

Original Research

Nutritional assessment via anthropometry and biochemical indices in pulmonary tuberculosis patient a comparison with HIV-TB and MDR-TB

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ABSTRACT:

Background: Tuberculosis is known from the times of the Egyptian pharaohs and recent genotype tracing suggests that it was a health issue in Neanderthal times. The present study was planned with aim of nutritional assessment via anthropometry and biochemical indices in pulmonary tuberculosis patient a comparison with, HIV-TB and MDR-TB. **Materials & Methods:** 30 pulmonary tuberculosis patients, HIV-TB patient and Drug resistant tuberculosis (MDR-TB) from each group patient admitted to Hospital of Chest & TB (Bari), Department of Pulmonary Medicine, RNT Medical College Udaipur, Rajasthan, India were assessed for Smoking index (SI) nutrition status, lipid profile, etc. **Results:** Majority of patient are non-smoker and there is distribution of patient according to smoking status which is significant ($P=0.04$) between HIV-TB and Pul-TB. Majority of patient in HIV-TB minimal disease (43.33%), in MDR-TB mod. advance disease (50%) and in Pul-TB minimal disease (40%) in Chest X-ray. Majority of patient's severely undernourished and significantly undernourished in HIV/MDR ($P=0.04$) and HIV/NonH M ($P=0.05$). All patients (100%) in HIV-TB, MDR-TB (86.66%) and Pul-TB(96.66%) had undernutrition according to TSF. There is difference in distribution of according to TSF which is significant ($P=0.04$) between HIV-TB and MDR-TB. **Conclusion:** The study demonstrated significant correlation of various anthropometric indices with duration of illness, Smoking and biochemical parameters.

Key words: Tuberculosis, Smoking, Malnourished.

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INTRODUCTION

Tuberculosis is known from the times of the Egyptian pharaohs and recent genotype tracing suggests that it was a health issue in Neanderthal times. In the 18th and 19th century tuberculosis was known as "consumption". One billion people are undernourished out of an estimated 2 billion people worldwide infected with Mycobacterium tuberculosis.¹

Malnutrition can also impair the protective efficacy of Bacille Calmette Guerin vaccine, among a nutritionally deficient vaccinated population i.e. malnourished children contract tuberculosis twice

more common than appropriately nourished peers.² In 2015, there were an estimated 10.4 million new TB cases and 1.2 million (11%) new cases of TB amongst people who were HIV-positive. In 2015 an estimated 36.7 million (34-39.8 million) people globally and 5.1 million (4.4-5.9 million) people in Asia pacific region and 2.1 million people in India living with HIV.³ Tuberculosis is a leading cause of death in HIV-positive people. In 2015, 1.8 million people died from TB, out of these 0.4 million people had HIV-associated TB, about 35% of deaths among HIV-positive people were due to TB.⁴ Relative risk of death in HIV-associated tuberculosis is 2.1 compared

with subjects without tuberculosis. MDR-TB is a man-made phenomenon. Poor treatment, poor drugs and poor adherence lead to development of MDR-TB. In 2015, there were an estimated 480000 new cases of multidrug-resistant (MDR-TB).⁵

According to Global Tuberculosis report 2016, globally 3.9% of new and 21% of previously treated TB cases was estimated to have multi-drug resistant tuberculosis (MDR-TB) in 2015.⁶ Amit kumar et al⁷ reported that 68.6% MDR-TB patients are undernourished and the female are more affected with undernutrition. Adverse drug reaction, poor treatment outcome are attributes of undernutrition. The present study was planned with aim of nutritional assessment via anthropometry and biochemical indices in pulmonary tuberculosis patient a comparison with, HIV-TB and MDR-TB.

MATERIALS & METHODS

Present study was carried out in pulmonary tuberculosis patients, HIV-TB patient and Drug resistant tuberculosis (MDR-TB) 30 cases from each group patient admitted to Hospital of Chest & TB (Bari), Department of Pulmonary Medicine, RNT Medical College Udaipur, Rajasthan, India .

After taking written consent explaining details and purpose of study, the selected patients were evaluated

and their anthropometric indices were measured and fasting blood sample was drawn for biochemical analysis. Standardized procedures was used to measure body weight and height while wearing minimal clothing's. The weighing and height scales were calibrated regularly. Symptoms scores ranges from zero to six with 1 point each for cough, haemoptysis, dyspnoea, fever, night sweats and weight loss. Smoking index (SI) was defined as number of cigarettes smoked multiplied by duration of smoking in years. The severity of smoking was classified as :- Light- up to 100 S, Moderate - 101-300 SI, Heavy- >300 SI. Body Mass Index (BMI) or Quetelet index calculated with the help of the formula as weight in kilograms divided by height in meters squared. The normal range of BMI is as under: BMIs <18.5 are considered as underweight (undernutrition), 18.5-24.9 are normal, 25-29.9 are overweight and BMIs ≥ 30 are obese. The severity of undernutrition according to BMI was categories as follows- Severe - < 16 kg/ m², moderate - 16-16.9 kg/ m² and mild - 17.1-18.4 kg/ m².

Mid upper arm circumference (MUAC), mid arm muscle circumference (MAMC) represents lean body mass derived as follows; MAMC = MUAC- (3.18x TSF). The biochemical indices of the patients was recorded.

RESULTS

Table no:1a -Distribution of patients according to age and Sex

Age in years		Type of cases					
		HIV-TB (n=30)		MDR-TB (n=30)		*Non-HM TB (n=30)	
		No.	%	No.	%	No.	%
15-34 years	Male	10	33.33%	10	33.33%	5	16.67%
	Female	2	6.67%	5	16.67%	8	26.67%
35-54 years	Male	10	33.33%	7	23.33%	9	30%
	Female	5	16.67%	3	10%	4	13.33%
More than 55 years	Male	3	10%	5	16.67%	3	10%
	Female	0	0%	0	0%	1	3.33%

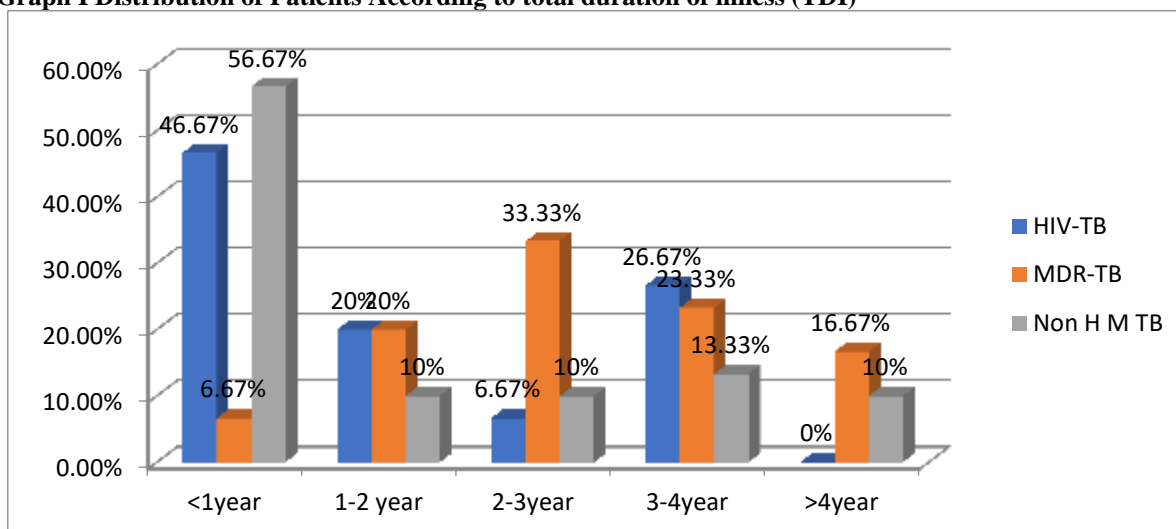
Table 1a show that majority of patient in HIV-TB are between 35-54 year 50% (33.33% male, 16.67%female) , in MDR-TB are between 15- 34 year 50% (33.33%male, 16.67%female) and Non HIV Non MDR TB equal no of patient in 15-34 year 43.33% (16.67% male, 26.67%female) and 35-54 year 43.33% (30% male, 13.33% female) age group.

Table no:2-Distribution of Patients According to Diet

Diet	Type of cases					
	HIV-TB (n=30)		MDR-TB (n=30)		*Non-HM TB (n=30)	
	No.	%	No.	%	No.	%
Non-veg	18	60.00%	12	40.00%	16	53.33%
Veg	12	40.00%	18	60.00%	14	46.67%
P value	HIV/ MDR 0.12		HIV/ Non H M TB 0.60		MDR/ Non H M TB 0.30	

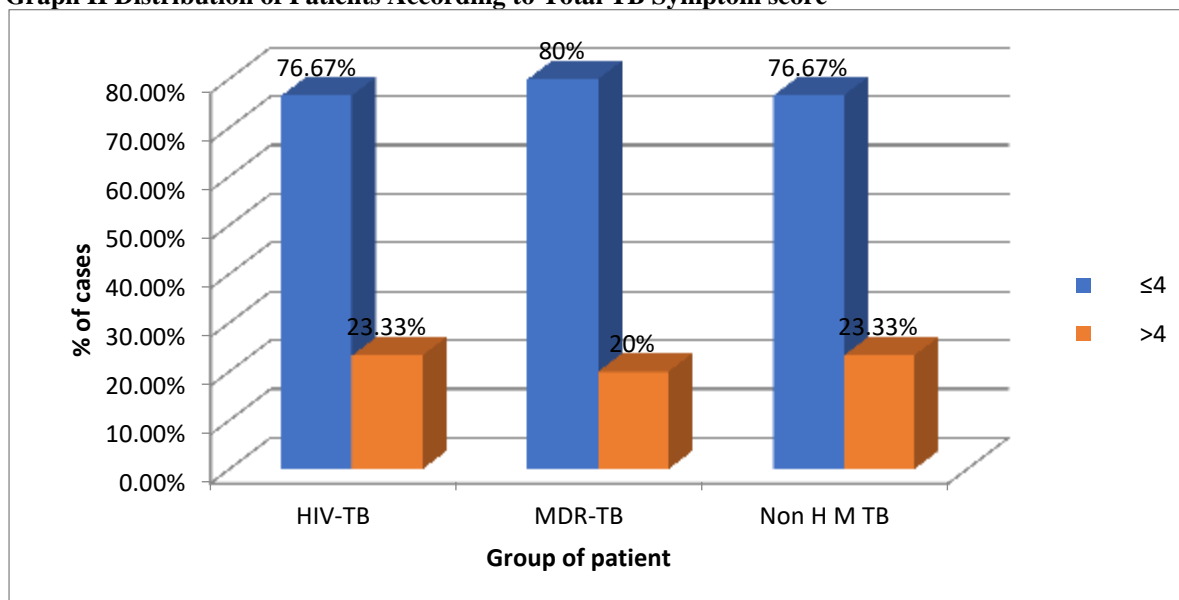
Table 2 shows that most of patient were Non-vegetarian in HIV-TB and Non H M group while vegetarian in MDR-TB group.

Graph I Distribution of Patients According to total duration of illness (TDI)



Graph I shows that majority of patients in group HIV-TB and Non-HM had TDI <1 years Except MDR-TB had TDI 2-3 year. The mean duration of illness was 1.88 ± 1.79 years.

Graph II Distribution of Patients According to Total TB Symptom score



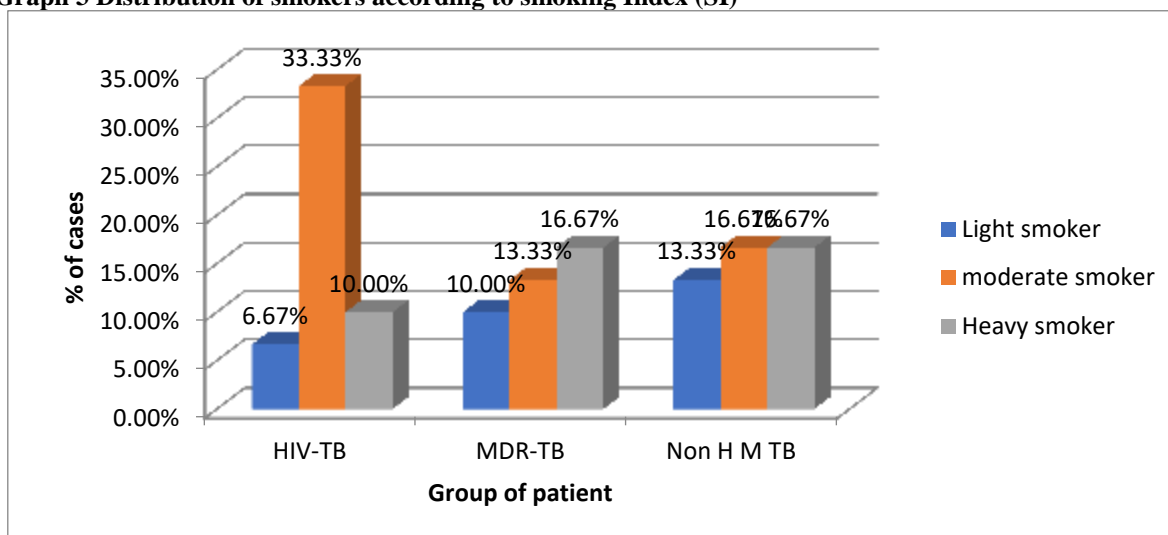
Graph II shows that majority of patient had TB symptom score <4.

Table no:3-Distribution of patients According to Smoking Status

SMOKING STATUS	TYPE OF CASE					
	HIV-TB (n=30)		MDR-TB (n=30)		Non H M TB (n=30)	
	No.	%	No.	%	No.	%
Current smoker	6	20.00%	9	30.00%	12	40.00%
Ex-smoker	9	30.00%	3	10.00%	2	6.67%
Non-smoker	15	50.00%	18	60.00%	16	53.33%
P value	HIV/ MDR 0.14		HIV/ Non H M TB 0.04		MDR/ Non H M TB 0.69	

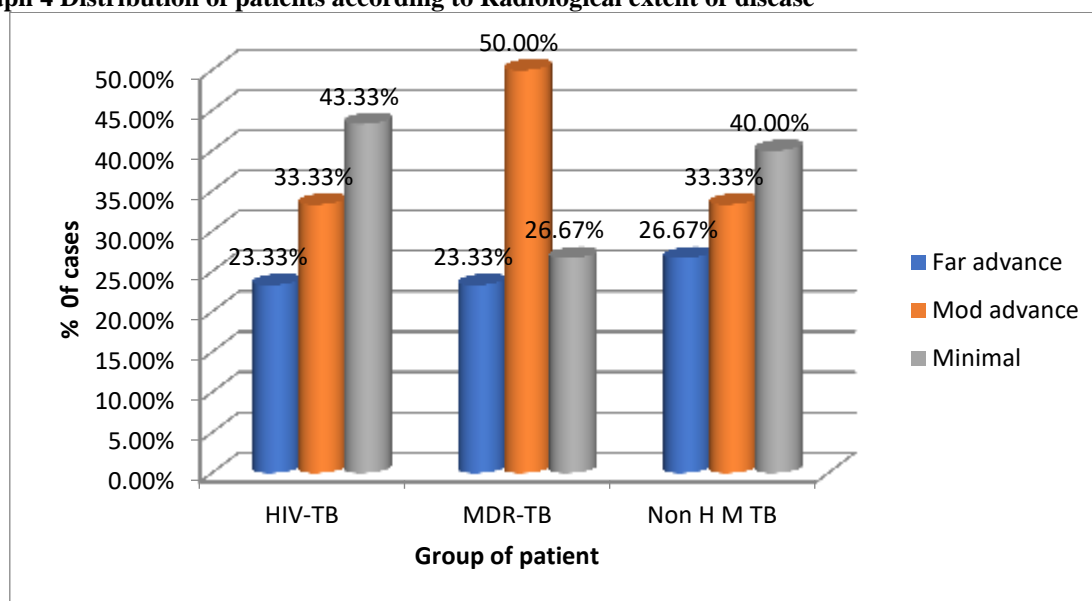
Table 3 shows that majority of patient are non-smoker and there is distribution of patient according to smoking status which is significant (P=0.04) between HIV-TB and Pul-TB.

Graph 3 Distribution of smokers according to smoking Index (SI)



Graph 3 shows that majority of patient in HIV-TB moderate smoker (33.33%), in MDR-TB heavy smoker (10%) and in Pul-TB equal number of patient are moderate and heavy smokers (16.67%).

Graph 4 Distribution of patients according to Radiological extent of disease



Graph 4 shows that majority of patient in HIV-TB minimal disease (43.33%), in MDR-TB mod. advance disease (50%) and in Pul-TB minimal disease (40%) in Chest X-ray.

Table no:4-Distribution of nutritional status according to BMI

BMI	TYPE OF CASE					
	HIV-TB (n=30)		MDR-TB (n=30)		Non H M TB (n=30)	
	No.	%	No.	%	No.	%
Under nutrition (<18.5)	29	96.67%	24	80.00%	27	90%
Normal (≥18.5-25)	1	3.33%	6	20.00%	3	10%
P value	HIV/ MDR 0.04		HIV/ Non H M TB 0.30		MDR/ Non H M TB 0.28	

The table 4 shows that majority of patients in HIV-TB (96.67%), MDR-TB (80%) and Pul-TB (90%) had undernutrition. Distribution of patient according to BMI which is significant (P=0.04) between HIV-TB and MDR-TB.

Table no:5-Distribution of severity of undernutrition according to BMI

BMI in Kg/m ²	TYPE OF CASE					
	HIV-TB (n=30)		MDR-TB (n=30)		Non H M TB n=30)	
	No.	%	No.	%	No.	%
≤16(Severe)	27	90.00%	17	56.67%	20	66.67%
16.1-17(Moderate)	2	6.67%	3	10.00%	2	6.67%
17.1-18.4(Mild)	0	0.00%	4	13.33%	5	16.67%
P value	HIV/ MDR 0.04		HIV/ Non H M TB 0.05		MDR/ Non H M TB 0.83	

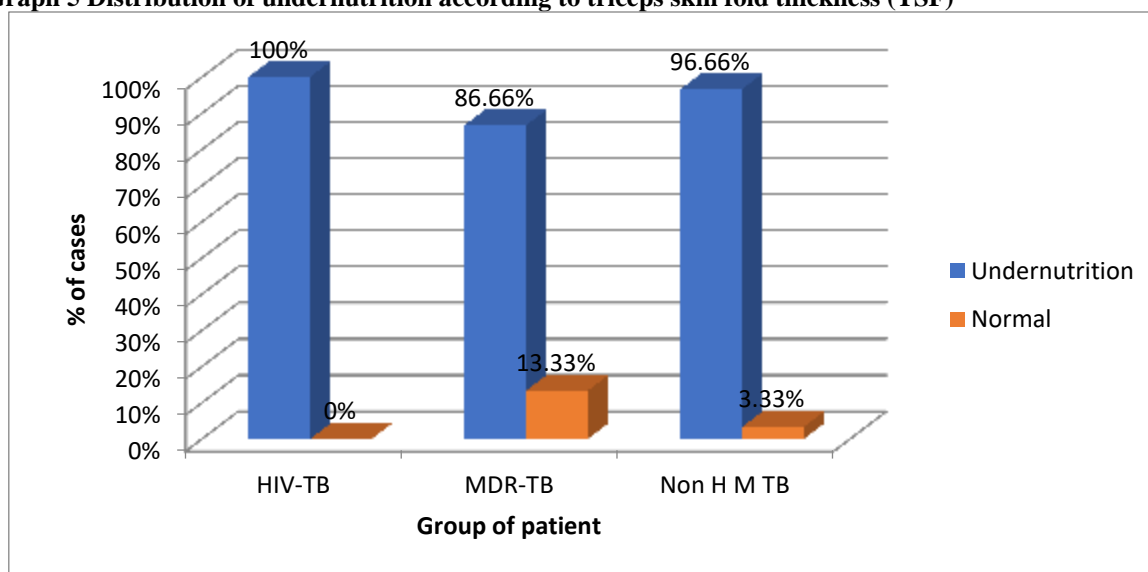
The table 5 shows that majority of patient’s severely undernourished and significantly undernourished in HIV/MDR (P=0.04) and HIV/NonH M (P=0.05).

Table no:6-Distribution of undernutrition according to mid arm circumference (MAC)

MAC in CM	TYPE OF CASE					
	HIV-TB (n=30)		MDR-TB (n=30)		Non H M TB (n=30)	
	No.	%	No.	%	No.	%
Undernutrition (<26 cm)	30	100.00%	28	93.33%	30	100.00%
Normal	0	0.00%	2	6.67%	0	0.00%
P value	HIV/ MDR 0.15		HIV/ Non H M TB NA		MDR/ Non H M TB 0.15	

Table 6 shows that majority of patient are undernourished in all group by MAC.

Graph 5 Distribution of undernutrition according to triceps skin fold thickness (TSF)



Graph 5 shows that all patients (100%) in HIV-TB, MDR-TB (86.66%) and Pul-TB (96.66%) had undernutrition according to TSF. There is difference in distribution of according to TSF which is significant (P=0.04) between HIV-TB and MDR-TB.

Table no:6-Distribution of undernutrition according to MAMC

MAMC in CM	TYPE OF CASE					
	HIV-TB (n=30)		MDR-TB (n=30)		Non H M TB (n=30)	
	No.	%	No.	%	No.	%
Undernutrition	30	100.00%	28	93.33%	30	100.00%
Normal	0	0.00%	2	6.67%	0	0.00%
P value	HIV/ MDR 0.15		HIV/ Non H M TB NA		MDR/ Non H M TB 0.15	

Table 6 shows that majority of patient are undernourished in all group by MAMC.

Table no :7-Distribution of patients according to Lipid Profile

Lipid Profile	HIV-TB		MDR-TB		Non H M TB	
	Mean	±SD	Mean	±SD	Mean	±SD
T. Cholesterol	121.46	28.64	136.27	22.45	136.37	27.37
Triglyceride	105.13	40.89	78.03	17.11	101.50	35.84
LDL	75.43	25.54	83.44	21.14	82.30	16.19
HDL	32.06	8.00	34.01	6.07	35.34	7.18

Table 7 shows that mean value of HDL- Cholesterol (32±8.0) was low. The difference in lipid profile values in T. cholesterol was found statistically significant between HIV/MDR (P=0.03) and HIV/Pul-TB (P=0.04), difference for Triglyceride also statistically significant for HIV/MDR (P=0.001) and MDR/Pul-TB (P=0.002).

Table no:8 -Distribution of undernutrition according to BMI with Alcoholic Status

	BMI	Non Alcoholic	Alcoholic	P value
HIV-TB	Undernutrition (<18.5)	14 (93.33%)	15 (100%)	0.30
	Normal (18.5-23.5)	1 (6.66%)	-	
		15	15	
MDR-TB	Undernutrition (<15)	17 (77.27%)	7 (87.50%)	0.53
	Normal (15-19)	5 (22.73%)	1 (12.50%)	
		22	8	
Non H M TB	Undernutrition (<15)	17 (94.44%)	11 (91.67%)	0.76
	Normal (15-19)	1 (5.56%)	1 (8.33%)	
		18	12	

Table 8 show that majority of alcoholic patient are undernourished in HIV-TB (100%) and MDR-TB (87.50) while in Non H M TB majority of Non-alcoholic patient (94.44%) are undernourished.

DISCUSSION

The present study was carried out on 90 patients (30 patients in each group HIV-TB , MDR-TB, Non HIV MDR TB) of pulmonary TB other than extra pulmonary TB admitted to Department of Respiratory Medicine , TB & Chest hospital (Badi), RNT medical College Udaipur (Rajasthan), India to assess the nutritional status of patients and to correlate this with disease related and other factors.

There were 23 male 7 female in HIV-TB , 22 male 8 female in MDR-TB, 17male 13 female in Non HIV MDR group belonging to 15 to 75 year of age .Various anthropometric parameters for nutritional assessment like BMI, MAC, MAMC, TSF and biochemical parameters like haemoglobin, S. total protein, S. albumin, S. globulin, BUN, S. calcium, phosphorous, uric acid, S. total cholesterol, TG, LDL, HDL correlated with disease related factors like TB symptom score , duration of illness(TDI), radiological extent of disease, and other factor like diet , smoking. Since there was a more significant correlation between smoking status, BMI, mean of MAC, TSF, MAMC, BUN, S. albumin, alcohol status, s. calcium, lipid profile. The detailed analysis of diet, alcohol consumption, TB symptom score were done with BMI, MAC, TSF. There was no significant correlation of diet, TB symptom score, smoking index, radiological extent of disease, Hb, phosphorous.

In the present study 96.67% patient according to BMI had under nutrition compare to Madebo et al⁸ who found that 78% patient have undernutrition. Severity of under nutrition in present study was 90% as

compare to 43% by same author in HIV-TB patient. In present study, undernutrition was present in MDR-TB 80%, 86.67%, 73.33% of patient according to BMI, S. albumin, haemoglobin respectively. Surajeet k Patra et al⁹ in a study of 50 MDR-TB patient were found undernutrition by BMI in 66%, by S. albumin in 74%, by haemoglobin in 42% of patient.

In the present study, 90% patient according to BMI had under nutrition, Whalen et al¹⁰ also found undernutrition in 64.8% in NonHM-TB. In the present study anthropometric parameters BMI in HIV-TB had positive significant correlation with S. calcium level i.e. patients with low calcium level had severe malnutrition. Nansera D et al¹¹, also found that Vita D and S. calcium level were low in low BMI patient in 50 HIV-TB patients.

We found that 73.33% had low Haemoglobin level in present study. Surajeet K Patra et al⁹ also reported low levels of S. protein, S. albumin, Haemoglobin in MDR-TB patient also. In the present study shows that patient with longer duration of illness had more under nutrition. Van lettow et al also reported more under nutrition with increasing severity of disease in NonHM-TB. Pablos-Méndez et al¹² reported low S. calcium and phosphorous level in NonHM-TB patient. In present study 73.33% low corrected calcium level and higher phosphorous level in 30%. None of the patient had low phosphorous level in NonHM-TB.

In the present study there no significant negative correlation between TB symptom score and all anthropometric parameters in all 3 group (HIV-TB, MDR-TB, NonHM-TB). Zachariah et al¹³ found that

pulmonary tuberculosis patients with moderate to severe clinical TB score had low BMI, LMI (Lean Mass Index) and FMI (Fat Mass Index) as compared to tuberculosis free controls.

In our study 90% HIV-TB, 80% NonHM-TB patient had anaemia at the time of presentation which reflects severe malnutrition. There was no significant positive correlation with haemoglobin and all anthropometric indices except TSF thickness in HIV-TB i.e. severe anaemic patients had severe malnutrition. Comparable to the present study Bhargava et al¹⁴ found 86 % were anaemic.

CONCLUSION

All anthropometric indices revealed majority of patients to be undernourished and severe undernourishment being the major type. The study demonstrated significant correlation of various anthropometric indices with duration of illness, Smoking and biochemical parameters.

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