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Serum Adenosine Deaminase Activity in Adult Age Groups in Active Infective Hepatitis

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***Abstract**: The present study was done to evaluate serum ADA activity as marker in acute infective hepatitis in different adult age groups. This estimation could serve as an useful and sensitive test in the early diagnosis of hepatitis.*
***Materials & Methods**: The study was undertaken from April 2012to May 2013. There are 100 clinically healthy subjects and 100 known acute infective hepatitis patients belonging to different adult age groups between 21-70 years were chosen for the test samples. Patient with signs and symptoms of acute infective hepatitis (A, B, C, D and E).*
***Results**: The data has been statistically analyzed . The mean and standard deviation for analyses in different age group in the cases and controls are represented. The comparison about different adult age groups HAV 36%, HBV 43%, HCV 12%, HDV 5% and HEV 4%.*
***Conclusions**: The present study was undertaken to study serum ADA in adult age groups in infective hepatitis and to assess their utility as marker of the disease in different age groups.*

I. Introduction:

Liver is the most biochemical complex organ within the body. It possesses enzymes and cofactors necessary for an unparalleled number of metabolic reactions. It is of vital importance in intermediary metabolism and in the detoxification and elimination of toxic substances. Damage to the organ may not obviously affect its activity since the liver has considerable functional reserve [1].Acute viral hepatitis (AVH) is a systemic infection predominantly affecting the liver. AVH is most often caused by hepatotrophic viruses (Hepatitis A, B, C, D, E, F and G) infrequent causes of viral hepatitis include adenovirus, cytomegalovirus, Epstein-Barr virus, and, rarely, herpes simplex virus infection. Newly discovered pathogens (e.g., virus SEN-V and TTV (Transfusion transmitted virus) [2].

Liver disease induced by viral hepatitis account for 4000-5000 death per year. As the predominant etiologic agent of viral hepatitis in United States. [3] HAV is thought to account for 25-50%of new cases per year. The CDC estimates that in 1991 the actual number of new cases of HAV approached 136,000; it is the third most important foreign travel associated infection after diarrhea and malaria. [4]

HBV cases reported in the estimated 50,000 to 2, 50,000 people in the United States become infected with HBV each year. Adults and adolescents account for the majority of cases. Estimates suggest that 400 to 500 million people worldwide are HBV carriers. The virus leads to million deaths annually as a result of viral hepatitis induced liver disease.

HCV estimation suggests that 170 million people are chronically infected with HCV. Those nearly 3 million have chronic infection. HCV causes approximately 17-20% of acute hepatitis cases in the United States and the CDC estimates that 150.000 new cases of HCV occur annually. Before the newer universal plasma screening measures, HCV accounted for 90% of post transfusion hepatitis cases. HDV is not reportable disease. The CDC estimates that it results in 7500 infections each year. Approximately 4% of cases of acute HDV are thought to involve co-infection with HDV. Until 1997 HEV transmission was undocumented in the states. All previously documented HEV cases occurred in travelers from countries where HEV is endemic. Hepatitis F is proposed as another enteric ally transmitted hepatitis virus. A small number of cases have been documented in France.

Hepatitis G virus, characterized in 1996 is associated with acute and chronic liver disease, but studies have not clearly implicated HGV as an etiologic agent of hepatitis. (Annemarie Wesley etal 2006).

Adenosine deaminase is an enzyme of Purine salvage pathway. Its main physiological activity is related to lymphocytic proliferation and differentiation. As a marker for cellular immunity its plasma activity is found to be elevated increases eliciting a cell-mediated immune response [5].The present study was done to elevated serum ADA activity as a marker in acute infective hepatitis in different adult age groups in comparison with , serum Total Bilirubin, serum AST, serum ALT and serum ALP.

II. Materials & Methods:

The present study was undertaken in the Department of Biochemistry, Malla reddy Medical College for Women With attached General Hospital, Hyderabad.

The acute infective hepatitis patients involved in this study were approached in the general Hospital Hyderabad. These entire patients participated in this study after giving their informed consent. The study was undertaken from April 2012to May 2013.

There are 100 clinically healthy subjects who came for routine investigation to the hospital, belonging to different adult age groups between 21-70 years were chosen for the control samples. There are 100 known acute infective hepatitis patients belonging to different adults age groups between 21-70 years were chosen for the test samples.

We Estimated 1.Serum ADA activity by Giusseppe Giusti and Bruno Galanti by Colorimetry
2. Amino transferases ALT and AST by Enzymatic method IN Erba chem5 Semi auto analyzer
3. Serum Bilirubin by End point method in Erba chem5 Semi auto analyzer
4. Alkaline phophatase by Kinetic method in, Erba chem5 Semi auto analyzer

The protocol for the study was approved by the ethical and research committee of the hospital. Data were collected only after patient consent.

This entire subject varied between 21-70 years, are divided into 5 groups based on their age. Each group comprises of 20 subjects. Both male and female sexes were included in the study. The patient were included or excluded from the study based on the following criteria.

Inclusion criteria:

1. Patient with signs and symptoms of acute infective hepatitis (A, B, C, D and E)
2. Age groups between 21-70 years.
3. Total bilirubin levels above 1.2 mg/dl

Exclusion criteria:

HIV, Tuberculosis, Leprosy, Enteric fever, Diabetes mellitus.

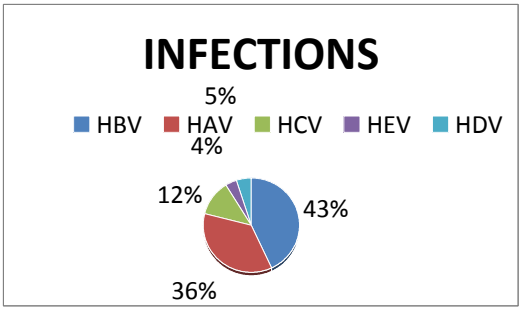
III. Results:

The following parameters were analyzed

Serum Total Billirubin mg/dl Serum AST/GOT U/L Serum ALT/GPT U/L Serum ALP IU/L Serum ADA U/L .The above parameters were analyzed in 100 controls and 100 cases. The cases and controls varied between ages of 21-70 years. The data has been statistically analyzed by using Graph Pad Prism

The mean and standard deviation for analyses in different age group in the cases and controls were represented, as Independent samples `t´ test were assed to know the significance of differences in the mean values of different parameters.

Mean ± S.D in controls of different parameters are represented in the table 1.It is observed that mean ± S.D of ADA in controls increased from 21-20 year's age group to31-40 years, from 31-60 years the activity is almost steady and there is a steep rise in the activity above 60 years of age.



Control:

		Mean±SD			
AGE	ADA (U/L)	Total Bilirubin (mg/dl)	AST(U/L)	ALT(U/L)	ALP(IU/L)
21-30	10.9±1.16	0.68±0.12	12±1.29	14.1±2.17	56.95±7.04
31-40	13.3±2.53	0.72±0.12	13.4±2.74	15.1±3.21	60.9±8.69
41-50	13.0±2.07	0.85±0.11	7.05±2.11	9.6±3.36	56.9±9.99
51-60	13.7±2.97	0.86±0.15	7.6±2.47	7.7±2.5	72±8.82
61-70	20.6±1.39	0.81±.0.16	8.9±3.29	8.6±3.08	83.2±8.71

It is observed that mean ± S.D of serum Total bilirubin in controls gradually increased from 21-60 years age groups and there decrease in age group of above 60 years. It is observed that mean ± S.D of serum AST in controls increased from 21-30 years age group to31-40 years. From 41-50 years there is decrease in activity and there is gradual increase in age group of above50 years. It is observed that mean ± S.D of serum ALT in controls increased from 21-30 years age group to31-40 years from 41-60 years there is decrease in activity and there is gradual increase in age group of above 60 years.

It is observed that mean ± S.D of serum ALP in controls there is increased from 21-30 years age group to31-40 years, from 41-50 years , there is decrease in activity and there is gradual increase in age group of above 51 years.

Mean ± S.D. in cases of different parameter are represented in the table 2.

Cases:

		Mean ± SD			
Age in year	ADA (U/L)	Total Bilirubin (mg/dl)	AST(U/L)	ALT(U/L)	ALP(IU/L)
21-30	82.7±11.53	7.68±2.3	669.3±129.2	696.2±98.3	82.8±10.98
31-40	70.3±10.4	7.53±1.82	592.1±93.2	615.7±94.8	84.4±13.0
41-50	66.4±10.8	7.18±2.17	532.1±153.4	537.7±299.8	82.6±7.86
51-60	71.2±17.9	6.87±2.2	527.6±139.2	561.2±266.8	92.1±11.0
61-70	76.1±12	7.22±2.61	543.1±135.8	544.5±206.8	102.7±11.59

It is observed that mean ± S.D of serum ADA in cases gradually decreased from 21-50 years, and the activity gradually increased in group of above 50.It is observed that mean ± S.D of serum Total bilirubin in cases gradually Decreased from 21-60 years age groups and there is increased in age group of above 60 years. It is observed that mean ± S.D of serum AST in cases, gradually decreased from 21-60 years, and the activity increase in age group of above 60 years. It is observed that mean ± S.D of serum ALT in cases, gradually decreased from 21-50 years. From 51-60 years age groups increased and the activity decreased in age group of above 60 years. Serum ALP in cases gradually increased from 21-40 years. From 41-50 years age group it decreased and the activity increased in age group of above 50 years. To assess the significance of alterations in individual group of acute infective hepatitis patient data is compared with that of age matched controls. The mean, SD, t and p values of serum ADA, Serum Total bilirubin, Serum AST, Serum ALT and Serum ALP are represented. The mean value for serum ADA was found to be increased in different adults age group as compared to control and this increase is statically highly significant.(`p´ value <0.001).

Mean ± SD, 'T' and 'P' value in Cases and Controls of Serum ADA (U/L)

Age in Years	Controls N=20		Cases N=20		T test	P test
	Mean	SD	Mean	SD		
21-30	10.9	1.16	82.7	11.53	27.6	<0.001
31-40	13.3	2.53	70.3	10.4	23.4	<0.001
41-40	13.0	2.07	66.4	10.8	21.7	<0.001
51-60	13.7	2.97	71.2	17.9	14.2	<0.001
61-70	20.6	1.39	76.1	12.0	20.5	<0.001

Mean ± SD, 'T' and 'P' value in Cases and Controls of Serum Serum Total bilirubin (mg/dl)

Age in Years	Controls N=20		Cases N=20		T test	P test
	Mean	SD	Mean	SD		
21-30	0.68	0.12	7.68	2.3	13.58	<0.001
31-40	0.72	0.12	7.25	1.82	15.97	<0.001
41-40	0.85	0.11	7.18	2.17	13.0	<0.001
51-60	0.86	0.15	6.87	2.2	12.1	<0.001
61-70	0.81	0.16	7.22	2.61	10.9	<0.001

Mean ± SD, 'T' and 'P' value in Cases and Controls of Serum AST (U/L)

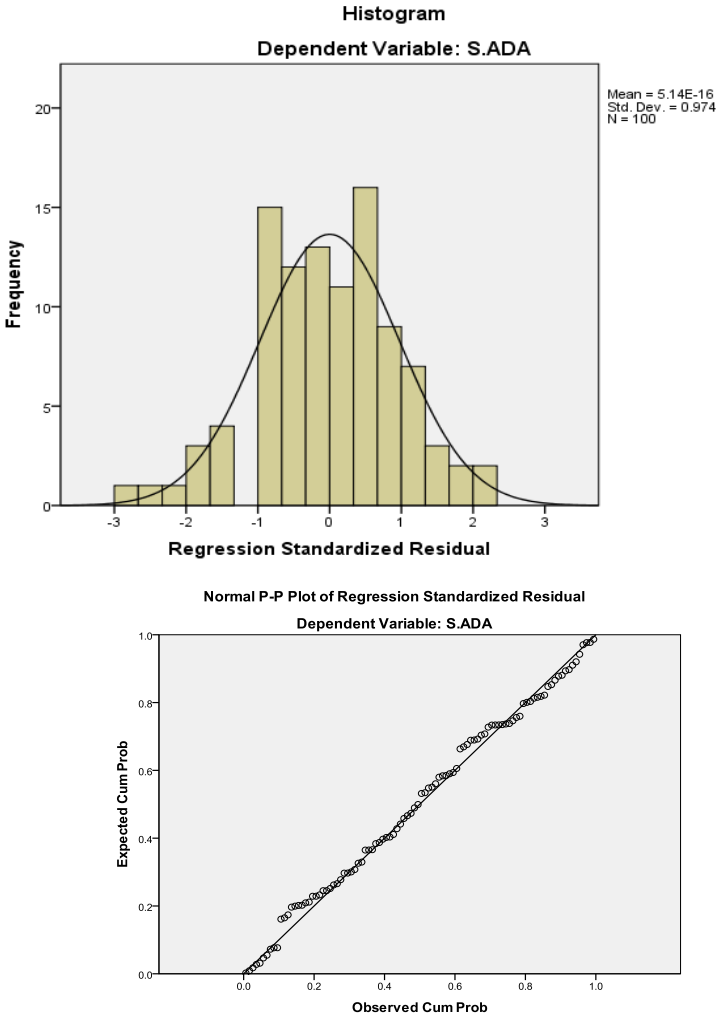
Age in Years	Controls N=20		Cases N=20		T test	P test
	Mean	SD	Mean	SD		
21-30	12.0	1.29	669.2	129.2	22.7	<0.001
31-40	13.4	2.74	592.1	93.2	27.8	<0.001
41-40	7.05	2.11	532.1	153.4	15.8	<0.001
51-60	7.6	2.47	527.6	139.2	16.7	<0.001
61-70	8.9	3.29	543.1	135.5	17.8	<0.001

Mean ± SD, 'T' and 'P' value in Cases and Controls of Serum Serum ALT (U/L)

Age in Years	Controls N=20		Cases N=20		T test	P test
	Mean	SD	Mean	SD		
21-30	14.1	2.17	696.2	98.3	31.01	<0.001
31-40	15.1	3.21	615.7	94.8	28.0	<0.001
41-40	9.6	3.36	537.7	299.8	7.87	<0.001
51-60	7.7	2.5	561.2	266.8	9.27	<0.001
61-70	8.6	3.08	544.5	206.8	11.58	<0.001

Mean ± SD, 'T' and 'P' value in Cases and Controls of Serum Serum ALP (IU/L):

Age in Years	Controls N=20		Cases N=20		T test	P test
	Mean	SD	Mean	SD		
21-30	59.95	7.04	82.8	10.98	8.88	<0.001
31-40	60.9	8.69	84.4	13.0	6.73	<0.001
41-40	56.9	9.99	82.6	7.86	8.9	<0.001
51-60	72.0	8.82	92.1	11.0	6.38	<0.001
61-70	83.2	8.71	102.7	11.59	6.01	<0.001



The mean value for serum Total bilirubin was found to be increased in different adults age group as compared to control and this increase is statically highly significant.(`p´ value <0.001).The mean value for serum AST was found to be increased in different adults age group as compared to control and this increase is statically highly significant.(`p´ value <0.001). The mean value for serum ALT was found to be increased in different adults age group as compared to control and this increase is statically highly significant.(`p´ value <0.001).The mean value for serum ALP was found to be increased in different adults age group as compared to control and this increase is statically highly significant.(`p´ value <0.001).

IV. Discussion:

Liver is an important site for storage of several metabolites. It is valuable to a wide variety of metabolic, toxic, microbial, circulatory and neoclassic insults. Liver Disease is the 4th commonest case of death in adults between the ages of 20-70 years [6]

Liver diseases are classified mainly as four major types: hepatocellular, autoimmune, cholestatic, and infiltrative. [7]During the first half 20th century viral etiology of hepatitis was established. Viral hepatitis causes a set of typical clinical biochemical and histological changes with icterus resulting from hepatic cell damage. It may be acute or chronic. Is a global disease of major public health importance, at a current estimation more than 300 million people worldwide suffer from viral hepatitis Nearly 300 deaths per year attributed to fulfillment acute disease and some 15,000 persons succumb each year to chronic liver disease. The acute form causes considerable morbidity and mortality and the chronic squealed may play havoc resulting in liver cirrhosis and hepatocellular carcinoma (HCC).

Viral hepatitis thus a major public health problem in all parts of the world. The disease has an enormous impact on health and national economy of many countries including India [8]

As very few studies on age related changes in serum non functional enzymes have been reported hence the present study was undertaken to study serum ADA activity in different adult age groups in active

invective hepatitis and assess it' s values a marker along with serum Total bilirubin, serum AST, serum ALT, serum ALP.

The present study was undertaken to study the liver function tests in different adult age groups that is between 21-70 years in acute infective hepatitis as compared to age matched controls and asses their utility as markers in different age groups of infective hepatitis patient.

The present study we found a statistically significant increase in the serum ADA in different adult age groups between 50-70years in acute infective hepatitis as compared to age matched controls.

Also reported statistically significant increase in the serum ADA in different adult age groups between 21-70 years in acute infective hepatitis as compared to age matched controls. It is observed in the present study that mean ± S.D of serum ADA in controls increased from 21-30 years age group to 31-40 years, from activity is almost steady and there is a steep rise in the activity above 60 years of age [10].

In cases are compared to controls the serum ADA activity in hepatitis increased 7.6 times in the age group of 21-30 years as against 3.6 times in the age group of 61-70 years .In comparison with the study by serum ADA activity is increased 4times in the group of 21-30 years as against t 1.5 times in the age group of 61-70 years.

Increased serum ADA in acute infective hepatitis when compared to control groups. But age related changes are not documented in their studies [11]. That ADA physiological activity is related to lymphocytic-proliferation and differentiation. As a marker for cellular immunity, its plasma activity is found to be elevated in diseases eliciting a cell-mediated immune response. In the present study we found a statistically significant increase in the serum Total bilirubin, serum AST, serum ALT, serum ALP in different adult age groups between 20-70 years in acute infective hepatitis is compared to controls [12].

Increase in serum Total bilirubin levels in patients with viral hepatitis when compared to controls [13]. But age related changes were not documented in their studies. In the present study we found a statistically significant increase in the serum AST in different adult age groups between 20-70 years in acute infective hepatitis as compared to the controls. It is observed in the present study that mean ± S.D of When compared to controls the serum AST activity in hepatitis increased 56 times in the age group of 21-30 years as against 61 times in the age group of 61-70 years.

Controls there are decrease in serum ALT beyond 41-50 years age group. It is observed that mean ± S.D of serum ALT in cases gradually decreased from 21-60 years, and activity increased in age group of above 60 years .When compared to controls the serum ALT activity in hepatitis increased 49 times in the age group of 21-30 years as against 63 times in the age group of 61-70 years.

Increase in serum AST levels in patient with viral hepatitis when compared to control. But age related changes were not documented in their studies [11].

When compared to controls the serum ALP activity in hepatitis increased 1.45 times in the age group of 21-30 years as against 1.2 times in the age group of 61-70 years. increase in serum ALP levels in patient with viral hepatitis when compared to control. But age related changes were not documented in their studies.

The normal levels in serum ALP levels in patient with viral hepatitis when compared to control. Hepatic ALP is present on the surface of bile duct epithelia. In acute hepatitis, increase in serum ALP is due to edema (due to inflammation) there may be obstruction in the bile canaliculated (cholestasis) which enhances the synthesis and release of ALP, and accumulating bile salts increase its release from the cell surface.

Higher values are observed for all analyzed parameters between 21-40 years. Relatively lower values are observed after 40 years. The discriminatory capacity of ALP, ALT and Total bilirubin is lower after 40years of age. However there is consistent for ADA and AST for almost all the age group. But serum ADA is showing higher than AST in older age group it is observed that is consistent for both serum ADA and AST levels throughout but for serum ALT decreases beyond 40 years of age probably suggesting that serum ADA is better diagnostic markers in the older age group as compared to serum AST, ALT, serum total bilirubin serum ALP [10].

V. Conclusions:

The present study was undertaken to study serum ADA in adult age groups in infective hepatitis and to assess their utility as marker of the disease in different age groups. Written consent was taken, the parameters were estimated and the data is statistically analyzed.

The present study revealed statistically significant difference in the activity of serum ADA, Total biliribin, serum AST, ALT and serum ALP, between active infective hepatitis patient and controls. Hence these all are good diagnostic marker in acute infective hepatitis.

In diagnostic enzymology the values of enzymes must be interpreted taking into consideration, the age of the patient.

But serum ADA level was showed to be a better marker in older age groups when compared to other as indicated by or magnitude of study effect for early diagnosis.

Thus it is concluded that determination of the serum ADA can be useful in the assessment of liver degeneration caused by infective hepatopathy.

VI. Future Scope:

The determination of ADA activity in older age groups can be used for the early diagnosis can be done with the other routine biochemical tests that are used in the diagnosis of active infective hepatitis.
Early diagnosis helps in early treatment, and prevents morbidity and mortality.

Furthermore determination of ADA isoenzymes may be helpful in differentiating acute and chronic liver disease.

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