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## Study of nutritional status of TB patients

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### Abstract

Tuberculosis (TB) is a human disease caused by *Mycobacterium tuberculosis*. Present research was perspective observational study on 30 patients of Tuberculosis at Mahatma Gandhi hospital, Jaipur. It was found from the collected data that disease (tuberculosis) was seen mostly in people of elder age (50-70 year) but is also found in younger adults. More cases were seen in men than in women. In this study it was found that most of the patients had similar types of clinical signs and symptoms like weakness, underweight, headache, fatigue, vomiting and shortness of breath. Majority of the patients (63.33%) showed normal nutritional status. Only 13% patients were at risk of malnutrition and only 10% patients were found malnourished. Overweight TB patients were also seen 10% due to their excess calorie intake and heredity as well. Therefore there is a need to give importance to nutritional status as this is an important factor in planning proper medical as well as dietary regimen for a better recovery and better quality of life.

### Introduction

Tuberculosis (TB) mainly affects lungs and is a disease caused by *Mycobacterium tuberculosis*. It is a most common types of pulmonary diseases (Zaman, 2010). It is a multi-systemic health issue. TB commonly affects many organ systems including respiratory, gastric, liver, central nervous system, bones (Mbuh et al., 2019; Mathiasen et al., 2020).

As per World Health Organization (WHO, 2017), 1.5% fall has been observed in the rate of tuberculosis. Moreover, a significant decline has been noted by tuberculosis. The global Tuberculosis mortality rate has dropped 22% from 2000 to 2015 (World Health Organization, 2016). It's still a cause of concern despite of so many worldwide efforts for controlling measures.

Majorly affected countries from tuberculosis mortality are Indonesia, China, Nigeria, Pakistan, South Africa including India (WHO, 2017). It is one of the major risk factor for morbidity and mortality in developing nations (Raviglione et al., 1995). Suppressed immune system is a major risk factor for mortality from tuberculosis (Boudville et al., 2020; Cui et al., 2020). These include HIV patients also (Shafer & Edlin, 1996). World Health Organization stated mortality rate of 35% in HIV/AIDS patients due to tuberculosis (WHO, 2017). As per WHO, children also fall under vulnerable age groups.

Tuberculosis can be totally eradicated by early diagnosis and treatment compliance, however, poor compliance to the long treatment regime is a major hindrance to curb this menace (Chaulet 1987). Diagnosis takes place in several months at many places in the World (Murray 1994). It is usually diagnosed by health care workers (HCWs) in their routine case finding activities (Chum et al., 1996). Successful outcome depends on early

diagnosis and early initiation of treatment. Delayed diagnosis increases the risk of spreading infection to others as well.

There are many health care-seeking behaviours that were explained by Kroeger (1983). Two of these are the pathway model and the determinants model. The pathway model explains the sequential steps taken by the patients from initiation of first symptoms till receiving health services, while the latter focuses on the preferred form of health care service. Similarly Chrisman (1977) gave five stages of diagnose a problem. These were:

- Symptom definition
- Illness-related shifts in the role behaviour
- Treatment actions
- Lay consultation
- Adherence to the treatment plan

After studying results of so many researches, it was evident that patients suffering from TB are very much vulnerable to malnutrition due to loss of appetite, altered taste, poor nutrient intake and weight loss. With this view, the present study was planned with an aim to assess nutritional status of TB patients admitted to Mahatma Gandhi Medical College & Hospital, Jaipur.

## Research Methodology

A baseline survey for assessment of nutritional status was planned. A sample of 30 was taken to study the nutritional status of tuberculosis patients. Purposive sampling method was used. Duration of study was three months. All tuberculosis patients were taken for study until sample size of 30 was completed.

### Inclusion criteria:

- All patients who were diagnosed from TB, admitted in Mahatma Gandhi Medical College & Hospital, Jaipur
- Patients willing to participate in study
- Both male & female patients were included
- Patients of all age groups

### Exclusion criteria:

- Patients who were suffering from other disorders
- People who were not willing to participate in the study

### Study was divided under following sections:

**Section 1: Collection of Review of Literature:** Review of literature was done for initial one month of the study. It was done from various libraries and from internet using research portals like PubMed, Google scholar, Research gate to collect authentic data. It was a very useful step to understand the problem from depth.

## Section 2: Data collection on nutritional status

2.1 Demographic profile of TB patients: Patient's demographic detail or general information was collected for name, age, place, education, work status, type of activity, economic status, marital status etc. Patient's medical diagnosis was also noted in this section.

2.2 Collection of anthropometric details: In this part, the patient's anthropometric measurements were carried out in which weight, height, mid upper arm circumference, body mass index etc. It was done using all standard methods (Bamji et al., 2019)

2.3 Collection of biochemical data: The biochemical data of the patient was taken, under which the electrolytes reports like sodium, potassium, HbA1c, lipid profile and RFT report were taken. Reports were collected that were observed in patient's in patient records as per following format

Parameters	Result values	References

2.4 Collection of data on clinical signs and symptoms: In this part, the data was collected on different clinical signs and symptoms like weakness, nausea, vomiting, diarrhoea, constipation, shoulder and back pain, fatigue, shortness of breath, anorexia etc.

2.5 Data collection on nutrient intake: In this part of study, the patients were asked for their 24 hour diet recall. After this, the patient was asked about his empty calories intake in form of 'Food frequency questionnaire' that take into account the quantity consumed of foods like sugar, oil, cold drinks, pickles & alcohol.

### Format for 24 hrs - home diet recall

Time/ meal	Food consumed	Cooked quantity	Raw ingredient	Raw quantity

### Format for food frequency questionnaire

Food items	Daily	Weekly	Fortnightly	Monthly	Total Empty Calories
Oil					
Sugar					
Cold drink/ Sharbat					
Juice					
Pickle/fried foods/ junk foods					
Alcohol					
Total					

### Section 3: Nutritional diagnosis

On the basis of data collected on nutritional status, nutritional diagnosis was derived in following format:

	No. of patients	Percentage
Normal		
Underweight		
Malnourished		
Overweight		
Obese		

## Results and Discussion

The data was collected for 30 patients on demographic profile and nutritional status of TB patients has been presented under following sub headings:

### Demographic profile of selected TB patients

Out of 30, 20 patients were male and 10 patients were female. It showed occurrence of TB was 50% more in male patients than in female or it can also be a reason that in rural areas, males are more privileged to get medical facilities, therefore the disease can be diagnosed more in male patients. Most of the male patients were from Jaipur and Bharatpur; although few number of patients came from all over the Rajasthan. Majority of female patients were from Bharatpur and Tonk district although significant number of patients came from other districts also. Some of the patients were suffering from COPD, COAD, type 2 respiratory failure, hypertension, Acute kidney injury, bronchial asthma, diabetes (1 patient) and cancer of ovary (1 patient) also.

Parameters		Total no. of patients N = 20	(%)
Age	10 – 30 year	5	25
	31 – 50 year	8	40
	51 – 70 year	6	30
	71 - 90 year	1	5
Education Status	Graduate	3	15
	Metric	6	30
	Primary	4	20
	Illiterate	7	35
Working status	Working	4	20
	Non working	16	80
Type of activity	Sedentary	10	50
	Moderate	9	45
	Heavy worker	1	5
Economic status	LIG	4	20
	MIG	16	80
	HIG	0	0
Marital status	Married	14	70
	Unmarried	6	30

Table 1: Demographic profile of male TB patients

Above Table 1 is depicting the demographic profile of male TB patients. Majority of patients (70%) were in the age group of 30-70 years of age. Only 15% patients were graduate while 35% patients were illiterate. Eighty percent patients were non-working. Activity pattern of 50% patients was sedentary, while 45% patients were moderately

active. Economic status of 80% patients was from middle income group while 20% patients were from lower income group. Seventy percent patients were married. No TB patient was found from higher income group. It shows that occurrence of TB is more in middle income group between 31-70 years of age in people who had very little physical activity.

Parameters		Total no. of patients N=10	(%)
Age	10 – 30 year	4	40
	31 – 50 year	2	20
	51 – 70 year	4	40
	71 - 90 year	0	0
Education Status	Graduate	1	10
	Metric	3	30
	Primary	0	0
	Illiterate	6	60
Working status	Working	3	30
	Non working	7	70
Type of activity	Sedentary	9	90
	Moderate	1	10
	Heavy worker	0	0
Economic status	LIG	2	20
	MIG	8	80
	HIG	0	0
Marital status	Married	8	80
	Unmarried	2	20

Table 2 Demographic profile of female TB patients

Table 2 is showing the demographic details of female TB patients. Females were affected in all age groups. Data showed that 60% females were illiterate and 70% were not working. 90% females were sedentary active. Eighty percent females were from middle income while 20% were from lower income group. Marital status showed that 80% females were married. Therefore the trend of occurrence of TB was quite similar to the pattern found in males.

### Anthropometric data of TB patients

Sample	Height (cm)	Weight (kg)	BMI (Kg/m <sup>2</sup> )	MUAC (cm)	Nutritional status as per BMI
P 1	165	49	18.01	17	Normal
P 2	160	50	19.53	19.05	Normal
P 3	162	72	27.48	12	Overweight
P 4	160	60	23.24	11	Overweight
P 5	155	80	33.33	14	Obese
P 6	160	45	17.57	18	Underweight
P 7	155	48	20	20	Normal
P 8	145	40	20.04	17	Normal
P 9	146	36	16.90	17	Underweight
P 10	165	50	20.22	21	Normal
P 11	155	50	20.83	17	Normal
P 12	150	40	19.77	13	Normal
P 13	158	58	23.44	17.28	Overweight
P 14	155	55	23.4	22	Normal
P 15	160	50	26	22.86	Overweight
P 16	158	48	16.6	20.34	Underweight
P 17	160	50	19.53	20.32	Normal
P 18	155	46	19.16	22.86	Normal

P 19	158	60	22.65	20.32	Normal
P 20	150	40	17.77	20.32	Underweight
P 21	160	58	22.65	25	Normal
P 22	158	40	16.06	24.13	Underweight
P 23	160	50	19.53	22.86	Normal
P 24	155	48	20	17	Normal
P 25	160	55	21.48	22	Normal
P 26	167	58	20.86	18	Normal
P 27	155	50	20.83	23	Normal
P 28	158	47	18.87	18	Normal
P 29	160	52	20.31	18	Normal
P 30	158	42	16.86	20	Underweight

Table 3: Anthropometric profile of TB patients

Table 3 is presenting the anthropometric measurements of 30 TB patients that is showing that as per body mass index, 6 out of 30 patients (20%) were underweight while, 13% patients were overweight. Majority of patients showed normal BMI range (43.33%).

### Biochemical Profile

It is evident from table 4 that 50% patients had their sodium content to lower side, while 50% showed normal values for sodium. Potassium content was found in the normal range for all patients. Creatinine was normal for all except 2 patients who suffered from acute kidney injury. WBCs level was found high in 50% patients while 46% patients showed normal WBCs level. RBCs and haemoglobin levels were also found on lower side in most of the patients.

Parameters		Total No.of Patients N= 30	Percentage %
Na (mg/dL)	Low	15	50
	Normal	15	50
	High	0	0
K ( mg/dL)	Normal	19	63.33
	Low	10	33.33
	High	1	3.33
Creatinine mg/dL	Normal	28	93.33
	High	2	6.66
WBC	Low	1	3.33
	Normal	14	46.66
	High	15	50
RBC	High	3	10
	Normal	5	16.66
	Low	22	73.33
Haemoglobin	Low	27	90
	Normal	3	10

Table 4: Biochemical profile of tuberculosis patients

## Clinical signs and symptoms

Parameters	Total no. of patients N = 30	%
Nausea	Yes - 3 No - 27	10 90
Diarrhoea	Yes - 1 No - 29	3.33 96.66
Constipation	Yes - 1 No - 29	3.33 96.66
Fatigue	Yes - 28 No - 2	93.33 6.66
SOB	Yes - 17 No - 13	56.66 43.33
Weakness	Yes - 17 No - 13	56.66 43.33
Anorexia	Yes - 21 No - 9	70 30
Taste change	Yes - 20 No - 10	66.66 33.33
Cough	Yes - 22 No - 8	73.33 26.66

Table 5: Clinical signs and symptoms of TB patients

It is evident from above table 5 that nausea, vomiting, diarrhoea and constipation were not very common in TB patients, but majority of TB patients faced problems of fatigue (93.33%), shortness of breath (SOB) (56.66%), weakness (56.66%), anorexia (70%) and altered taste sensation (66.66%). Seventy three percent patients showed symptoms of cough.

### Nutrient intake

Nutrient intake of TB patients was calculated by the data collected from 24 hours home diet recall and food frequency questionnaire. Patients diet intake was noted in cooked amount. It was converted to raw ingredients and then nutrient composition of those raw ingredients was calculated as shown in table 6.

Sample	Energy (Kcal)	Protein (g)	CHO (g)	Fat (g)
P 1	808.05	35.89	134.15	26.5
P 2	1054.64	38.17	207.7	4.18
P 3	1310.93	50.5	217.14	23.08
P 4	819.4	29.52	141.66	19.35

P 5	995.2	40.13	147.41	20.45
P 6	1007.76	35.73	121.17	69.09
P 7	1299.72	51.06	272	29.87
P 8	347.45	15.5	63.4	2.75
P 9	1017.07	39.84	192.31	7.04
P 10	1067.93	39.51	208.9	7.41
P 11	747	30.36	120.9	13.5
P 12	1124.65	39.3	182.38	23.84
P 13	1113.03	44.31	204.1	9.35
P 14	1006.1	36.4	192.42	6.14
P 15	737.92	28.18	138.72	5.68
P 16	1200.62	38.05	235	9.5
P 17	1338.48	47.65	263.9	6.3
P 18	964.58	40.1	159.3	15.8
P 19	985	42.92	144.83	38.38
P 20	1174.67	46.44	198.72	18.99
P 21	735.86	29.94	123.8	10.7
P 22	864.05	36.25	134.8	17.8
P 23	1245.07	44.5	125.76	15.3
P 24	1006	40	144.56	10.66
P 25	1550	45	124.77	14.88
P 26	1200	66	134.5	15.0
P 27	1400	55	122.2	14.55
P 28	1245	50	110.78	10.8
P 29	1256	55	166.6	15
P 30	1300	47	122.8	18

Table 6: Nutrient intake of TB patients

Above table is showing Calories and macro nutrients intake of all patients. These intakes were compared to their respective requirements for these nutrients are represented as -



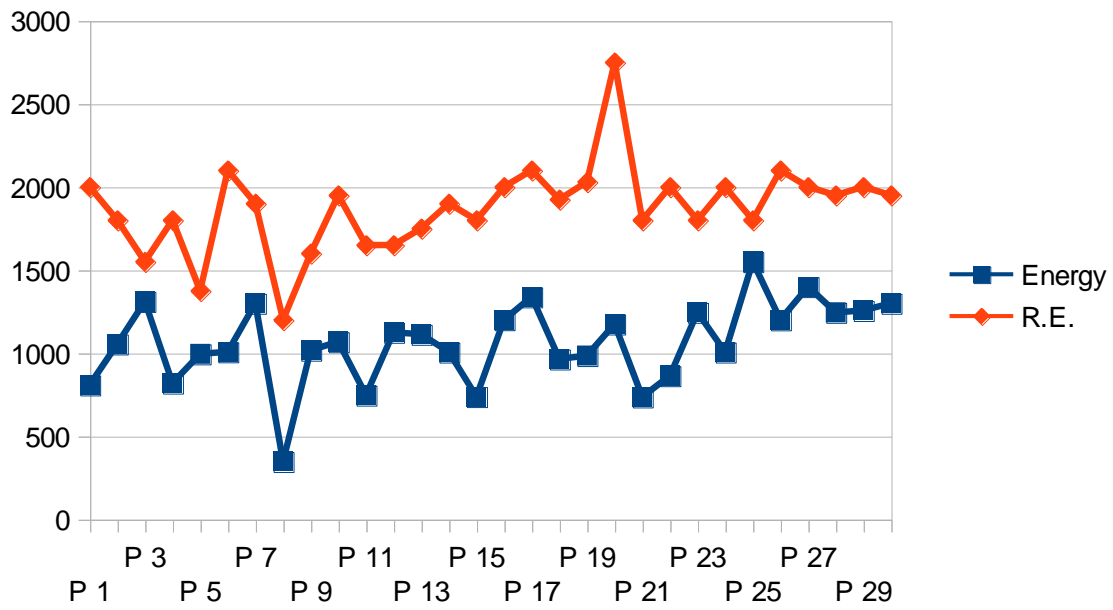


Figure 1: Energy intake of TB patients compared to their requirements

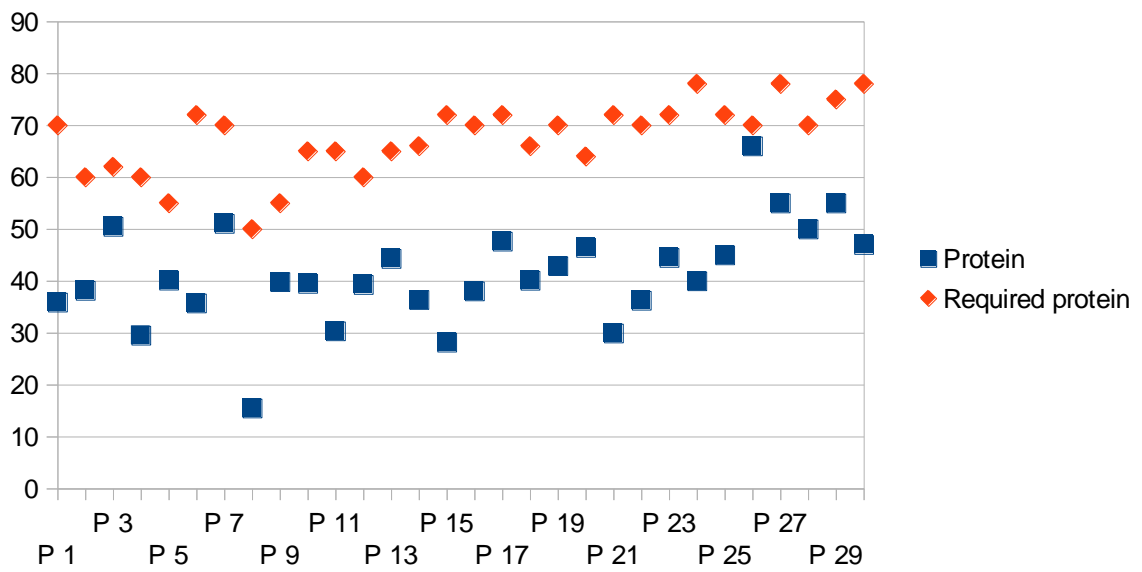


Figure 2: Protein intake as compared to their requirements

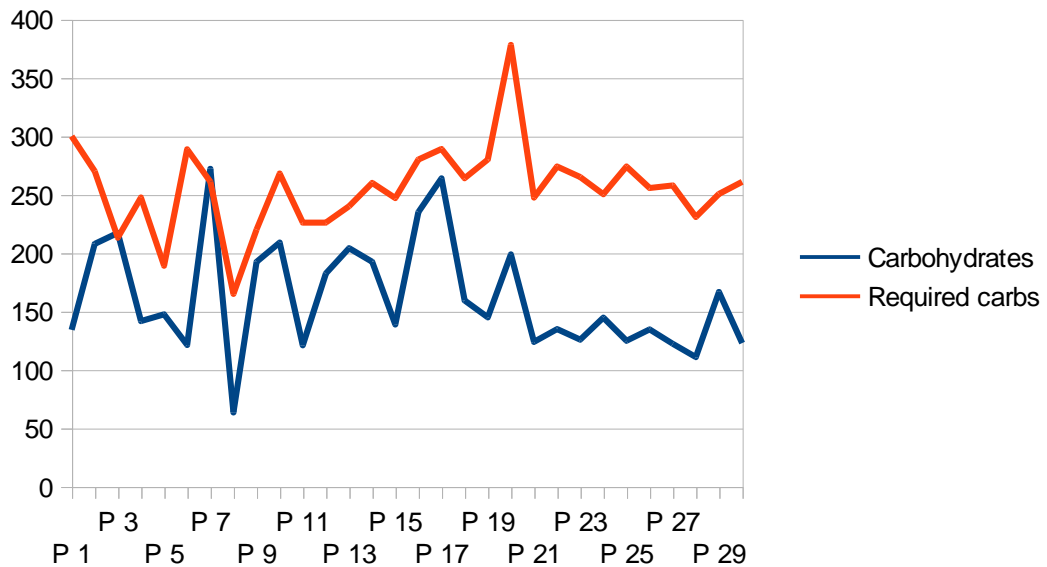


Figure 3: Carbohydrate intake compared to the requirements

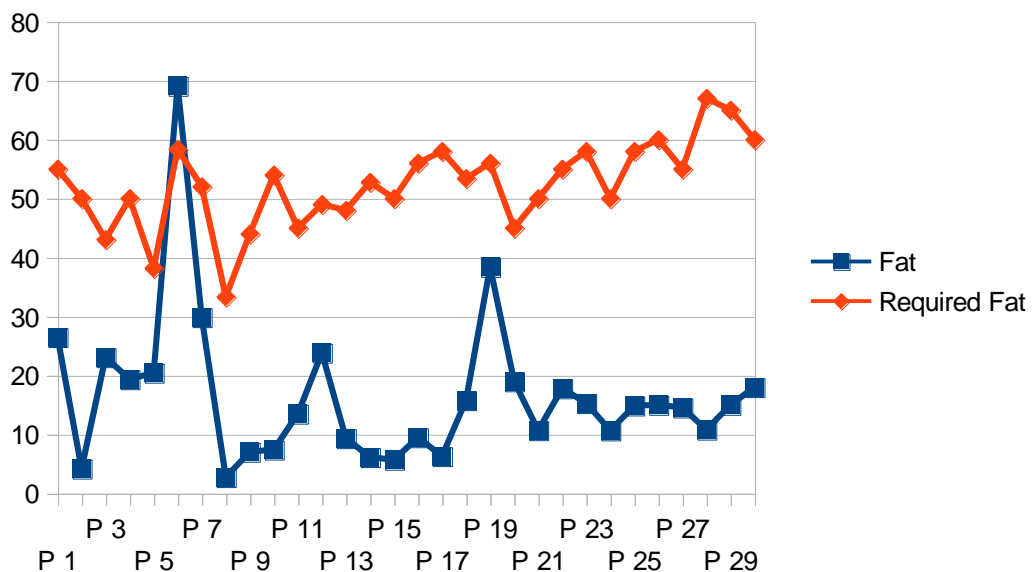


Figure 4: Actual fat intake as compared to requirements

Above figures 1, 2, 3 & 4 are showing it clearly that actual nutrient intake was very less compared to the requirements. It may be due to the fact that patients suffering from tuberculosis and undergoing its treatment may have problems of altered taste and poor appetite, due to which they were able to consume less food than their actual nutrient requirements. This ultimately led to weight loss and fatigue. Empty calorie intake ranged between 45-300 Kcal/day. It was majorly in the form of sugar, oil and ghee. Some of the

patients who were taking empty calorie near 300 Kcal/day, were also found to consume alcohol.

### Nutritional Diagnosis

Parameters	Total no. of patients N = 30	%
Malnourished	3	10
Underweight	19	63.33
Normal	10	33.33
Overweight	3	10
Obese	1	3.33

Table 7: Nutritional diagnosis of tuberculosis patients

Patients were categorized under 'Normal', 'Underweight', 'Malnourished', 'Overweight' and 'Obese' after nutritional assessment. Table 7 shows that 63.33% patients were underweight, while 10% patients were overweight and malnourished each. 33.33% patients showed normal nutritional status.

### Conclusion

Data on 30 tuberculosis patients showed that tuberculosis is found mostly in men than in women. Majority of patients between 30-70 years of age were more affected, although it can occur at any age. Symptoms like fatigue, weakness, shortness of breath, cough were found in majority of the patients. Reason of malnutrition and being underweight was clearly visible by symptoms of altered taste, loss of appetite, poor dietary intake in comparison to the requirements. Therefore, it's very important to assess patients nutritionally so that a suitable diet counselling can be done for their welfare.

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