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Original Research Article

# Evaluation of serum adenosine deaminase activity with reference to dyslipidemia in ischemic heart disease

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ABSTRACT

**Background:** Ischemic health disease is a major health and a modern epidemic which is increasing in India. Dyslipidemia is a major risk factor for atherosclerosis. Serum adenosine deaminase activity is associated with coronary artery disease.
**Aims and Objectives:** The present work was done to understand the relation of serum adenosine deaminase activity with dyslipidemia in ischaemic heart disease.
**Materials and Methods:** This cross-sectional study comprised 200 subjects; healthy and myocardial infarction. Serum ADA and lipids were estimated. Obtained data was statistically analysed.
**Results:** Increase in serum ADA activity correlating with dyslipidemia was found in Myocardial infarction subjects.
**Discussion:** Increased ADA has role in LDL oxidation, dyslipidemia, foam cell transformation etc. leading to atherosclerosis and ischemic heart disease.
**Conclusion:** Adenosine deaminase has a crucial role in the evolution of ischemic heart disease through dyslipidemia and coronary artery disease.



## 1. Introduction

Ischemic health disease is a major health problem. It is the single largest cause of mortality worldwide accounting for 30% of global deaths.[1,2] An estimated 7.4 million people died from cardiovascular disease in 2015 worldwide and 2.59 million people died from cardiovascular disease in India during 2016.[3] Coronary artery disease is considered a modern epidemic and is increasing in India.[4] Ischemic heart disease is a condition where there is inadequate supply of blood and oxygen to a portion of myocardium. The most common cause of myocardial ischemia is atherosclerotic disease of epicardial coronary artery disease sufficient to cause a regional reduction in myocardial blood flow and inadequate perfusion of myocardium supplied by involved coronary artery.[5]

Atherosclerosis results from endothelial dysfunction lipoprotein infiltration through arterial endothelium into intima, inflation and altered reverse cholesterol transport.[5] The risk factors for cardiovascular disease are cigarette smoking, dyslipidemia, obesity, hypertension, diabetes mellitus, alcohol etc.[6] Lipoproteins and dyslipidemia rank among the most prominent and modifiable risk factors for

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atherosclerosis.[7] Dyslipidemia is associated with adenosine deaminase in diseases.[8] Serum adenosine deaminase activity is associated with coronary artery disease.[9]

The present work was done to understand the relation of serum adenosine deaminase activity with dyslipidemia in ischaemic heart disease.

## 2. Objectives

1. To compare serum Adenosine deaminase activity, lipid profile & indices in myocardial infraction and healthy subjects.
2. To correlate the serum Adenosine deaminase activity with serum lipid profile in myocardial infarction and healthy subjects.

## 3. Materials and Methods

This observational cross-sectional study was carried out for a period of 1 year from October 2013 to September 2014 after obtaining institutional ethical committee clearance.

The study subjects were selected by random sampling. They comprised 200 subjects divided into 2 groups – controls and cases. The healthy volunteers were included in the control group and myocardial infarction patients were included in the cases group. The study subjects were selected by the following inclusion and exclusion criteria. Myocardial infraction patient of both sex, between age 30-60 years were included in cases group. Patients with cardiac risk factors, hepatic diseases, rheumatoid arthritis, tuberculosis, recent surgery or injury, endocrine disturbances, nutritional disorders, pregnant women, those on drugs affecting lipid metabolism were excluded.

The equipment used for the study were syringes, BD vacutainers, Biohit autopipettes, Remi centrifuges, ERBA CHEM 7 semi autoanalyser and ROCHE C111 autoanalyser. The reagent kits were obtained from Tulip and Roche Diagnostics company. The material used for the study was a well-structured questionnaire and blood sample. The volunteers were explained about the study and written informed consent was taken from them. A detailed history was taken and through physical clinical examination was done by a cardiologist. Diagnosis was based on changes in ECG and cardiac biomarkers. Overnight fasting 2 ml blood was collected aseptically from the median cubital vein using a 22 gauge needle syringe into a plain vacutainer. Blood was allowed to clot and centrifuged at 4000 RPM for 15 minutes to obtain serum. The obtained serum were subjected to the following biochemical analysis (Figure 1).

## 4. Results

The data from the above analysis were compiled into two table's i.e. (Tables 1 and 2).

Compares the mean value of variables in healthy volunteers and myocardial infraction patients. The difference for the age and sex was not statistically significant. Highly significant statistical differences were seen for serum Adenosine deaminase activity, Cholesterol, triglycerides, High density and low density lipoproteins between the study groups.

Figure 1 compares the mean value of variables in healthy volunteers and Myocardial infraction patients. The difference for the age and sex was not statistically significant. Highly significant statistical differences were seen for serum Adenosine deaminase activity, cholesterol, triglycerides, high density and low density lipoproteins.

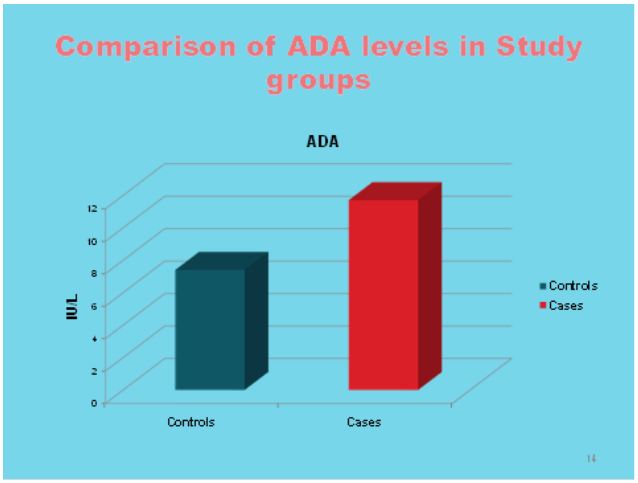


**Fig. 1:** Comparsion of ADA in healthy and MI subjects

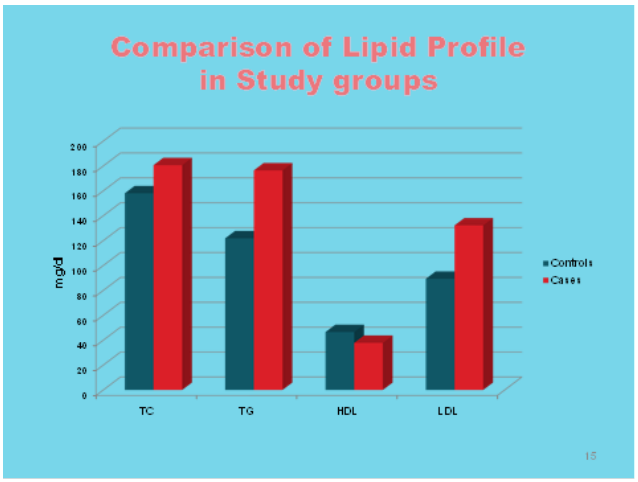


**Fig. 2:** Comparision of serum lipids in both healthy and MI subjects

Shows the association of serum adenosine deaminase activity with cholesterol, triglycerides, HDL and LDL. The enzyme activity showed statistical significant correlation with serum lipids in myocardial infraction subjects.

**Table 1:** Comparision of serum adenosine deaminase activity and serum lipids

| Parameters | Controls | Cases | P value | Interpretation |
|---|---|---|---|---|
| ADA (IU/L) | 7.4 | 11.7 | 0.0014 | Highly Significant |
| TC (mg/dl) | 158 | 180.6 | 0.019 | Highly Significant |
| TAG (mg / dl) | 121.8 | 176.4 | 0.0003 | Highly Significant |
| HDL(mg/dl) | 46.5 | 37.82 | 0.0001 | Highly Significant |
| LDL (mg/dl) | 89.3 | 132.2 | 0.0009 | Highly Significant |

ADA = Adenosine deamiase, TC = Total cholesterol, TAG = Triglycerided,
HDL = Highdensity lipoproteins, LDL = Low density lipoproteins

**Table 2:** Correlation of ADA with lipid profile

| Parameters | Controls (r value) | Cases (r value) |
|---|---|---|
| TC | 0.2 | 0.58 |
| TAG | -0.45 | 0.72 |
| HDL | 0.23 | 0.55 |
| LDL | 0.31 | 0.58 |

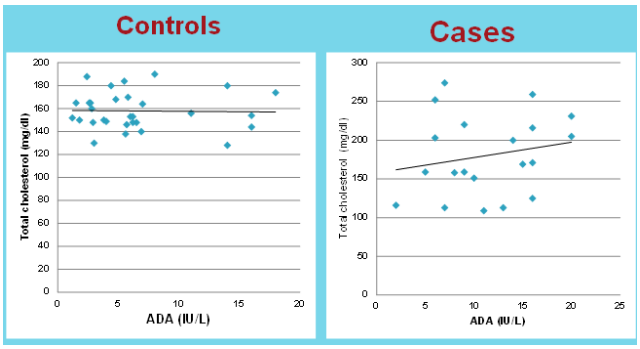


**Fig. 3:** Correlation of ADA with total cholesterol

## 5. Discussion

This study was done to understand the relationship between adenosine deaminase activity and dyslipidemia in Ischemic heart disease (Myocardial infarction). In the present study we have compared the levels of adenosine deaminase and serum lipids in healthy subjects and myocardial infarction patients. Also we correlated the adenosine deaminase activity with serum lipids. We found an increase in ADA activity, serum lipids and correlation of ADA with serum lipids in myocardial infarction. The findings of our study were similar to other studies.[10–20]

Increase in serum ADA levels of Myocardial infraction patients was also seen in works done by A Jyothy[11] [Mean ADA levels : 44.07±12.46 in patients and 20.71±5.63 in controls] Asiya[12] [Case 48.28±12.63 U/L, Control 16.39±3.63 U/L], Torrelas[13] [Case 120±19.59 nmol/ml] and decreased in work done by Chao[9] [Cases 10.08 ±3.57 U/L, Control 11.71±4.20 U/L]. Increase in serum cholesterol triglycerides, LDL and decrease in HDL in Myocardial subjects has been reported by Ferdous[17] and Ganesh Draupad Ghuge.[18] ADA had shown positive correlation with total Cholesterol (+ 0.2), Triglycerides (+ 0.4) and negative correlation with HDL (-0.3) in work done by P Vijaylaxmi.[19] Similar findings were reported by Shashikala Magadi Dasegowda[20] for ADA vs TG (0.858), ADA vs LDL (0.953), and ADA vs HDL (-0.604).

Altered cell mediated immunity increases adenosine deaminase, decreases Adenosine and adenosine receptor activation leading to decreased lipolysis, increased lipogenesis and LDL oxidation causing dyslipidemia. Also adenosine deaminase plays a role in foam cell transformation and vascular proliferation. The above actions of adenosine deaminase leads to atherosclerosis and ischemic heart disease.[21–25]

The strength of this work is standardized protocols, examination by experienced cardiologist and biochemist. The limitations of the work are cross-sectional study design, small sample size, subjects are not sex matched and single measurements.

## 6. Conclusion

Adenosine deaminase has a crucial role in the evolution of ischemic heart disease through dyslipidemia and coronary artery disease. It should be measured in suspected patients of ischaemic heart disease. Therapeutic strategies against it can be developed for prevention of ischemic heart disease.[25]

## 7. Source of Funding

None.

## 8. Conflict of Interest

None.

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