

Research Article

A Study on Diagnostic Importance of Serum Cholinesterase Activity in Hepatic Diseases and Non- Hepatic Diseases

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Abstract: A variety of laboratory tests are used in the evaluation of hepatic patients. Serum cholinesterase is reduced in liver dysfunction in contrast to other enzymes. Liver is the main source of Pseudocholinesterase. A comparative study of Pseudocholinesterase along with other relevant liver function test parameters were investigated in different hepatic disorders in present study. The present study was designed to compared the levels of the serum cholinestearse with convectional liver functions tests to determine whether the single estimation of serum CHE level can help to distinguish hepatic disease from non- hepatic diseases. Total 100 subjects of both sex with age ranged from 15 to 65 years were selected for the study. All the subjects were then divided into two groups, 50 hepatic diseases subjects and 50 non-hepatic diseases subjects. Then liver function tests were evaluated by estimating comprising total billirubin, direct billirubin, indirect billirubin total plasma protein, albumin, globulin serum glutamic pyruvic transaminase, serum glutamic oxaloacetic transaminase, serum alkaline phosphatases and Serum cholinesterase of both the groups. In this study all the parameters show highly significant changes in hepatic diseased as compared to non - hepatic diseased group. ($p < 0.001$). Serum cholinesterase values were significantly lowers in hepatic disease patients and mean \pm SD value was 10.81 ± 2.74 KU/L as compared to non hepatic diseased patients (23.56 ± 2.41). Data present study clearly states that serum cholinesterase activity alone can be useful to differentiate liver diseases from non- liver diseases. It is cost effective as compared to conventional liver function tests whenever there is need to excluded liver involvement.

Keywords: Serum Pseudocholinesterase, Hepatic diseases, Non- hepatic disease.

INTRODUCTION

Pseudocholinesterase is a non-specific cholinesterase found in the blood plasma and may be reduced in patients with advanced liver disease. Liver is the main source of Pseudocholinesterase. A comparative study of Pseudocholinesterase along with other relevant liver function test parameters were investigated in different hepatic disorders (like cirrhosis of liver, infective hepatitis and obstructive jaundice) and non hepatic disorders. The aim of the present was to investigate Pseudocholinesterase as a probable diagnostic marker in different liver disorders.

Serum albumin and serum cholinesterase levels are good prognostic factors of alcoholic liver cirrhosis. M. G. Khan had reported in his study that serum cholinesterase estimation is useful in deciding the liver disease and is especially useful in the diagnosis and prognosis of liver cirrhosis [1].

Andrew Wilson *et al.* [2] had compared the levels of serum cholinestearse in liver and non liver diseases subjects. It had been shown that in the patient of liver diseases, low levels of serum cholinestearse values provide confirmatory evidenses of considerable impairment of liver functions.

Although there are many liver function tests that can be used to differentiate liver diseases from non liver disease but some of these convectional liver function test may reflect other organ illness that may cause confusion to assess the disease. Keeping this in view with the observation and result reported in the previous studies, the present study was designed to compared the levels of the serum cholinestearse with convectional liver functions tests to determine whether the single estimation of serum CHE level can help to distinguish hepatic disease from non- hepatic diseases.

MATERIALS AND METHOD

The present study was conducted in Department of Biochemistry of Dr. S. N. Medical College, Jodhpur. Total 100 subjects of both sex with age ranged from 15 to 65 years were selected for the study. All the subjects for hepatic disease have been selected from OPD and those who admitted in ward of the Department of Medicine, M.G. Hospital And. M.D.M Hospital attached to DR.S.N. Medical college and attached groups of hospitals, Jodhpur. The subjects for non-hepatic diseases have been selected from healthy population randomly, of the same age group and BMI.

All the subjects were then divided into two groups.

Group I: Consisted of 50 hepatic diseases subjects. These subjects was primarily evaluated by the clinical examination and then confirmed by sonographically for liver involvement.

Group II: 50 non-hepatic diseases subjects. These subjects' was selected from healthy population randomly, of the same age group and BMI, with no clinical and sonographical evidences of liver dysfunction, confirmed by LFT.

Exclusion Criteria's for both groups

The individuals with past history of disease like acute abdominal diseases, chronic infection, protein energy malnutrition or post operative subjects, organophosphate poisoning, or subjects with diseases other then liver dysfunction has been excluded from the group-1. Subjects for group-2 were those who have no history of any type of diseases that means they should be healthy.

Measurement of biochemical serum markers

Blood samples were collected with minimal venostasis. Serum was obtained from clotted blood by centrifugation within 1 h of sampling. LFTs comprising total billirubin, direct billirubin, total plasma protein, albumin, serum glutamic pyruvic transaminase, serum glutamic oxaloacetic transaminase, serum alkaline phosphatases and Serum cholinesterase were analyzed by commercially available reagents and kits on Fully Automated Analyzer in the Department of Biochemistry, Dr. S. N. Medical College, Jodhpur. Manuals given with the kits, for procedures, were strictly followed, while globulin and indirect billirubin were calculated by using formulas.

All the biochemical parameters were analyzed by following commercially available reagents and kits.

- Cholinesterase-Kinetic, new DGKC method [3]
- Total & Direct Bilirubin – Dimethylsulfoxide (DMSO), Calorimetric [4]
- Indirect Bilirubin (by calculation)
- Total plasma protein- Biuret end point [5]
- Albumin- Bromocresol green dye method, Calorimetric [6]

- Globulin – By calculation (TPP-Albumin)
- Serum glutamic pyruvic transaminase (SGPT)- NADH,UV-Kinetic method [7]
- Serum glutamic oxaloacetic transaminase (SGOT)- UV-Kinetic method [8]
- Serum alkaline phosphates- Kinetic Method using P-nitophenylphosphate [9]

Statistical Analysis

Data was statically analyzed by non-parametric student t-test which evaluated the difference of various parameters in both groups on basis of p value. Table-2 shows all the calculation with p- value. Interpretation was done according to p-value ($p < 0.05$ - Significant, $p < 0.001$ - Highly Significant, $p \geq 0.05$ - Not Significant)

RESULTS

The present study was conducted in two groups. Group -1 includes 50 hepatic diseases subjects (patients) and Group - 2 includes 50 non – non-hepatic disease subjects (control). Table 1 shows distribution of male and female subjects in two groups.

Table 2 shows the comparison of mean activities of various serum biochemical markers in hepatic and non-hepatic diseases. All the parameters show significant changes in hepatic diseased as compared to non - hepatic diseased group ($p < 0.001$).

DISCUSSION

Liver function tests (LFTs) are used for the evaluation of patients with hepatic dysfunction that include serum aspartate and alanine transaminases, alkaline phosphatase, bilirubin and albumin. But they often reveal abnormal results in patients with clinical problems other than liver dysfunction [10].

Cholinesterase is synthesized mainly in hepatocytes. After that they are released into the blood [11]. In liver dysfunction the serum cholinesterase activity is reduced as a result of reduced synthesis. When compared to other serum enzymes associated with the clinical assessment of liver function, it is in contrast. Because during liver dysfunction activities of other serum enzymes increase as a result of enhanced release from their cellular sources following cell membrane damage [12].

Cholinesterase is a family of enzymes catalyzing the hydrolysis of the neurotransmitter acetylcholine into choline and acetic acid. It is necessary to allow a cholinergic neuron to return to its resting state following activation. There are two types of cholinesterase's: (a) Acetylcholinesterase (AChE), also known as RBC and erythrocyte cholinesterase's or acetylcholine acetylhydrolase. They are found primarily in the blood and neural synapses, existing in various molecular forms. In mammalian brain the majority of AChE occurs as a tetrameric, G4 form with much smaller amounts of a monomeric G1 form. (b)

Pseudocholinesterase, also known as plasma cholinesterase, butyrylcholinesterase or acylcholine acylhydrolase, is found primarily in the liver [13].

Estimation of the level of activity of the cholinesterase found in serum was first suggested by McArdle [14], as a useful means for differentiating hepatic from post-hepatic jaundice. It suggests that cholinesterase activity as an assessment indicator for liver function in liver diseased patients. Cholinesterase has been included in scores to distinguish hepatitis severity by society of liver disease in China [15]. However, few studies are available regarding the value of cholinesterase in evaluating liver reserve function.

Keeping in view the finding of earlier researchers, the present study was conducted to evaluate the effectiveness of serum cholinesterase to correctly diagnose patients of liver dysfunction. The study was conducted on 50 hepatic disease and 50 Non- hepatic disease patients, who were evaluated clinically, Biochemically and confirmed by ultrasonography for liver dysfunction. Out of 50 hepatic disease subjects 40(80%) was male and 10(20%) was female subjects

whereas in non- hepatic group subjects 48% (24) was male and 52% (26) was female subjects as showed in Table 1.

Serum cholinesterase values were significantly lowers in hepatic disease patients and mean \pm SD value was 10.81 ± 2.74 KU/L (Table 2). All the 50 cases of hepatic diseases patients shows decrease in levels in serum cholinesterase value less then 18KU/L while out of 50 Non-hepatic disease patients 49 cases had cholinesterase value more than 18KU/L and 1 shows less then 18KU/L. The results are highly significant ($p < .001$), it suggest that serum cholinesterase activity strongly correlated with the liver dysfunction as given in table 2 and represented in Fig. 1.

This study correlated with study conducted by Ogunkeye *et al.* [16]. They evaluated that Serum Cholinesterase activity was significantly lower in hepatic disease patients. Our study also correlates with various scientist study as given in Table 3, who found that Serum cholinesterase values were lowered in all the hepatic diseased patients.

Table 1: Categorization of the subjects studied

Groups	Subject studied	No. of cases		
		Male (%)	Female (%)	Total
I	Hepatic disease	40 (80%)	10(20%)	50
II	Non- hepatic disease	24(48%)	26(52%)	50

Table 2: Comparison of mean activities of various parameters in hepatic and non hepatic diseases

Sl. No.	Parameters	Normal Value	Hepatic Diseases	Non Hepatic Diseases	P value
1	Serum Cholinesterase (KU/L)	18-30KU/L	10.81 ± 2.74	23.56 ± 2.41	<0.001
2	Total Bilirubin (mg/dl)	Up to 1mg/dL	3.06 ± 4.07	0.97 ± 0.132	<0.001
3	Direct Bilirubin (mg/dl)	Up to 0.2 mg/dL	1.86 ± 2.88	0.387 ± 0.137	<0.001
4	Indirect Bilirubin (mg/dl)	Up to 0.7mg/dL	1.24 ± 1.31	0.58 ± 0.10	<0.001
5	SGPT (IU/L)	Upto 49 IU/L	167.26 ± 278.60	23.18 ± 7.96	<0.001
6	SGOT (IU/L)	Upto 46 IU/L	135 ± 171.56	26.42 ± 12.11	<0.001
7	ALP (IU/L)	108-306 IU/L	294.58 ± 89.95	166.16 ± 33.31	<0.001
8	Total protein (gm%)	6.3-8.4 gm%	6.74 ± 0.68	7.26 ± 0.273	<0.001
9	Albumin (gm%)	3.5-5.0 gm%	3.07 ± 0.43	3.68 ± 0.22	<0.001

Note: $p < 0.05$ - Significant, $p < 0.001$ - Highly Significant, $p \geq 0.05$ - Not Significant

Table 3: Comparison various scientist study on Serum cholinesterase Activities compared with present study

Studies	Cholinesterase Activity	
	Hepatic Disease	Non – Hepatic Disease
Present study (2012)	↓ statistically significant below normal range	Changes within normal range
Ogunkeye <i>et al.</i> study (2006) [16]	↓	No statistical significance changes
M.G.Khan study (1962) [1]	↓	No changes
William Burnett study (1960) [17]	↓	No changes
Andrew Wilson <i>et al.</i> study (1952) [2]	↓	No changes

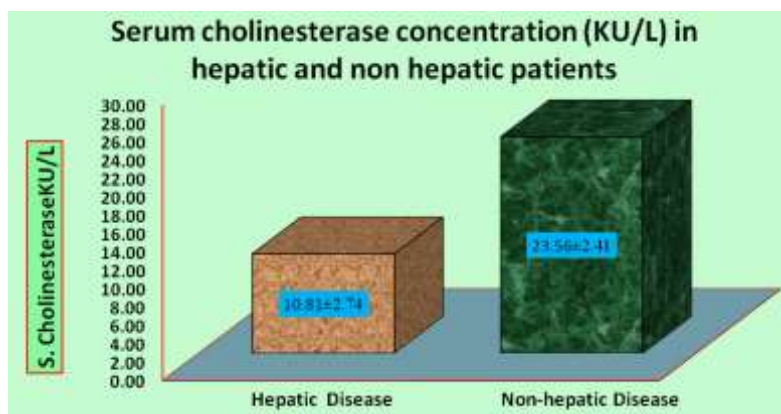


Fig. 1: Serum cholinesterase concentration (KU/L) in hepatic and non hepatic patients

None of single conventional liver function test is important in diagnosis of liver diseases but when many liver function test are abnormal at one time, then there can be probable chance of liver disease. Data present study clearly states that serum cholinesterase activity alone can be useful to differentiate liver diseases from non- liver diseases. It is cost effective as compared to conventional liver function tests whenever there is need to excluded liver involvement.

CONCLUSION

We suggest that determination of serum cholinesterase activity is a cost-effective diagnosis for differentiation between overt liver disease and non-liver diseases where there may be aberration of some liver function tests.

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