Serum adenosine deaminase levels in reactional and non-reactional leprosy

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ABSTRACT

Background and Aims: Altered serum adenosine deaminase (ADA) levels have been recorded in various diseases involving lymphocytes and/or lymphoreticular system including leprosy. The study was planned to evaluate alterations in serum ADA levels, if any, in reactional and non-reactional leprosy. **Methods:** Eighty patients of leprosy, comprising 60 patients of non-reactional leprosy and 20 patients of reactional leprosy were studied along with 20 normal healthy controls. Five milliliters of venous blood was collected and ADA levels were estimated by the method of Giusti (1974). **Results:** There were 54 males and 26 females. The age of the patients ranged from 5 years to 62 years. The duration of leprosy ranged from 15 days to 3 years. The mean serum ADA level in normal controls was 10.31 ± 0.58 u/L. The serum ADA levels were raised in leprosy patients, significantly so in multibacillary patients. The serum ADA levels were higher in patients of leprosy with reaction. **Conclusions:** The study showed significantly high serum ADA levels in multibacillary leprosy and this was further increased in patients of leprosy with reaction. This may be because of increased lymphoreticular activity during the reactional phases.

Key Words: Leprosy, Reactions, serum ADA.

INTRODUCTION

Adenosine deaminase (ADA), an enzyme of purine metabolism, in part regulates the lymphocytes metabolism and is also important for lymphocytic differentiation and growth.[1] It is present in lymphocytes in high concentration. The level of enzyme in T-lymphocytes varies according to cellular differentiation.[2] Its activity appears to be necessary for an effective immune response as shown by many studies like in combined immunodeficiency disease,[3] and in typhoid fever.[4] Besides this, increased activity of serum ADA has also been demonstrated in tubercular pleural effusion,[2] peritoneal tuberculosis,[5] AIDS, and cancer patients.[6]

METHODS

Eighty patients of different types of leprosy, clinically diagnosed, slit smear examined and biopsy confirmed wherever necessary, and 20 normal healthy controls preferably relatives of the patients, were included in the study. They were thoroughly examined to rule out any associated immunological disease. Five milliliters

How to cite this article: Nigam PK, Srivastava P, Patra PK. Serum adenosine deaminase levels in reactional and non-reactional leprosy. Indian J Dermatol Venereol Leprol 2005;71:20-2.

Received: May, 2004. **Accepted:** September, 2004. **Source of Support:** Nil.

of venous blood was collected and serum was separated. ADA estimation was done by the method as described by Giusti (1974).[7]

RESULTS

Eighty patients of leprosy comprised 54 males and 26 females. The age of the patients ranged from 5 years to 62 years. The duration of illness ranged from 15 days to 3 years. There were 12 patients each of tuberculoid (TT), borderline tuberculoid (BT), mid borderline (BB), borderline lepromatous (BL), and lepromatous leprosy (LL). Besides these, twenty patients were of reactional leprosy, 10 patients in type 1 and 10 patients in type 2 reaction were included. The mean serum ADA level in the normal healthy controls was 10.31 ± 0.58 u/L. The mean serum ADA levels in various types of non-reactional leprosy cases are shown in Table 1. Comparison of mean serum adenosine deaminase levels (u/L) in non-reactional leprosy patients (excluding LL) as a group and leprosy patients in type I reaction is shown in Table 2. Comparison of the mean serum adenosine deaminase levels (u/L) in LL leprosy patients (without reaction) and LL leprosy patients in type II reaction is shown in Table 3. Comparison of the mean serum adenosine deaminase levels (u/L) in leprosy patients with type I and type II reactions is shown in Table 4.

DISCUSSION

A number of parameters including ADA activity have been used to assess cell mediated immune response in different diseases. Low ADA activity has been observed in severe immune deficiency diseases and raised ADA levels have been reported in lymphocytic proliferative diseases.[4-6] There was a significant increase in serum ADA levels in our multibacillary leprosy patients as compared to paucibacillary leprosy patients. Paucibacillary patients in reaction showed a further increase in levels as compared to patients without reaction. Similarly LL patients in type II reaction showed significantly higher levels as compared to LL patients without reaction.

An increased activity of serum ADA has also been demonstrated in leprosy patients by other workers as well.[8-10] Suri Babu et al[9] in their study of ADA activity in serum and peripheral blood lymphocytes of leprosy patients also observed that serum ADA levels were elevated in tuberculoid as well as lepromatous cases as compared to control subjects. The lymphocyte adenosine deaminase activity also showed a similar trend. They suggested that, since the overall activity of the enzyme is not deficient in leprosy, the cellular immune aberration seen in the different types of leprosy may be due to abnormal proliferation of different subsets of lymphocytes in response to M. leprae. Shende et al[10] also observed that ADA levels were higher in leprosy patients as compared to that in controls thus correlating with the immunological status of patients. However, their patients with lepra reaction showed decreased ADA levels and higher grade of

Table 1: Mean serum adenosine deaminase levels (u/L) in non-reactional leprosy patients

Leprosy type	No. of patients (n)	Serum levels (mean ± s.d.)
1. Tuberculoid Leprosy (TT)	12	13.14 ± 0.58
2. Borderline Tuberculoid (BT)	12	13.65 ± 0.62
3. Mid-borderline (BB)	12	14.07 ± 0.51
4. Borderline-Lepromatous (BL)	12	17.43 ± 0.99*
5. Lepromatous (LL)	12	18.45 ± 0.83*
Normal healthy controls	20	10.07 ± 0.87

*P value = <0.05

Table 2: ADA levels in non-reactional leprosy (except LL) and in type I reaction

Leprosy group	No. of patients (n)	Serum levels (mean ± s.d.; u/L)
Controls	20	10.07 ± 0.87
Non-reactional leprosy (excluding LL)	48	14.57 ± 1.94*
Type I Reaction	10	19.74 ± 1.12*

*P value = <0.05

Table 3: ADA levels in non-reactional and reactional LL leprosy patients

Leprosy group	No. of patients (n)	Serum levels (mean ± s.d.; u/L)
Controls	20	10.07 ± 0.87
LL leprosy patients	12	18.45 ± 0.83*
LL with Type II Reaction	10	26.61 ± 2.54*

*P value = <0.05

Table 4: ADA levels in leprosy patients with Type I and type II reactions

Leprosy group	No. of patients (n)	Serum levels (mean ± s.d.)
Controls	20	10.07 ± 0.87
Type I Reaction	10	19.74 ± 1.12*
Type II Reaction	10	26.61 ± 2.54*

*P value = <0.05

lepromin test positivity was associated with increased ADA activity. Dayal et al[8] also observed that the mean serum and lymphocyte ADA levels in multibacillary leprosy were significantly high as compared to the control group. Our study showed that as one moves from tuberculoid to lepromatous spectrum mean serum ADA levels increase and are particularly more in the presence of lepra reactions. This indicates their potential for being used as a marker of activity of disease in leprosy in general and lepra reactions in particular. However, the difference between the values of the control group and type of leprosy was statistically significant only for the BL and LL group (Table 1).

Increase in ADA levels particularly in lymphocytes has been attributed by various workers to increased lymphocyte proliferation as a result of antigenic stimulation. This lymphocyte proliferation in vitro can be measured by lymphocyte transformation test (LTT). Studies have indicated that it gradually increases from LL to BB spectrum.[11] Dayal et al,[8] in their study indicated that ADA levels in serum can not be taken as an index of lymphocyte proliferation as suggested in some reports.[12,13] Chaudhary et al[14] have also shown that serum ADA levels may not run exactly parallel with the conventional parameters of cell mediated immunity in leprosy patients.

Lack of any correlation between ADA levels and LTT along the spectrum of leprosy can be due to many factors. ADA is also present in monocytes and increases tremendously during their maturation into macrophages.[1] Lymphocyte ADA level estimation also incorporates B-lymphocyte ADA which is not at all involved in cell mediated immune response. Further studies in this area should assess whether these raised levels of serum ADA revert back to normal or not once the reaction phase subsides.

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