



Study on Serum Zinc Levels and Vitamin a Levels in Tuberculosis Patients

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Tuberculosis, an infectious disease caused by the bacteria *Mycobacterium tuberculosis* (MTB), is also a major cause of death in humans around the world. According to a World Health Organization (WHO) survey, MTB infects one-third of the world's population, with 9.6 million new tuberculosis (TB) infections and 1.5 million deaths confirmed this in 2021

Aim: study of serum zinc levels and vitamin a levels in tuberculosis patients.

Materials and Methods: This study included 40 newly diagnosed PTB patients of both sex with the age group of 18-60. Time period of this study was from September 2020 to April 2021 a non-randomised controlled trial was involved.

Result: There was a strong correlation between serum zinc and vitamin A levels $P < 0.01$) Hb, $P < 0.01$) and serum albumin levels $P < 0.01$) were also strongly correlated with the vitamin A levels; however, WBC $P < 0.01$) and ESR $P < 0.01$) were negatively correlated with the vitamin A levels.

Conclusion: In view of the above, the patient's nutritional status may be the most important

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determinant of infection tolerance. Zinc deficiency can have an indirect impact on Vitamin A metabolism by reducing the levels of circulating protein. Because of this, the addition of zinc in combination with vitamin A may be helpful in achieving the disease status.

Keywords: MTB; Vit-A; Zinc; Retinol; Micronutrient.

1. INTRODUCTION

Malnutrition is a major public health problem in all developing countries. Increasing the incidence and severity of infection and tuberculosis (TB) is a prime example Malnutrition as shown by low body mass index (BMI) is common in TB patients and increases mortality due to TB. In addition to macronutrient deficiency, micronutrient availability has been found to be an important factor in TB outcomes. Other dietary symptoms, such as middle upper arm circumference (MUAC) and weight gain, are also associated with malnutrition [1]. Zinc and vitamin A are two important micronutrients. The role of zinc and vitamin A deficiency in cell defense, an effective way to prevent tuberculosis, was found in this control study. While micronutrients such as zinc and vitamin A can affect the functioning of the body, the extent to which these micro-factors affect the outcome of TB remains unknown [2]. The effects of zinc and vitamin A on the immune system have led to the question of whether this low chemical deficiency is associated with an increased risk of serious tuberculosis. However, proving this theory is difficult as the acute phase response in inflammation causes depletion of plasma zinc and vitamin A in the form of plasma retinol [3].

Vitamin A has a variety of functions in the immune system. Its absence has an effect on both innate and adaptive immunity [2-4]. Micronutrient deficiency, especially vitamin A deficiency, has previously been identified in tuberculosis patients. As a result, the aim of this research was to determine vitamin A concentrations in Moroccan tuberculosis patients in order to set up a major efficacy study of vitamin A supplementation in TB patients. Tuberculosis, an infectious disease caused by the bacteria *Mycobacterium tuberculosis* (MTB), is also a major cause of death in humans around the world. According to a World Health Organization (WHO) survey, MTB infects one-third of the world's population, with 9.6 million new tuberculosis (TB) infections and 1.5 million deaths confirmed this year [5].

The vast majority of tuberculosis patients live in developed countries, which are plagued by

hunger, poor working standards, and insufficient medical care [2]. The progression of tuberculosis is highly dependent on the hosts' immunological status, and it requires the availability of micronutrients such as iron, zinc, and vitamins A and D to function properly. As MTBA high prevalence of (VAD) has been identified in patients with pulmonary tuberculosis, vitamin A plays a critical role in immune responses and is thus important in the host defence against pathogen. indicating a close connection between vitamin A deficiency and the production of tuberculosis with a high rate of 82 new infections per 100,000 people in 2014, tuberculosis is considered a significant public health problem [6].

Tuberculosis mostly impacts young people, and thus has a significant effect on the country's socioeconomic status. To combat tuberculosis, the Ministry of Health developed a national tuberculosis programme that focuses on rapid diagnosis and proper treatment of TB patients. The national programme, however, faces a number of challenges, including bacterial virulence, susceptibility to available anti-tuberculosis medications, medication adherence, and the prevalence of malnutrition. Particularly micronutrient deficiency, which has a significant effect on patients' immune status. As a result, vitamin A supplementation to modulate the immune response of TB patients may be of great interest in increasing the rate of sputum conversion, improving the well-being of TB patients, and thereby aiding the TB-fighting programme. Prior to implementing a dietary approach focused on vitamin A supplementation of TB patients for improved TB treatment, it is critical to assess their vitamin A status [2,3,7].

Weight loss, malnutrition, and weight loss are all linked to PTB. During the prebiotic process, TB patients are treated with sunburn, TB clinics, and cod liver oil. By the way, all of these foods are high in vitamin D. Directly observed treatment, short-course (DOTS) is the most effective tuberculosis therapy, and it entails giving anti-TB drugs in two stages: serious and incurable. With the development of successful anti-TB medications, interest in vitamin D-rich TB

therapies has waned. Impaired PTB metabolism will worsen the symptoms of VDD. Hepatic involvement, granulomatous hepatitis, or local tumour development in the chest can all affect liver function [8].

Aim: Study of Serum zinc levels and vitamin A levels in tuberculosis patients

2. MATERIALS AND METHODS

This study included 40 newly diagnosed PTB patients of both sex with the age group of 18-60. Time period of this study was from September 2020 to April 2021 a non-randomised controlled trial was involved.

2.1 Sample Collection

5ml of blood samples were collected from each of the patients and were distributed in plain and EDTA as 3ml and 2ml each respectively. The serum sample from the plain vial was used for the estimation of Albumin, and Vitamin A while the EDTA samples were used for the estimation of Haemoglobin, ESR, WBC count.

2.2 Biochemical Analysis

Vitamin A was Estimated by Colorimetric Method [9]. EDTA samples were used for the Haemoglobin, ES, WBC count was estimated on 3 parts coulter counter. Albumins were estimated on AU480 Analyser.

3. RESULT

Serum zinc levels and their relationship to Vitamin A levels are investigated in 40 TB patients. The serum zinc and vitamin A levels of the patients were 10.1 ± 0.46 mol / l and

(0.68 ± 0.96) mol / l, respectively. Hb, WBC, ESR, and serum albumin, on the other hand, were 9.6 ± 2.10 g / dl, (11000.0 ± 2000.45) cell / mm³, 15.2 ± 3.10 mm / h, and 3.64 ± 0.71 g / dl, respectively.

4. DISCUSSION

Zinc deficiency has various effects on the immune system, including a reduction in phagocytosis, a decrease in the number of circulating T-cells, and a decrease in tuberculin reuptake, at least in animals [1]. The ability of macrophages to destroy cells in vitro has been shown to decrease during zinc deficiency and was restored immediately after zinc supplementation. Zinc is needed to make the body vitamin A. Adding Zinc improves vitamin A metabolism, which is important in the treatment of tuberculosis. Adequate availability of zinc can also reduce the damage caused by free radicals in the lining during inflammation [3]. The findings of this study also show that zinc deficiency can have a negative impact on the conversion of certain nutrients in men by reducing the circulation of protein levels. The role of zinc deficiency in vitamin A metabolism, especially in its effect on retinol-binding proteins, has been widely studied in animals and to a lesser extent in men. Excessive zinc deficiency can alter the metabolism of other nutrients that depend on transport proteins, such as iron and transferrin, resulting in less carbohydrates being utilized for organ use [4]. Compared with control groups, we found a lower level of serum Zn in patients with tuberculosis. Taneja DP *et al* and Karyadi E *et al*. They all agreed with our findings. Ray M *et al*. India [10]. looked at the serum Zn status of 50 children with TB and compared it to the experience of 10 healthy and 10 malnourished children without TB at 0, 1, 2, 3, and a half

Table 1. Parameters in PTB Patients

Parameters	PTB Patients(n=40)
Weight (kg)	51.11±11.22
Vit -A (µmol/l)	0.68±0.96
Zinc (µmol/l)	10.1±0.46
HB (gm/dl)	9.6±2.10
WBC (cells/mm ³)	11000.0±2000.45
ESR (mm/h)	15.2±3.10
Albumin(gm/dl)	3.64±0.71

There was a strong correlation between serum zinc and vitamin A levels $P < 0.01$) Hb, $P < 0.01$) and serum albumin levels $P < 0.01$) were also strongly correlated with the vitamin A levels; however, WBC $P < 0.01$) and ESR $P < 0.01$) were negatively correlated with the vitamin A levels

years after starting ATT [8,9]. In addition to the nutritional status, children with TB had lower plasma Zn levels than those without the disease. Jain *et al.* [11]. The role of Zinc in lung tuberculosis. As a result, it is wise to consider that Zn support may be effective in resolving the disease. Until treatment, intermediate levels of serum Zn in people with pulmonary TB were very low [12,13]. The serum Zn level with the highest decrease in stage 3, which was statistically significant, was a steady decline in the number of people researching lung TB [14-18].

2. CONCLUSION

In view of the above, the patient's nutritional status may be the most important determinant of infection tolerance. Zinc deficiency can have an indirect impact on Vitamin A metabolism by reducing the levels of circulating protein. Because of this, the addition of zinc in combination with vitamin A may be helpful in achieving the disease status.

ETHICAL APPROVAL

Ethical clearance taken from institutional ethics committee and preserved by author (s)

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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