



Received on 23 April 2026; received in revised form, 15 May 2026; accepted, 19 June 2026; published 01 September 2026

PREDICTORS OF TREATMENT OUTCOME AMONG SPUTUM POSITIVE ADULT PULMONARY TUBERCULOSIS PATIENTS IN NORTH INDIA: A PROSPECTIVE COHORT STUDY

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Keywords:

Tuberculosis, Cured, Health Education, Morbidity, Mortality

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ABSTRACT: Background: India is one of the highest TB burden countries with an annual incidence 199 TB cases/100,000 population and the estimated death rate in the year 2023 among all forms of TB was 23/100,000 population. The variables like undernutrition or malnutrition at treatment initiation, low BMI, presence of comorbidities and severe stunting were associated with unfavourable TB treatment outcomes. **Material and Methods:** The study was a prospective cohort study carried out at DTC Rohtak and study period was 6 months i.e. January 2024 - June 2024. The study recruited all newly diagnosed sputum positive pulmonary tuberculosis adult age ≥ 18 years patients registered during the period Jan 2024-June 2024 on Nikshay portal for DTC urban TU Rohtak. **Results:** A total of 65 study subjects; majority of study subjects 57 (87.7%) were cured, 7 (10.8%) study subjects completed treatment while one study subject was died during course of treatment. In the multivariable analysis, the variables like: age, caste, marital status, education, occupation, BMI, DM and AFB Grading were found statistically significant with the treatment outcome of the patients. **Conclusion and Recommendations:** The study concluded that various predictors were found to be significantly associated with a successful treatment outcome. The study recommends that primary health care workers/professionals or DOTS providers should be apprised about the importance of completing of treatment though health education to TB patient.

INTRODUCTION: The World Health Organization (WHO) estimates that >30% of the global population has latent or active tuberculosis (TB), and nearly 8 million new cases are detected every year. India is one of the highest TB burden countries with an annual incidence of 2.8 million cases at 199 TB cases/100,000 population and the estimated death rate among all forms of TB was 23/100,000 population in the year 2023¹. The WHO had planned in the 1990s to reduce globally the burden of TB.

To achieve this, WHO set “STOP TB” and “END TB by 2030” programs aim to eliminate TB as a public health problem by 2050².

The WHO should ensure that no household incurs catastrophic healthcare costs due to TB, through effective implementation of three strategic pillars (patient-centered care and prevention, bold policies and supportive systems, and intensified research and innovation) and through four principles i.e. government stewardship, a strong coalition with civil society and communities, a human rights and equity-based approach and country level adoption. India's focuses on preventing the emergence of TB in a vulnerable population through four critical pillars (Detect – Treat – Prevent – Build) in National Strategic Plan for Elimination of Tuberculosis (2017-25). In the program, TB Preventive Therapy (TPT) is being given to all

QUICK RESPONSE CODE  DOI link: https://doi.org/10.13040/IJPSR.0975-8232.17(9).2676-84	DOI: 10.13040/IJPSR.0975-8232.17(9).2676-84 This article can be accessed online on www.ijpsr.com
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household contacts of index case of pulmonary TB patients irrespective of their age, sex and other high-risk groups.

The Kamble B K *et al* carried out a study on young TB patients (15-24 yrs) in Faridabad, Haryana and revealed that a high treatment success rate with the most cured (93.2%), or completed treatment ³. Kumar A retrospective cohort study carried in Belagavi district of North Karnataka and found that variables like females, younger age group, absence of comorbidities, having extra-pulmonary TB, smear-negative pulmonary TB, and new TB patients had successful treatment outcome. The authors also reported that early detection of tuberculosis, comprehensive counselling to patients regarding the disease and its treatment and management could lead to successful treatment outcomes ⁴. Roy AK *et al* conducted a cross-sectional study in Nabagram block of Murshidabad district in the year 2023 and reported that underweight is the most common predictor for treatment outcome among tuberculosis patients ⁵. Golsha R *et al* concluded that patients with older age, underlying diseases, and cultural poverty had the higher chance of active TB or unfavourable treatment outcomes ⁶. The predictors like premorbid under nutrition, malnutrition at treatment initiation, BMI did not increase after intensive therapy, and severe stunting were associated with unfavourable TB treatment outcomes ⁷.

Evidences indicated that old age, uncontrolled sugar, high initial sputum smear acid fast bacilli (AFB) grade, cavitory lesion and low BMI may delay the time to smear conversion. Identification of the risk factors are vital for improving treatment outcomes. Cured, treatment completed, treatment failed, died, and defaulted were five exclusive groups of TB treatment outcome used as a benchmark for global TB data collection and treatment success assessment. The good treatment outcome is considered when the significant number of TB patients cured or completed treatment, while patients those who missed treatment, defaulted, or died are considered to have a poor treatment outcome ⁸. WHO recommends that monitoring is an important evaluating tool to measures the efficacy of TB treatment outcome and identifying possible barriers to control and prevent TB in the

community. There is paucity of data regarding treatment outcome and its determinants among sputum positive adult pulmonary tuberculosis in Haryana that's why a prospective cohort study was planned to evaluate the treatment outcomes and predictors of newly diagnosed adult sputum positive TB patients in District Rohtak, Haryana, India.

METHODOLOGY: The present study was conducted at District Tuberculosis Centre (DTC) of District Rohtak, Haryana. The DTC Rohtak is working under Directorate General of Health Services (DGHS), Haryana and it has 5 Tuberculosis Units (TU). One TU was selected randomly for the study. The Urban TU District Tuberculosis Centre, Rohtak catering the population of 2 to 2.5 lakhs and has 3 Designated Microscopic Centers (DMCs), 2 Medical Office Tuberculosis Control (MO-TC), 2 Senior Treatment Supervisor (STS), 1 Senior Tuberculosis Laboratory Supervisor (STLS), 3 Tuberculosis health visitor (TBHV) and DOTS providers.

Around 18,000-20,000 patients are attending OPD annually at DTC and out of these, nearly 300 patients turn out to be newly diagnosed sputum positive tuberculosis patients and non-pulmonary tuberculosis. The design of study was a prospective cohort study and study period was 6 months i.e. January 2024 –December 2024. The study recruited all newly diagnosed sputum positive pulmonary tuberculosis adult age ≥ 18 years patients during the study period registered on Nikshay portal for DTC urban TU Rohtak. The age of participant was ≥ 18 years, new adult patients of pulmonary tuberculosis confirmed by sputum smear examination and those who are willing to participate in study were the inclusion criteria, while pregnant women, patients who had previous history of TB, those patients who had been diagnosed psychiatric illness, bedridden and who were not able to cooperate were the exclusion criteria of the study.

Data Collection: Before commencement of the study a written permission was also obtained from the Civil Surgeon office, Rohtak. The investigator visited on working day of DTC Rohtak and recruited adult patients (age ≥ 18 years) who were diagnosed sputum positive pulmonary tuberculosis

and fulfilled the inclusion criteria of study. The study participants were contacted personally and administered a pre-tested semi-structured questionnaire interview schedule for socio-demographic characteristics and other variables after obtaining the written informed consent.

As these patients visiting for follow up at 2nd and 6th month for sputum examination and for their treatment course as per NTEP. These study subjects were contacted and interviewed face to face on the days of follow ups. The investigator administered again the semi-structured questionnaire interview schedule for assessing the predictors and status of sputum examination during 2nd month visit. The investigator again contacted these patients at 6 months follow up visit for sputum examination at DTC Rohtak and again administering the semi-structured questionnaire interview schedule to assess and records the result of sputum examination and predictors of TB treatment outcome like cured, treatment failed, treatment completed, died, loss to follow up, not evaluated or treatment success. Operational definitions of treatment outcome like cured, treatment completed, died, lost to follow-up, and not evaluated were used as mentioned in the NTEP guidelines ¹.

Data Analysis: Data was compiled and entered in the MS Excel sheet and the data were described

using frequency and percentages through univariate analysis. The chi-square test and multivariate analysis were performed using SPSS (Statistical Package for Social Sciences)-20.

Ethical Clearance: Ethical Clearance was obtained from Ethics Committee PGIMS/UHS Rohtak, Haryana (BREC/22/TH/COMMM. MED.-02 dated 29.09.2023).

RESULTS: The study was a prospective cohort study carried out at DTC Rohtak and found that 39 (60%) of patients were males and the rest were female. The most of the patients 39 (60%) were in the age group of 18-40 years. Majority of patients 64.7% belonged to nuclear family and 46.2% patients were SC/ST by caste. One third of patients had lower socio-economic status while one quarter had lower middle socio-economic status. Nearly half of patients (47.7%) were either primary or illiterate. 35.4% patients were primary while only six patients were educated up to graduate and above. Majority of the TB patients (75.3%) were married and out of these 60% patients were living within partner. Occupation wise, nearly one third (36.9%) of patients were labourers while 96% (24/25) female TB patients were housewives while one patient had private/govt job **Table 1**.

TABLE 1: SOCIO-DEMOGRAPHIC DISTRIBUTION OF THE STUDY PARTICIPANTS (N=65)

Variable		Frequency	Percentage
Gender	Male	40	61.5
	Female	25	38.5
Age in years	18-40	39	60.0
	41-60	8	12.3
	>61	18	27.7
Types of Family	Joint Family	23	35.3
	Nuclear Family	42	64.7
Caste	General	19	29.2
	OBC	16	24.6
	SC/ ST	30	46.2
Socioeconomic status	Class I (Upper)	7	10.77
	Class II (Upper middle)	12	18.46
	Class III (Middle)	10	15.38
	Class IV (Lower middle)	16	24.61
	Class V (Lower)	20	30.77
Education	Illiterate	8	12.3
	Primary	23	35.4
	Secondary	21	32.3
	Higher secondary	7	10.8
	Graduate and above	6	9.2
Marital status	Unmarried	16	24.6
	Divorced/Separated	1	1.5

Occupation	Living together	39	60.0
	Widow	5	7.7
	Widower	4	6.2
	Labourer	24	36.9
	Housewives	24	36.9
	Self employed	4	6.2
	Student	12	18.5
	Employed (Private/ Govt.)	1	1.5

Regarding the treatment outcomes among the study subjects, from 65 study subjects; majority of study subjects 57(87.7%) were cured, 7(10.8%) study subjects completed treatment while one study subject was died during course of treatment **Table 2**.

TABLE 2: TREATMENT OUTCOMES AMONG STUDY SUBJECTS (N=65)

Treatment outcome	Frequency	Percentage
Cured	57	87.7
Died	1	1.5
Treatment completed	7	10.8

The association between different variables of study subjects and treatment outcome was studied and found that 53.85% males cured and 1 (1.54%) male died during the treatment while 88% females got cured and 12% females were completed their treatment. This association was found statistically not significant. The association between age group, caste wise, education wise, BMI, DM and treatment outcome among study subjects were found statically significant **Table 3**.

TABLE 3: ASSOCIATION BETWEEN DIFFERENT VARIABLES AND TREATMENT OUTCOME AMONG STUDY SUBJECTS

Characteristics		Treatment Outcome				Chi Sq., p-value
		Cured	Treatment complete	Died	Total	
Gender	Male	35 (87.5%)	4 (10%)	1(2.5%)	40(61.54%)	0.682,
	Female	22 (88%)	3 (12%)	0 (0%)	25(38.46%)	0.41
Age in Years	18-40	35 (89.7%)	4 (10.3%)	0 (0%)	39 (60%)	4.423,
	Above 40 years	22 (84.6%)	3 (11.5%)	1 (3.9%)	26 (40%)	0.03
Caste	General	17 (89.4%)	1 (5.3%)	1 (5.3%)	19 (29.23%)	4.367,
	OBC	15 (93.7%)	1 (6.3%)	0 (0%)	16 (24.62%)	0.04
Education	SC/ST	25 (83.3%)	5 (16.7%)	0 (0%)	30 (46.15%)	
	Illiterate	6 (75%)	2 (25%)	0 (0%)	8 (12.31%)	8.847
	Primary	22 (95.6%)	1 (4.4%)	0 (0%)	23 (35.38%)	0.00
	Secondary	18 (85.7%)	2 (9.5%)	1 (4.8%)	21 (32.31%)	
	Higher secondary	7 (100%)	0 (0%)	0 (0%)	7 (10.77%)	
	Graduate & above	4 (66.6%)	2 (33.4%)	0 (0%)	6 (9.23%)	
Occupation	Laborer	22 (91.6%)	2 (8.4%)	0 (0%)	24 (36.92%)	10.860
	Housewife/	20 (83.3%)	3 (12.5%)	1 (4.2%)	24 (36.92%)	0.00
	House maker					
	Self employed	4 (100%)	0 (0%)	0 (0%)	4 (6.15%)	
	Student	11 (91.6%)	1 (8.4%)	0 (0%)	12 (18.47%)	
	Employed (Govt./Private)	0 (0%)	1 (100%)	0 (0%)	1 (1.54%)	
BMI (Kg/m ²)	<18.5	29(90.6%)	2 (6.2%)	1 (3.2%)	32 (49.23%)	4.043
	18.5-24.9	22(81.4%)	5 (18.6)	0 (0%)	27 (41.54%)	0.04
	25.0-29.9	5 (100%)	0 (0%)	0 (0%)	5 (7.69%)	
	>30	1 (100%)	0 (0 %)	0 (0%)	1 (1.54%)	
Type of Family	Joint	18 (78.2%)	4 (17.3%)	1 (4.5%)	23 (35.38%)	3.637
	Nuclear	39 (92.8%)	3 (7.2%)	0 (0%)	42 (64.62%)	0.05
Diabetes Mellitus	Yes	13 (86.6%)	2 (13.4%)	0	15 (33%)	2.872
	No	44 (88%)	5 (10%)	1 (2%)	50 (77%)	0.048

In the study, data was coded and used SPSS (Statistical Package for Social Sciences)-20 for analyzed multivariable association between dependent variables with interdependent variables.

The variables like: age, caste, marital status, education, occupation, BMI, DM and AFB Grading were found statistically significant with the treatment outcome of the patients. Patients had 1.20 times odds of a favourable treatment outcome among younger patients i.e. as age advances, the outcome of treatment is going towards worse (the older the age, the worse the outcome). Patients who belonged to OBC had 1.87 times odds of more favourable treatment outcomes than those SC/ST patients. Unmarried patients have 1.08 times odds higher in treatment outcome as compared to married patients. Similarly, those patients who were graduated and above had 1.20 times higher

odds of better treatment outcomes as compared to illiterate patients.

Patients who were self-employed/employed (Govt/private) had 1.12 times higher odds of favourable treatment outcome than the labourers. The patients who had BMI less than 18 didn't have a favorable outcome as compared to those who had normal BMI. The predictors like DM, Respiratory problems and AFB grading had significant effect on outcomes of TB while the type of family and alcohol didn't have significant effect on outcomes of TB patients **Table 4**.

TABLE 4: RESULTS OF UNIVARIABLE AND MULTIVARIABLE ANALYSIS ON TREATMENT OUTCOMES OF TB PATIENTS

	Variable	Cured (%)	N =57	p-value	Crude OR	Adjusted OR
Gender	Male	35 (87.5%)	N=40	0.910	Reference	Reference
	Female	22 (88%)	N= 25		.000his	.004
Age	18-40 years	35 (94.8%)	N=39	0.027	.802	1.20
	Above 40 years	22 (84.6%)	N=26		Reference	Reference
Caste	General	17 (89.4%)	N=19	0.026	.79	1.05
	OBC	15 (93.7%)	N=16		1.15	1.87
	SC/ST	25 (83.3%)	N= 30		Reference	Reference
Marital Status	Married	42 (85.7%)	N= 49	0.035	Reference	Reference
	Unmarried	15 (93.7%)	N=16		.74	1.08
Education	Illiterate	5 (62.5%)	N=8	0.041	Reference	Reference
	Primary	20 (86.9%)	N=23		.63	1.06
	Secondary	19 (90.4%)	N=21		.68	1.09
	Higher secondary	7 (100%)	N=7		.98	1.15
	Graduate & above	6 (100%)	N=6		1.02	1.20
Occupation	Laborer	21 (87.5%)	N=24	0.038	Reference	Reference
	House wife/ House maker	20 (83.3%)	N=24		.76	1.04
	Self employed	04 (100%)	N=4		.91	1.12
	Student	11 (91.6%)	N=12		.85	1.02
	Employed (Govt/Pvt)	01 (100%)	N=1		1.02	1.12
BMI (Kg/m ²)	<18.5	27 (84.3%)	N=32	0.049	.87	.92
	18.5-24.9	25(92.5%)	N=27		Reference	Reference
	25.0-29.9	5 (100%)	N=5		1.06	1.18
	>30	1 (100%)	N=1		1.03	1.17
Type of Family	Joint Family	18 (78.2%)	N=23	0.058	Reference	Reference
	Nuclear Family	39 (92.8%)	N=42		1.01	1.10
Diabetes	No	44 (88.0%)	N=50	0.048	1.09	1.12
Mellitus	Yes	13 (86.6%)	N=15		Reference	Reference
Respiratory Problems	No	43 (89.6%)	N=48	0.045	1.20	1.31
	Yes (Asthma & COPD)	14 (82.3%)	N=17		Reference	Reference
Alcohol Intake	No	46 (90.1%)	N=51	0.36	Reference	Reference
	Yes	11 (78.5%)	N=14		.000	0.000
AFB Grading	1+	39 (92.8%)	N=42	0.049	1.10	1.28
	2+	7 (77.7%)	N=9		Reference	Reference
	3+	11 (78.5%)	N=14		1.04	1.13

DISCUSSION: The study recruited a total of 65 adult sputum positive pulmonary TB patients in this prospective cohort study carried out at DTC Rohtak, Haryana. The socio-demographic variables

of the study reported that 40 (61.5%) patients were males and most of the patients 39 (60%) were in the age group of 18-40 years. The findings of the present study were in compliance with the

Yasobant S *et al* study, which reported that 60.9% of patients were in the age group of 18-40 years⁹. Fayaz SA *et al*, which observed that the majority of subjects were male and one-third were female¹⁰. In the present study, two-thirds of patients belonged to nuclear families and 46.2% of patients were SC/ST by caste. Lower caste families are often associated with poverty and a lower standard of living, which are significant risk factors for both contracting TB and having poor treatment outcomes. In India, caste-related discrimination and a lack of access to health care facilities can lead to delays in testing, diagnosis and treatment that can increase the likelihood of an unfavorable outcome or developing drug resistance.

One third of patients had lower socio-economic status, while one-quarter had lower-middle socio-economic status in the present study. Nearly half of patients (47.7%) were either primary or illiterate, while only six patients were educated up to graduate and above. Mandal S *et al* revealed that 35.3% of patients were illiterates, and just literates, study subjects educated up to primary and secondary were 43.3%, and 16.1% respectively while only 5.0% of study subjects had higher secondary education¹¹. The education directly impacts the outcome of TB treatment as by improving patient knowledge, the adherence to the intensive and continuation phases of course also increases. Better adherence leads to better outcomes that reduce the risk of developing multidrug-resistant TB. Literate patients are more likely to maintain good personal hygiene, adopt self-care behaviors and maintain a healthy lifestyle like regular exercise, proper nutrition, effective stress management, strong social relation, avoiding harmful habits of smoking or alcohol etc which improves not only the overall quality of life but also improves the treatment outcomes of TB patients.

The majority of the TB patients (75.3%) were married, and out of these, 60% of the patients were living with their partners **Table 1**. The findings were analogous with the findings of the study conducted by Yasobant S *et al* in which they revealed that 62.6% of the participants were married, 32.7% were single, while the rest were divorced/separated/widowed⁹. A stable marital status and supportive family are often linked to

better treatment outcomes, like higher treatment adherence, cure rates etc. The spousal or family support has played a crucial role in reminding the TB treatment regimen and emotional encouragement, which helps the patients in treatment outcome.

A significant proportion of the study subjects were either laborers or housewives/househusbands 24 (36.9%). Self-employed individuals made up a smaller portion of cohort 4 (6.2%). Students represent 12 (18.5%) of the study subjects. The findings were in coherence with the findings of the study conducted by Yasobant S *et al* in which daily laborers were 21.2%, housewives were 19.6%, self-employed were 9.8% and 15.1% were employed (private/ govt.)⁹.

The occupations, especially unskilled labor, were associated with increased disease risk, higher deaths, and poorer treatment outcomes. The jobless and low-paying jobs significantly impact on the successful treatment. The stable and higher-paying jobs (e.g., professional occupations, govt./pvt.jobs) are associated with better treatment outcomes, because the patients are able to afford transportation to health care services, have low financial strain and eat nutritious food.

Regarding the treatment outcomes among the study subjects, the majority of study subjects 57 (87.7%) were cured, 7 (10.8%) subjects completed treatment, while one study subject died during the course of treatment **Table 2**. In the research, no patients were identified as lost to follow-up, treatment failures, or not evaluated. The results were in coordination with Laux TS *et al* study in which, they reported that 1093 (22.0%) patients were cured, 219 (4.4%) died and 1468 (29.5%) completed their treatment¹². Kamble B K *et al* carried out a study on young TB patients (15-24 yrs) in Faridabad, Haryana and revealed a high treatment success rate (93.2%), with most cured or completed treatment³.

Sumana M *et al* found that 259 (86.33%) were cured, 20 (6.67%) died, 14 (4.67%) were lost to follow-up, and three (1%) had treatment failure as the treatment outcomes. The overall treatment success rate was 87.67%¹³. Prajapati *et al* reported that 69.1% completed treatment, 20.9% were cured,

and 3.6% died among the newly detected pulmonary TB patients. The overall treatment success rate was 87.9% in the new treatment category¹⁴. A study by Teferi M Y *et al* in Ethiopia also reported a similar cure rate of 82.5% among TB patients¹⁵.

Table 3 depicts the association between different variables of study subjects and treatment outcome and found that 53.85% males were cured and 1 (1.54%) male died during the treatment while 88% females got cured and 12% females completed their treatment. This association was found statistically not significant. The association between age group, caste-wise, education-wise, BMI, DM and treatment outcome among study subjects was found to be statistically significant. In the present study, by applying the bivariable analysis the variables like sex, education, occupation, BMI, sputum result, types of family and history of diabetes were found to be significantly associated with treatment outcome. In the multivariable analysis, patients who did not have a history of TB (AOR: 2.9, 95% CI: 1.24 to 6.66) and patients having a sputum result of 2+ or less (AOR: 0.46, 95% CI: 0.33 to 0.65) were significantly associated with a successful treatment outcome. This highlights that young TB patients having sputum results 1+, 2+ or more (compared with negative) warrant higher focus while managing them to achieve a 100% treatment success rate and protecting them from developing drug resistance in further later life³.

In the multivariable analysis, the variables like: age, caste, marital status, education, occupation, BMI, DM and AFB grading were found statistically significant with the treatment outcome of the patients. Patients were 1.20 times odds more likely to have a favourable outcome of treatment among younger patients i.e. as age advances, the outcome of treatment is going to be worse (the older the age, the worse the outcome). Patients belonging to OBC had 1.87 times odds higher of favourable treatment outcomes and those patients who have graduated and above had 1.20 times higher odds in relation to better treatment outcomes as compared to illiterate patients. The study observed a higher treatment success rate among sputum smear-negative TB patients compared to smear-positive cases, consistent with previous studies in India³. Patients who were self-employed/employed (govt/private)

had 1.12 higher odds of favourable treatment outcome than labourers. The patients whose BMI is <18 do not have favorable outcomes as compared to those who have normal or low BMI typically predicting worse results like treatment failure and more deaths. The predictors like DM, Respiratory problems and AFB grading significantly impacted on the TB outcome, while the type of family and alcohol consumption were not significantly impacted on the outcome of TB patients **Table 4**.

These variables were negatively impacted on TB treatment outcomes i.e. increasing the risks of treatment failure, relapse, and death. DM impairs the immune system of the body, resulting in higher initial AFB loads, which leads to delayed sputum conversion and increased risk of developing multidrug-resistant TB (MDR-TB). So, proper glycaemic control of TB patients is crucial for improving the outcome of treatment or prognosis of patients. Meghan A B quoted that those individuals who have DM with TB were cured or had treatment completion were four times more likely to develop a relapse of TB disease than patients without DM¹⁶.

In India, the prevalence of DM is expected to increase; patients of TB-DM will become an increasingly important part and require specialized focus in the national TB elimination programme. The existing respiratory diseases significantly worsen TB outcomes by increasing exacerbation frequency, making diagnosis more challenging, delaying treatment outcome, and the increasing the risk of treatment failure. These conditions can lead to more severe lung damage, impaired quality of life and death of patients. Initial bacterial load is a significant predictor for delayed sputum conversion, higher initial AFB grading lower cure rates that increase the risk of treatment failure, relapse, and mortality. Mohammadbeigi A *et al* reported that a higher sputum smear grade lowers the conversion and cure rates and such patients had comparatively not good treatment outcomes¹⁷.

The present study revealed that the age, caste, marital status, education, occupation, BMI, DM and AFB Grading of patients had significantly impacted on treatment outcome of TB patients and the study highlighted that improving the treatment outcomes for TB patients requires early case detection, continuous intensified health education

efforts focusing on the importance of controlled blood sugar level in TB, treatment completion, no alcohol/smoking and proper nutrition. The study also emphasizes that the community and health care professionals should follow the target interventions approach, strategies of comprehensive management and address any specific need of the vulnerable patients to enhance compliance for better outcomes of TB patients. The study has also few limitations like sample size and the study was carried at 1 TU thus the findings of the research could not be applied broadly.

CONCLUSION: The present study is one of the few studies that focus on treatment outcomes especially on adult age patients (>18 years) and registered on Nikshay portal for DTC urban TU Rohtak, Haryana. Variables like age, caste, marital status, education, occupation, BMI, DM and AFB Grading were found to be significantly associated with a successful treatment outcome. The study recommends that primary health care workers or DOTS providers should impart the health education to individual patient about the importance of nutrition, personal hygiene, control of their blood sugar level, quitting the habit of smoking and alcohol, completing the course of TB treatment and taking of care of other comorbidities. This will help not only for favourable treatment outcome but also improve the health of patients and may be a step towards achieving the goal set for TB in Sustainable Development Goals 2030.

ACKNOWLEDGEMENTS: Nil

CONFLICTS OF INTEREST: Nil

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How to cite this article:

Verma R, Singmar A, Meena, Kalhan M, Chayal V, Himani, Yadav M, Kaur A, Kumar A, Singla S and Kataria D: Predictors of treatment outcome among sputum positive adult pulmonary tuberculosis patients in North India: a prospective cohort study. *Int J Pharm Sci & Res* 2026; 17(9): 2676-84. doi: 10.13040/IJPSR.0975-8232.17(9).2676-84.

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