

EVALUATION OF SERUM PROTEINS IN PULMONARY TUBERCULOSIS

¹Jemikalajah JD, ²Okogun GRA, ³Adu ME*, ⁴Okolie GC

1. Department of Medical Microbiology and Parasitology, Delta State University, Abraka Delta State.
2. Department of Medical Laboratory Science, Parasitology and Entomology Unit, Ambrose Alli University, Ekpoma, Edo State.
3. Department of Medical Laboratory Services, Antiretroviral Therapy Centre, Central Hospital, Agbor, Delta State
4. Department of Medical Laboratory Science, College of Health Technology, Ofuoma – Ughelli, Delta State.

*Corresponding author: adumathew10@yahoo.com

ABSTRACT

Aim: Tuberculosis (TB) remains a major public health problem throughout the world, especially in developing countries with its attendant mortality and morbidity. Proteins in plasma or serum are readily accessible and can be analyzed directly to produce diagnostic information on disease states in patients.

Methods: 5ml of venous blood was collected from One hundred (100) volunteers which comprised fifty (50) pulmonary tuberculosis patients and fifty (50) age – sex matched apparently healthy subjects as controls. The levels of total proteins, albumin, globulins and albumin/globulin ratio were determined in pulmonary tuberculosis patients.

Results: Our results show significantly increased total protein, albumin and globulins in pulmonary tuberculosis patients when compared with controls but no significant difference was observed in the albumin/globulin ratio. There was gender difference in globulin levels.

Conclusion: The study has heightened the imperative of serum proteins assay in the management of pulmonary tuberculosis.

Keywords: Pulmonary tuberculosis, Total proteins, Albumin, Globulins.

INTRODUCTION

Tuberculosis (TB) remains a major public health problem throughout the world, especially in developing countries (Damburam et al., 2012). The reasons for this high prevalence may be due to socioeconomic status of the patients, mostly in the depressed economics of the world. Other contributory factors are the high prevalence of malnutrition, poor health education and increased threat posed by infection with the Human Immunodeficiency Virus (HIV). Proteins are linear chains or polymers of amino acids, which are covalently linked by peptide bonds (Rawn, 1989). They are large molecules of varying molecular weight ranging from 1 to 1000kda. Protein functions mainly as transporter of substances within the blood circulation and the defense of the body against tissue damage. Proteins in the plasma or serum are readily accessible and can be analyzed

directly to produce diagnostic information in disease state of the patients (Luzio and Thompson, 1990). Nutritional deficiencies influence various components of the immune system. Previous studies investigated the association between nutrition and immunity and focused on generalized protein – energy malnutrition. The extent of immunological impairment depends not only on the severity of malnutrition but also on the presence of infection, among other factors. Deficiencies of protein and its amino acids component, as well as vitamins are associated with reduced immune-incompetence. Dysproteinemic syndromes are found frequently in clinical practice and the determination of the different protein fractions found in plasma may help in the diagnosis and management of the disease. Adedapo et al., (2006) and Nnodim et al.,

(2012) reported decreased levels of total proteins and albumin in pulmonary tuberculosis patients but Sasaki et al., (1999), Yamanaka et al., (2001) reported increased total protein and albumin levels in pulmonary tuberculosis. These conflicting reports need to be confirmed because of the paucity of data on serum proteins in pulmonary tuberculosis in Delta State, Nigeria. Therefore, this study aims to determine the serum proteins of pulmonary tuberculosis patients attending Central Hospital, Warri, Delta State, Nigeria.

MATERIALS AND METHODS

Study Area

This study was conducted in Central Hospital, Warri Delta State, South-South Nigeria from October 2012 to February 2013. A total of 100 persons were recruited into this study which comprised 50 tuberculosis patients and 50 non infected apparently healthy hospital staffers. Out of the 50 tuberculosis patients, 22(44%) were males while 28 (56%) were females giving a ratio of 1:1.2. Ethical clearance was obtained from the ethnical committee, Central Hospital, Warri and informed consent was obtained from all participants

Collection of Samples

Venous blood (5ml) was collected from each patient aseptically into a plain container and allowed to clot. This was spun at 3000rpm to obtain a clear serum that was separated into a container and kept frozen until ready for analysis.

Biochemical Analysis

Total serum protein was determined spectrophotometrically using Biuret method (Doumas et al., 1981) while serum albumin was determined by bromocresol green method (Doumas et al., 1981). Serum globulin was calculated by subtracting albumin from total protein. The Albumin Globulin ratio was also

determined by dividing Albumin with Globulin. All reagents were products of Randox Laboratories UK. Manufacturer's instructions were strictly adhered to.

Statistical Analysis

The groups mean \pm SD was calculated for each analyte and significant difference between means evaluated using the student t-test. Statistical Package for Social Science SPSS version 16.0 software (SPSS Inc., Chicago, IL USA) for windows was used, with $P < 0.05$ considered as statistically significant.

RESULTS

The results of our study show a significant increase in total proteins, albumin and globulins of tuberculosis patients when compared to apparently healthy control subjects (Table 1). There was no significant difference observed in the Albumin/Globulin ratio of tuberculosis patients and control subjects. The total proteins, albumin and globulin of male tuberculosis patients were observed to be significantly increased when compared with apparently healthy control subjects (Table 2). There was no significant difference observed when the Albumin/Globulin ratios were compared. The total proteins, albumin and globulins of female tuberculosis patients were observed to be significantly increased when compared with apparently healthy control subjects, but there was no significant difference in the albumin/globulins ratio (Table 3). When the means of the male and female tuberculosis patients were compared, there was no significant difference in the total proteins, albumin and albumin/globulin ratio but globulins was observed to be significantly increased in the female subjects (Fig 1). There was no significant difference observed in the total protein, albumin, globulins and albumin/globulin ratio of apparently healthy subjects (Fig 2).

Table 1: Mean \pm SD of serum Total protein, Albumin, Globulins and Albumin/ Globulins Ratio of Tuberculosis patients and Controls

	Total Protein	Albumin	Globulins	A/G
TB (N=50)	82.0 \pm 13.8	48.6 \pm 7.6	33.6 \pm 6.2	1.5 \pm 1.2
Controls (N=50)	65.5 \pm 9.8	37.9 \pm 5.5	27.6 \pm 4.3	1.4 \pm 1.3
P value	2.2, $P < 0.05$	5.8, $P < 0.05$	5.6, $P < 0.05$	0.4, $P > 0.05$

TB – Tuberculosis, A/G – Albumin/Globulin Ratio

Table 2: Mean \pm SD of serum Total protein, Albumin, Globulins and Albumin/Globulins Ratio of male Tuberculosis patients and Controls.

	Total Protein	Albumin	Globulins	A/G
TB (N=22)	78.8 \pm 13.6	48.3 \pm 7.2	30.5 \pm 6.4	1.6 \pm 1.1
Controls (N=22)	64.3 \pm 8.2	37.7 \pm 5.2	26.6 \pm 3.0	1.4 \pm 1.7
P value	4.3,P<0.05	5.6,P<0.05	2.6,P<0.05	0.8,P>0.05

TB – Tuberculosis, A/G – Albumin/Globulin Ratio

Table 3: Mean \pm SD of serum Total protein, Albumin, Globulins and Albumin/ Globulin Ratio of female Tuberculosis patients and controls.

	Total Protein	Albumin	Globulins	A/G
TB (N=28)	83.4 \pm 13.9	48.0 \pm 8.3	35.4 \pm 5.6	1.4 \pm 1.5
Controls (N=28)	66.4 \pm 10.9	38.1 \pm 5.8	28.3 \pm 5.1	1.3 \pm 1.1
P value	5.1,P<0.05	5.2,P<0.05	5.0,P<0.05	0.3,P>0.05

TB – Tuberculosis, A/G – Albumin/Globulin Ratio

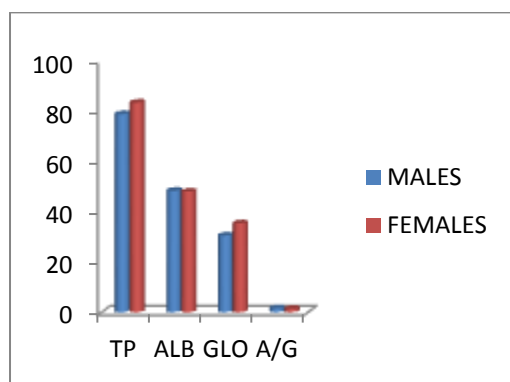


Fig.1: Mean \pm SD of Serum Total protein, Albumin, Globulins and A/G of male and female tuberculosis patients.

KEY

TP-Total Proteins, ALB-Albumin, GLO-Globulin, A/G-Albumin/Globulin Ratio

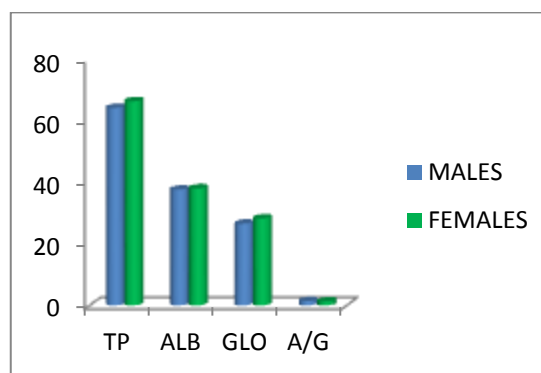


Fig 2: Mean \pm SD of Serum Total protein, Albumin, Globulins and A/G of apparently healthy males and females subjects.

KEY

TP -Total Proteins, ALB-Albumin, GLO-Globulin, A/G-Albumin/Globulin Ratio

DISCUSSION

The main factors contributing to variation in the levels and pattern of serum proteins include parasitic infestation, culture and socio-economic status (Onwuameze, 1989). Edozien, (1957, 1961) in his work attributed the high gamma-globulin levels in Nigerians to the prevalence of malaria and other microbial infections. The results of our study show an increased level of total protein and albumin in pulmonary tuberculosis patients when compared with apparently healthy individuals in this locality. This is in consonance with previous studies on Tuberculosis patients reported by Sasaki et al., (1999) and Yamanaka et al., (2001), but at variance with Adedapo et al., (2006), Akiibinu et al., (2007), Nnodim et

al., (2012) and Damburam et al., (2012) who reported decreased total protein and albumin levels in Tuberculosis. The increased serum proteins observed in the tuberculosis patients in our study may be attributed to dehydration and the impact of isoniazid and rifampicin used for the treatment of Mycobacterium tuberculosis, the causative organism of pulmonary tuberculosis as earlier reported by Nnodim et al., (2012). Adedapo et al., (2006), in their study observed that total protein and albumin increased in tuberculosis patients on treatment than naive tuberculosis patients which may have resulted from the impact of anti tuberculosis drugs. Our study also shows increased globulin level in tuberculosis patients

when compared with apparently healthy subjects. This is in agreement with the findings of Damburam et al., (2012), but in contrast with the studies of Sasaki et al (1999), Yamanaka et al., (2001), and Nnodim et al., (2012) who reported decreased level of globulins in tuberculosis patients. This increased globulin level can be attributed to immunologic response to tubercle bacilli that elicit the production of gamma globulins as previously reported by Damburam et al., (2012). Arinola and Igbi (1998) also reported high levels of IgG and IgM in pulmonary tuberculosis. Significant decrease in body weight has been commonly found in patients with active tuberculosis and this may likely be attributed to the combination of associated tissue inflammations and immune responses. Nagayama et al., (1999) and Paton et al., (2004) had earlier stated that hyperglobulinaemia in tuberculosis is one of the predictive factors for the development of residual thickening in tuberculous pleurisy. However, there was no significant difference observed in the Albumin/Globulins ratio of the tuberculosis patients and apparently healthy subjects. The male tuberculosis patients were observed to have increased total proteins, albumin and globulins when compared with apparently healthy male controls but no significant difference was observed in the Albumin/Globulin ratio. The female tuberculosis patients also show increased total proteins, albumin and globulins but no significant difference was observed in the Albumin/Globulin ratio. There was a significant decrease in globulin level of female tuberculosis patients but no significant difference was observed in total proteins, albumin, and albumin/globulins ratio when compared to the male tuberculosis patients. This difference in gender is still elusive and requires further investigations. However, the serum proteins of apparently healthy male and female controls show no significant difference in the parameters studied. Conclusively, the serum proteins of pulmonary tuberculosis have been found to show increased total protein, albumin and globulins in this locality which can be attributed to dehydration and anti-tuberculosis drugs (Rifampicin and Isoniazid) as well as immunologic responses to the tubercle bacilli. We therefore advocate that serum proteins should be among the retinue of tests required for pulmonary tuberculosis patients before, during and after treatment.

REFERENCES

- Adedapo KS, Arinola OG, Ige OM, Adedapo ADA, Salimonu LS (2006). Combination of reduced levels of serum albumin and alpha 2-macroglobulin differentiates newly diagnosed pulmonary tuberculosis patients from patients on chemotherapy. *African Journal of Biomedical Research*, 9: 169-172.
- Akiibinu MO, Arinola OG, Ogunlewe JO, Onih EA (2007). Non – enzymatic antioxidants and nutritional profiles in newly diagnosed pulmonary tuberculosis patients in Nigeria. *African Journal of Biomedical Research*, 10: 223-228.
- Arinola OG, Igbi J (1998). Serum immunoglobulins and CICs in Nigerian with pulmonary TB and HIV. *Tropical Journal Medical Research*, 2(2); 41-48.
- Damburam A, Garbati M.A, Yusuph H (2012). Serum proteins in health and in patients with pulmonary tuberculosis in Nigeria. *Journal of Infectious Diseases and Immunity* 4 (2):16-19
- Doumas BT, Bayse D, Borner K, Carte RJ, Peters T.Jr, Schaffer R (1981). A candidate reference method for determination of total protein in serum: 1. Development and validation. *Clinical Chemistry*. 27:1642.
- Doumas BT, Watson WA, Brggs HG (1971). Albumin standards and the measurement of serum albumin with bromocresol green. *Clinical Chemistry Acta*. 31:87.
- Edozien JC (1957). The serum proteins of healthy adult Nigerians. *Journal Clinical Pathology*. 10: 2769.
- Edozien JC (1961). The development of serum protein pattern in Africa. *Journal Clinical Pathology*. 14:64453.
- Luzio JP, Thompson RJ (1990). *Molecular Medical Biochemistry* (1st ed) Cambridge Press New York pp 1-28.
- Nagayama N, Tamura A, Kurashima A (1999). Parameters relating to the development of residual pleural thickening in tuberculous pleurisy. *Kekkaku* 74(2); 91-97.

Nnodim JK , Afolabi EM, Udujih HI, Okorie H, Nwobodo EI, Nwadike CN (2012). Alterations in some biochemical indices of hepatic function in tuberculosis patients on antituberculosis therapy. *Indian Journal of Medicine and Healthcare*, 1(1):12-15.

Onwuameze IC (1989). Specific protein pattern in adult healthy Nigerians. *African Journal Medicine Medical Science*.18: 49-53.

Paton NI, Chua YK, Earnest A, Chee CB (2004). Randomised controlled trail of nutritional supplementation in patients with newly diagnosed tuberculosis and wastings. *American Journal Nutrition*, 80(2):460-465.

Rawson J D (1989). *Biochemistry (Int. ed) Neil Paterson Burlington* pp 57-73.

Sasaki Y, Yamagishi F, Yasi T, Mizutani F (1999). A case of pulmonary tuberculosis case with pancytopenia accompanied to bone marrow gelatinous transformation. *Kekkaku*, 74 (4); 361-364.

Yamanaka K, Sakai S, Nomura F, Akashi T, Usui T (2001). A nutritional investigation of homeless patients with tuberculosis. *Kekkaku*, 76 (4): 363- 370.