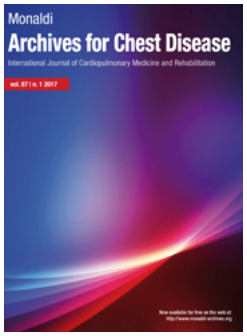

Monaldi Archives for Chest Disease

eISSN 2532-5264 https://www.monaldi-archives.org/

Monaldi Arch Chest Dis 2025 [Online ahead of print]

To cite this Article:
Nugraha Putra O, Indah N, Rif'atul Chumaidah F, et al. **Health-related quality of life based on the European Questionnaire 5D-5L utility score in patients with multidrug-resistant tuberculosis.** *Monaldi Arch Chest Dis* doi: 10.4081/monaldi.2025.3450

Health-related quality of life based on the European Questionnaire 5D-5L utility score in patients with multidrug-resistant tuberculosis

Oki Nugraha Putra,[1] Nur Indah,[2] Fristia Rif'atul Chumaidah,[3]
Telly Purnamasari,[4] Muhammad Arif Saifudin[5]

[1]Faculty of Pharmacy, Hang Tuah University, Surabaya; [2]Department of Pulmonology, Haji Hospital, Surabaya; [3]Department of Pharmacy, Haji Hospital, Surabaya; [4]Pre-Clinical and Clinical Studies, National Research and Innovation Agency (BRIN), Bogor; [5]Study Program of Pharmacy, Hang Tuah University, Surabaya, Indonesia

Correspondence: Oki Nugraha Putra, Faculty of Pharmacy, Hang Tuah University, Arief Rahman Hakim, 150, Surabaya, East Java, Indonesia.
Tel.: + 62 856 342 8984. E-mail: oki.nugraha@hangtuah.ac.id

Contributions: ONP, FRC, MAS, concept and design of the study; ONP, NI, MAS, conducting research; NI, FRC, TP, supervised and handled data collecting; ONP, TP, MAS, analyzed and interpreted data; ONP, FRC, TP, conceptualization and draft manuscript. All authors have reviewed and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

Conflict of interest: the authors declare that they have no competing interests, and all authors confirm accuracy.

Ethics approval and consent to participate: this study was authorized by the Haji Hospital's ethical committee for health research with approval number 445/149/KOM.ETIK/2024

Informed consent: participants were thoroughly educated on the study's objectives. The study was explained in the local language, and participants could ask questions. All eligible patients

were asked to complete written and signed informed consent before enrollment. The manuscript does not contain any person's data in any form.

Patient consent for publication: all participants in the study have given their consent to publication.

Availability of data and materials: data and materials are accessible from the corresponding author upon reasonable request.

Funding: none.

Acknowledgments: the authors are grateful to all the healthcare providers who contributed to and assisted with the study.

Abstract

Patients' health-related quality of life (HRQOL) is negatively impacted by multidrug-resistant tuberculosis (MDR-TB). The HRQOL of MDR-TB patients was assessed in this study using the European Questionnaire 5D-5L (EQ-5D-5L) utility score and HRQOL-related parameters. We conducted a case-control study at the Haji Hospital from June to December 2024. MDR-TB patients and drug-sensitive (DS-TB) patients were divided into case and control groups, respectively. The HRQOL utility score and depression levels were measured using the Indonesian EQ-5D-5L and Patient Health Questionnaire-9 (PHQ-9), respectively. This study included 84 TB patients, 36 and 48 of whom had MDR-TB and DS-TB, respectively. Patients with DR-TB had a significantly higher PHQ-9 score (7.55±5.97 *vs*. 4.69±4.21; p=0.047) than patients with DS-TB. When compared to the control group, the case's EQ-5D-5L and EQ Visual Analog Scale utility scores were considerably lower, at 0.86±0.11 and 69.30±16.65 (p=0.005) against 0.92±0.07 and 80.70±15.53 (p=0.002), respectively. The EQ-5D-5L utility score was considerably lower in DR-TB patients with depression and a history of TB treatment. In conclusion, the HRQOL of MDR-TB patients was low. Among MDR-TB patients, depression and TB treatment history were associated with quality of life. This study provides insight into the need for healthcare practitioners to evaluate patients' HRQOL, particularly for those with risk factors.

Key words: EQ-5D-5L, quality of life, MDR-TB, HRQOL.

Introduction

Having a treatment success rate of 51% in 2022, Indonesia is among the nations with the highest prevalence of TB, TB/HIV, and multidrug-resistant TB (MDR-TB) [1]. These results did not meet the national target of 80%. It demonstrates that the main problem in the treatment of MDR-TB is the high treatment failure, one of which is caused by the high rate of loss to follow-up [2]. The WHO incorporates bedaquiline in all oral regimens to treat MDR-TB, including bedaquiline/pretomanid/ linezolid/moxifloxacin (BPaL/M), nine months, and longer regimens to enhance treatment outcomes [3].

Patients with MDR-TB require long-term treatment with several adverse effects that impact patients' health-related quality of life (HRQOL). Evaluating HRQOL in TB patients is essential to identify appropriate actions to improve health quality [4,5]. Studies demonstrate that a good quality of life during treatment correlates with favorable outcomes in TB patients [6,7]. However, the measurement of HRQOL as part of treatment outcomes in patients with MDR-TB has not been widely studied across countries, including in Indonesia. Several studies in Indonesia reported that the HRQOL in MDR-TB patients was lower than in patients with drug-sensitive TB (DS-TB) [6,8]. However, neither study identified factors associated with HRQOL. Furthermore, MDR-TB patients are more vulnerable to psychological disorders, such as depression. TB patients with psychological disorders will reduce medication adherence and ultimately lead to a reduction in treatment success [4].

Most studies used the Short Form-36 (SF-36) and World Health Organization Quality of Life – BREF (WHOQOL BREF) to measure HRQOL in TB patients. They evaluate the patient's health status across several dimensions. However, utility scores cannot be directly calculated from both, because the scoring is not based on individual preferences [9,10]. Conversely, the EQ-5D-5L to evaluate HRQOL assessment is a simpler and economic appraisal because it can quantify general health based on visual analog score (VAS) and is also designed to be self-administered by patients and is relatively short compared to others [11].

No study in Indonesia has evaluated HRQOL in MDR-TB patients using EQ-5D-5L. To provide a reference for developing programs to improve and enhance the QoL of MDR-TB patients and to demonstrate the additional burdens caused by drug resistance, we compare the QoL of MDR-TB patients with that of drug-sensitive TB patients. This study assesses a variety of five QoL domains

using standardized instruments of EQ-5D-5L and investigates factors associated with HRQOL in MDR-TB patients who use all oral regimens containing bedaquiline. This evaluation may help MDR-TB patients obtain appropriate treatment to improve QoL.

Materials and Methods

Patient selection

We carried out a case-control study at the Haji Hospital's TB outpatient clinic in Surabaya. This study was authorized by the Haji Hospital's ethical committee for health research with approval number 445/149/KOM.ETIK/2024. We separated TB patients into two groups: drug-sensitive TB (DS-TB) patients as the control group and MDR-TB patients as the case group.

Regimens for MDR-TB patients include:

1. Bedaquiline/pretomanid/linezolid/moxifloxacin (BPaL/M) for six months
2. Nine months consists of bedaquiline/high-dose isoniazid/clofazimine/levofloxacin/ethionamide/pyrazinamide/ethambutol
3. Longer regimens consist of bedaquiline/levofloxacin/linezolid/clofazimine/cycloserine.

All TB patients receiving therapy for MDR-TB and DS-TB during the study period made up the research population. This study included consecutive patients from June to December 2024. We used a case-control formula to determine the sample size. The sample size formula was:

$$n1 = n2\frac{\mathrm{p0.q0}(\,\mathrm{Z1} - \frac{\alpha}{2} + \mathrm{Z1} - \beta)^2}{(p1 - p0)^2}$$

A 95% CI level, 80% sampling power, and 5% (alpha) statistical significance were applied to determine the sample size. The corresponding values for Z1-α/2 and Z1-β were 1.96 and 1.28. We obtained the P1 and P0 values from a study by Izhar et al. (2021), where the proportion of MDR-TB patients with poor quality of life was P1 = 0.286 and the proportion of DS-TB patients with poor quality of life was P0 = 0.089.[6] q0 = 1-p0 and q1 = 1-p1. According to the formula's sample calculation, there were 17 samples in each group. A comprehensive sampling strategy was employed in this investigation. All 84 TB patients still receiving TB treatment were included in the sample.

Criteria of inclusion and exclusion

The study's inclusion requirements were as follows: age > 18 years old and at least undergoing TB treatment in regimens containing bedaquiline for eight weeks; able to read and write the questionnaires; and willing to participate by filling out and signing the informed consent. Patients were excluded if they did not have a complete medical record, had a psychiatric disorder, or had chronic diseases such as cancer, stroke, or malignancy. We asked all eligible patients to complete written informed consent before enrollment.

Data collection

The instruments in this study were questionnaires, standardized forms of The Indonesian European Questionnaire 5D-5L (EQ-5D-5L) to measure the utility score of HRQOL, and the Indonesian Patient Health Questionnaire-9 (PHQ-9) to assess the depression level. The Indonesian version of EQ-5D-5L was adapted from Purba et al. (2018) with good validity and high test-retest reliability [12]. The Indonesian version of PHQ-9 was adapted from Dian et al. (2022), considering that the questionnaire was valid and reliable [13]. The questionnaire collected demographic data such as education, age, sex, occupation, marital status, income, and duration of treatment. We collected body mass index (BMI), comorbidities, history of TB treatment, and treatment regimens from the electronic medical records of TB patients.

We gathered demographic information such as age, education, sex, occupation, marital status, income, and duration of treatment via the questionnaire. We searched TB patients' electronic medical records for information on body mass index (BMI), comorbidities, history of TB treatment, and treatment regimens.

We calculated the utility score for each patient by subtracting the coefficient of each response from 1 [14]. The utility score reflects the patient's preference for their health. A higher number denotes a higher quality of life; the score ranges from 0 to 1. The EQ-VAS captures the patient's self-rated health, ranging from 0 to 100 [14]. Nine questions with four possible responses and scores comprise the PHQ-9. The total score is categorized as follows: no depression (1-4).: mild (5–9), moderate (10–14), fairly severe (15–19), and severe (20–27) [13]. There are no cut-off points for good or poor HRQOL on the EQ-5D-5L questionnaire. As a result, cut-off points were not used in this study to classify subjects as having good or poor HRQOL.

Statistical analysis

We used numbers or percentages to report categorical variables and mean ± SD to express continuous data. Kolmogorov-Smirnov analyzed the normality of the data distribution for overall comparisons. We used an independent t-test to compare the demographics of the two groups because the continuous data were normally distributed. Factors related to DR-TB patients' utility scores on the EQ-5D-5L were examined using an independent t-test to find variations between variables. Chi-square or Fisher's exact was used to assess descriptive or categorical variables. The two groups' EQ-5D-5L and EQ-VAS utility scores were correlated using Pearson correlation. We used SPSS version 20.0 for the statistical analysis (SPSS Inc. Chicago, IL, USA). A P-value < 0.05 was deemed statistically significant.

Results

36 MDR-TB patients and 48 DS-TB patients who fulfilled the inclusion criteria were enrolled. Table 1 exhibits the differences between the two groups. BPaL/M, nine-month, and longer regimens were administered in 11/36 (30.5%), 3/36 (8.3%), and 22/36 (61.2%) for MDR-TB patients, respectively.

Table 1 shows that more than 60% of TB patients were men, and their mean age was productive. Patients with DR-TB had a considerably lower BMI than those with DS-TB. DR-TB patients had a higher prevalence of DM than DS-TB patients, although not statistically significant (p-value ≥ 0.05). 55% of patients with MDR-TB had previously received antitubercular medication treatment, according to their TB treatment history. MDR-TB patients had a higher PHQ-9 score than those in DS-TB, which was categorized as mild depression (p-value < 0.05). Table 2 describes the transformation score for every EQ-5D-5L domain. It shows that MDR-TB patients had a higher transformation score than DS-TB patients, but only two domains, mobility and pain/discomfort, were statistically significant. Figure 1 displays the EQ-5D-5L utility score for the two groups. Based on Figure 1, the utility score of EQ-5D-5L was lower in MDR-TB than in DS-TB patients (p-value < 0.05). The score of EQ-VAS between the two groups is shown in Figure 2. Figure 2 shows that MDR-TB patients had significantly lower EQ-VAS scores than DS-TB patients (p-value < 0.05). Table 3 shows a positive correlation between the two groups' utility scores of EQ-5D-5L and EQ-VAS. Table 4 displays the correlation between the two groups' EQ-VAS and 5D-5L utility scores.

Factors associated with the utility score of EQ-5D-5L among MDR-TB patients are shown in Table 4. Among MDR-TB patients, those who were previously treated and those with depression had a significantly lower utility score EQ-5D-5L than those newly treated and without depression (p-value < 0.05). The frequency of self-reported adverse events among MDR-TB patients is shown in Table 5.

Discussion

Males were higher in our study between the two groups compared with females. Similar to the previous studies in Indonesia, males are commonly found among TB patients [15]. BMI among MDR-TB patients was significantly lower than that in DS-TB. In addition, the rate of underweight patients was much higher in MDR-TB. It may be explained that the BMI was lower in DR-TB patients since more than 50% of patients had secondary TB and it was associated with chronic inflammation and TB symptoms, such as coughing, night sweats, and loss of appetite. Previous studies reported that low BMI was a risk factor for MDR-TB. In order to improve BMI in MDR-TB patients, undernutrition must be addressed with all-encompassing nutritional interventions. Combining dietary support, supplementation, education, and routine monitoring may establish a robust framework for TB patients' BMI improvement [16,17].

Approximately 58% of MDR-TB patients were previously treated with first-line antitubercular drugs in our study. It was similar to our previous study, which reported that secondary TB was more commonly found in MDR-TB patients than primary TB [18]. A meta-analysis study by Xi et al. (2022) indicated that TB patients who had previously been treated were significantly associated with MDR-TB [19]. One of the significant causes of MDR-TB cases after completion of DS-TB treatment is low treatment adherence [20]. Diabetes mellitus (DM) was found in nearly 50% of MDR-TB patients. A previous meta-analysis indicated that poor glycemic control among DM is a risk factor for MDR-TB, especially primary TB [21].

Among MDR-TB patients, those with depression were considerably higher than those in DS-TB (p-value < 0.05). In addition, the PHQ-9 score was significantly higher in MDR-TB patients than in DS-TB (p-value < 0.05). It indicates that MDR-TB patients were more susceptible to depression during treatment. High scores of PHQ-9 in DR-TB patients were supported by scores on the depression domain of the EQ-5D-5L, which were greater in DR-TB patients than DS-TB patients.

Studies reported a higher prevalence of depression among MDR-TB patients than those in DS-TB, ranging from 42.8% to 69.0%. Duration of illness was significantly associated with depression among MDR-TB patients [22,23]. Since more than 50% of MDR-TB patients had a history of TB treatment that prolonged their illness and treatment, they were at high risk of depression. It was supported by Louw et al. (2012), who demonstrated that patients with TB retreatment experienced harm to physical and mental health [24]. Conversely, a study by Jo et al. (2020) in Malawi reported no difference in quality of life between new and retreated TB. It was more likely that less than 30% of patients had retreated TB [25].

MDR-TB patients are more susceptible to depression, which is most likely due to the adverse effects of cycloserine. As is known, cycloserine is one of the class B anti-TB drugs used in longer treatment. In our study, 61% of patients received a longer treatment regimen containing cycloserine. A study in China reported that among DR-TB patients who had undergone cycloserine therapy, especially those who were underweight and had a history of TB treatment, there was an association with depression [26]. Cycloserine could render pre-existing psychiatric disorders worse. MDR-TB patients frequently experience social vulnerability, extreme poverty, and stigma, all of which have an impact on mental health. Additionally, depression is very common and may result in a poorer prognosis and loss to follow-up. A crucial aspect of managing TB patients is treating the accompanying depression. Even after TB treatment, untreated depression may culminate in an impairment of quality of life and a persistent functional decline. Furthermore, untreated depression can negatively impact the outcomes of TB treatment. By altering daily activities and pathogenic mechanisms, depression can reduce treatment adherence in TB patients. As a result, treating depression is thought to be crucial during TB treatment. Depression and TB must be treated as a single issue rather than as distinct ones [3]. In these circumstances, controlling cycloserine toxicity is essential to attain a favorable outcome and prevent severe adverse events. Evaluation of the dose and plasma concentration of cycloserine, counseling, and psychosocial support may help patients to overcome symptoms of depression and improve treatment adherence [22].

Hence, MDR-TB patients could be more susceptible to depression or anxiety than DS-TB patients. Generally, the score for all domains was higher in the case group than in the control group, indicating that the disease and treatment impaired each domain. It was supported by Araia et al.

(2021), who reported lower scores in WHOQOL BREF domains in MDR-TB [7]. Pain was the most affected domain, with the highest score among the two groups. This suggests that pain is a major problem during MDR-TB treatment that is associated with adverse effects. Based on Table 5, 38% and 25% of patients experienced neuropathy and joint pain. In our study, MDR-TB patients received BPaL/M (30%) and longer regimens (60%) containing linezolid. Peripheral neuropathy is the most common adverse effect of linezolid in MDR-TB patients and impacts HRQOL [27]. It was supported by Sineke et al. (2021), reporting that MDR-TB patients in Johannesburg who experienced joint pain and peripheral neuropathy had a substantial impact on the patient's HRQOL

Peripheral neuropathy in MDR-TB patients may induce significant movement impairment and discomfort. Closely monitoring and appropriate treatment are essential to prevent long-term complications and improve patients' QoL. The risk of neuropathy increases with duration of use and higher doses of linezolid [28]. The mechanism underlying linezolid-induced neuropathy is not fully understood, but it is thought to be related to mitochondrial dysfunction leading to damage to peripheral nerves.

The overall utility score of the EQ-5D-5L and EQ-VAS was significantly lower in MDR-TB than in DS-TB, as shown in Figures 1 and 2. It was supported by Araia et al. (2021) reported that HRQOL was low in MDR-TB patients [7]. EQ-VAS has a higher score of 79 in MDR-TB compared to our study, as reported by Rodriguez et al. (2025) in the Dominican Republic. It was more likely because only 25% and 6% of patients had a history of TB treatment and existing neuropathy, respectively [29]. Amer et al. (2023) reported a lower EQ-VAS score of DS-TB patients than our study. They demonstrate that EQ-VAS was 65.56 ± 17.02. It was more likely because 23.2% of patients were aged > 60 years [30]. Conversely, 13.2% of patients were aged > 60 years in our study. Older people had limitations in mobility and were more susceptible to pain and depression that impacted their HRQOL.

Surprisingly, a study by Park et al. (2021) demonstrates an improvement in the utility score of EQ-5D-5L before and after treatment completion among MDR-TB patients through a systematic review [31]. A recent study also reported substantial improvements in all domains after six months of treatment with regimens containing bedaquiline, indicating a positive impact of the treatment [32]. However, our study did not analyze the utility score of EQ-5D-5L before and after MDR-TB

treatment. We found a positive correlation between the utility scores of EQ-5D-5L and EQ-VAS. It was similar to the study by Amer et al. (2023), which demonstrated a correlation between EQ-5D score and EQ-VAS. It indicates that the higher utility score of EQ-5D-5L reflects better general health in TB patients [30].

In this study, MDR-TB patients with depression exerted a direct effect on the lower utility score of EQ-5D-5L. Patients who were depressed were unable to comply with their TB treatment, which worsened their HRQOL, hindered their function, and diminished the chance of a favorable outcome [33,34]. Another study by Rouf et al. (2021) indicated a correlation between PHQ-9 and HRQOL among TB patients. This suggests that the higher the levels of depression, the lower the HRQOL in TB patients [35]. Patients previously treated with first-line antitubercular drugs had a lower score of EQ-5D-5L in our study. A study in Botswana reported that MDR-TB patients who had a history of TB treatment were associated with anxiety and depression due to negative stigma and poor social support, thus lowering HRQOL [36]. Retreated MDR-TB patients are more likely to experience depression, according to a meta-analysis, underscoring the importance of paying closer attention to their mental health. Long treatment durations, prior treatment failures, and the psychological burden of managing a recurrent illness are some factors that are thought to be responsible for this increased risk. To identify and address depression early, healthcare providers should incorporate mental health services into TB treatment programs. Additionally, providing patients with support groups and counseling may reduce their psychological burden [37]. A comprehensive, patient-centered strategy that takes into account systemic, social, and medical factors must be adopted to reduce treatment failure in TB patients. This is especially important for high-burden TB countries like Indonesia. Our study has several limitations. Initially, it was a single-center study with a small sample size, and its limitations made our conclusion less compelling. Thus, further studies with many participants at multiple TB centers are urgently required to validate our findings. Second, the observation time of quality of life varies between patients, which may cause differences in HRQOL scores. Third, given the nature of the study design, we can not determine the impact of HRQOL on treatment outcomes.

Conclusions

Our study concluded that MDR-TB patients had a poorer overall HRQOL than patients with drug-sensitive TB, with the mobility and pain domains being the most notable. During treatment, depression with a high PHQ-9 score was experienced by two-thirds of MDR-TB patients. Depression and a history of TB therapy were associated with a lower HRQOL among MDR-TB patients. Treatment protocols for MDR-TB must include psychological interventions to address patients' mental health needs. Approaches such as psychoeducation, motivational therapy, and social support may improve quality of life, promote adherence to treatment, and lead to better health outcomes for patients with MDR-TB. A multicenter, longitudinal study with a larger sample size should be conducted in order to generate reliable and widely useful information on the quality of life among MDR-TB patients during treatment. Therefore, there was an urgent need to create more focused and efficient therapies to raise HRQOL concerning these issues.

References

1. World Health Organization. Global Tuberculosis Report 2020. Available from: https://www.who.int/publications/i/item/9789240013131.
2. Soedarsono S, Mertaniasih NM, Kusmiati T, et al. Determinant factors for loss to follow-up in drug-resistant tuberculosis patients: the importance of psycho-social and economic aspects. BMC Pulm Med 2021;21:360.
3. World Health Organization. WHO consolidated operational handbook on tuberculosis: module 4: treatment and care. 2025. Available from: https://www.who.int/publications/i/item/9789240108141.
4. Fuady A, Arifin B, Yunita F, et al. Stigma, depression, quality of life, and the need for psychosocial support among people with tuberculosis in Indonesia: a multi-site cross-sectional study. PLOS Global Public Health 2024;4:e0002489.
5. Kodical SP, Roy R, Shetty D, et al. Exploring factors influencing the health-related quality of life of tuberculosis patients: a WHOQOL-BREF-based study. 2024. Monaldi Arch Chest Dis 95:2913.

6. Izhar MD, Butar MB, Hidayati F, Ruwayda R. Predictors and health-related quality of life with short form-36 for multidrug-resistant tuberculosis patients in Jambi, Indonesia: a case-control study. Clin Epidemiol Glob Health 2021;12:100872.
7. Araia ZZ, Mesfin AB, Mebrahtu AH, et al. Health-related quality of life in tuberculosis patients in Eritrea: comparison among drug-susceptible and rifampicin/multidrug-resistant tuberculosis patients. Patient Relat Outcome Meas 2021;12:205-12.
8. Duarsa KH, Widhiartini IA, Aman IG. Quality of life profile on multidrug-resistant tuberculosis patient at Prof. Dr. I Goesti Ngoerah Gde Ngoerah General Hospital. Neurol Spinal Med Chir 2023;6:1-5.
9. Datta S, Gilman RH, Montoya R, et al. Quality of life, tuberculosis and treatment outcome; a case-control and nested cohort study. Eur Res J 2020;56:1900495.
10. Venkatesh U, Sharma A, Srivastava DK, Durga R. Health-related quality of life of multidrug-resistant tuberculosis patients: a study of eastern Uttar Pradesh, India. Indian J Tuberc 2022;69:347-53.
11. Bai G, Zhang J, Chen Y, et al. Health-related quality of life assessed by EQ-5D-5L and its determinants among Chinese adults. Front Public Health 2024;12:1383781.
12. Purba FD, Hunfeld JAM, Iskandarsyah A, et al. Quality of life of the Indonesian general population: test-retest reliability and population norms of the EQ-5D-5L and WHOQOL-BREF. PLoS One 2018;13:e0197098.
13. Dian CN, Effendy E, Amin MM. The alidation of Indonesian version of patient health questionnaire-9. Open Access Maced J Med Sci 2022;10:193-8.
14. EQ-5D-5L. EuroQol Available from: https://euroqol.org/information-and-support/euroqol-instruments/eq-5d-5l/.
15. Nurlaela S, Rahardjo S, Jayanti RD. Analysis of the quality of life of tuberculosis patients based on the SF-36 form (case study in Banyumas Regency). Indian J Tuberc 2024;71:225-8.
16. Vyawahare C, Mukhida S, Khan S, et al. Assessment of risk factors associated with drug-resistant tuberculosis in pulmonary tuberculosis patients. Indian J Tuberc 2024;71:S44-51.
17. Russikh A, Korotych O, Sereda Y, et al. Factors associated with culture conversion among adults treated for pulmonary extensively drug-resistant tuberculosis during 2018-2019 in

the Russian Federation: an observational cohort study. Monaldi Arch Chest Dis 2021;91;1678

18. Putra ON, Yulistiani Y, Soedarsono S, Subay S. Early efficacy of individual regimens containing bedaquiline in patients with drug-resistant tuberculosis. Asian Pac J Trop Med 2023;16:169-75.
19. Xi Y, Zhang W, Qiao RJ, Tang J. Risk factors for multidrug-resistant tuberculosis: A worldwide systematic review and meta-analysis. PLoS One 2022;17:e0270003.
20. Soedarsono S, Mertaniasih NM, Kusmiati T, et al. Characteristics of previous tuberculosis treatment history in patients with treatment failure and the impact on acquired drug-resistant tuberculosis. Antibiotics 2023;12:598.
21. Chen Z, Liu Q, Song R, et al. The association of glycemic level and prevalence of tuberculosis: a meta-analysis. BMC Endocr Disord 2021;21:123.
22. Srinivasan G, Chaturvedi D, Verma D, et al. Prevalence of depression and anxiety among drug-resistant tuberculosis: a study in North India. Indian J Tuberc 2021;68:457-63.
23. Apang O, Shringarpure K, Laxmeshwar C, et al. Screening and management of depression among patients on TB treatment in Papumpare district, Arunachal Pradesh, India. Indian J Tuberc 2024;71:S155-61.
24. Louw J, Peltzer K, Naidoo P, et al. Quality of life among tuberculosis (TB), TB retreatment and/or TB-HIV co-infected primary public health care patients in three districts in South Africa. Health Qual Life Outcomes 2012;10:77.
25. Jo Y, Gomes I, Shin H, et al. Health-related quality of life of inpatients and outpatients with TB in rural Malawi. Int J Tuberc Lung Dis 2020;24:1165-71.
26. Pang Y, Liu R, Song Y, et al. High incidence of psychiatric disorders associated with cycloserine treatment of multidrug-resistant tuberculosis patients: a cohort study in Beijing, China. Infect Drug Resist 2022;15:3725-32.
27. Mishra G, Alffenaar JW, Munje R, Khateeb S. Adverse drug reactions due to linezolid in the programmatic management of drug-resistant tuberculosis in India: a retrospective multicenter study. Indian J Tuberc 2024;71:S101-9.

28. Sineke T, Evans D, Schnippel K, et al. The impact of adverse events on health-related quality of life among patients receiving treatment for drug-resistant tuberculosis in Johannesburg, South Africa. Health Qual Life Outcomes 2019;17:94.
29. Rodríguez M, Bustos YC, Encarnación M, et al. Evaluation of a modified short all oral treatment regimen for rifampicin-multidrug resistant tuberculosis in Dominican Republic. BMC Infect Dis 2025;25:196.
30. Amer M, Akhlaq M, Rafique M, et al. Health-related quality of life (HRQoL) in tuberculosis patients: a cross-sectional study using the EuroQoL EQ-5D-3L scale. SN Compr Clin Med 2023;5:53.
31. Park HY, Cheon H Bin, Choi SH, Kwon JW. Health-related quality of life based on EQ-5D utility score in patients with tuberculosis: a systematic review. Front Pharmacol 2021;12:659675.
32. Paikray E, Pattnaik M, Mishra V, et al. Evaluation of health-related quality of life and adherence among pre-extensively drug-resistant tuberculosis patients receiving either Bedaquiline or Delamanid regimen at a teaching hospital in Eastern India. J Family Med Prim Care 2024;13:4684-92.
33. Solanki N, Upadhyay A, Upadhyay R, et al. A cross-sectional study on the prevalence of depression and associated factors in tuberculosis patients in the Vidisha district of Madhya Pradesh, India. Cureus 2023; 15:e46637.
34. Walker IF, Khan AM, Khan AM, et al. Depression among multidrug-resistant tuberculosis patients in Punjab, Pakistan: a large cross-sectional study. Int J Tuberc Lung Dis 2018;22:773-8.
35. Rouf A, Masoodi MA, Dar MM, et al. Depression among tuberculosis patients and its association with treatment outcomes in district Srinagar. J Clin Tuberc Other Mycobact Dis 2021;25:100281.
36. Gare KP, Sebakeng M, Molefi M. The health-related quality of life of drug-resistant tuberculosis patients receiving treatment in Botswana. BMC Infect Dis 2024;24:1367.
37. Shen R, Zong K, Zhang L. Risk factors for depression in tuberculosis patients: a meta-analysis. Neuropsychiatr Dis Treat 2022;18:847-6.

Table 1. Demographic characteristics between the two groups.

Variables		MDR-TB (N=36), n (%)	DS-TB (N=48), n (%)	p-value
BMI (kg/m^2), mean ± SD		19.22 ± 4.52	21.46 ± 4.89	0.036#
< 18.5 kg/m^2		15 (41.6)	11 (22.9)	
Age (years), mean ± SD		45.19 ±14.19	42.06 ±18.14	0.394
Sex	**Male**	24 (66.7)	32 (66.7)	1.000
	Female	12 (33.3)	16 (33.3)	
DM	**Yes**	17 (47.2)	16 (33.3)	0.197
	No	19 (52.8)	32 (66.7)	
History of TB treatment	**New**	16 (44.4)	48 (100)	
	Previously treated	20 (55.6)	0	NA
Education	**Elementary school**	7 (19.4)	11 (22.9)	
	Junior high school	5 (13.9)	5 (10.4)	
	Senior high school	20 (55.6)	16 (37.6)	0.177
	Higher education	4 (11.1)	14 (29.1)	
Occupation	**Unemployed**	11 (30.6)	16 (33.3)	0.903
	Employee	25 (36.1)	32 (31.2)	
Income (IDR)	**<2.5 billion**	30 (83.3)	31 (64.6)	0.057
	>2.5 billion	6 (16.7)	17 (35.4)	
Marital status	**Married**	28 (77.7)	30 (62.5)	
	Unmarried	5 (13.8)	16 (33.3)	0.113
	Separated	3 (8.5)	2 (4.2)	
PHQ-9, mean ± SD		7.55 ± 5.97	4.69 ± 4.21	0.047#
Depression	**Yes**	24 (66.6)	20 (41.6)	0.023#
	No	12 (33.4)	28 (58.4)	

BMI, body mass index; DM, diabetes mellitus; MDR-TB, multidrug-resistant tuberculosis; DS-TB, drug-sensitive tuberculosis; IDR, Indonesian rupiah; PHQ-9, patient health questionnaire-9. #significant, p-value < 0.05

Table 2. Transformation score for each domain of EQ-5D-5L.

Domain	DR-TB (N=36)	DS-TB (N=48)	p-value
Mobility	0.036 ± 0.043	0.015 ± 0.032	0.014*
Self-care	0.005 ± 0.011	0.003 ± 0.009	0.421
Usual activities	0.021 ± 0.034	0.010 ± 0.022	0.090
Pain/Discomfort	0.053 ± 0.051	0.023 ± 0.023	0.001*
Anxiety/Depression	0.028 ± 0.039	0.020 ± 0.041	0.786

*significant, p-value < 0.05

Table 3. Correlation between the utility score of EQ-5D-5L and EQ-VAS.

Utility score of 5D-5L and EQ-VAS	MDR-TB (N=36)	DS-TB (N=48)
p-value	0.005*	0.037*
Coefficient correlation (r)	0.458	0.302

*significant, p-value < 0.05

Table 4. Factors associated with utility score of EQ-5D-5L among MDR-TB patients (N=36).

Variables	Utility Score EQ-5D-5L	p-value
Sex		0.580
Male	0.85 ± 0.11	
Female	0.87 ± 0.11	
Age (years)		0.876
<48	0.86 ± 0.13	
≥48	0.85 ± 0.09	
IMT (kg/m^2)		0.432
<18.5	0.84 ± 0.13	
≥18.5	0.79 ± 0.10	
History of TB		0.044*
New	0.87 ± 0.13	
Previously treated	0.84 ± 0.09	
Diabetes mellitus		0.813
Yes	0.86 ± 0.12	
No	0.85 ± 0.10	
Education Level		0.541
Elementary	0.81 ± 0.12	
Junior	0.80 ± 0.20	
Senior	0.75 ± 0.13	
Higher education	0.82 ± 0.15	
Marital status		0.231
Married	0.82 ± 0.23	
Unmarried	0.80 ± 0.17	
Separated	0.81 ± 0.21	
Income (IDR)		0.334
< 2.5 billion	0.83 ± 0.24	
≥ 2.5 billion	0.82 ± 0.21	
Time since first treatment initiation (months)		0.793
<6	0.86 ± 0.11	
≥6	0.85 ± 0.12	
Depression		0.000*
Yes	0.79 ± 0.11	
No	0.95 ± 0.03	

BMI, body mass index; IDR, Indonesian Rupiah.

Table 5. Frequency of MDR-TB patients' self-reported adverse events.

Adverse event	Patients reporting (N=36), n (%)
Neuropathy	14 (38.8)
Nausea	11 (30.5)
Joint pain	9 (25.0)
Skin discoloration	9 (25.0)
Headache	5 (13.8)
Dizziness	4 (11.1)
Vomiting	3 (8.3)

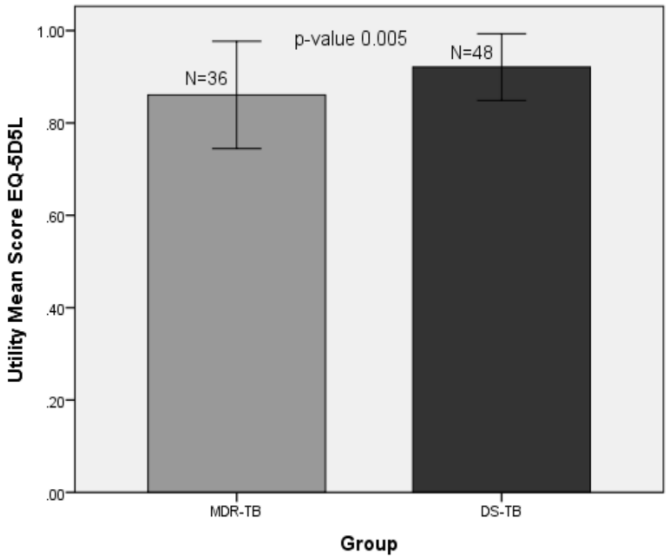

Figure 1. Utility score of EQ-5D-5L between the two groups.

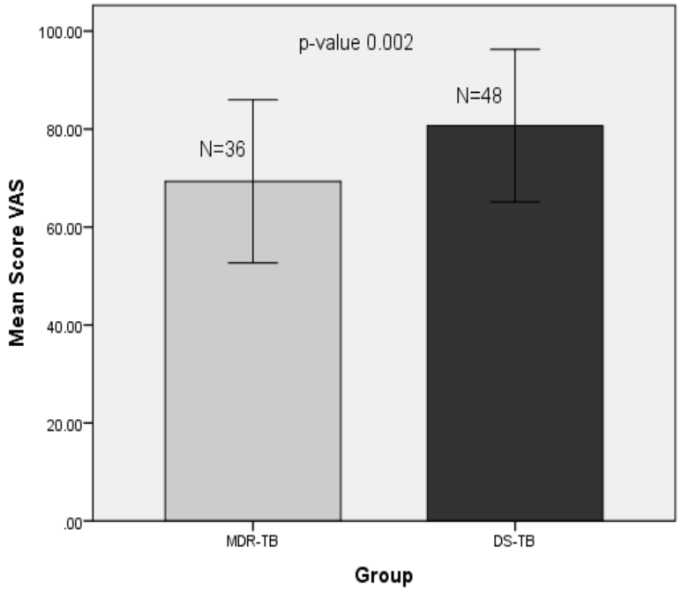

Figure 2. Score of EQ-VAS between the two groups.