ORIGINAL ARTICLE

Nutritional status in multi-drug resistance-pulmonary tuberculosis patients

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Citation

Abstract

Introduction: Malnutrition and tuberculosis are the major concerns of underdeveloped regions of the world. Undernutrition increases the risk of tuberculosis (TB) and in turn TB can lead to Malnutrition. Undernutrition is therefore highly prevalent among people with TB. It has been demonstrated that undernutrition is a risk factor for progression from TB infection to active TB disease and severe form viz. MDR-TB. Undernutrition is a predictor of increased risk of death and TB relapse. **Objectives:** To study the effect of nutrition in MDR-TB patients at DR-TB centre, Dehradun. **Methodology:** The Observational cross sectional study was conducted at Drug Resistant Tuberculosis (DR-TB) Centre of HIMS, Dehradun over a period of 12 months to include all the cases reported from 1st October, 2011 (start of DR-TB Centre at HIMS, Dehradun) to 30th April, 2014. 376 Subjects were recruited from 1598 suspected MDR TB subjects who were screened by Drug Susceptibility Testing (DST) results. **Results:** Out of 376 MDR-TB patients, 258 (68.6%) subjects were found to be undernourished. The mean body mass index (BMI) was 17.33+1.99 kg/m^2. Though undernutrition was more common among Males (61.2%) but female's BMI was more affected by MDR in comparison to males. Treatment success was better amongst males between 21-60 year age group with normal BMI having mono drug resistance with no adverse reaction. The majority 47 (18.2%) of adverse effect was found in undernourished patients. Treatment outcome was also poor among undernourished (76.9%) MDR-TB patients. **Conclusion:** Prevalence of undernutrition was high (68.6%) among subjects and the mean BMI was lower in female. Adverse drug reaction, poor treatment outcome are attributes of Undernutrition.

Key Words

Undernutrition; MDR-TB; BMI; ADR; treatment outcome

Introduction

Malnutrition and tuberculosis are both problems of considerable magnitude in most of the underdeveloped regions of the world (1). Undernutrition increases the risk of tuberculosis (TB) and in turn TB can lead to Malnutrition (2). Nutrition status is a principal determinant of morbidity and mortality from tuberculosis. Tuberculosis affects the metabolism of important nutrients such as protein and some micronutrients. Malnutrition on the other hand limits cell mediated immunity and increases susceptibility to infection .This leads to nutritional stress and weight loss, thereby lowering the body's ability to fight infections (weakening immune functions) and nutritional status (3). A systematic review of six cohort studies showed a strong inverse log-linear relationship between undernutrition (defined as low body mass index [BMI]) and incidence of TB, and concluded that a low BMI was a risk factor for development of TB. (5) Several studies report that patients with active TB are more likely to be wasted or have a lower body mass index (BMI = kg/m2) than healthy controls and that wasting is

associated with increased mortality in TB patients. Nutritional deficiencies can in turn may delay recovery by compromising immune functions. Nutritional supplements might therefore promote recovery in people being treated for tuberculosis (4). Substantial part of the incidence of TB among Indian adolescents and adults may be attributable to undernutrition (5). The prevalence of widespread malnutrition in the population may be expected to pose some special problems with regard to the control of the tuberculosis in the developing countries from the larger point of view of prevention and therapeutic management of individual cases, from the narrower clinical point of view (1). Under nutrition increases the risk of TB (6), poor nutritional status weakens their immune system and makes them more vulnerable to developing TB and those develop this disease also loses their weight, several second-line drugs used to treat MDR-TB such as PAS (Para-Aminosalicylate Sodium), fluoroquinolones, they can cause significant anorexia, nausea, vomiting and diarrhoea interfering with food intake and it is further compromising the cachectic state. Therefore, nutritional support is a key factor in the care of patients with MDR-TB (7).

Aims & Objectives

To study the effect of nutrition in MDR-TB patients at DR-TB centre, Dehradun.

Material and Methods

The Observational cross sectional study was conducted at Drug Resistant Tuberculosis (DR-TB) Centre of HIMS, Dehradun over a period of 12 months to include all the cases reported from 1st October, 2011 (start of DR-TB Centre at HIMS, Dehradun) to 30th April, 2014. Subjects were recruited from 1598 suspected MDR TB subjects who were screened by Drug Susceptibility Testing (DST) results. Sample includes only cases with definitive diagnosis of MDR-TB referred from District Tuberculosis Centre (DTCs) of Uttarakhand & hospitalized in MDR ward of DR-TB Centre of Himalayan Institute of Medical Sciences (HIMS), Dehradun during the study period. 376 subjects i.e. all MDR-TB patients who received inpatient treatment at DR-TB Centre of HIMS, Dehradun. Written informed consent was obtained from all study subjects. Clearance was obtained from the Institute Ethics Committee to conduct the study. While those who were unwilling to give their consent were excluded. A pre-designed and pre-tested structured study instrument (case recording form) was used to generate data. Relevant data from the records of MDR-TB patient was obtained and analyzed using EPI info 7 software.

Results

Table 1 shows distribution of patients according to BMI (Body Mass Index) and various socio-demographic variables, 258 (68.6%) subjects found to be undernourished whereas 118 (31.4%) had normal BMI. The mean body mass index (BMI) was 17.33+1.99kg/m2. Most common affected group whose BMI was found lower than 18 Kg/m^2 was 21-40 year age group (55%) followed by 41-60 years (24%).

Though undernutrition was more common among Males (61.2%) but female's BMI is more affected by MDR in comparison to males.

Nutritional status was not found associated with history of previous TB among MDR contacts, while those MDR contacts who had developed primary MDR were mostly undernourished 11(68.8%).

Treatment success was better amongst males between 21- 60 year age group with normal BMI having mono drug resistance with no adverse reaction.

The study found that 258 (68.6%) subjects found to be undernourished and the mean BMI in female was 15.90 + 2.87 kg/m^2, below the normal range. However in males the mean BMI are 18.08 + 2.85 kg/m^2. This difference was statistically significant at 5% level of significance. It shows that female's BMI is more affected by MDR in comparison to males.

Better treatment success was observed among MDR TB patients with normal BMI i.e. 93 (81.6%) than in undernourished MDR-TB patients 184 (72.4%).

Table 4 shows association between adverse effect and nutritional status. The majority 47 (18.2%) of adverse effect was found in undernourished patients.

Discussion

Undernutrition is major problem of developing countries, especially in India Bhargava .et al reported overall prevalence of undernutrition in the age group of 15– 49 years was 35.6% among women and 34.2% among men. Overall, 55.4% (95% CI 27.4–75.9) of all cases of active TB in women and 54.4% (95% CI 26.5–75.2) of all cases among men are attributable to undernutrition (5). Due to high burden of malnutrition community is susceptible to many

prevalent infections in which immunity plays major role, Tuberculosis is such infection.

The study found that more than two third subjects found to be undernourished. Most common affected group was 21-40 year age group followed by 41-60 years. The mean age was $34\pm$ 12.7 year (range 2 to 60 years). Study done by Kapadia et al shows that Mean age was 34 ± 11.54 years (range, 16 to 62 years) (8). In current study the mean BMI in female was $15.90 + 2.87$ kg/m^2, below the normal range. However in males the mean BMI are $18.08 + 2.85$ kg/m^2. It shows that female's BMI is more affected by MDR in comparison to males. Analogous study by Patra SK (2010) shows that in study groups BMI was 18.3 ± 0.5, while in controls it was 23.9 ± 1.3 (p value 0.01) (7). In another study by Sharma SK. et.al 2010 in New Delhi has observed that the mean body mass index (BMI) was $17.33+ 1.99$ kg/m^2, out of 177 cases, two cases of MDR-TB were detected in males (9). Study done by Kapadia et al shows that Mean body mass index (BMI) was 18.67}3.45 (range, 14 to 23.5) (8). The median pretreatment BMI in men and women was about 16 kg/m2 and 15 kg/m2 respectively (10).

Under nutrition increases the risk of TB (6), poor nutritional status weakens their immune system and makes them more vulnerable to developing TB (7) and those develop this disease also loses their weight, thus in current study those with history of previous TB i.e. 247(68.6%) are undernourished this is due to many factors like socioeconomic factors, drugs or disease manifestation itself. Undernutrition was also high among MDR contacts patients who developed primary MDR 11(68.8%). But significant association was not found between nutritional status and history of previous TB among MDR contacts. Among the total undernourished MDR-TB patient three fourth i.e. 195 (75.5%) of them were in cat II failure, but the association was not significant. Better treatment success was observed among MDR TB patients with normal BMI i.e. 93 (81.6%) than in undernourished MDR-TB patients 184 (72.4%). Kapadia VK et al observed in their study that BMI less than 18 is also associated with poor outcome (8). Similar results were observed in one another study also (11).

In present study adverse effect was found more amongst undernourished patients as compared to their counterpart having normal BMI. Some studies reported malnutrition as risk factors for the development of anti-tuberculosis drug adverse reactions (12),(13) but no literature is available for comparison with MDR-TB taking DOTS plus treatment.

Conclusion

Prevalence of undernutrition was high among subjects and the mean BMI was lower in female. There is limited data to compare studies examining the optimal nutritional intervention in an MDR-TB population. Further, there is lack of evidence-based guidelines on nutritional supplementation in MDR-TB patient.

It is evident from the study that nutrition plays vital role at every stage i.e. if there is undernutrition TB can develop in severe form, also adverse effect can hamper cure due to poor adherence and thus treatment outcome become poor.

Recommendation

Besides the weight loss during clinical course of TB & MDR-TB development, several second-line drugs used to treat MDR-TB can cause significant anorexia, nausea, vomiting and diarrhoea interfering with food intake and further compromising the cachectic state. Therefore, nutritional support is a key factor in the care and management of patients with MDR-TB as it also improves treatment outcome.

Limitation of the study

Extended Study duration could have captured complete nutrition impact viz. treatment outcome profile of MDR- TB patient which may facilitate insight into management parts of DOTS plus treatment. The small sample size and the use of data from one facility may not allow for generalization of findings beyond the studied sample.

Relevance of the study

Undernutrition is an important risk factor for progression from TB infection to active TB disease and severe form viz. MDR-TB. Undernutrition is a predictor of increased risk of death and TB relapse. By studying effect of nutrition on MDR-TB management, treatment outcome can be improved.

Authors Contribution

AK: Concept, Study Design, Literature search, Data collection, Acquisition of data and analysis. RK, SDK & GS: Concept, Study Design, Drafting and revising it critically for finalization of content.

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Tables

TABLE 1 DISTRIBUTION OF STUDY POPULATION BY SOCIO-EPIDEMIOLOGICAL CORRELATES AND NUTRITIONAL STATUS

Socio-demographic Variables	BMI category		
	Undernourished (n= 258)	Normal (n= 118)	Total
Age category			
< 20 Years	50(19.4%)	8(6.8%)	58(15.4%)
21-40 Years	142 (55.0%)	68(57.6%)	210(55.9%)
41-60 Years	63(24.4%)	39(33.1%)	102(27.1%)
> 60 Years	3(1.2%)	3(2.5%)	6(1.6%)
Sex			
Female	100(38.8%)	19(16.1%)	119(31.6%)
Male	158(61.2%)	99(83.9%)	257(68.4%)
Total	258(100.0%)	118(100.0%)	376(100.0%)
*Figures in parenthesis indicate percentage			

TABLE 2 DISTRIBUTION OF DRUG RESISTANCE WITH DOTS DRUGS AND NUTRITIONAL STATUS AMONG MDR-TB PATIENTS AT DR-TB CENTRE

Drug resistance type	BMI category		Total
	Undernourished	Normal	
Mono resistant	54(20.9%)	29(24.6%)	83(22.1%)
Poly resistant	159(61.6%)	70(59.3%)	229(60.9%)
Multi Resistant	45(17.4%)	19(16.1%)	64(17.0%)
Total	258(100.0%)	118(100.0%)	376(100.0%)
*Figures in parenthesis indicate percentage			

TABLE 3 DISTRIBUTION OF TREATMENT OUTCOME AMONG MDR-TB PATIENTS WITH NUTRITIONAL STATUS AT DR-TB CENTRE

Treatment outcome	BMI category		P-Value
	Undernourished	Normal	
Treatment success (n=277)	184(72.4)	93(81.6)	0.060
Poor treatment outcome (n=91)	70(27.6)	21(18.4)	
Total (n=368)^	254(69.0)	114(31.0)	

TABLE 4 DISTRIBUTION OF ADVERSE EFFECT WITH DOTS-PLUS DRUGS & NUTRITIONAL STATUS AMONG MDR-TB PATIENTS AT DR-TB CENTRE

Adverse effect	BMI category		Pearson Chi Square Test
	Undernourished	Normal	
Yes (n=66)	47(18.2)	19(16.1)	0.617
No (n= 310)	211(81.8)	99(83.9)	
Total	258(100.0)	118(100.0)	