Journal of Population Therapeutics & Clinical Pharmacology

A cross sectional study on nutritional status and depression among Tuberculosis patients of Ahmedabad, Gujarat

Dr. Kamlesh kumar Jain[1], Dr.Sahil Solanki[2], Dr. Bhavya Darji[3],Dr.Bhavik Sanghvi[4], Dr. Ayman Vakil[3]

1. Professor, Community Medicine Department, GCS Medical College, Hospital and Research Centre, Ahmedabad
2. Assistant Professor, Community Medicine Department, GCS Medical College, Hospital and Research Centre, Ahmedabad
3. Intern Doctor, GCS Medical college Hospital and Research Centre,Ahmedabad
4. Resident doctor, Medicine Department, GCS Medical College, Hospital and Research Centre, Ahmedabad
5.

Corresponding Address: Dr. Kamlesh kumar G Jain, Hirani Haweli, Behind Dharamnagar Post Office, Sabarmati, Ahmedabad- 380005

Abstract

Background: The prevalence of malnutrition and depression is high among TB patients. The goal of this study was to assess the nutritional status and depression as well as understand their association with various sociodemographic determinants. **Methods:** Total 180 consenting TB patients aged more than 18 years, who were on anti-TB treatment were selected from a tertiary care hospital within 2 years. Sociodemographic data, BMI classification and PHQ-9 were included in the questionnaire. **Results:** Male Gender(66.6%), Urban residence(73.3%), Married status(58.9%) and lower class(48.4%) were more commonly observed. Prevalence of undernutrition (BMI<18.5) was 71% in grade 3(severe undernutrition) was most common(36%).Mild depression was seen in 39.4% patients. A statistically significant (<0.05) and strong association (Cramer's V>0.25) was found between grades of malnutrition and variables like gender, residence, duration since treatment initiation, drug sensitivity and socioeconomic class. Grades of depression also showed statistically significant association with variables like residence, drug sensitivity and duration since treatment. **Conclusion:** More than half of the participants were undernourished while a little less than half were having mild depression. Malnutrition had a significant association with gender, residence, drug sensitivity and socioeconomic class while Depression had a significant association with residence, drug sensitivity and duration since treatment initiation.

Keywords: Tuberculosis, Malnutrition, Depression, Ahmedabad

INTRODUCTION

Tuberculosis is an infectious disease caused by Mycobacterium Tuberculosis species. India is the highest Tuberculosis-burden country in terms of absolute number of Tuberculosis cases that occur each year.[1]In 2021, an estimated 10.6 million individuals developed tuberculosis (TB) disease and 1.6 million died, making it the second most lethal infection globally after severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[2]

The End TB Strategy aims to reduce tuberculosis (TB) incidence by 80% and TB mortality by 90% by 2030, but this approach is not meeting its milestones. Despite a goal of reduction in TB incidence of 20% between 2015 and 2020, TB incidence only fell by 11%.[3]Inadequate food intake leads to poor nutritional status and impaired immune function. It was detected that there is a vicious cycle between undernutrition and TB, according to which poor nutritional status increases the risk of tuberculosis (TB) and in turn, TB can lead to undernutrition.[4] Patients with active TB are more likely to be emaciated and have a low body mass index (BMI),with a value less than 18.5 kg/m2 being considered as an index of undernutrition.[5]

Today, undernutrition is the leading risk factor for TB, with a population-attributable fraction (PAF) of 15%, compared to 7.6% for HIV and 3.1% for diabetes. The PAF of undernutrition for TB is particularly substantial in countries with the highest burdens of TB like India.[3] Several studies have shown that the prevalence of psychiatric disorders,

particularly depression, is high among TB patients. Studies also reported that TB patients are at higher risk of developing psychological problems.[6]

There is a scarcity of literature regarding malnutrition together with depression among TB patients in the Ahmedabad City. Hence this study was planned with the aim of assessment of malnutrition and depression in TB patients and its association with various sociodemographic determinants.

MATERIALS AND METHODS

The present study had a cross sectional study design. A tertiary care hospital was selected randomly by lottery method for the study after obtaining the list of all such hospitals located within Ahmedabad City. The sampling frame included TB patients receiving medications from the selected tertiary care centre.

As per a previous study[1], the prevalence of undernutrition was 54.16 among TB patients. Taking p as 54.16,q(100-p) as 45.84, allowable error l (15% of p) as 8.12 as per the formula $N=4*pq/l^2$ the sample size turns out to be 150.Owing to the non response, a final sample size of 180 was decided for the study.

TB patients giving consent, above the age of 18 years and receiving treatment from the selected tertiary care centre were included in the study. The study duration was 2 years starting from late 2019 to 2022 but due to Covid 19 pandemic the study was postponed and concluded by mid 2024.A pre designed pre structured questionnaire was used for data collection which consisted of two parts. Part 1 were sociodemographic data. Updated and Modified B.G.Prasad classification was used to calculate socioeconomic class.[7] Part 2 were BMI classification to assess malnutrition[2], PHQ-9(Patient Health Questionnaire-9) for grading depression[8].In the present study, mild undernutrition was considered grade 1 malnutrition, moderate as grade 2 and severe as grade 3 malnutrition.

Data collection was started after receiving permission from institutional ethics committee and was continued till sample size of 180 was reached.Data collection was done by personal interview. Data entry was done in MS Excel. Data analysis was carried out using SPSS(Statistical package for social sciences) version 26.Frequency and percentage, Chi square test and Cramer's V[9] were used for data analysis.

RESULTS

Table 1: Sociodemographic details of study participants(n=180)

Variable	Category	Frequency (%)
Age	18-40	85(47.3)
	40-60	70(39)
	>60	25(13.7)
Gender	Male	120(66.6)
	Female	60(33.4)
Residence	Urban	132(73.3)
	Rural	48(26.7)
Marital Status	Married	106(58.9)
	Unmarried	45(25)
	Divorced/Widow	29(16.1)
Socio economic class(as per modified BG Prasad Classification)*	Upper Middle	6(3.3)
	Middle	36(20)
	Lower Middle	51(28.3)
	Lower	87(48.4)

*****AICPI April 2024=139.4[10]

Sociodemographic details of study subjects are shown in table 1.Out of total, 85(47.3%) participants belonged to age group of 18 to 40 years followed by 70(39%) who belonged to 40 to 60 years age group. Majority of the subjects were male(120,66.6%).Urban type of residence was the most common(132,73.3%).Married patients were more common(106,58.9%).As per modified BJ Prasad Classification, Lower(87,48.4%) and lower middle(51,28.3%) class were more commonly observed.

Drug sensitive Tb patients were 131(72.7%) while drug resistant were 49(27.3%).

Figure 1: Grades of Malnutrition among TB patients(n=180)

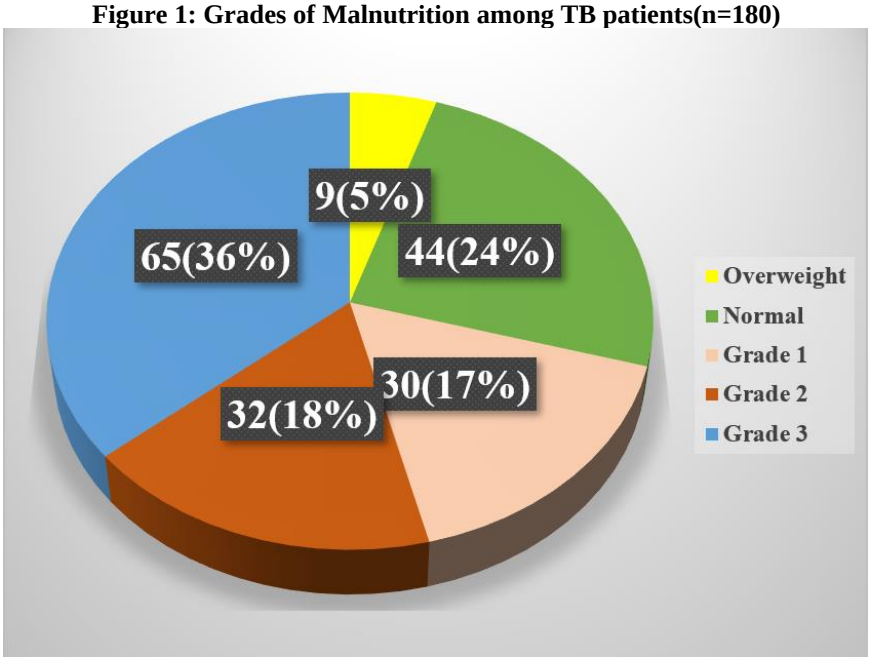

Figure 1 shows various grades of malnutrition among study subjects.Grade 3 (Severe)malnutrition was seen in 65(36%) patients followed by normal(44,24%) and grade 2(32,18%).The prevalence of undernutrition is 71%.

Figure 2: Grades of Depression among TB patients(n=180)

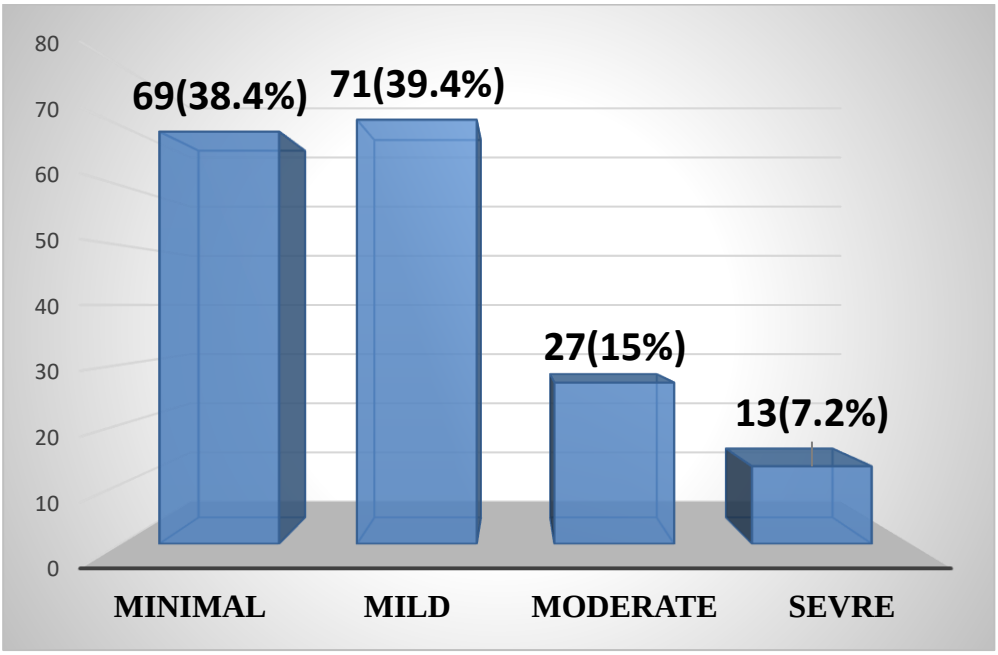

Figure 2 shows various grades of depression among TB patients. Mild depression was most common(71,39.4%) followed by minimal depression(69,38.4%).

Variable	Category	Grades of Malnutrition					Chi-Square (p value)	Cramer's V
		Grade 3	Grade 2	Grade 1	Normal	Overweight		
Gender	Male	58	11	16	32	3	37.53 (<0.0001)	0.456
	Female	7	21	14	12	6		
Residence	Urban	41	24	24	39	4	13.33 (0.009)	0.272
	Rural	24	8	6	5	5		
Duration since treatment initiation	<6 months	23	12	22	36	9	39.91 (<0.0001)	0.332
	6-12 months	35	18	7	8	0		
	>12 months	7	2	1	0	0		
Drug Sensitivity	Drug Sensitive TB	40	26	14	42	9	30.41 (<0.0001)	0.411
	Drug Resistant TB	25	6	16	2	0		
Socio-economic class	Upper Middle	0	1	2	1	2	36.29 (<0.0001)	0.259
	Middle	8	6	11	9	2		
	Lower Middle	12	15	7	14	3		
	Lower	45	10	10	20	2		

Table 2: Association between grades of malnutrition and different variables(n=180)

A statistically significant association(<0.05) was found between grades of malnutrition and variables like gender, residence, duration since treatment initiation, drug sensitivity and socioeconomic class as shown in table 2.Further analysis by Cramer's V shows a strong association between grades of malnutrition and above determinants.(Cramer's V >0.25)

Table 3: Association between grades of depression and different variables(n=180)

Variable	Category	Grades of Depression				Chi-Square (p value)	Cramer's V
		Minimal	Mild	Moderate	Severe		
Gender	Male	46	50	14	10	3.73(0.29)	0.143
	Female	23	21	13	3		
Residence	Urban	38	60	22	12	19.83(0.0001)	0.331
	Rural	31	13	3	1		
Duration since treatment initiation	<6 months	62	34	5	1	76.64(<0.0001)	0.461
	6-12 months	6	36	18	8		
	>12 months	1	1	4	4		
Drug Sensitivity	Drug Sensitive TB	60	56	11	4	33.90(<0.0001)	0.433
	Drug Resistant TB	9	15	16	9		
Socio-economic class	Upper Middle	3	1	1	1	19.69(0.01)	0.190
	Middle	22	9	2	3		
	Lower Middle	19	25	4	3		
	Lower	25	36	20	6		

Table 3 shows statistically significant association (<0.05) between grades of depression and variables like residence, duration since treatment initiation, drug sensitivity and socioeconomic class. Further analysis by Cramer's V shows a strong association between grades of depression and drug sensitivity, duration since treatment initiation as well as residence. (Cramer's V >0.25)

Table 4: Association between malnutrition and grades of depression among study subjects(n=180)

Malnutrition	Grades of Depression				Chi Square (p value)	Cramer's V
	Minimal	Mild	Moderate	Severe	22.02(0.03)	0.201
Grade 3	16	35	9	5		
Grade 2	10	11	9	2		
Grade 1	18	8	3	1		
Normal	20	16	4	4		
Overweight	5	1	2	1		

As shown in table 4, a statistically significant (<0.05) but weak association(Cramer's V<0.25) was found between grades of depression and grades of malnutrition among the TB patients.

DISCUSSION

Males were more in the present study(66.6%) which is similar to a study carried out at Pokhara, Nepal[11](60.9%) and central India[12](68%).Married patients were 58.9% which is nearer to a study at Eastern Ethiopia[13](51%).Urban residence was more common(73.3%) which is in line with the analysis of a national prevalence study[14] showing urban preponderance. Lower class was observed maximum(48.4%) which is similar to the study of Eastern Ethiopia[13](47%).

Prevalence of Undernutrition was found to be 71% in the present study which is close to the study done at Raipur[1](63.3%).The prevalence of undernutrition in a study at Nepal[11]showed 21.8% undernutrition. This difference could be due to difference in the geographical location, sample size, cultural and economic as well as lifestyle and dietary patterns between the two countries. Prevalence of depression in the mild category was 39.4% in the current study which is similar to a study done at Vidisha, Madhya Pradesh[6](41.5%).

Present study shows a statistically significant association(p<0.05) between gender and grades of malnutrition. Similar association was observed in the study done at Eastern Ethiopia[13] while studies at Nepal[11](p=0.90) and Uganda[15](p=0.51) did not show such association. This may be due to difference in study methodology and population demographics. Among the drug resistant TB patients, 51% had grade 3 malnutrition which slightly higher than the study done at Uganda[15](41.7%) while mild or grade 1 malnutrition was similar in both the studies(33.3%, 32.6%).

Socioeconomic class showed a statistically significant association(p<0.05) with grades of depression in the current study which is also shown by a study at Delhi[16]. However gender did not show significant association with grades of depression which is shown by the study at Delhi[16]. The difference in the study setting and sample size may have led to such a difference.

Malnutrition and Depression had a statistically significant association(p<0.05) which is in line with the findings of a study done at Shanghai[17].

CONCLUSION

More than half of the participants were males, married and residing in urban area. A little more than one fourth of the patients had severe malnutrition while less than half the patients had mild grade of depression. The different grades of malnutrition had a statistically significant and strong association with variables like gender, residence, duration since treatment initiation, drug sensitivity and socioeconomic class while grades of depression had a statistically significant and strong association with residence, drug sensitivity and duration since treatment initiation. Both depression and malnutrition were significantly associated in TB patients.

Limitations and Recommendations

One of the limitation of this study is the sample size. A study with more number of patients involving multiple centres would give a generalizable result. Types of TB(pulmonary, extra pulmonary), physical activity, addiction and comorbidities were not included in the questionnaire.

REFERENCES

1. Sinha AK, Debata I, Pradhan PC, Panda PS, Behera BK, Mukhopadhyay A. Original Article A study to assess the nutritional status and dietary gap among pulmonary tuberculosis patients in Raipur city. 2024;2138–42.

2. Sinha P, Ponnuraja C, Gupte N, Babu SP, Cox SR, Sarkar S, et al. Impact of Undernutrition on Tuberculosis Treatment Outcomes in India : A Multicenter , Prospective , Cohort Analysis. Clin Infect Dis [Internet]. 2023;76(8):1483–91. Available from: https://doi.org/10.1093/cid/ciac915
3. Carwile ME, Hochberg NS, Sinha P. Journal of Clinical Tuberculosis and Other Mycobacterial Diseases Undernutrition is feeding the tuberculosis pandemic : A perspective. J Clin Tuberc Other Mycobact Dis [Internet]. 2022;27(March):100311. Available from: https://doi.org/10.1016/j.jctube.2022.100311
4. Endalkachew K, Mulu Y, Derso T, Kebede A. Journal of Clinical Tuberculosis and Other Mycobacterial Diseases Prevalence and associated factors of undernutrition among adult TB patients attending Amhara National Regional State hospitals , Northwest Ethiopia. J Clin Tuberc Other Mycobact Dis [Internet]. 2022;26:100291. Available from: https://doi.org/10.1016/j.jctube.2021.100291
5. Musuenge BB, Poda GG, Chen PC. Nutritional Status of Patients with Tuberculosis and Associated Factors in the Health Centre Region of Burkina Faso. Nutrients. 2020 Aug 21;12(9):2540.
6. Solanki N, Upadhyay A, Upadhyay R, Dabar D, Mandal UK, Yadav V, et al. A Cross-Sectional Study on the Prevalence of Depression and Associated Factors in Tuberculosis Patients in the Vidisha District of Madhya Pradesh, India. Cureus [Internet]. 2023 Oct 7 [cited 2023 Oct 18];15(10). Available from: https://www.cureus.com/articles/187047-a-cross-sectional-study-on-the-prevalence-of-depression-and-associated-factors-in-tuberculosis-patients-in-the-vidisha-district-of-madhya-pradesh-india#
7. Ghodke M. Updated BG Prasad's Socioeconomic Status Classification for the Year 2023. Indian Journal of Community Medicine. 2023 Jan 1;48(6):934–6.
8. Stanford Medicine. PATIENT HEALTH QUESTIONNAIRE (PHQ-9) [Internet]. Stanford Medicine. 2005. Available from: https://med.stanford.edu/fastlab/research/imapp/msrs/_jcr_content/main/accordion/accordion_content3/download_256324296/file.res/PHQ9%20id%20date%2008.03.pdf
9. Dias, D.; Silva, J.S.;Bernardino, A. The Prediction of Road-Accident Risk through Data Mining: A Case Study from Setubal,Portugal. Informatics **2023**, 10, 17. https://doi.org/10.3390/informatics10010017
10. Consumer Price Index Numbers for Industrial WorkersBase2016=100. Available at:https://labourbureau.gov.in/uploads/public/notice/Press-Release-CPI-IW-FebMarApr2024Epdf-e49e5139fa35fa73a8deea0aa1ea55c5.pdf
11. Gurung LM, Bhatt LD, Karmacharya I and Yadav DK (2018) Dietary Practice and Nutritional Status of Tuberculosis Patients in Pokhara: A Cross Sectional Study. Front. Nutr. 5: 63.doi:10.3389/fnut.2018.00063
12. Bhargava A, Chatterjee M, Jain Y, Chatterjee B, Kataria A, Bhargava M, et al. Nutritional Status of Adult Patients with Pulmonary Tuberculosis in Rural Central India and Its Association with Mortality. Noymer A, editor. PLoS ONE. 2013 Oct 24;8(10):e77979.
13. Muse AI, Osman MO, Ibrahim AM, Wedajo GT, Daud FI, Abate KH. Undernutrition and Associated Factors Among Adult Tuberculosis Patients in Jigjiga Public Health Facilities, Somali Region, East, Ethiopia. Research and Reports in Tropical Medicine. 2021 Jun;Volume 12:123–33.
14. Selvaraju S, Velayutham B, Rao R, Rade K, Thiruvengadam K, Asthana S, et al. Prevalence and factors associated with tuberculosis infection in India. Journal of Infection and Public Health [Internet]. 2023 Oct 13;16(12). Available from: https://www.sciencedirect.com/science/article/pii/S1876034123003362
15. Baluku JB, Namiiro S, Nabwana M, Muttamba W, Kirenga B. Undernutrition and Treatment Success in Drug-Resistant Tuberculosis in Uganda. Infection and Drug Resistance [Internet]. 2021 Sep 9;14:3673–81. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8437412/
16. Kamble B, Dhaked S, Mahaur G, Prasad B, Kumar P, Dhaked GK. Depression Among Patients With Tuberculosis at a Directly Observed Treatment Short-Course (DOTS) Center in Rural Delhi. Cureus. 2022 Oct 29;
17. Fang XE, Chen DP, Tang LL, Mao YJ. Association between depression and malnutrition in pulmonary tuberculosis patients: A cross-sectional study. World Journal of Clinical Cases. 2022 May 16;10(14):4395–403.