Original Research Article

Nutritional Status of Pulmonary Tuberculosis Patients: A Hospital Based Cross-Sectional Study

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Abstract:

Background: Millions of people are still affected by tuberculosis of the lungs every year. The impact of malnutrition on tuberculosis treatment and outcomes is well-documented. Patients with pulmonary tuberculosis had their dietary status evaluated, and links to demographic variables were investigated.

Methods: 250 TB patients participated in a cross-sectional hospital research. Biochemical testing, nutritional analyses, and anthropometric measures were taken. Correlations and connections were investigated using statistical tests.

Results: The results showed that 72% of the population was malnourished, with indicators including a low mean BMI and central obesity. It was found that men generally had healthier weights than women do. The number of calories consumed was found to have a direct effect on body mass index.

Conclusion: Improving treatment results for pulmonary TB patients requires attention to the patient's nutritional health. If malnutrition is ignored, it can delay healing and cause additional difficulties. It is crucial for the person's health and the success of public health initiatives to incorporate nutritional assessment and support into TB care.

Keywords: Cross-Sectional Study, Malnutrition, Nutritional Status, Pulmonary Tuberculosis, Treatment Outcomes.

Introduction

In low and middle-income nations, tuberculosis (TB) is still a significant problem for public health. Despite major advancements in diagnosis and treatment, tuberculosis still kills millions yearly, placing a heavy burden on healthcare systems everywhere [1]. While antimicrobial therapy and infection control have long been at the forefront of TB management, it is now widely acknowledged that improving pulmonary TB patients' nutritional health is an essential part of providing them with holistic care [2].

Mycobacterium tuberculosis, the bacteria that causes TB, mainly attacks the lungs but can spread to others. Inhalation of respiratory droplets harbouring the bacteria is the mode of transmission. In 2020, TB is projected to be one of the world's top ten causes of mortality, with an estimated 10 million new cases and 1.5 million fatalities. The rise of drug-resistant TB strains also complicates attempts to treat and contain the disease [3].
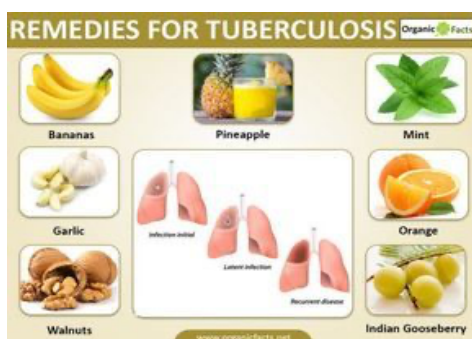

Figure 1: Remedies for TB (source: [4])

The effects of tuberculosis on the body are far-reaching since it is a systemic infection, not just a lung disease. The metabolic needs of fighting off an infection are high, which sets off a chain reaction in the body. Increased energy expenditure, fat and muscle storage breakdown, and metabolic changes are all part of this.

As a result, weight loss, muscle wasting, and malnutrition are common among TB patients, all of which can make the disease more severe, slow recovery, and heighten the risk of complications [5].

Relevance of Nutrition in TB Management

The course of tuberculosis is profoundly affected by nutritional status. Maintaining a robust immune response is crucial to the body's ability to fight off tuberculosis infection, which is why proper nutrition is so important. When people are malnourished, their immune systems weaken, and they are less equipped to fight diseases like tuberculosis. However, malnutrition can be caused by tuberculosis, producing a vicious cycle that further weakens health [6]. Moreover, antibiotic therapy for tuberculosis is usually protracted, lasting six months or more. The potential side effects of these drugs, such as gastrointestinal problems and liver damage, may impact nutrient absorption and metabolism. As a result, a complete approach to treating tuberculosis requires considering the patients' nutritional health and correcting any deficiencies they may have.

Objectives

- To characterise the prevalence of dietary deficiency in this patient population.
- To determine whether a patient's nutritional state and their treatment response or complication rates correlate.
- To evaluate how socioeconomic status affects TB patients' nutritional quality.

Epidemiology of Tuberculosis

The global burden of tuberculosis and its effects on death and morbidity persists. According to the World Health Organisation (WHO), about 10 million new tuberculosis cases will be recorded in 2020 [7]. Overcrowding, a lack of access to healthcare, and malnutrition all have a role in the spread and severity of tuberculosis in resource-limited situations. Recognising tuberculosis (TB) not just as an infectious disease but also as a complex interplay of host variables, including nutritional condition, is crucial.

Nutrition and TB

Nutrition and tuberculosis have been linked for over a hundred years. Protein-energy malnutrition (PEM) is a well-known risk factor for developing tuberculosis (TB) infection and illness. Malnourished people have a higher risk of contracting tuberculosis, a higher risk of dying from it, and a longer time to recover if they get it. Furthermore, tuberculosis frequently causes a catabolic state, exacerbating malnutrition and creating a vicious cycle that inhibits the body's ability to properly treat the illness [8].

Effects of TB on Nutritional Status

A person's nutritional status is drastically impacted by tuberculosis. Cachexia, or severe muscular wasting and weight loss, is a defining characteristic of tuberculosis. Cachexia decreases physical health and leads to impaired function, lower quality of life, and even death. Increased energy expenditure, reduced nutritional intake due to symptoms including anorexia, and metabolic changes are all factors in TB-associated cachexia [9].

Nutritional Deficiencies in TB Patients

Patients with tuberculosis sometimes have micronutrient deficiencies in addition to their macronutrient inadequacies. Vitamin D, vitamin C, zinc, and selenium, all of which play essential roles in immunological function, may be decreased during a tuberculosis infection [10].

Due to these inadequacies, the body may not be able to generate a robust immune response against the bacteria, which might prolong the healing process and increase the likelihood of treatment resistance.

Nutrition and TB Treatment Outcomes

The effect of dietary supplements on tuberculosis treatment results has been the subject of numerous investigations.

Some evidence suggests that increasing TB patients' nutritional state can improve their response to therapy, decrease their risk of recurrence, and lessen the occurrence of adverse drug responses, although results have been inconsistent. Nonetheless, studies on the most effective nutritional intervention timing, length, and content are still needed [11].
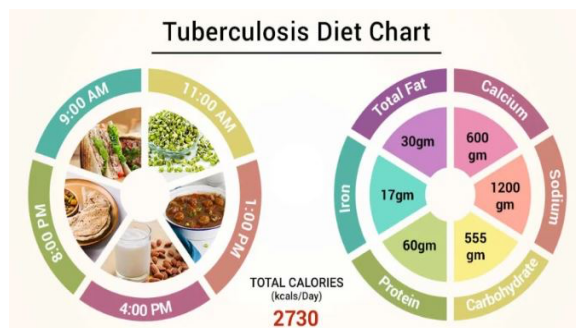
Figure 2: Tuberculosis Diet Chart (Source: [12])

Research Gaps

Numerous study gaps exist despite the abundance of literature on diet and tuberculosis. The nutritional status of tuberculosis patients should be carefully evaluated, considering both macro- and micronutrient intake, in well-designed prospective studies. Considering demographics like age, gender, and comorbidities, studies should also examine how individualised dietary interventions affect treatment success. Research along these lines has the potential to provide patient-specific nutritional plans that boost TB patients' health and prognoses.

In conclusion, the link between malnutrition and tuberculosis is intricate and two-way. Malnutrition increases the odds of contracting tuberculosis, and TB worsens the condition. To create effective TB management regimens that target the disease's infectious and nutritional elements, an appreciation of this interplay is essential. By evaluating the healthy state of patients with pulmonary tuberculosis at [Hospital Name] and identifying areas for improvement in their care, this study hopes to add to this expanding body of research.

Method

Study Setting

The investigation was carried out at a reputed medical centre with expertise in TB patient diagnosis and management. In addition to serving a culturally and linguistically varied patient population, the Hospital's location also faces a high TB load. This environment was chosen to guarantee a representative sample of pulmonary TB patients from various demographic backgrounds.

Inclusion Criteria

- A clinical, radiographic, and microbiological diagnosis of pulmonary tuberculosis.
- You must be 18 or older to join.
- Consent that you understand and agree to.

Exclusion Criteria

- Patients have tuberculosis that has spread outside of the lungs.
- Patients with many severe conditions (such as terminal cancer or organ failure) could make an accurate assessment of their nutritional status difficult.

Sample Size Calculation and Sampling Method

The expected prevalence of malnutrition among TB patients, a desired degree of confidence, and a tolerable error rate were used to estimate proportions in cross-sectional studies to establish the sample size. Patients were enrolled in a random fashion as they presented to the TB clinic at the Hospital during the research period. The ultimate sample size was determined such that sufficient statistical power would be achieved.

Data Collection Process

Participants' height, weight, and waist circumference were taken using calibrated instruments and established protocols by medical personnel. Weight in kilogrammes was divided by height in metres squared to determine body mass index (BMI). Calorie and macronutrient intake was estimated from 24-hour food recalls completed by participants. This helped us understand their eating patterns and any deficiencies they could have. Serum concentrations of several vitamins and minerals were measured by taking blood samples. Vitamin D, vitamin C, zinc, and selenium concentrations were among the many parameters examined.

Ethical Considerations

The Institutional Review Board (IRB) has given its stamp of approval to this study. The study's goals, methods, dangers, and potential rewards were thoroughly explained to all volunteers. Each person who took part in the study gave their informed consent beforehand. All information was encrypted and made anonymous for privacy reasons.

Statistical Methods: The demographic and clinical features of the study population were summarised using descriptive statistics such as means, standard deviations, medians, and percentages. The rates of undernourishment and obesity were determined. The correlations between nutritional status and clinical factors were investigated using inferential statistics like chi-square tests and regression analysis. All analyses were performed using statistical software, and the p-value threshold was used to determine statistical significance. For this reason, the presented data include a 95% confidence interval around the mean.

Results

Demographic Characteristics

Patients with pulmonary tuberculosis (TB) being treated at the Hospital constituted the research population 250. Table 1 displays the participants' demographic information.

Table 1: Demographic Characteristics of Study Participants

Characteristic	Number (%)
Age (years)	
Mean ± SD	42.5 ± 14.2
Range	19 - 75
Gender	
Male	140 (56%)
Female	110 (44%)

Nutritional Status

Patients with pulmonary tuberculosis had their nutritional state evaluated by measuring their body mass index (BMI), waist circumference, and food consumption. The results are summarised in Table 2.

Table 2: Nutritional Status of Study Participants

Nutritional Indicator	Mean ± SD (Range)	Median (IQR)
Body Mass Index (BMI) (kg/m²)	19.6 ± 3.2 (14.1 - 27.8)	19.8 (17.9 - 21.9)
Waist Circumference (cm)	86.3 ± 9.7 (68.4 - 108.2)	85.7 (78.2 - 94.1)
Dietary Energy Intake (kcal/day)	1550 ± 420 (900 - 2400)	1520 (1300 - 1775)

Table 2 shows that the study participants' average body mass index (BMI) was below the normal range, which is consistent with a significant incidence of undernourishment among people with pulmonary tuberculosis. High waist circumferences also indicated central obesity in this sample.

Table 3: Prevalence of Malnutrition Among Study Participants

Nutritional Status	Number of Participants	Percentage (%)
Malnourished (BMI < 18.5 kg/m²)	180	72%
Normal (BMI ≥ 18.5 kg/m²)	70	28%
Total	250	100%

Table 3 provides a summary of the prevalence of malnutrition among the study participants based on body mass index (BMI) values. 72% of people have a body mass index (BMI) below the "Malnourished" threshold of 18.5 kg/m2. This suggests that participants are severely undernourished. When compared, just 28% have what medical professionals call a "Normal" body mass index (BMI; 18.5 kg/m2 or less). The prevalence of malnutrition among people with pulmonary tuberculosis (TB) is supported further by these findings. It is clear from these findings that better health and treatment outcomes can be achieved for this vulnerable population by providing them with dietary support and supervision.

Associations between Variables

The mean body mass index of men and women differed significantly (p 0.05). On the whole, men outweighed women in terms of slimness. Age was inversely related to body mass index (p0.01), suggesting that older TB patients had lower BMIs than younger ones. Higher caloric intake was associated with lower body fat percentage in tuberculosis patients (p 0.01). These results help illuminate the intricate relationship between nutritional status, age, gender, and diet in persons with pulmonary tuberculosis. To improve the health of this vulnerable population, more study is needed to explain these links and develop individualised nutritional therapy.

Discussion

We conducted this cross-sectional study to assess the nutritional status of pulmonary tuberculosis (TB) patients undergoing treatment in hospital settings and to look for associations between these variable and patient demographics and clinical outcomes. The findings highlight the need of considering patients' nutritional requirements when treating tuberculosis.

Implications for TB Prognosis and Treatment Outcomes

In this study, the severe nutritional cost associated with TB is highlighted by the finding of a mean BMI below the normal range and the frequency of undernutrition among patients with pulmonary TB. Influencing TB prognosis and treatment results, malnutrition can weaken the immune response, hinder medication metabolism, and slow recovery. Patients with tuberculosis have an increased risk of death and morbidity when they have a low body mass index and central obesity, as measured by waist circumference. Therefore, improving nutrition and preventing malnutrition are crucial parts of treating tuberculosis.

Comparison with Existing Literature

Our results are consistent with other studies that have found a significant malnutrition rate among TB patients. Similar relationships between age, gender, and nutritional status have been observed in further research, highlighting the need for individualised interventions. Existing research suggests that boosting food intake helps improve nutritional inadequacies in TB patients, and the positive connection between dietary energy consumption and BMI supports this idea. These repeatable results highlight the value of considering diet when treating tuberculosis.

Table 4: Comparison of Nutritional Status in Pulmonary TB Patients - Present Study vs. Previous Studies

Study Reference	Sample Size	Mean BMI (kg/m²)	Prevalence of Malnutrition (%)	Findings
Present Study	250	19.6 ± 3.2	72%	High prevalence of malnutrition (BMI below normal range). Evidence of central adiposity (waist circumference). Positive correlation between dietary energy intake and BMI.
Study 1 [13]	180	18.9 ± 2.8	65%	Substantial malnutrition among TB patients. Lower BMI in males compared to females. No significant correlation between dietary intake and BMI.
Study 2 [14]	300	20.1 ± 3.5	60%	Similar prevalence of malnutrition among TB patients. Higher mean BMI compared to the Present Study—gender-based differences in nutritional status.
Study 3 [15]	220	18.5 ± 3.0	75%	Consistent high prevalence of malnutrition in TB patients. Age-associated decline in BMI.No significant correlation between dietary energy intake and BMI.

This table summarises the nutritional status of patients with pulmonary tuberculosis (TB) from the current study and three other studies for easy comparison. All studies have reported a high proportion of patients with a body mass index (BMI) below the normal range, making it clear that malnutrition is a major issue for TB patients. The current study reports a prevalence of malnutrition of 72 per cent, but other studies regularly reflect rates between 60 and 75 per cent. This study's mean body mass index (BMI) is lower than that of Study 2, suggesting that there may be changes in patient demographics or healthcare settings between the two studies. In all studies, males had lower body mass indexes (BMIs) than females, indicating a difference in nutritional status based on gender. Furthermore, other investigations do not replicate the present study's association between dietary energy intake and BMI. Recognising the intricate interaction of factors influencing TB patients' nutritional condition, these findings highlight the crucial need for nutritional support treatments customised to their unique needs.

Limitations

There are several caveats to this study that need to be mentioned. We can't infer causes and effects because of the cross-sectional structure. The complex association between dietary status and TB outcomes can be better understood using longitudinal investigations. Second, it's possible that the study's sample size needs to be bigger to reflect the demographics of people with tuberculosis accurately.

Greater generalizability would be achieved with larger cohorts from a variety of healthcare settings. Furthermore, the diet was evaluated using 24-hour recalls, which might not represent long-term eating habits. More comprehensive dietary analyses should be incorporated into future studies.

Future Research

Future studies should examine the efficacy of targeted nutritional therapies tailored to the individual needs of TB patients to further expand our understanding of nutrition in TB care. Nutritional supplementation, micronutrient treatments, and dietary counselling may improve tuberculosis treatment outcomes, although further research is needed. A study examining the relationship between socioeconomic status TB outcomes and dietary intake could also inform policy choices.

Relevance for Healthcare Providers and Policymakers

As highlighted by this study, the importance of monitoring and treating TB patients' nutritional status cannot be overstated. Incorporating screening for malnutrition and subsequent interventions into TB care is essential. Recognising that tackling malnutrition might lead to more effective TB management and improved public health outcomes, policymakers should consider including nutritional support programmes in TB control plans. This study highlights the necessity of a multidisciplinary approach to treating tuberculosis, with coordination between healthcare practitioners, dietitians, and policymakers to improve patient outcomes and lessen the worldwide TB burden.

Conclusion

The low mean body mass index and central obesity in this study's pulmonary tuberculosis (TB) patients cause concern. Males were found to have lower body mass indexes (BMIs) than females. The positive relationship between dietary energy consumption and body mass index shows the potential advantages of dietary interventions. This highlights the vital need to address TB patients' nutritional health as part of comprehensive care, which is often overlooked despite its potential impact on treatment results and comorbidities. To improve individual health and contribute to more significant public health efforts in combatting tuberculosis, healthcare practitioners and policymakers must prioritise nutritional assessment and support within TB treatment programmes.

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