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Evaluation of Serum Proteins in Some Immuno-Compromised Patients in Auchi, Edo State

¹Okogun GRA, ²Jemikalajah DJ, ³Adu ME* and ¹Saliu R

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

Corresponding author: adumatthew10@yahoo.com; +234-803-425-8067

Abstract

Immunocompromised state is a condition associated with the alteration in the immune status of an individual's thereby promoting the progression of disease. Proteins in plasma are readily accessible and can be analyzed directly to produce diagnostic information on disease states in patients. Five milliliters of venous blood was collected from one hundred and twenty (120) volunteers which comprised twenty (20) tuberculosis patients, forty (40) Human immunodeficiency virus patients, forty (40) pregnant women and twenty (20) age and gender- matched apparently healthy individual as control. Colorimetric methods were used to determine the serum total protein and albumin, while serum globulin and albumin/globulin ratio were derived. Our results show a significant increase ($P < 0.05$) in total proteins, albumin, and globulins as well as albumin/globulin ratio of Tuberculosis (9.83 ± 2.04 , 4.15 ± 0.98 , 5.68 ± 2.08 , 0.73 ± 0.47) and HIV patients (9.53 ± 1.39 , 4.00 ± 0.92 , 5.53 ± 1.37 , 0.72 ± 0.67) but decrease in pregnant women (6.23 ± 0.69 , 3.48 ± 0.61 , 2.75 ± 0.29 and 1.27 ± 2.10) when compared with control subjects (6.7 ± 0.53 , 9.5 ± 0.47 , 2.75 ± 0.24 , 1.44 ± 1.96). Serum protein is a significant diagnostic index in the management of immune-compromised patients.

Keywords: Immuno-compromised, Human immunodeficiency virus, Tuberculosis, Pregnancy.

Introduction

Immunocompromised is a condition in which an individual immunity has been reduced thereby making them vulnerable to diseases such as Human Immunodeficiency Virus (HIV) and Mycobacterium tuberculosis (MTB) (WHO, 2009). Also, there is reduced immunity during pregnancy in order to accommodate the foetus (Lannders *et al.*, 1987).

Human Immunodeficiency Virus (HIV) infection has reached epidemic proportions in Nigeria, where increasing numbers of people now die because of Acquired Immune Deficiency Syndrome (AIDS). Malnutrition remains a significant but intriguing consequence of HIV infection. Immunocompromised patients are prone to various infectious and non infectious disorders. The infectious disease is the commonest among these patients because of the weakening of the immune system. The severity of the infection depends on the degree of the immune-suppression. Some organs like respiratory pathways are more liable to infection in these patients for obvious anatomical reasons; however all organs are at risk of developing infection. Protein is a linear chain or polymer 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 the disease state of the patients (Luzio and Thompson 1990). Previous studies have reported increased serum protein as a result of hypergammaglobulins in HIV naïve patients (Sarro *et al.*, 2010, Kamangu *et al.*, 2012). On the other hand serum protein in Tuberculosis patients has been found to be significantly increased (Jemikalajah *et al.*, 2014). Pregnancy is the period between conception and delivery and has been associated with increased dietary protein requirement in humans. During their period of rapid growth, the foetus and placenta utilize protein very rapidly (Lewis *et al.*, 2010). Proteins and vitamins deficiencies are common features in pregnant

women belonging to the lower socioeconomic groups, thus affecting serum protein concentrations (Bhatty *et al.*, 2001). Variations in the level of serum proteins occur between racial groups and under physiological and pathological conditions (Ekeke *et al.*, 1983, Cohen *et al.*, 1998, Adedeji *et al.*, 2004). There are no documented evidence on the serum proteins of immunocompromised patients in this locality hence the need to evaluate the serum proteins of immunocompromised patients in Auchi, Edo State, South- South Nigeria.

Materials and Methods

Study Area

This study was carried out in the Central Hospital, Auchi in Etsako West Local Government Area of Edo State. It is a secondary health institution that serves as a referral centre for other primary health institution in this locality.

Sample Collection

A total of 120 subjects comprising of 20 TB, 40 pregnant women, 40 HIV Positive patients and 20 apparently healthy individual as control were randomly selected and enrolled in to this study. 5mls of venous blood was collected from each subject aseptically into a plain container after informed consent. Samples were allowed to clot, spun at 3000rpm for 10minutes, serum obtained and kept frozen until required for analysis. Ethical approval was given by institution ethical committee, of Central Hospital Auchi.

Biochemical Analysis

Total serum protein and albumin was determined spectrophotometrically using Biuret and Bromocresol Green methods by 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.

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) windows was used, at $P < 0.05$ considered as statistically significant.

Results

Our results show a significant increase in Total protein, Albumin and Globulin HIV and Tuberculosis patients, and decreased total protein, albumin in pregnant women when compared with control subjects. The Albumin /Globulin Ratio (A/G) is reduced in HIV, Tuberculosis patients and pregnant women when compared to the control subjects as shown in table 1. Table 2 shows the Total protein, Albumin, Globulin and Albumin /Globulin ratio of male immunocompromised patients. While table 3 shows the total proteins, albumin, globulin and albumin/globulin ratio in female immunocompromised patients.

Table 1: Serum Protein Levels of Immunocompromised Patients

	Control {a}	HIV {b}	TB {c}	PREG {d}	Level of Significance					
					av b	Avc	av d	bvc	bvd	cvd
Total Protein	6.7 \pm 0.5	9.53 \pm 1.3	9.83 \pm 2.0	6.23 \pm 0.6	t=3.2<0.05	t=1.9<0.05	t=2.5<0.05	t=0.3<0.05	t=4.7<0.05	t=2.6<0.05
		9	4	9	5	5	5		5	5
Albumin	3.95 \pm 0.4	4.00 \pm 0.9	4.15 \pm 0.9	3.48 \pm 0.6	t=0.3<0.05	t=0.2<0.05	t=-3.3	t=-0.8	t=2.0<0.05	t=1.5<0.05
n	7	2	8	1	5	5	<0.05	<0.05	5	5
Globulin	2.75 \pm 0.2	5.53 \pm 1.3	5.68 \pm 2.0	2.75 \pm 0.2	t=1.7<0.05	t=1.6<0.05	t=0.0<0.05	t=0.21<0.05	t=2.6<0.05	t=1.6<0.05
n	4	7	8	9	5	5	5	5	5	5
A/G	1.44 \pm 1.9	0.72 \pm 0.6	0.73 \pm 0.4	1.27 \pm 2.1	t=0.5<0.05	t=0.5<0.05	t=-1.2	t=0.2<0.05	t=0.4<0.05	t=0.3<0.05
	6	7	7	0	5	5	<0.05		5	5

Table 2: Serum Protein of Male Immunocompromised Subjects

	Control {a}	HIV {b}	TB {c}	Level of Significance		
				av b	avc	bvc
Total Protein	6.76 \pm 0.58	9.62 \pm 1.25	9.60 \pm 1.90	t=4.3<0.05	t=2.2<0.05	t=0.0<0.05
Albumin	3.96 \pm 0.57	4.08 \pm 1.07	4.16 \pm 0.88	t=0.2<0.05	t=0.6<0.05	t=-0.5<0.05
Globulin	2.80 \pm 0.24	5.65 \pm 1.25	5.51 \pm 1.64	t=3.5<0.05	t=1.9<0.05	t=-0.4<0.05
A/G	1.44 \pm 2.38	0.72 \pm 0.86	0.75 \pm 0.59	t=0.5<0.05	t=0.4<0.05	t=-0.1<0.05

Table 3: Serum Protein of Female Immunocompromised Subjects

	Control {a}	HIV {b}	TB {c}	PREG {d}	Level of Significance					
					a v b	avc	av d	bvc	bvd	cvd
Total Protein	6.63±0.43	9.44±1.57	9.77±2.26	6.23±0.69	t=2.5<0.05	t=1.7<0.05	t=-1.5<0.05	t=0.5<0.05	t=3.6<0.05	t=2.3<0.05
Albumin	3.93±0.36	4.12±0.77	3.93±1.12	3.48±0.61	t=0.5<0.05	t=0.0<0.05	t=-0.2<0.05	t=-2.6<0.05	t=2.0<0.05	t=0.9<0.05
Globulin	2.70±0.24	5.42±1.50	5.84±2.53	2.75±0.29	t=2.1<0.05	t=1.4<0.05	t=0.0>0.05	t=0.4<0.05	t=2.2<0.05	t=1.4<0.05
A/G	1.46±1.5	0.76±0.51	0.67±0.44	1.27±2.10	t=0.7<0.05	t=-0.2<0.05	t=-0.3<0.05	t=1.3<0.05	t=0.3<0.05	t=0.4<0.05

Discussion

Immunosuppression or immunodeficiency is a condition whereby the immune system has been altered either due to disease condition or naturally as found in pregnancy (to enable the foetus to survive) which leads to a condition known as immunocompromised. 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 and 1961) in his work attributed the high gamma globulin levels in Nigerians to prevalence of malaria and other microbial infections. In our study, we examine the serum protein of some immunocompromised patients (HIV, TB and Pregnant women) assessing care at the Central Hospital Auchi. The results of our study shows a significant increased in total proteins and albumin of tuberculosis individuals when compared with HIV, Pregnant and control individuals. This is in tandem with previous studies on tuberculosis patients as reported by Sasaki *et al.*, (1999), Yamanaka *et al.*, (2001) and Jemikalajah *et al.*, (2014), but in disagreement with Adedapo *et al.*, (2006), Akiibinu *et al.*, (2007), Nnodim *et al.*, (2012) who reported decreased total proteins in tuberculosis patients. Nnodim and his colleagues (2012) attributed the increased total proteins in these individuals to dehydration and impact of isoniazid and rifampicin used for the treatment of Mycobacterium tuberculosis, the causative organism of pulmonary tuberculosis. The globulins levels and Albumin/Globulin ratio of Tuberculosis patients is significantly increased when compared with HIV, Pregnant and control subjects. This is in agreement with the work of Damburam *et al.*, (2012), but in contrast with the work of Sasaki *et al.*, (1999). This increased globulin can be attributed to immunologic response to the tubercle bacilli that elicit the production of gamma globulin (Damburam *et al.*, 2012).

The serum total proteins, albumin and globulins of HIV patients are observed to be significantly

increased when compared with Pregnant and control individuals. This is in consonance with the work of Gramlich and Mascioli (1995) who reported elevated total proteins and normal or reduced albumin in HIV patients. They attributed this to factors such as infection, changes in vascular permeability and hydration status of these individuals.

The total serum total proteins, albumin and globulins of pregnant women are significantly decreased when compared with the controls. This is in agreement with the work of Bacq *et al.*, (1996), Haram *et al.*, (1983), Ekeke *et al.*, (1985), Adedeji *et al.*, (2012). Adedeji and his colleagues (2012) attributed this decrease to increase plasma volume among pregnant women.

Conclusively, the serum total proteins, albumin, globulin as well as albumin/globulin ratio of immunocompromised patients apart from pregnant women is significantly increased which has been attributed to dehydration and effect of the therapeutic regimen used in the treatment of such ailment. We therefore advocate routine measurement of these parameters in immunocompromised patients in order to have a better understanding and management of such patients to reduce mortality and morbidity.

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