



Original Article



Assessment of Nutritional Status among Tuberculosis Patients: A Survey-Based Study

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ABSTRACT

Tuberculosis (TB) remains a formidable global health challenge, representing a significant contributor to illness, mortality, and disability. Despite medical advancements, TB persists as the leading cause of death attributable to treatable infectious diseases, underscoring its enduring impact on public health worldwide. **Objective:** To assess the nutritional status among tuberculosis patients. **Methods:** A cross-sectional study encompassing both male and female participants was conducted. Out of the 205 participants involved, 115 were male and 90 were female, with an average age of 45 years. Our sample pool included both newly diagnosed and retreatment tuberculosis (TB) patients, and data gathering took place across various healthcare facilities within the Sahiwal district of Punjab, Pakistan. **Results:** Our research also found that patients with tuberculosis (TB) symptoms lasting over three months before diagnosis, were more prone to malnutrition compared to those with symptom durations. Additionally, our study indicated that 46.8% of the individuals involved in the research were malnourished. To sum up, our study underscores the link between health and TB among individuals. This study noted multiple factors like family size, income, education level, and other socioeconomic factors that affect tuberculosis outcomes and emphasized the importance of treatment outcomes. **Conclusions:** Detecting TB early and ensuring patients receive diagnosis and treatment is essential to prevent undernutrition from developing in TB patients.

INTRODUCTION

Tuberculosis remains a health challenge causing a significant effect on well-being, mortality, and incapacity worldwide despite developments in health science. Despite advancement, TB remains the cause of death due to curable infectious disorders emphasizing its persistent impact on public health internationally [1]. This challenge is impaired by expanding poverty levels, growing populations, and the existence of HIV/AIDS. The World Health Organization (WHO) has stressed the consequence of this

issue leading to a rise in TB cases globally [2]. Many problems like poverty, lack of education, overpopulation, and nutritional status of the subjects, are linked with the incidence of tuberculosis (TB). Recent studies have proved that TB is related to the frequency of diseases with genetic susceptibility [3]. Malnutrition is considered one of the major reasons among them, influencing its impact by the development of latent tuberculosis disease into active disease and increasing the rate of disease recurrence [4].

Various studies have shown that TB and malnutrition can coexist, both in developed and underdeveloped countries of the world [5]. Tuberculosis patients show poor nutritional status and play a key part in the healing of the disease and prognosis [6]. Poor nutritional status damages the immune system of the patients. There is a necessary to identify the relationship between malnutrition and tuberculosis and develop focused approaches to address both malnutrition and tuberculosis [7]. Moreover, the poor nutritional status contributed to latent tuberculosis infection repetition, strengthening the tuberculosis prevalence, especially when linked with HIV infection [8]. The assessment of nutritional status is necessary for the active therapy of disease and for reducing disease-related difficulties [9]. However, multiple indications shown by tuberculosis patients like reduced metabolism, lack of appetite, and reduced food intake, enhance the risk of death and delay recovery from the disease [6]. It is important to know the association between undernutrition and tuberculosis for the improvement of the treatment outcomes [10].

The objective of this study was to reveal potential risk factors such as age, gender, socioeconomic levels and education that might interact with the nutritional status of tuberculosis patients. The goal of the research was to find these correlations to advance data on the complex relationship between tuberculosis and malnutrition, which would assist develop tuberculosis prevention and management strategies.

METHODS

A cross-sectional study was conducted, including both males and females, for assessment of the members. The desired confidence level 95% which has a z-score of 1.96. A total number of 205 participants, who had an average age of 45, were included 115 males and 90 females. The data were gathered from patients with tuberculosis (TB) disease in the Sahiwal area of Punjab, Pakistan, across several healthcare centers. The study was conducted in 4 months. A questionnaire was designed to get data on nutritional status and its related determinants in TB patients through individually conducted interviews. The survey was categorized into five sections, each comprised of different criteria that were crucial for the study. The first section related to anthropometric measurements like waist circumference, mid-arm circumference, weight, and height. The second section examined the socio-demographic traits, and the third section was associated with questions for evaluating the participant's health. The fourth section identified the symptoms of tuberculosis disease, while the last section included questions about biochemical data. First, the nutritional status of the patients was evaluated by carefully weighing the subjects

with the use of a standard balance, which was accurate near 0.1 kg. Similarly, the height of the patients was measured while they were standing, and the results were recorded to the closest 0.5 cm. Body mass index (BMI) was calculated using the formula: $BMI = \text{weight in kg} / (\text{height in meters})^2$. BMI charts were then used to identify the results. To further clarify the results of the nutritional health, measurements of the waist and mid-upper arm circumference (MUAC) were made and compared to the standard norms. To ensure data accuracy, definite procedures were applied. The relevant questionnaire was designed to ensure relevance and accuracy. The collection of data was strictly observed throughout the interviews, the procedure was reviewed for uniformity and completeness. The descriptive data were collected including age, sex, type of occupation, level of education, and ethnic group. The data of different variables was collected for statistical analysis using SPSS version 24.0 software. The study provided useful data related to nutritional status and the related variables that impact the health status of the patients.

RESULTS

Total 205 participants included males and females were provided data in this study. The number of males and females included were 115 and 90 respectively. The mean age of study participants was 45 years (18-92 Years). The results were calculated on the basis of objectives of study. Table 1 shows that 115 (56.1%) were males and 90 (43.9%) were females. Males were slightly higher than females. 186 (90.7%) participants were married and 19 (9.3%) were single. Among study participants 141 (68.8%) were uneducated, 30 (14.6%) were got primary education, 16 (7.8%) were got middle and only 18 (8.8%) participants were got matriculation or higher education. 87 (42.4%) females were house wives, 6 (2.9%) were government employee, 30 (14.6%) were farmer, 27 (13.2%) were unemployed, 26 (12.7%) were merchant and 29 (14.1%) choose the other option. Among participants 81 (39.5%) were from urban area and 124 (60.5%) were from rural area. 63 (30.7%) participants had 5 or less family members while 142 (69.3%) had more than 5 family members. Among participants 110 (53.7%) were earning less than 15000 rupees, 82 (40%) were earning from 15000 to 30000 and only 13 (6.3%) were earning more than 30000 rupees monthly. 123 (60%) participants were smoking and 82 (40%) were not smoking. 28 (13.7%) participants were immunized with vaccine while 177 (86.3%) were not.

Table 1: Socio-Demographic Characteristics of the Study Participants

Subject	Category	Frequency (%)
Age	< 25 y	16 (7.8)
	25-35 y	44 (21.5)
	36-45 y	54 (26.3)
	>45 y	91 (44.4)
Sex	Male	115 (56.1)
	Female	90 (43.9)
Marital Status	Married	186 (90.7)
	Single	19 (9.3)
Educational Status	Uneducated	141 (68.8)
	Primary	30 (14.6)
	Middle	16 (7.8)
	Higher Education	18 (8.8)
Occupation	House Wife	87 (42.4)
	Govt. Employee	6 (2.9)
	Farmer	30 (14.6)
	Unemployed	27 (13.2)
	Merchant	26 (12.7)
	Others	29 (14.1)
Residence	Urban	81 (39.5)
	Rural	124 (60.5)
Family Size	≤ 5	63 (30.7)
	>5	142 (69.3)
Income (Rupees)	<15000	110 (53.7)
	<30000	82 (40)
	>30000	13 (6.3)
Smoking	Smoking	123 (60)
	Not Smoking	82 (40)
BCG Vaccination	Vaccine	28 (13.7)
	Not Vaccine	177 (86.3)

Table 2 shows health status of the participants. 6 (2.9%) females were pregnant and 13 (6.3%) were feeding their children. 31 (15.1%) participants were diabetic. 39 (19%) of study participants showed the symptom of a cough or other TB symptoms within less than one month, 162 (79%) study participants were showed the symptom of a cough or other TB symptoms within one to three months and 4 (2%) of study participants were showed the symptom of a cough or other TB symptoms after three months before diagnosis of TB. 176 (85.9%) were new cases and 29 (14.1%) were retreatment cases. Among participants 99 (48.3%) were smear +ve and 106 (51.7%) were smear -ve. Among 166 (81%) patients were in intensive phase and 39 (19%) in continuous phase.

Table 2: Health Status of Study Participants

Subject	Category	Frequency (%)
Pregnancy	Yes	6 (2.9)
	No	199 (97.1)
Lactation	Yes	13 (6.3)
	No	192 (93.7)

Diabetes	Yes	31 (15.1)
	No	174 (84.9)
CKD	Yes	6 (2.9)
	No	199 (97.1)
Symptoms Before Diagnosis	Less than a Month	39 (19)
	1-3 Month	162 (79)
	Above 3 Month	4 (2)
Form of TB	New Case	176 (85.9)
	Retreatment Case	29 (14.1)
Type of TB	Smear +ve	99 (48.3)
	Smear -ve	106 (51.7)
Anti-TB Rx Status	Intensive Phase	166 (81)
	Continuous Phase	39 (19)

Table 3 shows 200 patients were complaining of cough that lasts three or more months, 45 of coming blood with coughing, 191 were complaining of chest pain, 61 were complaining of night sweats, 139 for loss of appetite and 165 for unexplained weight loss.

Table 3: Clinical Data of Study Participants

Subject	Category	Frequency (%)
Coughing (3 or >3 Weeks)	Yes	200 (97.6)
	No	5 (2.4)
Coughing Up Blood	Yes	45 (22)
	No	160 (78)
Chest Pain	Yes	191 (93.2)
	No	14 (6.8)
Night Sweats	Yes	61 (29.8)
	No	144 (70.2)
Loss of Appetite	Yes	139 (67.8)
	No	66 (32.2)
Weight Loss	Yes	165 (80.5)
	No	40 (19.5)

Figure 1 shows that 96 patients were underweight, 107 were normal and 2 were overweight according to BMI.

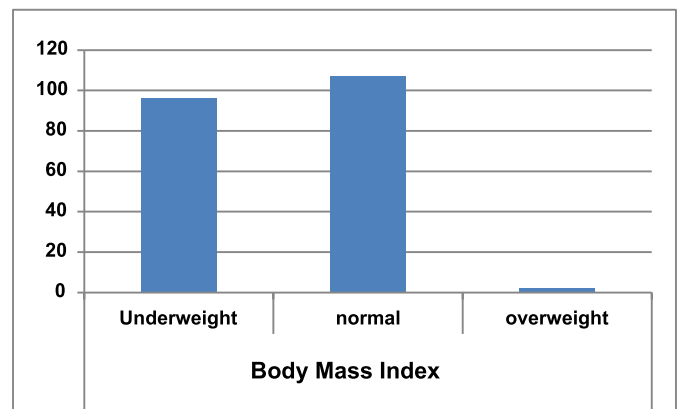


Figure 1: Body Mass Index (BMI)

94 were underweight and 111 were normal in accordance with Mid Upper Arm Circumference (MUAC) as shown in figure 2.

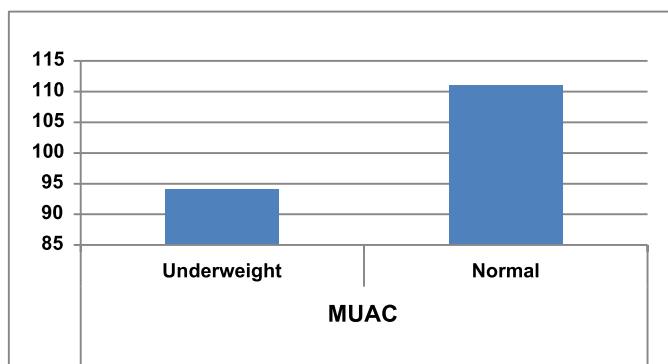


Figure 2: Mid Upper Arm Circumference(MUAC)

According to waist circumference 91 were underweight and 114 were normal (figure 3).

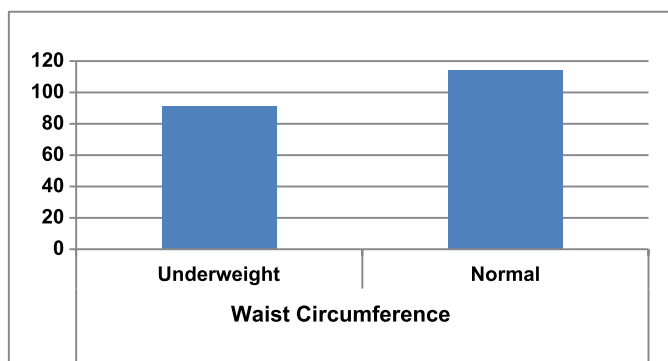


Figure 3: Waist Circumference

DISCUSSION

The main conclusion of our study underscored the implication of nutritional status as an independent variable associated with tuberculosis (TB) among individuals in Timor and Rote Islands [11]. A study has shown that many sociodemographic characteristics like large family size, family history of tuberculosis, non-indigenous ethnicity, and employment status were significantly related to tuberculosis [12]. Particularly, participants (46.8%) of our study were undernourished, which was consistent with results from a previous study conducted in Addis Ababa [13]. The prevalence of the disease may be explained by the region's public health facilities like medical support, high-quality treatment, and counseling services related to dietary choices. Our study is comparable with the results of previous studies. Studies in places like Gonder (Ethiopia), rural India, Uganda, Sekondi-Takoradi (Western region of Ghana), and Malawi reported higher rates of undernutrition, whereas studies conducted in Taipei, Taiwan, and Peru reported lower rates of undernutrition among adult tuberculosis patients compared to our study [14]. Different studies showed different results due to multiple reasons like lifestyle characteristics, dietary habits, socioeconomic and sociocultural factors, and the duration of the data collection [15]. This study reported that individuals were showed disease symptoms for more than

three months are more prone to a high risk of undernutrition as compared to those whose symptoms lasted for a shorter duration. It is important to identify problems early, make a diagnosis, and recommend treatment and follow-up for the patients. Poor nutritional status is the major risk factor for the onset of tuberculosis [16]. Moreover, overpopulated and densely living areas are more susceptible to transmitting tuberculosis [17]. The results are consistent with other studies from Ghana and Indonesia that show an association between adult TB patients' undernutrition and the size of their families [18]. Compared to, the person with a high literacy rate shows greater adherence to drug consumption and follows a healthy diet. This shows that education level provides support against the prevention of the disease [19]. Extreme poverty is the major contributing factor to malnutrition, acting as a major risk factor for the development of tuberculosis [20]. This study showed that multiple factors like family size, income, education level, and other socioeconomic factors were associated with malnutrition in tuberculosis patients at the time of registration at the health center for treatment.

CONCLUSIONS

Our study shows a significant correlation between the nutritional status of an individual and tuberculosis. Different sociodemographic characteristics like extended families, nonindigenous ethnicities, employment status, and a family history of tuberculosis, were found to be associated with tuberculosis. This study noted multiple factors that affect tuberculosis outcomes and emphasized the importance of treatment outcomes.

Authors Contribution

Conceptualization: TA

Methodology: TA, HN, SQ, FQ, SM, ASQ

Formal analysis: SQ

Writing-review and editing: ISQ, AA, FQ, ASQ

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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