HBV infection induces considerable hepatic inflammation with respect to MCP-1 and E-selectin levels

which are in an positive correlation hence it reflects coordinated chemokine and adhesion molecule activity. These markers appear to be independent of demographic or renal function variables. This emphasizes their role as specific indicators of liver immune activity in HBV patients..

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