Nutritional Status and Chronic Disease among the Adult Tribal Population of Northeast India

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Abstract: A prospective case-control study was done on adult TB cases between the age 20-40 years diagnosed and registered in the different TB centers in Manipur, Northeast India. Cases were defined as subjects who were diagnosed as suffering from TB and taking regular medicines. Controls were apparently healthy subjects who had never suffered from tuberculosis as confirmed from doctors. Anthropometric measurements like stature, body weight and mid upper circumference were taken for the study. Body mass index (BMI) which is one of the index of nutritional status was computed. The percentage of chronic energy deficiency (CED) based on body mass index (BMI<18.5kg/m^2) were 42.6% among subjects suffering from TB and 4.2% from non-TB patients respectively. The prevalence of undernutrition based on mid upper arm circumference (MUAC<22.0cm) was found to be 64.8% for TB patients but none in the healthy controls. Based on the World Health Organization BMI classification, the prevalence of CED (BMI<18.5kg/m^2) among tuberculosis patients indicated a critical situation.

Keywords: Tuberculosis, CED, tribals, Northeast India, MUAC, BMI.

INTRODUCTION

Tuberculosis(TB) is a chronic disease requiring prolonged treatment and is a leading cause of death in many developing countries. India is one of the 22 high burden countries for tuberculosis. Global estimate of the burden of tuberculosis related disease and death for 1997 indicated that 8 million people developed active tuberculosis every year and nearly 2 million died [1]. India alone accounts for one-third of the global burden of TB and every year more than 1.8 million new cases appear in the country. Approximately 4,00,000 people die from TB every year in India, more than 1,000 die every day and 100 million work days are lost [2]. The situation in the remote tribal areas is still grim. Among the tribals the prevalence of tuberculosis was found to be affected by socio-economic status, nutrition, family size, customs, beliefs and use of medical facilities [3].

Anthropometry is considered to be an important tool for assessing the nutritional status of adults. Body mass index (BMI) is found to be inexpensive, non-invasive and suitable for large scale surveys [4-8]. Thus, BMI is the most established anthropometric indicator used not only for assessment of adult nutritional status but also the socio-economic condition of a population, specially adult populations in developing countries [9-11].

Mid upper arm circumference (MUAC) is another anthropometric measure that can be used to evaluate adult nutritional status. It has been found that MUAC is particularly effective in the determination of malnutrition among adults in developing countries [5].

Several studies like association of body mass index and incidence of tuberculosis [12], body build and tuberculosis [13-15], nutritional status and weight gain in pulmonary tuberculosis patients with treatment [16, 17] have been conducted. But the assessment of the nutritional status of TB patients by BMI and MUAC is still poorly documented. In view of this, the present investigation was undertaken to study the nutritional status of patients suffering from tuberculosis among the adult tribal population of Manipur, Northeast India.

MATERIALS AND METHODOLOGY

The data for the present study was collected from the different district TB centers in Manipur from August 2000 to July 2001. The density of population is 82 per sq.km., the literacy rate is 59.89% and the per capita income is Rs. 3502/- [18].

According to the 1991 census report, Manipur has a population of around 1,837,149 out of which the tribal population accounts for approximately 30 percent. The state of Manipur may be simply divided into a valley at the centre and the hills surrounding it. The hills are said to be abode of the tribals. The main occupation of the people is agriculture and rice is their staple food.

A cross sectional study among the female adult pulmonary tuberculosis (TB) patients between 20-40 years of age was conducted in four district TB centers of Manipur. The TB patients selected were patients who had been taking regular TB medicine as confirmed from doctors at their respec-

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tive TB centers. These subjects came to various TB centers for constant monitoring. None of the subjects were related to each other by birth or by marriage. Controls were healthy subjects with no history of tuberculosis, matched with cases for age, and selected from among the non-family neighbors of the patients.

Certain guidelines were laid down for selecting the subjects who had TB and were willing to co-operate in the present study, (1) only those subjects who took their medicines regularly as confirmed by the doctors and/or health workers and also followed the dietary norms as advised by doctors were taken, (2) only new cases of pulmonary tuberculosis were taken, (3) none of the HIV +ve patients were retained in the sample. Exclusion criteria for the controls were as follows: previous anti-TB treatment, any form of disease and HIV+ve as confirmed by the doctors.

A well-informed written consent from the subjects for their willingness to participate in the present study was taken before the measurements were taken.

Anthropometric measurements were taken on each subject following the techniques described by Weiner & Lourie [19]. The stature was measured to the nearest 0.1cm with a Harpenden anthropometer. Body weight was measured to the nearest 0.1kg using a beam balance scale with subjects wearing minimum clothing and no shoes. The mid upper arm circumference was measured to the nearest 0.1 cm using a flexible steel tape. Body mass index was calculated as body weight in kg divided by stature in meter squared [BMI=wt (kg)/ stature (m^2)].

Data management and statistical analyses were performed using SPSS 13.0 version.

RESULTS

Table **1** gives the means and standard deviations of stature, body weight, mid upper arm circumference (MUAC) and body mass index (BMI) of TB patients and healthy controls. It was found that the mean values of all the measurements among TB patients was the lowest and was highest among healthy control subjects. The differences in the mean values of stature, body weight, mid upper arm circumference and body mass index between TB patients and healthy controls were found to be statistically significant at $p<0.001$.

The percentage distribution of BMI categories is given in Table **2**. Following the World Health Organization [20] classification of CED, 42.6% of the subjects suffering from TB and 4.2% of the healthy controls were found to be CED.

Table **3** shows that the percentage of subjects who were malnourished based on MUAC<22.0cm was highest among subjects suffering from TB (64.8%). None of the healthy control subjects were found to be malnourished based on MUAC.

DISCUSSION

The wasting of soft tissues as a cardinal sign of TB even in ancient time led to speculation that the impact of this disease eventually extends beyond the lungs. In the present study it was observed that the TB patients were relatively

Table 1. Basic Data of the Subjects

Subjects	n	Stature(cm) Mean ± SD	Body Weight(kg) Mean ± SD	MUAC(cm) Mean ± SD	BMI(kg/m^2) Mean ± SD
TB patients	108	153.6 ± 3.35	44.4 ± 5.63	21.8 ± 2.12	18.8 ± 2.29
Controls	120	156.1 ± 4.06	52.8 ± 5.61	24.2 ± 1.43	21.6 ± 1.89
t- value		5.06***	11.32***	10.22***	10.14***

***p<0.001.
MUAC-mid upper arm circumference.
BMI-body mass index.

Table 2. Distribution of Subjects According to Nutritional Status based on Body Mass Index (BMI)

Subjects	n	CED I n(%)	CED II n(%)	CED III n(%)	Total CED n(%)	Normal n(%)	Overweight n(%)
TB patients	108	14(13.0)	12(11.1)	20(18.5)	46(42.6)	62(57.4)	-
Controls	120	-	-	5(4.2)	5(4.2)	111(92.5)	4(3.3)

CED-chronic energy deficiency.

Table 3. Distribution of Subjects according to Nutritional Status based on Mid Upper Arm Circumference (MUAC)

Subjects	n	MUAC <22.0 cm n(%)	MUAC ≥22.0 cm n(%)
TB patients	108	70(64.8)	38(35.2)
Controls	120	-	120(100)

shorter and thinner than the healthy control subjects. This confound with the earlier findings that tuberculosis develops much more frequently among men who were tall and thin than those who were short and heavy set [13-15].

Tungdim *et al.*, [3] have found that the socio-economic status of the healthy controls was found to be comparatively higher than the TB patients at different stages of treatment which confound with the findings of Ginzburg & Dadamukhamedov) [21] and Ulijaszek [22].

It was demonstrated that the nutritional status as assessed by body mass index and mid upper arm circumference was significantly poor in TB patients as compared with healthy controls. Similarly, Tverdal [12] found a distinct association between an increasing risk of pulmonary TB with a decreasing body mass index which was observed for both sexes, all age groups, and at all lengths of observations. It is well established that people show a decrease in their body fat content and protein contents with the onset of the chronic disease. As one of the symptoms of TB is anorexia or loss of appetite which results in low energy intake, this further cause a loss in body weight with a concomitant decrease in body fat and muscle mass. Hopewell [23] concluded that the poor nutritional status of patients with pulmonary TB may be due to anorexia, impaired absorption of nutrients or increased catabolism. The TB patients and healthy subjects had similar food habits and food intakes because their socio-cultural background and living conditions were similar. Thus, infectious disease such as TB may have led to impaired absorption and increased rates of metabolism [21, 22]. TB is probably associated with more severe malnutrition than other chronic illnesses [24]. The nutritional status of the patients with TB was worse than those patients suffering from leprosy [25]. Similarly, Onwubalili [26] also found that TB patients had significant reduction in the body mass index, triceps skinfold thickness and arm muscle circumference. Kennedy *et al.* [16] found that TB patients displayed evidence of malnutrition both before and after treatment in a longitudinal study among the Tanzanian population. So, good diet is certainly very important during rehabilitation.

Tungdim & Kapoor [8] found that with TB disease there was depletion of fat stores and muscle wastage but with TB treatment there was improvement in fatness level, muscle strength and mass. So, regular intake of medicine is important for the significant improvement of nutritional status of TB patients.

Cegielsky & McMurray [27] also found that malnutrition appeared to increase the risk of developing tuberculosis. It can thus be perceived that there is a strong association of tuberculosis with anthropometric indices of nutritional status. The prevalence of malnutrition based on BMI<18.5kg/m^2 and MUAC<22.0cm are found to be the likely predictors of tuberculosis. The BMI and MUAC are significantly influenced by chronic disease like tuberculosis and that tuberculosis leads to loss of energy reserve and muscle wastage which later predisposes individuals to chronic energy deficiency (CED). Thus, in the present study it was found that the tuberculosis patients displayed high prevalence of CED as compared to the healthy controls and this confirmed the findings of Karyadi *et al.* [24]. Thus, TB is a chronic disease associated with depletion of fat stores and muscle wastage [8].

It is evident from the present study that nutritional status as assessed by various anthropometric indices appeared to be reliable indicators for the detection of the chronic disease TB.

CONCLUSION

From the present study it can be concluded the nutritional status of patients with pulmonary TB was poor as compared with the healthy controls. This further indicates depletion of fat stores and muscle wastage with onset of tuberculosis.

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