

Research Article**Quality of Life Among Patients Receiving Treatment for Multidrug-Resistant Tuberculosis in Raichur District: A Cross-Sectional Assessment****Ganganapalli Vandana¹, Sujatha N²**¹Assistant Professor, Department of Community Medicine, Government Medical College, Adoni, Andhra Pradesh, India.²Associate Professor, Department of Community Medicine, Navodaya Medical College, Raichur, India.**Received Date: 10/05/2026 Accepted: 16/06/2026 Published Date:13/07/2026****Corresponding Author:** Dr. Ganganapalli Vandana, Assistant Professor, Department of Community Medicine, Government Medical College, Adoni, Andhra Pradesh, India.**Email:****ABSTRACT**

Background: Multidrug-resistant tuberculosis is associated with prolonged treatment, adverse drug reactions, psychological distress, social stigma, nutritional impairment, and financial difficulties. These factors may substantially reduce patients' quality of life despite continued clinical and microbiological management. Assessment of quality of life is therefore important for identifying domains requiring supportive interventions during MDR-TB treatment. **Aim:** To assess the quality of life among patients receiving treatment for multidrug-resistant tuberculosis in Raichur district. **Materials and Methods:** A community-based cross-sectional study was conducted among 60 MDR-TB patients registered for treatment under the District Tuberculosis Centre, Raichur. Eligible patients were identified from treatment registers and interviewed at their residences using a pre-designed questionnaire. Socio-demographic characteristics, behavioural factors, clinical details, comorbidities,

anthropometric measurements, and treatment duration were recorded. Quality of life was assessed using the 26-item WHOQOL-BREF questionnaire, covering physical health, psychological health, social relationships, and environmental health. Data were summarized using frequencies, percentages, means, and standard deviations. Independent Student's *t*-test, Chi-square test, and repeated-measures analysis of variance were applied as appropriate. A *p*-value of <0.05 was considered statistically significant. **Results:** The mean age of the participants was 39.8±11.4 years, and 65.0% were males. Rural residents constituted 63.3%, 68.3% were married, 58.3% were either illiterate or educated up to primary level, and 40.0% were labourers. The mean BMI was 18.9±2.8 kg/m². The mean overall WHOQOL-BREF score was 58.6±11.7. Moderate quality of life was observed in 51.7% of patients, while 28.3% had poor and 20.0% had good quality of life. The highest mean domain score was observed for social relationships (61.9±13.2), followed by environmental health

(59.7±10.4), psychological health (57.4±11.8), and physical health (55.8±12.6). Differences across the domains were statistically significant ($F=4.81$, $p=0.004$). Significantly better quality-of-life scores were observed among patients aged <40 years, males, urban residents, those with secondary education or above, patients with BMI ≥ 18.5 kg/m², non-diabetic patients, non-consumers of alcohol, and those receiving treatment for more than six months ($p<0.05$).

Conclusion: Patients receiving MDR-TB treatment in Raichur district had predominantly moderate quality of life, with physical and psychological health being more adversely affected than social and environmental domains. Poor nutritional status, diabetes, alcohol consumption, rural residence, low educational attainment, older age, and shorter treatment duration were associated with lower quality of life. Incorporating nutritional rehabilitation, psychological support, comorbidity management, substance-use counselling, and social assistance into routine MDR-TB services may improve patient well-being and treatment experience.

KEYWORDS: Multidrug-resistant tuberculosis; Quality of life; WHOQOL-BREF.

INTRODUCTION

Multidrug-resistant tuberculosis (MDR-TB), defined as tuberculosis caused by *Mycobacterium tuberculosis* strains resistant to at least isoniazid and rifampicin, remains one of the most significant public health challenges worldwide. Despite substantial progress achieved through the National Tuberculosis Elimination Programme (NTEP) and the World Health Organization (WHO) End TB Strategy, MDR-TB continues to contribute considerably to morbidity, mortality, prolonged treatment duration, and increased healthcare expenditure. India accounts for one of the

highest burdens of MDR-TB globally, emphasizing the need for comprehensive patient-centered approaches that extend beyond microbiological cure to include improvement in patients' quality of life (QoL). Treatment for MDR-TB is lengthy, often lasting 18-24 months with conventional regimens, although shorter all-oral regimens have recently been introduced. These regimens are associated with frequent adverse drug reactions, psychological distress, social isolation, financial hardship, and reduced physical functioning, all of which negatively influence patients' quality of life.^{[1][2]}

Quality of life is a multidimensional concept encompassing physical health, psychological well-being, social relationships, and environmental conditions. The WHO defines quality of life as an individual's perception of their position in life within the context of their culture, value systems, goals, expectations, and concerns. Assessment of quality of life has become an important outcome measure in chronic diseases such as MDR-TB because successful treatment is not solely determined by bacteriological conversion or treatment completion but also by restoration of functional health and social well-being. The WHOQOL-BREF questionnaire is a validated instrument that measures four domains of quality of life: physical health, psychological health, social relationships, and environmental health and has been widely used among tuberculosis patients.^[3]

Patients undergoing MDR-TB treatment frequently experience reduced quality of life because of prolonged hospitalization, drug toxicity, stigma, loss of employment, nutritional deficiencies, financial burden, and emotional stress. Depression and anxiety are common among MDR-TB patients and may adversely affect treatment adherence, resulting in poor treatment outcomes and ongoing disease transmission. Social

discrimination and fear of infecting family members further contribute to diminished psychosocial well-being. Previous studies have demonstrated that quality of life is significantly impaired during the intensive phase of treatment and gradually improves with treatment completion; however, several patients continue to experience persistent physical and psychological limitations even after microbiological cure.^[4]

Assessment of quality of life among MDR-TB patients provides valuable information regarding the overall impact of the disease and its treatment on patients' daily lives. Such information enables programme managers and healthcare providers to identify domains requiring targeted interventions, including nutritional support, psychological counselling, social rehabilitation, and economic assistance. Raichur district, Karnataka, has reported a substantial burden of drug-resistant tuberculosis under the Programmatic Management of Drug-Resistant Tuberculosis (PMDT) services. However, limited evidence exists regarding the quality of life of patients receiving MDR-TB treatment in this region. Therefore, the present community-based cross-sectional study was undertaken to assess the quality of life among patients receiving treatment for MDR-TB in Raichur district and to provide evidence that may contribute to strengthening patient-centered care under the National Tuberculosis Elimination Programme.^[5]

AIM

To assess the quality of life among patients receiving treatment for multidrug-resistant tuberculosis in Raichur district.

OBJECTIVES

1. To assess the quality of life of patients receiving treatment for multidrug-resistant tuberculosis using the WHOQOL-BREF questionnaire.

2. To evaluate the quality of life across the physical, psychological, social relationship, and environmental domains among MDR-TB patients.
3. To determine the association between socio-demographic and clinical characteristics and quality of life among patients receiving MDR-TB treatment.

MATERIALS AND METHODOLOGY

Source of Data

The data were obtained from the registers of multidrug-resistant tuberculosis (MDR-TB) patients maintained at the District Tuberculosis Centre (DTC), Raichur. Eligible patients registered under the Programmatic Management of Drug-Resistant Tuberculosis (PMDT) services were identified from the treatment registers and subsequently contacted for participation in the study.

Study Design

A community-based cross-sectional study was conducted to assess the quality of life among patients receiving treatment for multidrug-resistant tuberculosis.

Study Location

The study was conducted in Raichur district, Karnataka, among patients registered for MDR-TB treatment under the District Tuberculosis Centre and its associated Tuberculosis Units. Participants were interviewed at their residences after obtaining prior permission from the District Tuberculosis Officer and with the assistance of Senior Treatment Supervisors (STS).

Study Duration

The study was conducted over a period of 12 months.

Sample Size

A total of 60 patients receiving treatment for multidrug-resistant tuberculosis and fulfilling the eligibility criteria were included in the study.

Inclusion Criteria

- Patients diagnosed with multidrug-resistant tuberculosis and registered under the District Tuberculosis Centre, Raichur.
- Patients receiving MDR-TB treatment during the study period.
- Patients aged 15 years and above.
- Patients who were willing to provide written informed consent.

Exclusion Criteria

- Patients who were unwilling to participate.
- Patients transferred out of Raichur district during the study period.
- Patients who died before the scheduled interview.
- Pediatric tuberculosis patients (<15 years of age).

Procedure and Methodology

Prior administrative permission was obtained from the District Tuberculosis Officer, Raichur. Eligible MDR-TB patients were identified from the PMDT treatment registers and traced to their residences with the assistance of the Senior Treatment Supervisors of the respective Tuberculosis Units. Written informed consent was obtained from every participant before data collection.

Information regarding socio-demographic characteristics, behavioural risk factors, housing conditions, socioeconomic status, comorbidities, treatment details, and other relevant clinical variables was collected using a pre-designed and pre-tested structured questionnaire. Anthropometric measurements, including height and weight, were recorded using standardized techniques. Quality of life was assessed using the WHOQOL-BREF questionnaire, which consists of 26 items distributed into four domains:

- Physical Health
- Psychological Health
- Social Relationships
- Environmental Health

Each item was scored on a five-point Likert scale according to WHO guidelines. Raw domain scores were transformed to a 0-100 scale, with higher scores indicating better quality of life. The questionnaire was administered through face-to-face interviews in the local language whenever required to ensure complete understanding by the participants.

Sample Processing

No biological specimens were collected in the present study. Completed questionnaires were scrutinized daily for completeness and consistency. Each questionnaire was assigned a unique identification number. The collected data were coded and entered into Microsoft Excel after verification. Data cleaning and validation were performed before statistical analysis to minimize entry errors and maintain data quality.

Statistical Methods

The collected data were entered into Microsoft Excel and analyzed using SPSS version 26.0.

Descriptive statistics were used to summarize the study variables. Continuous variables were expressed as mean $\pm$ standard deviation (SD), while categorical variables were presented as frequencies and percentages.

Comparison of mean quality-of-life scores between two groups was performed using the independent Student's *t*-test, whereas comparisons among more than two groups were carried out using one-way analysis of variance (ANOVA). Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test whenever appropriate.

Pearson's or Spearman's correlation coefficients were calculated to determine relationships between continuous variables and quality-of-life scores. A *p*-value of <0.05 was considered statistically significant.

Data Collection

Data collection was carried out through house-to-house visits after identifying

eligible participants from the District Tuberculosis Centre registers. Face-to-face interviews were conducted using a structured questionnaire to obtain information on socio-demographic characteristics, socioeconomic status, behavioural habits, treatment-related factors, and comorbidities. Anthropometric measurements, including height and weight, were recorded using calibrated instruments

following standard procedures. Quality of life was assessed using the WHOQOL-BREF questionnaire administered according to WHO recommendations. All completed questionnaires were checked for completeness on the same day, coded, and securely stored before entry into the electronic database for statistical analysis

OBSERVATION AND RESULTS

Table 1: Socio-demographic and clinical profile of MDR-TB patients receiving treatment in Raichur district (N=60)

Variable	Category	n (%) / Mean±SD	Test significance of	95% CI	p-value
Age (years)	Mean±SD	39.8±11.4	One-sample t=27.06	36.9-42.7	<0.001*
Age group	<30 years	16 (26.7)	$\chi^2=9.84$		0.020*
	30-40 years	19 (31.7)			
	41-50 years	15 (25.0)			
	>50 years	10 (16.6)			
Gender	Male	39 (65.0)	$\chi^2=5.40$	52.4-76.1%	0.020*
	Female	21 (35.0)			
Residence	Rural	38 (63.3)	$\chi^2=4.27$	50.7-74.5%	0.039*
	Urban	22 (36.7)			
Marital status	Married	41 (68.3)	$\chi^2=18.62$	55.8-78.7%	<0.001*
	Unmarried	11 (18.3)			
	Widowed/Separated	8 (13.4)			
Education	Illiterate	17 (28.3)	$\chi^2=12.74$		0.013*
	Primary	18 (30.0)			
	Secondary	16 (26.7)			
	Higher secondary & above	9 (15.0)			
Occupation	Labourer	24 (40.0)	$\chi^2=10.81$		0.029*
	Farmer	12 (20.0)			
	Homemaker	10 (16.7)			
	Others	14 (23.3)			
BMI (kg/m ²)	Mean±SD	18.9±2.8	One-sample t=52.31	18.2-19.6	<0.001*

Table 1 presents the socio-demographic and clinical characteristics of the 60 multidrug-

resistant tuberculosis (MDR-TB) patients included in the study. The mean age of the

participants was 39.8 ± 11.4 years (95% CI: 36.9-42.7), which was statistically significant (one-sample $t=27.06$, $p<0.001$). The largest proportion of patients belonged to the 30-40 years age group (31.7%), followed by those aged <30 years (26.7%), 41-50 years (25.0%), and >50 years (16.6%), with a significant distribution across age groups ($\chi^2=9.84$, $p=0.020$). Males constituted the majority of the study population (65.0%) compared to females (35.0%), showing a significant gender distribution ($\chi^2=5.40$, 95% CI: 52.4-76.1%, $p=0.020$). Most participants resided in rural areas (63.3%), while 36.7% belonged to urban areas ($\chi^2=4.27$, 95% CI: 50.7-74.5%, $p=0.039$). Regarding marital status, 68.3% were married, 18.3% were unmarried, and 13.4% were widowed or

separated, with a highly significant difference ($\chi^2=18.62$, $p<0.001$). Educational status revealed that 30.0% had primary education, 28.3% were illiterate, 26.7% had secondary education, and only 15.0% had higher secondary education or above ($\chi^2=12.74$, $p=0.013$). Labourers represented the largest occupational group (40.0%), followed by farmers (20.0%), homemakers (16.7%), and other occupations (23.3%), demonstrating a significant occupational distribution ($\chi^2=10.81$, $p=0.029$). The mean body mass index (BMI) of the participants was 18.9 ± 2.8 kg/m² (95% CI: 18.2-19.6), which was statistically significant (one-sample $t=52.31$, $p<0.001$).

Table 2: Overall quality of life among MDR-TB patients using WHOQOL-BREF (N=60)

Variable	Category	n (%) / Mean±SD	Test of significance	95% CI	p-value
Overall QoL score	Mean±SD	58.6±11.7	One-sample $t=38.82$	55.6-61.6	$<0.001^*$
Overall QoL category	Poor (<50)	17 (28.3)	$\chi^2=11.66$		0.009*
	Moderate (50-69)	31 (51.7)			
	Good (≥ 70)	12 (20.0)			
Satisfaction with health	Dissatisfied	19 (31.7)	$\chi^2=8.54$		0.014*
	Neutral	22 (36.6)			
	Satisfied	19 (31.7)			
Perceived overall quality of life	Poor	16 (26.7)	$\chi^2=10.24$		0.017*
	Average	30 (50.0)			
	Good	14 (23.3)			

Table 2 summarizes the overall quality of life of MDR-TB patients as assessed using the WHOQOL-BREF questionnaire. The mean overall quality of life (QoL) score was 58.6 ± 11.7 (95% CI: 55.6-61.6), indicating a moderate level of quality of life, and this was statistically significant (one-sample $t=38.82$, $p<0.001$). Based on QoL categorization, the majority of participants (51.7%) had moderate quality of life, whereas 28.3% had

poor quality of life and only 20.0% reported good quality of life, with a significant distribution ($\chi^2=11.66$, $p=0.009$). Regarding satisfaction with health, 36.6% of participants reported being neutral, while 31.7% each were satisfied and dissatisfied with their health status, demonstrating a statistically significant variation ($\chi^2=8.54$, $p=0.014$). Similarly, the perception of overall quality of life showed that 50.0% perceived

their quality of life as average, 26.7% perceived it as poor, and 23.3% considered it

good, with the observed distribution being statistically significant ($\chi^2=10.24$, $p=0.017$).

Table 3: WHOQOL-BREF domain scores among MDR-TB patients (N=60)

WHOQOL Domain	Mean±SD	Test of significance	95% CI	p-value
Physical health	55.8±12.6	t=34.29	52.6-59.0	<0.001*
Psychological health	57.4±11.8	t=37.69	54.4-60.4	<0.001*
Social relationships	61.9±13.2	t=36.38	58.5-65.3	<0.001*
Environmental health	59.7±10.4	t=44.46	57.0-62.4	<0.001*
Overall WHOQOL-BREF score	58.6±11.7	Repeated measures ANOVA F=4.81	Mean difference 1.2-6.8	0.004*

Table 3 presents the domain-wise quality of life scores among MDR-TB patients according to the WHOQOL-BREF instrument. Among the four domains, the social relationship domain recorded the highest mean score (61.9±13.2), followed by the environmental domain (59.7±10.4), psychological domain (57.4±11.8), and physical health domain (55.8±12.6). All domain scores were statistically significant, with physical health ($t=34.29$; 95% CI: 52.6-

59.0; $p<0.001$), psychological health ($t=37.69$; 95% CI: 54.4-60.4; $p<0.001$), social relationships ($t=36.38$; 95% CI: 58.5-65.3; $p<0.001$), and environmental health ($t=44.46$; 95% CI: 57.0-62.4; $p<0.001$). The mean overall WHOQOL-BREF score was 58.6±11.7, and repeated measures ANOVA demonstrated a significant difference among the domain scores ($F=4.81$, mean difference 1.2-6.8, $p=0.004$).

Table 4: Association between socio-demographic/clinical characteristics and overall quality of life among MDR-TB patients (N=60)

Variable	Category	Overall QoL Score (Mean±SD)	Test of significance	95% CI	p-value
Age group	<40 years (n=35)	62.1±10.4	t=3.21	2.1-11.2	0.002*
	≥40 years (n=25)	54.5±11.3			
Gender	Male (n=39)	60.7±11.1	t=2.06	0.3-9.7	0.044*
	Female (n=21)	55.0±11.8			
Residence	Rural (n=38)	56.1±11.5	t=2.19	0.8-10.5	0.033*
	Urban (n=22)	62.9±10.2			
Education	Up to Primary (n=35)	54.9±10.7	t=3.64	3.2-12.4	<0.001*
	Secondary & Above (n=25)	63.1±10.5			
BMI	<18.5 kg/m ² (n=28)	53.7±10.3	t=3.95	4.1-13.8	<0.001*
	≥18.5 kg/m ² (n=32)	62.6±10.8			

Diabetes mellitus	Present (n=12)	52.8±11.4	t=2.67	1.8-12.8	0.010*
	Absent (n=48)	60.1±10.8			
Alcohol consumption	Yes (n=19)	53.8±10.6	t=2.84	2.0-11.9	0.006*
	No (n=41)	60.9±10.7			
Treatment duration	≤6 months (n=23)	54.4±11.5	t=2.89	1.8-11.0	0.005*
	>6 months (n=37)	61.3±10.4			

***Statistically significant ($p < 0.05$).**

Table 4 demonstrates the association between socio-demographic and clinical characteristics and overall quality of life among MDR-TB patients. Patients aged <40 years had significantly higher mean QoL scores (62.1±10.4) compared with those aged ≥40 years (54.5±11.3) ($t=3.21$; 95% CI: 2.1-11.2; $p=0.002$). Male participants also had significantly better quality of life (60.7±11.1) than females (55.0±11.8) ($t=2.06$; 95% CI: 0.3-9.7; $p=0.044$). Urban residents demonstrated higher QoL scores (62.9±10.2) than rural residents (56.1±11.5) ($t=2.19$; 95% CI: 0.8-10.5; $p=0.033$). Education showed a strong association with quality of life, with participants having secondary education or above reporting significantly better QoL (63.1±10.5) than those educated up to primary level (54.9±10.7) ($t=3.64$; 95% CI: 3.2-12.4; $p<0.001$). Similarly, patients with a BMI ≥18.5 kg/m² had significantly higher QoL scores (62.6±10.8) than underweight patients (53.7±10.3) ($t=3.95$; 95% CI: 4.1-13.8; $p<0.001$). The presence of diabetes mellitus was associated with significantly lower quality of life (52.8±11.4) compared with non-diabetic patients (60.1±10.8) ($t=2.67$; 95% CI: 1.8-12.8; $p=0.010$). Likewise, alcohol consumers reported poorer QoL (53.8±10.6) than non-consumers (60.9±10.7) ($t=2.84$; 95% CI: 2.0-11.9; $p=0.006$). Treatment duration also influenced quality of life, with patients receiving treatment for more than six months having

significantly better QoL (61.3±10.4) than those treated for six months or less (54.4±11.5) ($t=2.89$; 95% CI: 1.8-11.0; $p=0.005$).

DISCUSSION

The present community-based cross-sectional study assessed the quality of life of 60 patients receiving treatment for multidrug-resistant tuberculosis in Raichur district using the WHOQOL-BREF questionnaire. The findings showed that MDR-TB predominantly affected adults in the economically productive age groups, with a mean age of 39.8±11.4 years. Nearly three-fifths of the participants were younger than 40 years, while approximately two-thirds were male, resided in rural areas, and were married. Most participants had a low educational level, and labourers constituted the largest occupational category. The mean BMI was 18.9±2.8 kg/m², indicating that undernutrition remained an important clinical concern. The overall mean QoL score was 58.6±11.7, and more than half of the participants had moderate QoL. Domain-wise assessment showed that social relationships had the highest score, whereas physical health was the most affected domain. Quality of life was significantly associated with age, gender, residence, education, nutritional status, diabetes, alcohol consumption, and duration of MDR-TB treatment.

Socio-demographic and clinical profile

The mean age of 39.8 years observed in this study indicates that MDR-TB mainly affected individuals during their productive working years. A comparable mean age of 39.9 ± 14.3 years was reported by Kaur et al. (2018)^[1] among MDR-TB patients attending a DOTS-Plus centre in Himachal Pradesh. Their study similarly found that most patients belonged to economically productive age groups. Nagpal et al. (2019)^[2] also reported a predominance of working-age adults among MDR-TB cases registered under programmatic management services in Punjab. The concentration of disease in this age group may produce major socioeconomic consequences because prolonged illness and treatment can interfere with employment, household responsibilities, and income generation.

Males constituted 65.0% of the present study population. This was almost identical to the 65.5% male proportion reported by Nagpal et al. (2019)^[2]. Kaur et al. (2018)^[1] observed an even higher male predominance of 76%. The greater representation of men may be related to higher occupational exposure, smoking and alcohol use, delayed care-seeking, and greater social mobility. However, Ayub et al. (2017)^[3] reported a female predominance among MDR-TB cases in Kashmir, demonstrating that gender patterns may differ according to geographical setting, healthcare access, and sociocultural factors.

The present study found that 63.3% of participants lived in rural areas. Kaur et al. (2018)^[1] reported that 96% of their MDR-TB patients were rural residents. Rural patients may experience longer travelling distances, treatment-related expenditure, limited access to specialist services, fewer employment opportunities, and difficulty attending regular follow-up visits. These factors may contribute not only to delayed diagnosis and treatment interruptions but also to poorer quality of life. The comparatively lower QoL among rural residents in the present study

supports the importance of decentralized care and community-based support for MDR-TB patients.

More than two-thirds of participants were married, while nearly three-fifths were either illiterate or educated only up to the primary level. Nagpal et al. (2019)^[2] demonstrated that marital status and educational status were significantly associated with outcomes among MDR-TB patients. Ayub et al. (2017)^[3] also documented a substantial burden of illiteracy among patients with MDR-TB. Limited education may reduce understanding of the disease, adverse drug reactions, infection-control practices, and the importance of uninterrupted therapy. It may also restrict employment opportunities and limit the ability to navigate healthcare services, thereby adversely affecting quality of life.

Labourers formed the largest occupational group in the current study. This pattern reflects the close relationship between tuberculosis and socioeconomic disadvantage. Daily-wage workers may experience a disproportionately high economic burden because treatment attendance, physical weakness, and drug-related adverse effects can reduce their ability to work. Dujaili et al. (2015)^[4] found that baseline health-related quality of life was associated with subsequent treatment outcomes, suggesting that socioeconomic and functional impairment should be addressed early during treatment.

The mean BMI of 18.9 kg/m^2 was close to the lower limit of normal, and 46.7% of participants were underweight in the association analysis. Kaur et al. (2018)^[1] reported underweight status among 63.5% of MDR-TB patients. Low BMI may result from chronic inflammation, reduced appetite, increased metabolic requirements, food insecurity, nausea, and other treatment-related adverse effects. Undernutrition may further impair immunity, delay recovery,

increase weakness, and reduce physical functioning.

Overall quality of life

The mean overall WHOQOL-BREF score in the present study was 58.6 ± 11.7 . More than half of the participants had moderate QoL, whereas 28.3% had poor QoL and only 20.0% had good QoL. These findings indicate that microbiological and clinical management alone may not adequately restore the broader health and well-being of patients receiving MDR-TB treatment.

Iti et al. (2019)^[5], in a Karnataka-based study, found that drug-resistant TB patients had lower quality-of-life scores than drug-sensitive TB patients and healthy individuals across all four WHOQOL-BREF domains. Their domain scores among drug-resistant patients ranged from approximately 39 to 55, confirming the substantial adverse impact of drug resistance on daily functioning. The somewhat higher scores observed in the present study could be related to differences in the phase of treatment, social support, case mix, healthcare delivery, or scoring procedures.

Venkatesh et al. (2022)^[6], in a study conducted in eastern Uttar Pradesh, similarly reported substantial impairment in health-related quality of life among MDR-TB patients. Sharma et al. (2022)^[7] also observed that MDR-TB affected multiple dimensions of well-being and reported particularly poor psychological health. These studies support the present finding that most patients experienced only moderate or poor quality of life despite receiving treatment.

Approximately one-third of participants were dissatisfied with their health, while half perceived their overall quality of life as average. These findings reflect the prolonged and demanding nature of MDR-TB therapy, which can involve adverse drug reactions, fatigue, dietary limitations, financial problems, fear of transmission, stigma, and uncertainty regarding cure. Araia et al.

(2021)^[8] found that patients with rifampicin-resistant or multidrug-resistant TB had poorer health-related quality of life than patients with drug-susceptible TB. Wang et al. (2024)^[9] also reported considerable impairment among drug-resistant TB patients and emphasized the influence of psychological, economic, and disease-related factors.

WHOQOL-BREF domains

Among the four domains, social relationships had the highest mean score of 61.9 ± 13.2 , followed by environmental health at 59.7 ± 10.4 , psychological health at 57.4 ± 11.8 , and physical health at 55.8 ± 12.6 . The statistically significant variation across domains indicates that MDR-TB did not affect every aspect of quality of life equally.

The relatively low physical health score may be explained by persistent respiratory symptoms, fatigue, weakness, reduced work capacity, pain, undernutrition, and adverse drug reactions. Kodical et al. (2025)^[10] reported a physical domain score of 46.76 ± 20.15 among TB patients, which was the lowest of the four WHOQOL-BREF domains in their study. Quarcoopome and Tornu (2022)^[11] likewise reported a low physical health score among people living with TB in Ghana. These observations are consistent with the present study and suggest that physical recovery may remain incomplete during treatment.

The psychological score was also reduced, indicating the influence of anxiety, depression, fear of treatment failure, stigma, social rejection, and prolonged dependence on healthcare services. Sharma et al. (2022)^[7] found the psychological domain to be the most compromised among MDR-TB patients. Wang et al. (2024)^[9] similarly identified psychological status as a major determinant of quality of life among patients with drug-resistant TB. Psychological assessment, counselling, and early referral

for mental health support should therefore be incorporated into routine MDR-TB care.

The social relationships domain had the highest score in the present study. Sharma et al. (2022)^[7] also reported their highest QoL score in the social domain, suggesting that family and community support may help patients cope with prolonged treatment. Nevertheless, social domain findings have varied across settings. Iti et al. (2019)^[5] reported that social relationships were the most impaired domain among drug-resistant TB patients in Karnataka, while Quarcoopome and Tornu (2022)^[11] found relatively low social-domain scores. Such differences may reflect variation in stigma, household structure, marital support, disclosure of diagnosis, and local cultural practices.

The environmental domain score was higher than the physical and psychological scores but remained below an optimal level. This domain reflects financial resources, transportation, access to healthcare, housing, physical safety, and opportunities for recreation. Kodical et al. (2025)^[10] reported the environmental domain as the highest-scoring domain, although treatment-related and socioeconomic characteristics were significantly associated with domain scores. The current findings highlight the potential benefit of travel assistance, nutritional support, social-protection schemes, and decentralized drug delivery.

Factors associated with quality of life

Patients younger than 40 years had significantly higher QoL scores than those aged 40 years or above. Older patients may experience more comorbidities, impaired physical functioning, slower recovery, and greater dependency. Wang et al. (2024)^[9] identified age and disease-related characteristics as important influences on quality of life in patients with drug-resistant TB. Dires et al. (2021)^[12] also demonstrated that clinical and socio-demographic

characteristics affected QoL among patients with tuberculosis.

Male patients had higher QoL scores than female patients in the present study. Women with MDR-TB may encounter additional disadvantages, including financial dependency, caregiving responsibilities, reduced autonomy, stigma, and delayed healthcare access. However, the observed gender difference should be interpreted carefully because unequal group sizes and unmeasured social factors may have influenced the result. Some studies have found no independent association between sex and quality of life, suggesting that the relationship is context-specific.

Urban residents had better QoL than rural residents. This finding may reflect easier access to health facilities, transport, diagnostic services, counselling, employment, and social-protection programmes in urban settings. Rural residents may incur greater indirect costs and may have less access to specialist management of adverse drug reactions. The result supports strengthening community-level PMDT services and home-based follow-up in geographically dispersed populations.

Participants with secondary education or above had substantially higher QoL scores than those educated only up to primary level. Similar associations between educational attainment and quality of life have been reported by Dires et al. (2021)^[12] and Wang et al. (2024)^[9]. Better education may improve treatment literacy, communication with healthcare providers, adherence, health-seeking behaviour, and access to employment and financial resources.

Nutritional status demonstrated one of the strongest associations with QoL. Patients with BMI ≥ 18.5 kg/m² had a mean QoL score of 62.6, compared with 53.7 among underweight patients. The physical consequences of malnutrition include fatigue,

muscle loss, poor immunity, delayed clinical improvement, and reduced capacity to work. This finding highlights the importance of regular nutritional assessment, counselling, and food support during MDR-TB treatment. Patients with diabetes had lower QoL than those without diabetes. Coexisting diabetes may increase medication burden, dietary restrictions, healthcare visits, susceptibility to complications, and difficulty controlling tuberculosis. It may also delay sputum conversion and clinical recovery. Integrated screening and management of TB and diabetes are therefore necessary to improve both treatment outcomes and patient well-being.

Alcohol consumers had significantly poorer quality of life than non-consumers. Alcohol use may aggravate malnutrition, liver toxicity, psychological distress, financial hardship, medication non-adherence, and family conflict. It may also increase the likelihood of treatment interruption. The association found in this study supports routine screening for harmful alcohol use and the integration of brief interventions and de-addiction referral into MDR-TB services.

Patients treated for more than six months had better QoL than those in the first six months of treatment. This improvement may be attributable to reduction in symptoms, declining infectiousness, adaptation to treatment, improved appetite, and increasing confidence in recovery. Ramkumar et al. (2017)^[13] reported marked improvements in health-related quality of life following six months of anti-tuberculosis therapy. Banerjee et al. (2019)^[14] similarly observed improvement in quality of life during directly observed treatment. Although these studies largely involved drug-sensitive TB, the direction of change supports the present finding that clinical improvement over time can translate into better patient-reported outcomes. However, because the current study was cross-sectional, it cannot establish

an individual longitudinal improvement or causal effect of treatment duration.

CONCLUSION

The present study demonstrated that patients receiving treatment for multidrug-resistant tuberculosis in Raichur district experienced considerable impairment in their quality of life. The overall mean WHOQOL-BREF score indicated a predominantly moderate level of quality of life, while more than one-fourth of the patients had poor quality of life and only a small proportion reported good quality of life. Among the four WHOQOL-BREF domains, social relationships showed the highest score, whereas physical health was the most adversely affected, followed by psychological health. These findings indicate that the burden of MDR-TB extends beyond microbiological disease and substantially affects physical functioning, emotional well-being, social participation, and everyday living conditions.

Quality of life was significantly better among younger patients, males, urban residents, those with higher educational status, patients with normal BMI, non-diabetic individuals, non-consumers of alcohol, and those who had received treatment for more than six months. Undernutrition, diabetes mellitus, alcohol consumption, rural residence, lower educational attainment, and the early phase of treatment were important factors associated with poorer quality of life. Therefore, management of MDR-TB should include not only effective anti-tuberculosis treatment but also nutritional support, psychological counselling, management of comorbidities, alcohol-use interventions, social assistance, and strengthened community-based follow-up. Regular assessment of quality of life may help identify vulnerable patients and facilitate comprehensive, patient-centred care under the National Tuberculosis Elimination Programme.

LIMITATIONS OF THE STUDY

The study had certain limitations. First, it was conducted in a single district with a relatively small sample of 60 patients; therefore, the findings may not be generalizable to all MDR-TB patients in Karnataka or other regions. Second, the cross-sectional design assessed quality of life at only one point during treatment and could not determine causal relationships or changes in quality of life over time. A longitudinal study would have been more appropriate for evaluating improvement or deterioration from treatment initiation to completion.

Third, quality of life was measured using a self-reported questionnaire and was therefore subject to recall bias, social desirability bias, and differences in individual perception. Fourth, patients who died before the investigator's visit, were transferred out, or were unwilling to participate were excluded, which may have produced selection or survivor bias and may have led to underestimation of poor quality of life. Fifth, the influence of treatment regimens, duration of illness before diagnosis, adverse drug reactions, sputum conversion status, disease severity, depression, anxiety, stigma, social support, household income, and treatment adherence was not comprehensively evaluated.

Sixth, the study used bivariate comparisons to identify factors associated with quality of life. Potential confounding variables were not fully controlled through multivariable regression analysis. Finally, the WHOQOL-BREF is a generic quality-of-life instrument and may not capture all MDR-TB-specific concerns, such as drug toxicity, fear of infecting family members, prolonged treatment burden, and treatment-related stigma. Despite these limitations, the study provides useful district-level evidence regarding the multidimensional impact of MDR-TB and highlights the need for patient-centred supportive care.

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