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Medication adherence and quality of life in patientes with multidrug-resistant tuberculosis

Adesão medicamentosa e qualidade de vida de pacientes com tuberculose multirresistente

Adherencia a la medicación y calidad de vida en pacientes con tuberculosis multirresistente

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ABSTRACT

Background and Objectives: The increasing incidence of multidrug-resistant tuberculosis (MDR-TB) is associated with challenges in treatment adherence and impacts on quality of life (QoL). This study aimed to evaluate medication adherence and QoL in patients with MDR-TB. **Methods:** A cross-sectional, descriptive, and quantitative study was conducted in Northeastern Brazil, following the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) statement. In total, 50 patients participated in interviews using a semi-structured instrument. Adherence was assessed using the Brief Medication Questionnaire (BMQ). QoL was measured using the World Health Organization Quality of Life (WHOQOL-BREF). **Results:** Most participants were male (56%), 18–45 years old (60%), Black (86%), single (58%), with an income ≤1 minimum wage (98%), and incomplete high school (68%). According to the BMQ, 80% were adherent to treatment; 80% showed potential adherence to the regimen; 82% tested negative for belief barriers; and 92% tested negative for recall barriers. According to the WHOQOL-BREF, 50% considered their QoL to be fair. When considering the results by domain, the average scores ranged from 1.63 to 3.59. The social relationships domain had the lowest average (1.63±0.662), while the psychological domain had the highest average (3.59±0.958). **Conclusion:** High therapeutic adherence was demonstrated according to the BMQ criteria, contrasting with disparities in QoL, especially in the social relationships domain. The data reinforce the need for targeted psychosocial interventions to mitigate the identified gaps and ensure treatment sustainability.

Keywords: *Multidrug-Resistant Tuberculosis. Medication Adherence. Qualityof Life.*

RESUMO

Justificativa e Objetivos: O aumento de casos de tuberculose multirresistente (TB-MDR) está associado a desafios na adesão terapêutica e impactos na qualidade de vida (QV). Este estudo buscou avaliar a adesão medicamentosa e a QV de pacientes com TB-MDR. **Métodos:** Estudo transversal, descritivo e quantitativo, conduzido no Nordeste brasileiro, seguindo diretrizes STROBE. Participaram 50 pacientes submetidos a entrevistas com instrumento semiestruturado. A adesão foi avaliada pelo *Brief Medication Questionnaire* (BMQ). A QV foi mensurada pelo *World Health Organization Quality of Life* (WHOQOL-BREF). **Resultados:** A maioria dos participantes era do sexo masculino (56%), 18-45 anos (60%), negros (86%), solteiros (58%), com renda ≤ 1 salário-mínimo (98%) e ensino médio incompleto (68%). Conforme o BMQ, 80% dos pacientes apresentavam adesão ao tratamento; 80%, potencial adesão para o regime; 82% foi negativo para barreiras de crenças; e 92% foi negativo para barreiras de recordação. Conforme a WHOQOL-BREF, 50% dos entrevistados consideraram que sua QV não era ruim, nem boa. Ao considerar os resultados por domínios, obteve-se uma variação de 1,63 a 3,59 nas médias. O domínio das relações sociais apresentou a menor média (1,63±0,662) de pontos. Já a maior média foi obtida no domínio psicológico (3,59±0,958). **Conclusão:** Evidenciou-se alta adesão terapêutica conforme critérios do BMQ, contrastando com disparidades na QV, especialmente no domínio relacional. Os dados reforçam a necessidade de intervenções psicossociais direcionadas, visando mitigar as lacunas identificadas e garantir a sustentabilidade do tratamento.

Descritores: *Tuberculose multirresistente. Adesão à Medicação. Qualidade de Vida.*

RESUMEN

Justificación y Objetivos: El aumento de casos de tuberculosis multirresistente (TB-MDR) se asocia con desafíos en la adherencia al tratamiento e impactos en la calidad de vida (CV). Este estudio buscó evaluar la adherencia a la medicación y la CV de pacientes con TB-MDR. **Método:** Se realizó un estudio transversal, descriptivo y cuantitativo en el Nordeste de Brasil, siguiendo las directrices STROBE. Cincuenta pacientes participaron en entrevistas con un instrumento semiestructurado. La adherencia se evaluó mediante el Cuestionario Breve de Medicación (BMQ). La CV se midió utilizando la World Health Organization Quality of Life (WHOQOL-BREF). **Resultados:** La mayoría de los participantes eran del sexo masculino (56%), de entre 18-45 años (60%), negros (86%), solteros (58%), con ingresos ≤1 salario mínimo (98%) y escuela secundaria incompleta (68%). Según el BMQ, el 80% de los participantes se adhirieron al tratamiento; el 80% mostró una posible adherencia al régimen; el 82% dio negativo en la prueba de barreras de creencias; el 92% dio negativo en las pruebas de barreras de recuerdo. Según el WHOQOL-BREF, el 50% consideró que su calidad de vida no era ni mala ni buena. Al considerar los resultados por dominio, las puntuaciones promedio oscilaron entre 1,63 y 3,59. El dominio de relaciones sociales tuvo el promedio más bajo (1,63±0,662), mientras que el dominio psicológico tuvo el promedio más alto (3,59±0,958). **Conclusión:** Se demostró una alta adherencia terapéutica según los criterios del BMQ, en contraste con las disparidades en la calidad de vida, especialmente en el dominio relacional. Los datos refuerzan la necesidad de intervenciones psicosociales específicas para mitigar las brechas identificadas y garantizar la sostenibilidad del tratamiento.

Palabras Clave: *Tuberculosis multirresistente. Adherencia a la Medicación. Calidad de Vida.*

INTRODUCTION

Tuberculosis (TB) is an infectious, communicable disease that is preventable and curable. Owing to the persistence and increase of its incidence and prevalence rates, it is considered a public health issue and, particularly in developing countries, is classified as a neglected disease. The occurrence of TB is strongly associated with comorbidities and primarily affects vulnerable populations, being related to social inequality, poverty, reduced productivity of the working class, and decreased quality of life (QoL), with frequent complications related to medication adherence and treatment abandonment.[1]

Multidrug-resistant tuberculosis (MDR-TB), defined by resistance to at least isoniazid and rifampicin, represents one of the most important complications of the disease. There are two modes of development of TB resistance: primary resistance, which results from infection of an individual with no prior treatment by an already resistant strain, and acquired resistance, which results from poor adherence to medications, inadequate treatment regimens, and low-quality drugs.[2,3]

Although diagnosis and treatment for TB are available, the prevalence of the disease remains high, especially after the Covid-19 pandemic, which reversed years of progress in TB control. Regarding MDR-TB, cure rates are known to be significantly lower than those observed for drug-susceptible TB, underscoring the importance of surveillance, prevention, and treatment strategies. However, for MDR-TB, only about one third of individuals have access to appropriate treatment.[4]

Factors such as early diagnosis and timely treatment are determinants of prognosis and reductions in mortality rates. Nevertheless, the increase in MDR-TB cases occurs mainly due to difficulties in therapeutic adherence and repeated treatment abandonment, negatively impacting the epidemiological situation.[1,5] It is estimated that, in 2020, approximately 99 million people worldwide developed TB, resulting in about 1.5 million deaths and approximately 500,000 cases of MDR-TB.[6]

Treatment for MDR-TB is more prolonged, lasting from 18 to 20 months, and requires more expensive medications that are associated with a higher occurrence of adverse events, which may hinder adherence to the therapeutic regimen. Treatment adherence is defined as a process of negotiation between patients and health professionals, in which the responsibilities of each party are identified to strengthen individual autonomy and self-care. However, lack of knowledge about the disease, the long duration of treatment, the occurrence of adverse events, and psychological and social factors may hinder self-care, compromise adherence, and impair QoL.[7]

This study aimed to evaluate medication adherence and QoL among patients with multidrug-resistant tuberculosis.

METHODS

This was a cross-sectional, descriptive, quantitative study conducted at a referral hospital for infectious diseases, in the pulmonology outpatient clinic, in the city of Recife, Pernambuco, Brazil, from March to June 2022, following the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) statement.

A total of 65 individuals diagnosed with MDR-TB were being followed at the service during the study period. Participants were selected according to the adopted inclusion and exclusion criteria: age ≥18 years, of both sexes, with at least two months of follow-up at the service. Individuals with disorientation and those who, in addition to MDR-TB, had other respiratory diseases were excluded. Thus, the sample consisted of 50 participants.

Data were collected via face-to-face interviews using a semi-structured questionnaire developed by the authors, including sociodemographic and clinical information, medications in use, duration of the MDR-TB treatment regimen, symptoms prior to and after treatment initiation, and hospitalization history. Data collection was complemented by a review of medical records to confirm the information. Other concomitant medications were not evaluated.

Therapeutic adherence was assessed using the Brief Medication Questionnaire (BMQ), a validated instrument composed of three domains that identify barriers related to adherence, beliefs, and recall of treatment. A score greater than or equal to 1 in any domain indicates a potential positive for non-adherence to pharmacological treatment. In addition, based on the total score, adherence can be classified as: adherent (no positive responses), probably adherent (one positive response), probable low adherence (two positive responses), and low adherence to pharmacological treatment (three or more positive responses).[8]

QoL was measured using the World Health Organization Quality of Life instrument (WHOQOL-BREF) (Brazilian Portuguese version), composed of 26 items distributed across four domains: physical, psychological, social relationships, and environment. Responses follow a Likert-type scale, in which higher scores indicate better QoL, except for items 3, 4, and 26, which have reverse scoring. Scores should be analyzed according to the following classifications: “needs improvement” (1.0–2.9 points), “fair” (3.0–3.9 points), “good” (4.0–4.9 points), and “very good” (score equal to 5.0).[9]

The collected data were compiled and stored in Microsoft Office Excel® software and subsequently imported into the Statistical Package for the Social Sciences (SPSS), version 22.0®, for analysis. The analytical approach was based on univariate descriptive and inferential statistics. For categorical variables, absolute and relative frequency distributions were employed. For continuous variables, mean, median, standard deviation, and range (minimum and maximum values) were estimated. The 95% confidence intervals (95% CI) were estimated based on the total sample size (N = 50), using the Wilson method for proportions.

To compare frequencies across the five ordered QoL categories, (very poor, poor, fair, good, very good), pairwise comparisons were conducted using chi-square (χ^2) tests for 2×2 contingency tables, without continuity correction. In cases in which more than 20% of cells had expected frequencies below 5, Fisher's exact test was used. Considering the total of ten comparisons performed, the Bonferroni adjustment was applied to control type I error, establishing a corrected significance level of $\alpha = 0.005$.

The study complied with all ethical principles for research involving human participants, in accordance with Resolution 466/2012 of the Brazilian National Health Council. All patients agreed to participate in the study and signed informed consent forms. This research was reviewed and approved by the Research Ethics Committee, under opinion no. 5,263,921.

RESULTS

A total of 50 patients with MDR-TB were interviewed. Most were male (n = 28; 56%), aged from 18 to 45 years (n = 30; 60%), self-identified as Black (n = 43; 86%), single (n = 29; 58%), had not completed secondary education (n = 34; 68%), were unemployed or on leave from work (n = 35; 70%), and reported a monthly income of up to one minimum wage (n = 49; 98%). Most participants (98%; n = 48) tested negative for HIV.

Pyridoxine® (n = 36; 72%), levofloxacin® (n = 32; 64%), and ethambutol (n = 32; 64%) were the most used medications. Regarding hospitalization due to TB, 74% reported no hospital admission in the previous year. The main symptoms prior to treatment were cough lasting more than three weeks (n = 34; 68%), weight loss (n = 27; 54%), and afternoon fever (n = 25; 50%). With respect to current symptoms (after treatment initiation), joint pain (n = 35; 70%) and weight gain (n = 32; 64%) were reported. Regarding the duration of the MDR-TB treatment regimen, 96% (n = 46) reported an 18-month course. In addition, 82% (n = 41) reported no adverse effects related to treatment; however, 6% (n = 3) reported hearing loss and 10% (n = 5) reported changes in skin pigmentation in some area of the body (Table 1).

Table 1. Descriptive analysis of clinical characteristics of MDR-TB cases. Recife, Pernambuco, Brazil, 2022 (n = 50).

Parameter	N (%)
Medications in use	
Pyridoxine®	36 (72)
Ethambutol	32 (64)
Levofloxacin®	32 (64)
Terizidone	24 (48)
Pyrazinamide	18 (36)
Linezolid®	16 (32)
Bedaquiline®	15 (30)
Amikacin®	10 (20)
Clarithromycin®	10 (20)
Clofazimine	9 (18)
Moxifloxacin®	8 (16)
Hospitalization due to TB in the past year	
No	37 (74)
Yes, once	9 (18)
Yes, two to three times	4 (8)
Symptoms prior to treatment	
Cough > three weeks	34 (68)
Weight loss	27 (54)
Afternoon fever	25 (50)
Night sweats	17 (34)
Current symptoms after treatment initiation	
Joint pain	35 (70)
Weight gain	32 (64)
Cough	18 (36)
Weight loss after treatment initiation	5 (10)
Adverse effects of medication	
None reported	41 (82)
Hearing loss	3 (6)
Skin pigmentation changes	5 (10)

Abbreviation: TB: Tuberculosis.

Regarding medication treatment characteristics assessed by the Brief Medication Questionnaire (BMQ), the adherence category showed the highest frequency (80%), with a 95% confidence interval (95% CI) ranging from 34 to 45 individuals, indicating a relatively precise estimate consistent with the sample size. For the regimen domain, the proportion of individuals classified as having potential adherence was also high (80%), with a 95% CI of 34–45, reinforcing the robustness of this estimate. In the beliefs domain, most participants were classified as negative for belief-related barriers (82%), with a 95% CI of 35–46, suggesting a high prevalence of this profile and good estimate precision. Finally, in the recall domain, a high proportion of participants were negative for recall-related barriers (92%), with a narrow confidence interval (95% CI: 41–49), indicating high precision of the estimate (Table 2).

Table 2. BMQ performance associated with patients' adherence to tuberculosis treatment over the previous seven days. Recife, Pernambuco, Brazil, 2022 (n = 50).

Parameter	Category	N	Proportion	95% CI (n)
Adherence	Treatment abandonment	1	0.02	0–5
	Adherence	40	0.80	34–45
	Probable adherence	6	0.12	3–12
	Probable low adherence	0	0.00	0–3
	Low adherence	3	0.06	1–8
Regimen	Potential adherence	40	0.80	34–45
	Potential non-adherence	10	0.20	6–17
Beliefs	Negative for belief-related barriers	41	0.82	35–46
	Positive for belief-related barriers	9	0.18	5–15
Recall	Negative for recall-related barriers	46	0.92	41–49
	Positive for recall-related barriers	4	0.08	2–10

Based on the WHOQOL-BREF assessment of QoL, the fair and good categories showed statistically significant differences when compared with the extreme categories (very good, very poor, and poor), with χ^2 values ranging from 9.00 to 26.84 ($p < 0.001$ to $p = 0.0027$). Specifically, the fair category differed significantly from very good ($\chi^2 = 21.42$; $p < 0.001$), very poor ($\chi^2 = 24.01$; $p < 0.001$), and poor ($\chi^2 = 26.84$; $p < 0.001$). Similarly, the good category showed significant differences in comparison with very good ($\chi^2 = 9.00$; $p = 0.0027$), very poor ($\chi^2 = 10.98$; $p < 0.001$), and poor ($\chi^2 = 13.28$; $p < 0.001$). No significant differences were observed between the extreme categories (very good vs. very poor, very good vs. poor, and very poor vs. poor; $p > 0.39$), nor between the intermediate categories (fair vs. good; $\chi^2 = 3.35$; $p = 0.067$) (Table 3).

Table 3. Quality of life classification according to the WHOQOL-BREF among patients with MDR-TB Recife, Pernambuco, Brazil, 2022 (n = 50).

Comparison	χ²*	df**	p-value
Fair × Very good	21.42	1	<0.001
Fair × Very poor	24.01	1	<0.001
Fair × Poor	26.84	1	<0.001
Good × Very good	9.00	1	0.0027
Good × Very poor	10.98	1	<0.001
Good × Poor	13.28	1	<0.001
Fair × Good	3.35	1	0.067
Very good × Very poor	—	—	> 0.39
Very good × Poor	—	—	> 0.39
Very poor × Poor	—	—	> 0.39

Abbreviation: *Chi-square test; **Degrees of freedom.

When the WHOQOL-BREF domain-specific results were considered, mean scores ranged from 1.63 to 3.59. The social relationships domain, which includes questions on satisfaction with friends and family, social support, and sexual life, showed the lowest mean score, with 1.63 ± 0.662. In contrast, the highest mean score was observed in the psychological domain (3.59 ± 0.958), which includes items related to meaning in life, concentration, acceptance, and negative feelings (Table 4).

Table 4. Quality of life assessment by WHOQOL-BREF domains among patients with MDR-TB. Recife, Pernambuco, Brazil, 2022 (n = 50).

Domain	N	Mean	Median	Standard deviation	Minimum	Maximum
Physical	50	3.37	3.14	0.716	2.29	5.00
Psychological	50	3.59	3.08	0.958	2.00	5.00
Social relationships	50	1.63	1.33	0.662	1.00	3.67
Environment	50	3.10	3.00	0.786	1.88	5.00

DISCUSSION

The sociodemographic profile of individuals diagnosed with MDR-TB reinforces the relationship between the disease and social issues. The higher prevalence observed among men is consistent with previous data linking this pattern to cultural and economic factors.[10] Men generally seek preventive health services less frequently, which may delay appropriate diagnosis and treatment. In addition, greater exposure to the etiological agent is observed among men due to social interactions outside the household.[11,12] Although women face more barriers to initiating treatment, men tend to show greater resistance to adherence to therapeutic plans, as beliefs in their own physical resilience—often associated with masculinity—hinder behavioral change.[13]

Regarding age, the number of MDR-TB cases has increased in recent decades, particularly among individuals of economically active age, as observed in this study. It is noteworthy that in developing countries, most individuals with TB are aged from 15 to 59 years, a period of greater social productivity. This may lead to delays in economic growth and hinder societal development, in addition to increasing exposure time and contact with other individuals.[14]

Low schooling level, high unemployment rates, and low income among patients with MDR-TB, as identified in this study, are associated with social vulnerability and limited access to information and education. Adherence to TB treatment is conditioned by social and financial barriers, which influence diagnostic quality and therapeutic effectiveness. Individuals with low educational levels tend to have poorer understanding of the disease and the importance of treatment adherence, which may result in higher rates of treatment abandonment. This factor is critical, as inadequate adherence contributes to the development of drug resistance, further hindering disease management.[15] Moreover, poverty and lack of economic stability are critical factors affecting adherence. Low educational attainment is associated with a range of adverse socioeconomic conditions, such as low income, unhealthy living environments, household overcrowding, and reduced social and economic support.

The success rate of first-line TB treatment has been estimated at 86%, whereas the success rate for MDR-TB treatment is approximately 59%. It is estimated that in 2020, about 2.1 million people were diagnosed with rifampicin-resistant TB, representing nearly 71% of the total 3 million bacteriologically confirmed pulmonary TB cases.[16] In response to this challenge, the Brazilian Unified Health System (SUS) incorporated pretomanid into the therapeutic regimen for MDR-TB. The inclusion of pretomanid aims to shorten treatment duration and, consequently, increase medication adherence and cure rates.[17]

The results showed that many patients reported persistence of symptoms, such as joint pain and cough, even after treatment initiation. The continued presence of symptoms may be discouraging and negatively affect adherence to the therapeutic regimen. It is essential that health professionals provide adequate patient education regarding the nature of treatment, including the possible persistence of symptoms and the importance of completing treatment, even if symptoms improve.[17]

Adverse drug effects, such as skin pigmentation changes and hearing loss, were also reported. These adverse effects are clinically relevant and may negatively influence QoL and treatment adherence. Strategies to monitor and manage adverse effects should be an integral component of care for patients with MDR-TB.[4,18]

Evaluation of medication adherence revealed a high adherence rate among patients. Adherence to treatment remains one of the greatest challenges in the management of MDR-TB, as non-adherence may result in secondary resistance, increasing treatment complexity and costs. Adherence is influenced by multiple factors, including patient knowledge about the disease, social support, and the presence of medication-related adverse effects.[19] In Brazil, treatment abandonment increased progressively from 2013 to 2019, accompanied by a decline in treatment completion rates during this period. This trend reflects the well-known fragility of public policies aimed at disease control and treatment continuity.[20] From 2018 to 2019, abandonment rates reached 12.0% for drug-susceptible TB and 27.8% for MDR-TB.[21]

QoL assessment revealed significant variation across domains. The social relationships domain showed the lowest mean score, indicating that MDR-TB negatively impacts patients' social interactions. The ability to maintain social support networks is essential for promoting QoL in these patients. The disease may lead to social isolation and stigma, which constitute additional barriers to treatment adherence and psychosocial rehabilitation. Unemployment, lack of social support, social isolation, and adverse effects of TB medications are associated with difficulties in treatment adherence and are individual factors that negatively impact QoL.[22]

Emotional instability and the need for psychological adjustment are common among patients, underscoring the importance of psychological support during treatment. Support programs that include psychological counselling and peer support groups may be beneficial in improving emotional well-being and treatment adherence.[23-25]

QoL assessment has received increasing attention in recent years, particularly among individuals with chronic diseases and/or those undergoing prolonged treatment. This shift reflects a change in the evaluation of patients' overall condition, which is no longer based solely on healthcare professionals' assessments but also incorporates the individual's own perspective. QoL perception is subjective, complex, and dynamic, representing an inherently human concept that has been linked to levels of satisfaction in family, emotional, social, and environmental life, as well as to one's existential experience.[25]

This study demonstrates that high therapeutic adherence to MDR-TB treatment in socioeconomically vulnerable contexts does not translate into meaningful improvements in psychosocial QoL, highlighting the need for approaches that integrate material, emotional, and educational support. As limitations, the cross-sectional design precludes causal inferences between adherence and QoL variables, and the homogeneity of the sample—predominantly characterized by low income and low educational levels—may limit the generalizability of the findings to populations with more diverse profiles. Future research should combine longitudinal and qualitative methods to explore how social determinants dynamically interact with QoL throughout the treatment course.

In conclusion, the findings of this study indicate high therapeutic adherence alongside marked disparities in QoL, particularly in the domain of social relationships. The originality of this research lies in demonstrating that, even in contexts of socioeconomic vulnerability, medication adherence may be high but does not ensure psychosocial well-being, thereby revealing critical gaps in patient support systems.

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Tacyla Rayssa Carneiro Amorim contributed to the literature review; drafting of the abstract, introduction, methodology, and discussion; interpretation and description of the results; preparation of tables; conclusions; revision; and statistical analysis. **Débhora Ísis Barbosa e Silva** contributed to project administration; literature review; drafting of the abstract, introduction, methodology, and discussion; interpretation and description of the results; conclusions; revision; and statistical analysis. **Tainara Barbosa Nunes** contributed to drafting of the abstract and methodology; interpretation of the results; conclusions; revision; and statistical analysis. **Conceição Maria de Oliveira** contributed to drafting of the abstract; revision; and statistical analysis. **Fábio Henrique Portella Corrêa de Oliveira** contributed to drafting of the abstract; revision; and statistical analysis. **Amanda Tavares Xavier** contributed to project administration; funding acquisition; literature review; revision; and statistical analysis. **Maria Mariana Barros Melo da Silveira** contributed to project administration; funding acquisition; literature review; revision; and statistical analysis. **Keylla Talitha Fernandes Barbosa** contributed to project administration; literature review; drafting of the abstract, introduction, methodology, and discussion; interpretation and description of the results; conclusions; revision; and statistical analysis. **João Victor Batista Cabral** contributed to project

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