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Assessment of Serum Zinc and Albumin Levels among Newly Diagnosed Patients with Pulmonary Tuberculosis in Khartoum State

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Abstract: Background*: Tuberculosis is a major public health problem world-wide, it is contagious disease caused by organism mycobacterium tuberculosis. The aim of this study was to assess the level of zinc and albumin in newly diagnosed patients with pulmonary tuberculosis in Khartoum state.*

Methods*: Fifty blood samples were collected from newly diagnosed pulmonary tuberculosis patients during the period between April to May 2017, chosen randomly from Abu Anga Teaching Hospital and fifty blood samples from apparently healthy individuals serve as control group. Estimation of serum albumin level was performed using spectrophotometer and estimation of serum zinc by using flame atomic absorption spectrophotometer. The results were analyzed by using (SPSS) computer program.*

Results*: The study showed that, serum level of zinc and albumin were significantly decrease in patients compared to control group (mean± SD for cases versus control).*

For zinc :(0.16±0.05 versus 0.58± 0.13 mg/l, P. value= 0.000). For albumin: (2.5±0.58 versus 4.1±0.31g/dl, P. value= 0.000). The result of this study showed that, there was statically significant decrease in the mean of BMI in patients compared to control group. Mean ±SD for case versus control (18.7±0.17 versus 21.5±1.7). The result of this study showed that, pulmonary tuberculosis most common among age between (20-39) years (52%) and (48%) of patients between age (40-58) years and this disease most abundant in males (78%) than females (22%). Persons correlation showed that there was no correlation between serum zinc level and age (r =-0.128, p. value=0.374) also there was no correlation between the level of serum albumin and age (r=0.137, p. value =0.344).

Conclusion*: The serum levels of zinc and albumin were significantly decreased in newly diagnosed patients with pulmonary tuberculosis in Khartoum state.*

Keywords: Pulmonary tuberculosis patients, Zink level, Albumin level

1. INTRODUCTION

Tuberculosis is a major public health problem worldwide. It is responsible for more than 2 million deaths each year's, kills more adults than any other disease; especially developing countries is the second biggest killer. Globally it is contagious disease caused by organism mycobacterium tuberculosis, aerobic non-motile bacillus, it is a bacterium can attack any part of the body, most commonly the lung. It is spreads through the air, when infectious people cough, sneeze, talk or spit. The propel TB germs known as bacilli into air, inhalation of very small numbers of bacilli will lead Mycobacterium tuberculosis infection [(1)]. Mycobacterium tuberculosis infect about one-third of world's population, of whom more than 80% live in developing countries like Iran and India [(2)]. Annually, more than 8 million people have developed TB and approximately 1.8 million cases result in death [(3)]. More than 80% of TB patients live in Asia and sub-Saharan Africa, considered by WHO to be "high burden countries." Sub-Saharan Africa has the highest incidence of the disease.[(4,5,6)] India, China, Indonesia, Bangladesh, and Pakistan together account for more than half of the global estimate of active TB.[(7)] Population increases in South Asia and central Africa alone will account for ~75% of new cases of active TB in the next ten years [(8)]. For the most part, active TB cases have steadily declined in western and central Europe, North and South America, and in the Middle East, but are increasing in sub-Saharan Africa and the former Soviet Union [(4,6)]

Malnutrition may predispose individuals who have latent infection to active disease as malnutrition affects cell-mediated immunity, which decreases the body defense to TB and increases the risk of infection [(9)]. For this reason, malnutrition and tuberculosis have a long history of being associated with each other [(10)]. Micronutrient like zinc play important role in many biological system such as, biochemical reactions in metabolism, maintenance of nutritional health, growth of the human tissues and organs, zinc is used by the cells of the immune system to destroy bacteria such as, tubercle or *Escherichia coli* [(4)].

Deficiency of zinc impairs over all immune function and resistance to infection [(11).] The reason for low serum zinc

level in TB patient could be multi-factorial. Firstly, a change in distribution of zinc in the body tissues is known to occur in chronic infections, with a net flow of zinc to the liver for synthesis of acute phase reactants including metalo enzymes. Secondly, zinc might be utilized by tuberculosis for growth and multiplication [(12)]. Albumin is a globular protein; serum albumin is the protein of human blood plasma. There is relationship between TB and nutrition.

Serum albumin is macronutrient, most common essential parameter used for evaluation of nutritional status patient with TB [(13)].

2. MATERIALS AND METHODS

This study was conducted in Abu Anga Teaching Hospital, Khartoum -Sudan from April to May 2017. A total of 120 individual were enrolled in this study; divided into two groups, 60 healthy individual (Control group) and 60 patients newly diagnosed with pulmonary tuberculosis (cases group). The study was approved by hospital's ethics committee. Informed consent was obtained from patients before blood sampling.

Inclusion criteria

Patients newly diagnosed with pulmonary tuberculosis infection and healthy individual serve as control were included in this study.

Exclusion criteria

Patients with other diseases that affect the levels of serum zinc and albumin such as liver diseases, Chronic renal failure, nephritic syndrome, previous anti-TB treatment, using supplementation containing zinc and Patients that refuse to participate in this study were excluded.

Blood sample and Analysis

About 2ml of venous blood was collected from the antecubital vein by taking aseptic precautions. Care was taken to prevent venous stasis during the sample collection. The blood was allowed to clot and the serum was separated by centrifugation. The estimation of the parameters was carried out within 4-6 hrs. The samples were analyzed for Serum zinc by using atomic absorption method and Serum albumin was measured by using spectrophotometer method at 630nm.[(14)] The internal control sera of two different levels were used to calibrate the instruments.

Data was analyzed using SPSS computer program version (21), the mean and standard deviation were obtained and the independent T test used for comparison (p value of ≤ 0.05) was considered significant and person correlation was used for correlation.

3. RESULTS

In comparison with the controls, tuberculosis patients had statistical significantly lower means of serum Zinc and albumin in case group compared to control group, zinc (mean ±SD), for cases versus control,(0.16±0.04 versus 0.58±0.13mg/l, *P. value* = 0.000), albumin (mean ±SD, for cases versus control, (2.45±0.57 versus 4.07±0.30g/dl, *P. value* = 0.000). The mean of BMI in patients with pulmonary tuberculosis, was significantly decreased compared to control group (mean± SD for cases versus control, 18.7±0.17 versus 21.5±1.7) as in table (1).

Table (1): Mean concentration of serum zinc and albumin in case and control groups:

Variables	Case (n=60) Mean ± SD	Control (n=60) Mean ± SD	*P. value*
Zinc mg/l	0.16 ± 0.04	0.58 ± 0.13	0.000
Albumin g/dl	2.45 ± 0.57	4.07 ± 0.30	0.000
BMI kg/ cm^2	18.7±0.17	21.5±1.7	0.000

*Result given in mean ±SD. **P. value* < 0.05 consider significant. Independent sample T test was used for comparison.

The present study observed that, no statistical significant difference between means concentration of serum zinc and albumin among age in case group. The mean of serum zinc and albumin in patients between (20-39) years versus the mean in patients between (40-58) years, (mean ± SD; zinc,(0.17 ± 0.05 versus 0.16 ± 0.05 mg/dl, *p. value* =0.268) albumin (2.4 ± 0.54 versus 2.5 ± 0.62 g/dl, *p. value*= 0.592) as in table (2).

Table (2): Mean concentration of serum zinc and albumin among age in case group.

Variables	(20-39 years) n=52% Mean ± SD	(40-58 years) n=48% Mean ± SD	*P .value*
Zinc mg/l	0.17 ± 0.05	0.16 ± 0.05	0.268
Albumin g/dl	2.4 ± 0.54	2.5 ± 0.62	0.592

*Result given in mean± SD. **P .value* < 0.05 consider significant. Independent sample T test was used for comparison.

In this study, 78% of patients were males, while 22% were females as shown in figure (1)

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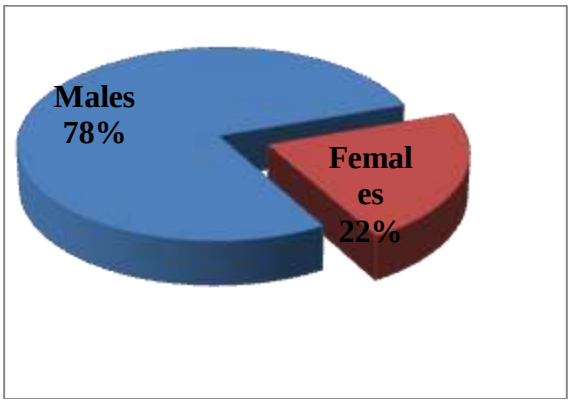

Figure (1): Gender distribution in case group.

The result showed that, 52% of patients at age range between (20-39) years and 48% of patients at age range between (40-58) years, as shown in figure (2).

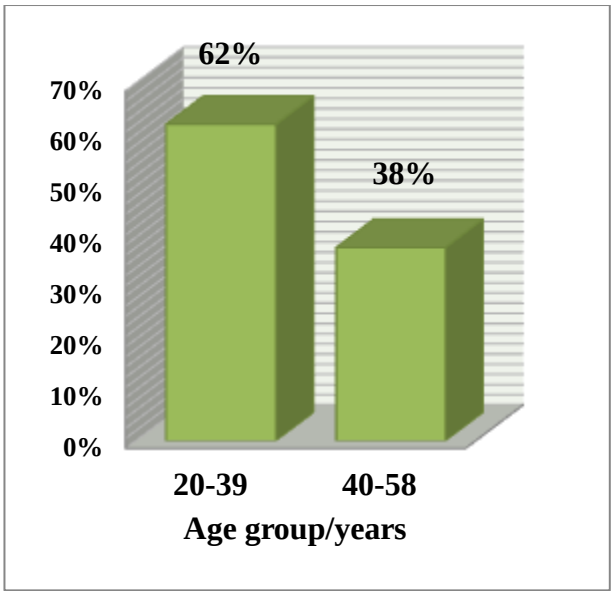

Figure (2): Age distribution among case group.

Correlation between the level of serum zinc and age showed, there was no statistical significant difference (r= - 0.128, *P. value*= 0.374) as in figure (3)

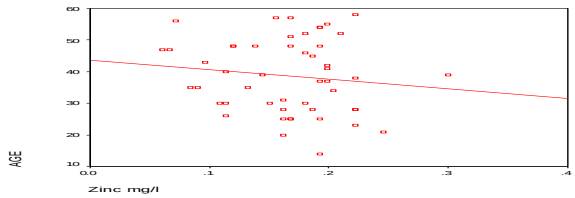

Figure (3): Correlation between serum zinc and age (r= - 0.128, *P. value*= 0.374).

Correlation between serum albumin level and age showed, there was no statistical significant difference (r=0.137, *P .value* = 0.344) as in figure (4).

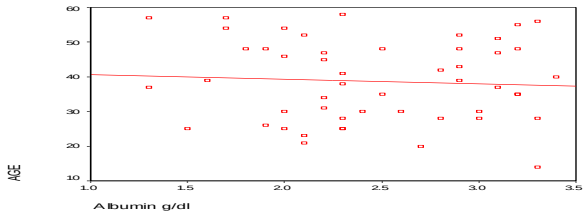

Figure (4): correlation between serum albumin and age (r=0.137, *P .value* =0.344).

4. Discussion

Pulmonary tuberculosis is a global disease affecting about third of the world's population with its attendant mortality and morbidity [15]. Pulmonary tuberculosis can affect many substances in the body by decreasing them. This study was carried out to assess serum zinc and albumin levels in newly diagnosed patients with pulmonary tuberculosis in Khartoum state. From the finding of this study the mean serum levels of zinc and albumin were significantly decreased in case group in comparison to control group (*P.value*=0.000). This result agreed with another study, which showed that; serum zinc and albumin concentration frequently decreased in case group compared to control group [16]. The reduction in zinc and albumin concentration in TB patients were considered to be nutritional factors, enteropathy and acute phase reactant proteins, redistribution of zinc from plasma to other tissues, or a reduction of the hepatic production of metabollothionin, a protein that transport zinc to the liver, albumin level in the serum decreases with increase in severity. This is because of hemodynamic changes that occur in response to T cell reaction and decreased synthesis as a result of direct inhibition by cytokines [17]. Parallel finding to this results observed by other studies carried by many authors [16, 17, 18], their findings confirmed that patients with pulmonary tuberculosis at greater risk of development of low serum zinc and albumin and place them at risk of developing life threatening situation. Result of this study showed that, there was significant decreased in BMI in patients with pulmonary tuberculosis compared to control group (*P.value*=0.000), this result agreed with another studies done in Indonesia and Malawi [19, 20]. The low BMI in patients with pulmonary tuberculosis may be due to poor dietary intake, anorexia and impaired absorption of nutrients or increased catabolism [13]. Low BMI is a known risk factor for mortality [21].

The result of current study showed that pulmonary tuberculosis most common among age (20-58) years. These results in agreement with previous study, which showed that pulmonary tuberculosis infection is common among, age (18-54) years. [15].The finding of this study revealed that, the majority of patients with pulmonary tuberculosis participate in this study were male (78%) while female was (22%). These results in agreement with previous study that showed pulmonary tuberculosis infection is more common in male than female [18]. It is of interest to observe that there was no correlation between zinc level and age of patients. This result agreed with another result, which showed that, there was no correlation between zinc levels and age [21]. According to

finding of this present study, there was no correlation between serum albumin level in PTB patients and age. These results agreed with another study, which showed no correlation was found between age and serum albumin level [(16)].

5. CONCLUSION

According to the results of this study, it concluded that serum zinc and albumin levels are decreased in patients with pulmonary tuberculosis, BMI is decreased in patients with pulmonary tuberculosis and there are no correlation between zinc, albumin level and age.

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REFERENCES

1. **Bhandari, S., Badade, Z.G., Neupane, Y**. Role of Micronutrient Zinc in Pulmonary Tuberculosis**.** *Journal of Universal College of Medical Sciences.* 2013; 15: 1-3.
Organization WHO. Tuberculosis. *Saudi Med Journal*.2013; 34:1205–1207.

3. **Organization WHO**. The Global Tuberculosis Control .*WHO Journal*.2016; 4:437-439.

4. Doyin, O., Sambe, D., Justin, O., Winston, W.,Stephen, M., Silvio, W. Nutrition and tuberculosis: a review of the literature and consideration for TB control programs. *Global tuberculosis control: WHO report*. 2007; 376.

5. Doyin, O., Sambe, D., Justin, O., Winston, W., Stephen, M., Silvio, W. Nutrition and tuberculosis: a review of the literature and consideration for TB control programs. *Global tuberculosis control: WHO report; 2005.*

6. Doyin,O., Sambe, D., Justin, O., Winston, W.,Stephen, M., Silvio, W.Nutrition and tuberculosis: a review of the literature and consideration for TB control programs. *Global tuberculosis control: WHO report* **;** 2006.

7. Davies, P.D. The worldwide increase in tuberculosis: how demographic changes, HIV infection and increasing numbers in poverty are increasing tuberculosis. *Ann Med.*2003; 35(**4**):235-243.

8. Corbett, E.L., Watt, C.J., Walker, N. The growing burden of tuberculosis: global trends and interactions with the HIV epidemic. *Arch Intern Med.* 2003; 163(9):1009-1021.

9. Cegielski, J.P., McMurray, D.N. The relationship between malnutrition and tuberculosis: evidence from studies in humans and experimental animals; *InternationalJournalTuberculosis andLungDisease*. 1994; 8(**3**):286-298.

10. Gupta, K.P., Gupta, R., Atreja, A. Tuberculosisand nutrition. *LungIndia*.2009; 26(**1**):9-16.

11. Walker, C.F., Black, R.E. Zinc and the risk for infectious disease**.** *Annu Rev Nutr.*2004*;* 24:255-275.

12. Liu, X. Determination of trace elements in serum of tuberculosis patients. *JiuWSY*, 2000; 29(**6**): 395-396.

13. Hopewell, P.C. Overview of clinical tuberculosis. *In: Tuberculosis Pathogenesis, Washington.*1994; 16:25-36.

14. Doyin, O., Sambe, D., Justin, O., Winston, W.,Stephen, M., Silvio, W. Nutrition and tuberculosis: a review of the literature and consideration for TB control programs. *Global tuberculosis control: WHO report;2005.*

15. Banarsidas, B., Park, K. Epidemiology of communicable diseases. *Park's text book of preventive and social medicine, 19th edition.* 2007; 150.

16. Mythili, C. Role of Micronutrient Zinc in Pulmonary Tuberculosis. *Sch. J. App. Med. Sci.*2016; 4(**5**):1519-1524).

17. Modawe, G. Biochemical Parameters in Relation to Tuberculosis in Sudanese Patientiens. *Sudan JMS*.2014; 3(**9**): 177-180.

18. **Damburam, A., Garbati, M. A., Yusuph, H.** Serum proteins in health and in patients with pulmonary tuberculosis in Nigeria. *Journal of Infectious Diseases and Immunity*. 2012; 4(2): 16-19.

19. Karyadi, F. Poor micronutrient status of active PTB patients in Indonesia. *J . Nutr.* 2000; 130:2953-2958.

20. Van, L. Malnutrition and severity of lung disease in adults with PTB in Malawi. *Int. J. tuberc.* 2004; 8: 211-217.

21. **Van, L**. Triple trouble: the role of malnutrition in tuberculosis and human immunodeficiency virus co-infection. *Nutr Rev*. 2003; 61: 81-90.