

A Study of Acute Phase Proteins in Liver Diseases

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Abstract: It is stated that the acute phase protein levels increased during the inflammatory reactions such as trauma, aseptic necrosis and infections. Present study is to study the levels of acute phase protein synthesis in the liver disorders like cirrhosis of liver and infective hepatitis.

Materials And Methods: 50 cases of liver disorders and 10 normal individuals were chosen for the present study. Determination of serum ceruloplasmin, transferrin, A/G ratio, serum total bilirubin, alanine amino transferase, alkaline phosphatase, HDL cholesterol, total cholesterol is done.

Results: when compared with controls, a significant increase ($P < 0.001$) in ceruloplasmin and transferrin levels and significant ($p > 0.001$) decrease in total proteins and albumin is observed in cases of cirrhosis of liver. A significant increase ($P < 0.001$) in ceruloplasmin and transferrin levels and non significant ($p > 0.5$) decrease in total proteins and albumin is observed in cases of infective hepatitis.

Discussion: Elevated ceruloplasmin levels are characteristically present in acute infections and various inflammatory states. Many pathological conditions are accompanied by a marked increase in plasma copper and ceruloplasmin levels. Serum ceruloplasmin levels increased both in cirrhosis of liver and viral hepatitis in this study. An increase in transferrin levels is seen in hemochromatosis and infective hepatitis. In this study there is decrease in albumin levels in all cases of liver diseases more so in cirrhosis of liver is seen.

Conclusion: Increased levels of serum ceruloplasmin and transferrin levels indicates the liver disorders with tissue lesions accompanied by inflammatory process. The acute phase proteins in liver disorders may play a role in the process of regeneration of damaged tissues.

I. Introduction

It is stated that the acute phase protein levels increased during the inflammatory reactions such as trauma, aseptic necrosis and infections. Acute phase proteins are synthesized in liver. To establish the variations in acute phase protein synthesis in the liver disorders like cirrhosis of liver and infective hepatitis. (1) This work is done. The diagnosis of cirrhosis of liver is established by the other parameters like serum bilirubin, alanine amino transferase, alkaline phosphatase.

Acute phase proteins which show marked increase in concentration during the early stages of disorders with tissue lesions accompanied by inflammation such as trauma, aseptic necrosis and infections. The term acute phase protein is imprecise as the same proteins also show up with high plasma concentration and high rate of synthesis in conditions accompanied by sub-acute or chronic inflammation. The difference between the plasma protein pattern in acute and in chronic inflammation mainly concerns the immunoglobulins and not the acute phase proteins. An increase in plasma concentrations of acute phase proteins is a regular part of inflammatory response.

Ceruloplasmin and transferrin are included in the group of acute phase proteins, but their increase during most acute inflammation is less pronounced than that of the other proteins. The other acute phase proteins that are changed in liver disorders are alpha-1 antitrypsin, C-reactive protein and fibrinogen etc.

In viral hepatitis and cirrhosis, the serum albumin levels bear a close relation to the clinical state and are helpful in prognosis and treatment of the disease. (2)

II. Materials And Methods

50 cases of liver disorders and 10 normal individuals were chosen for the present study. Among the 50 cases, 25 cases were of cirrhosis of liver with ascites and jaundice and 25 were of infective hepatitis with clear clinical manifestations of jaundice. Ceruloplasmin concentration is determined from the rate of oxidation of para phenylenediamine at 37 degree centigrade and at PH 6.0. The rate of appearance of the purple oxidation products which has an absorption peak at 520-530 nm is measured colorimetrically. Serum transferrin is derived from total iron binding capacity using Fogelson's formula. Estimation of A/G ratio by Biuret method, from which serum albumin level is measured. Serum bilirubin, alanine amino transferase, alkaline phosphatase, HDL cholesterol and total cholesterol are estimated manually. Agarose gel electrophoresis was done for protein fractions (10).

III. Results

Table1: controls

No.	Age and sex	Ceruloplasmin Mg%	Transferrin Mg%	Total Protein gm%	Albumin Gm%	Globulin Gm%
1	F48yrs	25.2	290	7.4	4.4	3.0
2	M48 yrs	24.0	310	6.8	4.2	2.6
3	M60 yrs	17.4	284	7.0	4.4	2.6
4	F48 yrs	25.2	302	7.2	4.8	2.4
5	F48 yrs	21.6	286	6.6	4.4	2.2
6	F61 yrs	15.6	295	6.9	4.4	2.5
7	M22 yrs	28.2	304	7.0	4.8	2.2
8	M40 yrs	25.2	288	7.2	4.6	2.6
9	M38 yrs	21.6	310	6.8	4.4	2.4
10	M42 yrs	22.2	284	7.0	4.6	2.4

Figure 1: Electrophoretic pattern of proteins in controls:

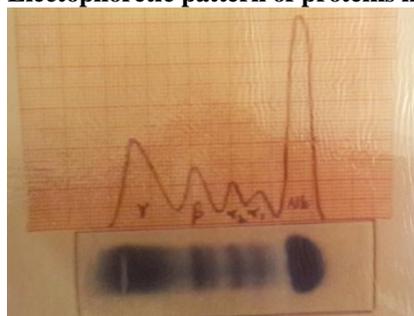


Table2: Cirrhosis:

no	Age and sex	Ceruloplasmin mg%	Transferrin mg%	Total Protein gm%	Albumin gm%	Globulin gm%
1	F60	32.8	441	6.4	3.4	3.0
2	M32	32.4	577	6.0	3.4	2.6
3	F45	31.2	405	5.6	3.4	2.2
4	M45	36.0	500	6.2	3.6	2.6
5	F40	32.4	489	5.8	3.2	2.6
6	F35	40.0	537	5.9	3.4	2.5
7	F61	36.4	487	5.8	3.2	2.4
8	M40	40.0	461	5.6	3.4	2.2
9	F44	42.0	527	6.0	3.4	2.6
10	M34	44.8	452	5.8	3.2	2.6
11	F 35	43.2	464	6.4	3.4	3.0
12	F 58	44.0	522	5.8	3.4	2.4
13	M42	41.0	437	6.0	3.6	2.4
14	F48	38.0	532	5.9	3.4	2.5
15	F60	48.0	405	6.2	3.6	2.6
16	M46	43.2	484	5.6	3.4	2.2
17	M50	37.6	477	6.2	3.6	2.6
18	F45	39.8	541	6.4	3.4	3.0
19	M46	38.0	477	5.8	3.2	2.6
20	M44	44.0	512	6.2	3.8	2.4
21	M48	48.0	487	5.9	3.4	2.5
22	M46	44.0	405	6.2	3.8	2.4
23	M42	42.4	469	6.4	3.4	3.0
24	M49	43.2	472	6.2	4.0	2.2
25	M50	42.0	464	5.9	3.5	2.4

Table3: comparative study of cirrhosis of liver with controls:

Parameter	Controls Mean&S.D	Cirrhosis Mean&S.D	significance
Ceruplasmin mg%	22.64±3.64	39.93±4.34	P<0.001
Transferrin mg%	295.2±9.88	480.88±43.27	P<0.001
Total protein g%	6.99±0.22	6.008±0.25	P<0.001
Albumin g%	4.5±0.18	3.46±0.17	P<0.001
Globulins g%	2.49±0.22	2.56±0.22	P>0.1

Figure2: Electrophoretic pattern of proteins in cirrhosis of liver:

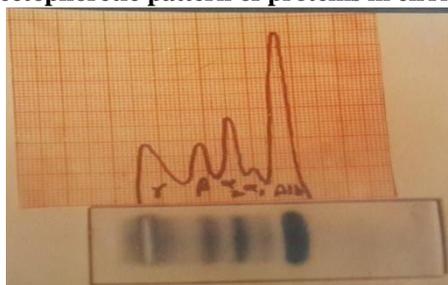


Table4: Infective Hepatitis:

no	Age and sex	Ceruloplasmin mg%	Transferrin mg%	Total Protein gm%	Albumin gm%	Globulin gm%
1	M40	39.4	533	6.9	4.4	2.7
2	M38	39.6	417	6.8	4.6	2.2
3	M30	32.4	433	6.9	4.4	2.5
4	M42	32.8	561	7.2	5.0	2.2
5	M45	34.0	497	6.4	4.0	2.4
6	M60	32.2	469	7.2	4.8	2.4
7	F40	38.0	533	7.2	4.6	2.6
8	F40	39.2	513	8.0	4.4	3.6
9	F30	39.2	477	6.8	4.6	2.2
10	M52	41.8	533	6.9	4.5	2.4
11	M28	42.0	467	6.4	3.9	2.5
12	F40	38.0	533	7.5	4.4	3.1
13	F50	40.0	493	6.9	4.6	2.3
14	M50	38.0	453	6.6	4.2	2.4
15	M40	39.4	510	7.4	5.0	2.4
16	M40	45.0	505	6.4	4.2	2.2
17	M24	46.2	477	6.5	4.1	2.4
18	M36	39.2	540	6.4	4.2	2.2
19	F35	38.4	533	6.6	3.3	3.3
20	M40	40.4	433	6.4	4.1	2.3
21	M48	39.4	477	6.9	4.2	2.7
22	F35	38.4	505	6.6	4.2	2.4
23	F42	37.6	498	7.2	5.0	2.2
24	M48	38.4	496	6.4	4.0	2.4
25	M50	40.2	524	6.2	4.0	2.2

Table5 : comparative study of infective hepatitis with controls

Parameter	Controls Mean&S.D	Infective Hepatitis Mean&S.D	significance
Ceruplasmin mg%	22.64±3.64	38.92±3.03	P<0.001
Transferrin mg%	295.2±9.88	496.4±36.4	P<0.001
Total protein g%	6.99±0.22	6.82±0.42	P>0.5
Albumin g%	4.5± 0.18	4.34±0.38	P>0.5
Globulins g%	2.49±0.22	2.48±0.34	P>0.1

Figure3: Electrophoretic pattern of proteins in infective hepatitis:



As shown in tables 3 and 5 the ceruloplasmin levels and transferrin levels were increased significantly in both cirrhosis of liver and infective hepatitis cases when compared to controls being acute phase proteins. Total proteins and albumin levels were decreased both in cases of cirrhosis of liver and infective hepatitis, more

significantly decreased in cases of cirrhosis of liver. There is no significant change in globulin level when compared with controls in both cases of cirrhosis of liver and infective hepatitis.

IV. Discussion

In the present study, the biochemical importance of ACUTE PHASE PROTEINS and their relevance to diagnosis and prognosis in Liver diseases is observed.

Ceruloplasmin is a alpha-2 glycoprotein which comes under the group of acute phase proteins(3). It is synthesized exclusively in liver. Elevated ceruloplasmin levels are characteristically present in acute infections and various inflammatory states. Many pathological conditions are accompanied by a marked increase in plasma copper and ceruloplasmin(4). Their chief clinical importance to date lies in the conclusion that serum ceruloplasmin plays the role of an acute phase reactant protein.

Transferrin is a Iron carrying beta-globulin and glycoprotein. An increase in transferrin was found in haemochromatosis and in infective hepatitis(5). As shown in figures 2 and 3, on electrophoresis in these cases of cirrhosis of liver and infective hepatitis, there is prominent alpha-1 and alpha-2 bands and some intensification of the beta zone that is transferrin zone. The albumin band is reduced while the gamma band is of variable intensity. This is the acute phase reaction. According to Stanley S Rapheal (1976)(6) excessive saturation of transferrin appears to favour transfer of iron to storage in the parenchymal liver cells and in the stroma of the portal tracts leading to cirrhosis.

Serum Albumin has been considered to be a reliable indicator of the functional status of liver. Present study shows a decrease in albumin in all cases of liver diseases, more so in cases of cirrhosis of liver. In the early 1940s POST AND PATEK (7) clearly showed that in patients without ascites a serum albumin level below 2gm/dl was a bad prognostic sign. It was believed that both degradation and synthesis were depressed in cirrhosis.(8,9). Cirrhosis is characterized by a low serum albumin level. This single observation does not have any direct bearing on prognosis on albumin synthesis or on total hepatic function.(11).

V. Conclusion

The acute phase proteins in liver disorders may play a role in the process of regeneration of damaged tissues. In the present study acute phase proteins like ceruloplasmin and transferrin are increased in concentration indicates the liver disorders with tissue lesions accompanied by inflammatory process. Along with proteins other supportive biochemical parameters were also done in this study. They are serum bilirubin, alanine amino transferase, alkaline phosphatase, total cholesterol and HDL cholesterol which help in the diagnosis and prognosis of the disease.

References

- [1]. Am.Assoc.Clin.Chem.1(9); 1-8; 1984 Nagashima.M. and Schreiber.G. Changes in specific proteins during acute inflammation.
- [2]. Sheila Sherlock 1981, Diseases of liver and biliary system, 6th edition, page 22-23.
- [3]. Recent advances in Clinical Biochemistry, C.P.Price, K.G.M.M.Alberti, page-115
- [4]. Blumberg.W.D and Elsinger J. journal of Biochem.238,1675,1963.
- [5]. Dahls 1948, British.Med.Jour.1,731
- [6]. Stanley .S.Rapheal, Lynch's Medical Lab.Tech.Edn.3,1976. Pages 227, 234-235, 281-282,345, 384.
- [7]. Post 1 and Patek.A.J., Jour.Arch.Inter.Med.69,P-67,82, 1942.
- [8]. Berson.S.A and Yallow.R.S., Jour.Clinic invest.33,377,1954.
- [9]. Dykes.P.W. Q.J.Med.30, 297.1961.
- [10]. Roths Child.M.A.Oratz.M and Schreiber.S.S.N. England journal of Medicine-286,816,1972.
- [11]. Ivor Smith, chromatography and electrophoretic techniques.