International Journal of Advances in Medicine
Babladi VP et al. Int J Adv Med. 2026 Mar;13(2):91-97
http://www.ijmedicine.com
pISSN 2349-3925 | eISSN 2349-3933
DOI: https://dx.doi.org/10.18203/2349-3933.ijam20260389

Original Research Article

Assessment of quality of life in tuberculosis patients at Aland Taluk in Kalaburagi district

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Received: 11 December 2025
Revised: 08 January 2026
Accepted: 19 January 2026

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ABSTRACT

Background: Tuberculosis (TB), a recalcitrant infectious disorder precipitated by *Mycobacterium tuberculosis*, continues to pose a formidable public health burden, exerting pervasive and long-standing detriments to health-related quality of life (HRQOL). Despite sustained implementation of national control initiatives such as the directly observed treatment, short-course (DOTS) program, TB prevalence in India remains disproportionately elevated, particularly within rural and socioeconomically marginalized populations. The disease's multisystemic impact necessitates comprehensive evaluation beyond microbiological and clinical indices. The objective of the study was to critically appraise the quality of life among individuals diagnosed with TB in the Aland region of Kalaburagi district and to ascertain the contributory impact of structured pharmacist-led counselling on patient outcomes.
Methods: A six-month prospective observational study was conducted across selected areas of Aland Taluk. Of 416 enrolled participants, 409 completed the study. Individuals aged 16–80 years were randomly assigned to intervention and control cohorts. Baseline sociodemographic characteristics and HRQOL parameters were assessed using standardized WHOQOL instruments, with follow-up evaluation performed at three months. Data were subjected to appropriate inferential statistical analysis.
Results: Baseline assessment revealed a predominance of active TB cases in both cohorts. Post-intervention analysis demonstrated a substantial reduction in disease burden in the intervention group (29.61%) compared with the control group (10.34%). Significant improvements were observed across all HRQOL domains, with consistently superior outcomes in the pharmacist-intervention cohort.
Conclusions: Pharmacist-mediated counselling significantly enhanced HRQOL and attenuated TB-related burden, underscoring its strategic value within integrated tuberculosis management frameworks.

Keywords: Tuberculosis, Health-related quality of life, Pharmacist counselling, Patient education, Outcome enhancement

INTRODUCTION

Tuberculosis (TB) persists as one of the most consequential infectious pathologies globally and continues to represent a formidable public health exigency, particularly within low- and middle-income nations. The World Health Organization (WHO) characterizes tuberculosis as "a specific infectious disease caused by *Mycobacterium tuberculosis*, predominantly involving the pulmonary system while retaining the capacity to affect the gastrointestinal tract, meninges, skeletal structures, lymphatic apparatus, integumentary system, and other extrapulmonary tissues.[1] Clinically, TB is typified as a chronic and heterogeneous disease entity, exhibiting a broad spectrum of symptomatology and disease trajectories.

Transmission is mediated principally via aerosolized droplet nuclei generated during coughing, sneezing, or verbal communication by individuals harboring active pulmonary tuberculosis, thereby facilitating efficient airborne dissemination and sustained community-level propagation of the pathogen.[2]

From a nosological standpoint, tuberculosis is conventionally stratified into three principal clinical phenotypes: latent tuberculosis infection (LTBI), active pulmonary tuberculosis, and extrapulmonary tuberculosis. These forms exhibit marked divergence with respect to disease severity, infectious potential, diagnostic complexity, and therapeutic considerations (Figure 1).[3]

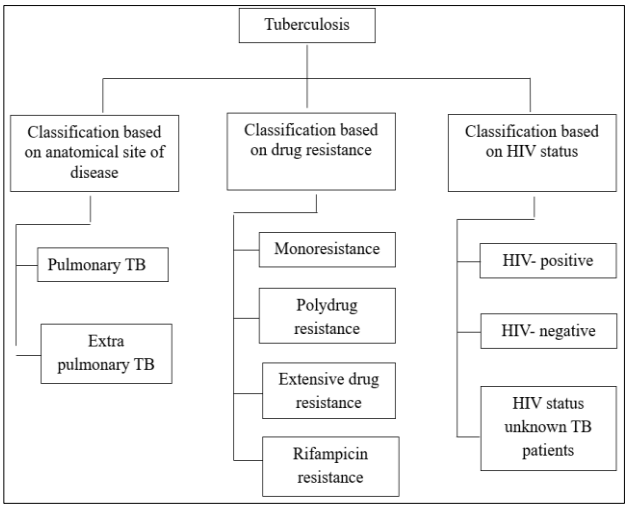

Figure 1: Classification of tuberculosis.[3]

At the global scale, it is estimated that nearly one-third of the world's population harbors *Mycobacterium tuberculosis*, predominantly in a clinically quiescent and asymptomatic latent state.[4] Of this vast reservoir, approximately 5–10% of infected individuals ultimately experience progression to active tuberculosis over the course of their lifetime, a transition that occurs with markedly greater frequency among immunocompromised and medically vulnerable populations.[5] Tuberculosis continues to exert a disproportionate burden on low- and middle-income nations, where primary exposure often occurs early in life and where adverse socioeconomic determinants substantially amplify transmission dynamics.[6] Within high-burden settings, the estimated annual risk of infection fluctuates between 0.5% and 2%, reflecting ongoing and unabated community-level transmission.[7]

In 2015, the global tuberculosis burden was quantified at approximately 10.4 million incident cases.[8] Of these newly documented infections, males constituted 56%, females 34%, and paediatric populations 10%, underscoring the disease's extensive demographic permeation.[9] Individuals living with human immunodeficiency virus (PLHIV) represented nearly 11% of incident TB cases, illustrating the profound synergism between HIV-induced immunosuppression and tuberculosis disease activation.[10] Despite a sustained downward trajectory in worldwide TB incidence, the observed annual decline of approximately 1.5% remains markedly inadequate to achieve the milestones articulated under the World Health Organization's end TB strategy.[11] During the same reporting period, tuberculosis was responsible for an estimated 1.4 million deaths globally, with an additional 0.4 million fatalities occurring among PLHIV, thereby reaffirming TB's position among the foremost causes of mortality worldwide.[12]

India bears the preeminent global burden of tuberculosis. According to the WHO Tuberculosis Report (2017), the country accounts for approximately 27% of all incident TB cases worldwide and nearly 25% of the global burden of multidrug-resistant tuberculosis (MDR-TB).[13] In 2016, the National Tuberculosis Programme documented close to two million notified TB cases across the country.[14] Furthermore, over 500,000 individuals underwent drug-resistance testing, culminating in the identification of substantial numbers of multidrug-resistant and rifampicin-resistant TB cases.[15] In response, the Government of India instituted universal drug-susceptibility testing (UDST) as a strategic measure to facilitate early detection, optimize individualized therapeutic regimens, and curb the amplification of antimicrobial resistance.[16] Notwithstanding these concerted efforts, the persistently high disease prevalence exacerbated by entrenched socioeconomic determinants including poverty, population overcrowding, undernutrition, and constrained access to healthcare services continues to perpetuate TB transmission across multiple settings, particularly in rural and underserved regions such as Aland Taluk of Kalaburagi district.[17]

Beyond its overt somatic manifestations, tuberculosis constitutes a chronic and debilitating illness with far-reaching psychological, socioeconomic, and interpersonal ramifications.[18] Affected individuals frequently encounter stigma, social marginalization, discriminatory practices, fear of disease transmission, and erosion of self-worth, collectively exerting a substantial deleterious effect on quality of life (QoL).[19] Systematic assessment of QoL affords critical insight into patients' perceived physical, psychological, social, and emotional well-being and serves as an indispensable metric for the formulation of patient-centered care strategies and the optimization of holistic health outcomes.[20]

Conventional anti-tuberculosis pharmacotherapy typically entails multidrug regimens comprising four first-line agents administered over a protracted duration of six to nine months, frequently accompanied by adverse drug reactions including hepatotoxicity, gastrointestinal intolerance, peripheral neuropathy, and hypersensitivity reactions.[21] These treatment-related burdens, compounded by regimen complexity, therapy-related fatigue, and prolonged duration of care, may significantly undermine medication adherence and further compromise QoL. The

WHO–endorsed directly observed treatment, short-course (DOTS) strategy remains the cornerstone of global tuberculosis control, emphasizing supervised drug administration to enhance adherence, ensure treatment completion, and mitigate the emergence of drug resistance.[22]

Pharmacists constitute a pivotal component of the multidisciplinary framework underpinning comprehensive tuberculosis management. Their clinical expertise is instrumental in the optimization of pharmacotherapeutic regimens through systematic evaluation of treatment appropriateness and therapeutic efficacy, vigilant surveillance for adverse drug reactions, identification and mitigation of clinically significant drug–drug interactions, and reinforcement of sustained medication adherence.[23]

In addition, pharmacists assume a critical educational role by imparting evidence-based guidance to patients and healthcare professionals concerning therapeutic objectives, anticipated clinical outcomes, and potential treatment-related toxicities.[24] A growing body of evidence substantiates that pharmacist-led counselling and structured pharmacotherapy monitoring markedly enhance treatment adherence, improve therapy completion rates, and yield superior overall patient outcomes.[25]

Consequently, the strategic integration of pharmacists into tuberculosis care and control programs is imperative for reinforcing disease management paradigms, particularly within resource-constrained and underserved settings such as Aland Taluk.

METHODS

Study site

The investigation was conducted at primary health centre (PHC), Aland Taluk, Kalaburagi district, Karnataka, India.

Source of data

Primary data were obtained through systematic, door-to-door household visits to randomly selected residences within the study area.

Relevant clinical, demographic, and quality-of-life information was directly elicited from eligible participants using standardized data collection procedures.

Study duration

The study was implemented over a continuous period of six months from 2025 June to November 2025.

Study design

This research was designed as a prospective, observational study.

Study criteria

Participant selection was undertaken in accordance with predefined inclusion and exclusion criteria. Prior to enrolment, informed consent was obtained from all participants in their regional or otherwise comprehensible language to ensure ethical compliance and participant understanding.

Inclusion criteria

Inclusion criteria included individuals who voluntarily consented to participate in the study. participants of either sex and individuals aged between 16 and 80 years.

Exclusion criteria

Exclusion criteria included healthcare professionals, individuals unwilling or uninterested in participating in the study, pregnant women and lactating mothers up to 12 weeks postpartum and patients diagnosed with extrapulmonary tuberculosis.

Study procedure

The study was conducted in Aland Taluk of Kalaburagi district following approval from the Institutional Review Board (IRB). Participant enrolment was undertaken in accordance with the predefined inclusion and exclusion criteria after obtaining written informed consent in a language comprehensible to the participants. The overall duration of the study was six months.

Following enrolment, participants were systematically oriented regarding the objectives and procedures of the study. Baseline assessment was performed, after which participants were randomly allocated into two groups: an intervention (test) group and a comparator (control) group. Health-related quality of life (HRQOL) was assessed using standardized World Health Organization quality of life (WHOQOL) questionnaires encompassing four domains: physical, psychological, social, and environmental well-being.

The intervention group received structured pharmacist-led counselling along with patient information leaflets (PILs) related to tuberculosis and its management, in addition to standard anti-tuberculosis pharmacotherapy. In contrast, the control group received routine pharmacological treatment alone without structured counselling. Both groups were administered the WHOQOL questionnaire, and scoring was performed in accordance with established guidelines based on participant responses.

Regular follow-up assessments were conducted for both groups throughout the study period. Collected data were systematically compiled and analysed using appropriate statistical methods to compare outcomes between the intervention and control cohorts.

Socioeconomic status assessment

Per capita monthly income was calculated based on the total income of all earning family members divided by the total number of individuals residing within the household, using the formula:

$$Per\ capita\ monthly\ income = Total\ family\ income / number\ of\ family\ members$$

Based on the calculated per capita monthly income, the socioeconomic status of each participant's household was categorized from class I to class III in accordance with the modified B. G. Prasad's criteria for the classification of socioeconomic status (2016 revision).[18] The classification scheme applied is delineated in the Table 1.

Table 1: Modified B. G. Prasad's criteria for the classification of socioeconomic status.

Socioeconomic status class	Modified Prasad's classification 2016
I	>Rs. 2876
II	Rs. 1438-2875
III	<Rs. 1437

RESULTS

The study population comprised participants allocated into two groups and multiple parameters were evaluated through the study period. The comparisons were made between the group to evaluate improvements. Overall, 416 participants were involved (Table 2).

A total of 416 participants, out of which 7 dropped out. The final study analysis included data from the 409 participants who completed the study. They were divided into two groups. Among the 409 participants included in the final analysis. 265 (64.8%) were males and 144 (35.2%) were females. This represents the gender distribution within the study group.

Table 3 summarizes the characteristics of participants in the test and control groups, including demographic details, education, socioeconomic categories, habits, TB status and intervention status.

Table 4 presents before-and-after mean values for test and control groups, analyzed using paired t-tests. Both groups show statistically significant increases after intervention, with p values indicating high significance.

Table 5 outlines the physical, physiological, social and environmental domain scores for both groups before and after intervention. The comparison highlights improvements, particularly in the test group following the intervention. Improvement was observed in every quality-of-life domain, with the test group demonstrating greater progress.

Table 2: Details of subjects enrolled in study.

Groups	Total subjects	No of dropouts	Subjects completed in study
Test	210	4	206
Control	206	3	203
Total	416	7	409

Table 3: Comparison of participants characteristics between test and control group.

Parameters		Test group (%)		Control group (%)	
Gender	Male	136	66.02	129	63.55
	Female	70	33.98	74	36.45
Age wise distribution (years)	16-25	51	24.76	28	13.80
	26-35	23	11.16	25	12.32
	36-45	36	17.47	28	13.80
	46-55	53	25.73	46	22.66
	56-65	28	13.59	45	22.16
	66-75	14	6.80	30	14.77
	76-85	01	0.49	01	0.49
Educational status	Illiterate	33	16.01	56	27.59
	Primary	21	10.19	16	07.88
	High school	74	35.95	50	24.63
	Intermediate	40	19.41	41	20.20
	Graduate	38	18.44	40	19.70
Socioeconomic status	Upper class	120	58.25	63	31.04
	Middle class	42	20.40	94	46.30
	Lower class	44	21.35	46	22.66

Continued.

Parameters		Test group (%)		Control group (%)	
Habits	No habits	30	14.56	40	19.70
	Alcohol	40	19.42	45	22.16
	Smoking	71	34.47	66	32.52
	Tobacco	45	21.85	35	17.24
	Alcohol and smoking	20	09.70	17	8.38
Subjects having tuberculosis	Positive	89	43.20	40	19.70
	Negative	117	56.80	163	80.30
Intervention	Before	176	85.43	163	80.29
	After	115	55.82	142	69.95

Table 4: Details of assessment of test and control group before and after intervention.

Groups	No. of cases	Before (mean±SD)	After (mean±SD)	Paired t-test and significance
Test group	206	175.92±27.51	195.39±25.61	t=3.246, p=0.00681, p<0.001, highly significant
Control group	203	170.32±25.61	184.32±12.71	t=2.489, p=0.00815, p<0.001, highly significant

Table 5: Intervention on health domain scores for test and control group.

Test group		Physical	Physiological	Social	Environmental
Before intervention	Average (SD)	159.75±20.57	169.57±35.72	175.25±14.25	175.14±22.31
After intervention	Average (SD)	180.5±30.4	198.57±46.95	137.5±10.68	191.86±33.80
Control group					
Before intervention	Average (SD)	158.57±23.75	164.00±20.04	137.50±10.68	160.71±24.89
After intervention	Average (SD)	177.71±31.77	178.57±27.14	165.00±28.25	181.14±30.04

DISCUSSION

The present investigation provides a comprehensive evaluation of HRQOL among tuberculosis patients residing in Aland Taluk of Kalaburagi district and critically examines the incremental benefit conferred by pharmacist-led counselling interventions. Tuberculosis, by virtue of its chronicity, prolonged treatment duration, and sociocultural stigma, exerts a multidimensional burden extending far beyond its biological manifestations. The findings of this study underscore the necessity of integrating patient-centred, multidisciplinary approaches into routine TB management to address these broader determinants of health.

In the present cohort, a clear male predominance was observed, with males constituting approximately two-thirds of the study population. This gender disparity aligns with national and global epidemiological patterns, wherein males consistently demonstrate higher TB notification rates, possibly attributable to increased occupational exposure, higher prevalence of risk behaviours such as smoking and alcohol consumption, and delayed healthcare-seeking behaviour among men.

Similar male preponderance has been documented by Dhuria et al and Muniyandi et al, reinforcing the external validity of the present findings.[1,3] Age-wise distribution revealed a clustering of TB cases in the economically productive age groups, particularly between 46–55 years. This trend is epidemiologically significant, as TB in this age bracket has far-reaching socioeconomic implications, including loss of productivity, financial instability, and household vulnerability. Comparable age distributions have been reported in large-scale Indian studies, highlighting TB's entrenched impact on the working population.[3,6]

Educational status emerged as an important determinant in the present study. Higher TB prevalence among individuals with lower educational attainment reflects the well-established association between limited health literacy and delayed diagnosis, poor treatment adherence, and suboptimal health outcomes. Studies by Ayub et al and Bauer et al similarly emphasize that inadequate awareness regarding disease transmission and treatment contributes significantly to sustained community transmission and impaired quality of life.[5,18]

Lifestyle habits, particularly smoking and alcohol consumption, were significantly associated with TB positivity in both study groups. Smoking is known to impair mucociliary clearance, reduce alveolar macrophage function, and compromise host immunity, thereby increasing susceptibility to TB infection and disease progression.

Alcohol misuse further exacerbates immune dysfunction and is strongly associated with treatment non-adherence. The elevated prevalence of smoking among TB patients observed in this study is consistent with findings reported by Patil et al and Lawn and Zumla, reinforcing the need for integrated behavioural counselling within TB programs.[2,6]

A central strength of this study lies in its evaluation of HRQOL outcomes following pharmacist-mediated counselling. Baseline HRQOL scores were markedly reduced across all WHOQOL domains, reflecting the profound physical, psychological, social, and environmental impairments associated with tuberculosis.

Following intervention, both groups demonstrated statistically significant improvements; however, the magnitude of improvement was substantially greater in the intervention group. The observed 29.61% reduction in disease burden in the test group compared to 10.34% in the control group provides compelling evidence for the effectiveness of pharmacist-led educational and counselling interventions.

These findings are concordant with prior studies demonstrating that pharmacist involvement enhances medication adherence, improves symptom perception, and mitigates treatment-related anxiety. Bond and Raehl, as well as Ghimire et al, reported significant improvements in treatment completion rates and patient-reported outcomes when pharmacists were actively engaged in TB care.[24,25] Furthermore, Marra et al and Brown et al emphasized that improvements in HRQOL are critical predictors of long-term treatment success and relapse prevention.[19,20]

The structured counselling provided in this study likely contributed to improved understanding of disease pathology, treatment rationale, adverse drug reaction management, and infection control practices. By addressing misconceptions, reducing stigma, and fostering therapeutic alliance, pharmacist counselling enhanced both adherence and psychosocial well-being. These findings strongly support the integration of pharmacists as core members of TB care teams, particularly in rural and resource-constrained settings.

Limitations

Despite its strengths, the study has certain limitations. First, the study was conducted in a single rural taluk, which may limit the generalizability of findings to urban or tertiary-care populations. Second, HRQOL assessment relied on self-reported questionnaires, which are subject to recall bias and social desirability bias. Third, the follow-up duration was limited to six months, precluding assessment of long-term sustainability of HRQOL improvements. Finally, potential confounders such as comorbidities, nutritional status, and mental health disorders were not independently stratified. Future multicentric studies with longer follow-up periods and broader psychosocial assessment are warranted.

CONCLUSION

The present study demonstrates that tuberculosis significantly compromises health-related quality of life and that structured pharmacist-led counselling produces a clinically meaningful improvement across all HRQOL domains. The findings underscore the critical role of pharmacists in strengthening tuberculosis care through patient education, adherence reinforcement, and holistic support. Incorporation of pharmacist-driven interventions within national TB programs may substantially enhance patient outcomes, particularly in rural and underserved populations.

ACKNOWLEDGEMENTS

Authors would like to thank all the participants, healthcare professionals, and supporting staff who contributed to this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Babladi VP, Patil S, Kondaparthi M, Salimath PV, Biyabani SAU, Nandyal BS. Assessment of quality of life in tuberculosis patients at Aland Taluk in Kalaburagi district. Int J Adv Med 2026;13:91-7.