

A Study on the Serum Immunoglobulin Levels in Pulmonary Tuberculosis Patients

Rohini K., Srikumar P. S., and Mahesh Kumar A.

Abstract—Tuberculosis is a severe bacterial infection caused by *Mycobacterium tuberculosis*. In the recent years, studies on the immunological diagnosis of tuberculosis have become advancing. In this study, forty patients diagnosed with tuberculosis on the basis of history, clinical examination, chest radiography, sputum examination and related laboratory parameters were recruited from The Institute of Thoracic Medicine, Chennai, India and were compared with age and sex matched healthy volunteers ($n=35$). The Serum immunoglobulins IgA, IgM, IgE levels were determined in 40 patients with pulmonary tuberculosis. IgA, IgM, IgE, levels were found to be increased significantly ($p<0.001$) when compared with normal healthy volunteers. The rise of IgA, IgM, IgE levels in patients with tuberculosis may be interpreted as humoral response to mycobacterial antigens.

Index Terms—Tuberculosis, IgA, IgM, IgE.

I. INTRODUCTION

About one third of the world population is infected with *Mycobacterium tuberculosis*, the causative organism of tuberculosis [1], [2]. The immunology of tuberculosis and the significance of delayed hypersensitivity as protective immunity have been extensively studied in the light of modern sophisticated immunological techniques [3], [4]. The clinical usefulness of detection of serum immunoglobulin IgG and IgM antibodies have been reported in tuberculosis and other pulmonary diseases [5]. Host humoral response to mycobacterial antigens depends upon the production of different types of antibodies (immunoglobulins) and is the expression of the functional capacity of immunoglobulin producing cells [4]. In the present study, we evaluated the serum immunoglobulin levels to study the humoral response in patients of pulmonary tuberculosis.

II. MATERIALS AND METHODS

The study was conducted on 40 pulmonary tuberculosis patients (25–75 yrs) recruited from The Institute of Thoracic Medicine, Chennai, India. Age and sex matched healthy volunteers ($n=35$) were used as control subjects. Blood samples were collected with the consent of each patient and processed for serum preparation.

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The diagnosis of tuberculosis was performed using Ziehl-Neelsen staining method for Acid-fast Microscopy (AFM) [6] and culture for growth of the organism on Lowenstein-Jensen (LJ) medium [7]. The patients were also tested for radiographic abnormalities and various other laboratory parameters. The levels of IgM and IgA were measured based on the methods of Geiger et al [8] and Whicher et al [9]. Briefly, diluted serum sample was mixed with specific human antiserum for IgM or IgA to form precipitate and the turbidity was measured at 340 nm in a semi auto analyzer. The level of IgE was measured by ELISA technique as described by Witing et al. [10] and Johansson et al. [11]. After quenching with acid, specific antibody for human IgE conjugated with horse radish peroxidase was added to serum sample followed by the addition of orthophenylene diamine phosphate and the colored product formed was measured at 450nm.

III. STATISTICAL ANALYSIS

The SPSS software package (Version 10) for used for all statistical analysis. All values were represented as mean \pm SD. Statistical analysis was performed by student's *t*-test.

IV. RESULTS

The findings of the serum immunoglobulins in tuberculosis patients and in normal healthy volunteers are represented in the Table I. The levels of IgM, IgA and IgE levels were compared with normal healthy volunteers and was found to be increased significantly ($p<0.001$) (Fig. 1). The level of IgA was found to be significantly increased in tuberculosis patients. There was a significant elevation in the levels of IgM and IgE when compared to normal healthy volunteers.

V. TABLES AND FIGURES

TABLE I: CLINICAL CHARACTERISTICS OF PATIENTS.

Clinical characteristics	No. of subjects
Total Number	40
Age	25 \pm 75 years
Sex	Male - 35; Female - 5
Clinical Signs	
Cough	40
Fever	25 – 30
Weight loss	40
Night sweats	25 – 30

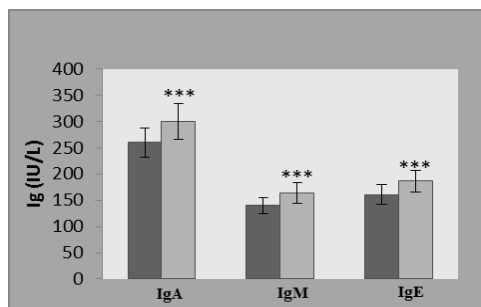


Fig. 1. Serum IgA, IgM and IgE (IU/L) in normal volunteers and tuberculosis patients.

VI. DISCUSSION

Pulmonary tuberculosis is diagnosed based upon the clinical, radiological and bacteriological evidence; however serological diagnosis is considered more significant. Studies have shown that a high proportion of patients with tuberculosis have significantly increased levels of antibody to mycobacterium tuberculosis by using “enzyme-linked immunosorbant assay” [12]. Our present study shows that the values of IgA, IgM, IgE were found to be significantly increased in tuberculosis patients when compared with normal healthy volunteers. Jha et al have reported that no definite relation of various levels of immunoglobulins with increasing severity of disease [13]. An increase in the level of IgA in relation to the extent of disease was reported by Skvor et al. [14]. Reports on total IgG and IgA levels in patients of pulmonary tuberculosis was interpreted as humoral response to mycobacterial antigens while Grange et al [12] observed no correlation between the levels of various immunoglobulins and the antimycobacterial antibody levels. Jha et al [13] suggested that insignificant increase in IgM could be attributed to the fact that more than 80% of their cases had cavitory lesions signifying post-primary disease and the patients exhibited a secondary response by synthesizing more IgG

VII. CONCLUSION

It has been clear that TB patients produce antibodies against more than one antigen and, consequently, a wide spectrum of humoral responses exists in these patients. In conclusion, the increase in the levels of IgA, IgM, IgE levels pulmonary tuberculosis patients may be interpreted as humoral response to mycobacterial antigens. However, keeping in mind the contradictory findings by different researchers, further studies need to be conducted to assert the role of these immunoglobulins as potential markers in tuberculosis diagnosis.

VIII. CONFLICT OF INTERESTS

The authors stated that there are no conflicts of interest

regarding the publication of this article. The study protocol was approved by the Institutional ethics committee and was carried out in accordance with the principle of Declaration of Helsinki. Informed consent was obtained from all the subjects.

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