PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

Title (Provisional)
Determinants of unfavourable treatment outcomes of drug-resistant tuberculosis cases in Malaysia: a case-control study

Authors
Kamarul Zaman, Mohd Fahmin; Nik Husain, Nik Rosmawati; Sidek, Mohd Yusof; Abu Bakar, Zamzurina

VERSION 1 - REVIEW

Reviewer 1
Name Weldegebreal, Fitsum
Affiliation Haramaya University, Medical Laboratory Sciences
Date 24-Nov-2024
COI None

Manuscript ID bmjopen-2024-093391

Title: Determinants of unfavourable treatment outcomes of drug-resistant tuberculosis cases in Malaysia: a case-control study

Comments

General comment
The manuscript is good structural, but it requires substantial revision and a language edition

Detail comments

Introduction section
1. The introduction is not in line with your study title i.e. determinant of unfavourable treatment outcomes of drug-resistant tuberculosis cases rather it describes the magnitude of Tb and drug resistance of TB. So, revise properly in line with your study
2. Write properly the rationale of the study why you conducted

**METHODS section**

**Study setting and subject recruitment**

1. Describe the number of TB cases
2. Define case vs control clearly

**Study population and sample size determination**

1. Due to the limited number of cases with unfavourable outcomes, no sampling was needed for the case group. This is not clear please elaborate it
2. You mentioned that the flow chart for the case-control study is shown in figure 1, but figure-1 is not self-explanatory modify properly.

**Operational definitions**

1. Cite with proper reference your operational definitions

**Data collection**

1. Data were collected from two primary sources: NTBR and the line listing of DR-TB cases.
   What are the differences and similarities between the two data sources or clearly state their connection?
2. A structured proforma checklist was used to guide data extraction, what is this not clear or is this relevant to your study?

**Results section**

1. You state as follows
   A total of 444 DR-TB cases were initially recorded in the NTBR database for Selangor and WPKL from 2016 to 2020. After excluding 19 cases due to missing or incomplete data, 425 cases met the study criteria. Among these, 244 cases (58.0%) had favourable treatment outcomes, while 181 cases (42.0%) had unfavourable outcomes. All cases with unfavourable outcomes were included, and 222 cases with favourable outcomes were selected through simple random sampling. Consequently, a total of 403 cases were analysed.
   **It is not clear how many cases and controls because with the ratio of 1:1**
2. Figure two you tried to present the categories of unfavourable treatment outcomes among DR-TB cases in Selangor and WPKL
   From the cases or control???
3. Table 3 Multiple logistic regression for factors associated with unfavorable treatment outcomes among DR-TB cases in Selangor and WPKL from 2016 to 2020 (n=403)
   This is not clear
   How many variables run at the beginning ????

**Discussion section**
This is good but still, it requires to discussion of your findings with current updates and adding possible scientific justifications

Conclusions
It is ok

Reviewer 2
Name Ridolfi, Felipe
Affiliation Vanderbilt University Medical Center, Dept of Medicine, Division of Infectious Disease
Date 03-Dec-2024
COI None

Dear Authors,

I want to express my gratitude for your submission of the manuscript. Your study addresses a significant issue by examining the factors associated with unfavorable treatment outcomes in patients with drug-resistant tuberculosis (DR-TB) in Malaysia. This research is crucial in addressing public health challenges related to DR-TB.

I have thoroughly reviewed your manuscript and compiled several questions and suggestions for your consideration. These insights are intended to enhance your work's clarity and overall quality. I have outlined them below.

I look forward to receiving your revised manuscript and collaborating further to strengthen this important study.

Title
Zaman, et al., “Determinants of unfavourable treatment outcomes of drug-resistant tuberculosis cases in Malaysia: a case-control study”

• Consider reviewing the title wording for “unfavorable”; as in the text, these outcomes are considered adverse treatment outcomes.

  o In fact, from my perspective, I would go with unfavorable or unsuccessful treatment outcomes.

Abstract
• Provide a brief background and include the objective as the last sentence.
Suggest grouping Design, Setting, participants, and outcomes measures in one section of the methods

Define the cases and controls

adjusted OR would be better abbreviated to aOR

prefer Person-First language, such as a person living with HIV instead of being human immunodeficiency virus (HIV)—positive

“Comprehensive public health interventions are needed, including integrated HIV-TB management, community support, and tailored interventions, especially for severe DR-TB cases.”

The authors did not assess this in the study, did they?

Introduction

Lines 8-12 – updated the WHO Global Report.

Please clarify the last sentence of the first paragraph – I did not understand what the authors meant

Paragraph 3: suggest also adding the value in dollars for the two other values the authors described in MYR

In the last paragraph, the authors mentioned the “knowledge gap.” Which gap? Please provide some information in the previous paragraphs and re-word the sentences.

Methods

Please clarify the study period. In the abstract, it is mentioned that it was from 2016, and 2020 and in methods, from December 2022 to May 2023. I understand that one would be the length of period the authors considered for inclusion and the other when the study was conducted, correct?

Provide references for DR-TB case definitions and TB treatment outcomes definitions.

Please be consistent with the grouping definition: unfavorable or adverse treatment outcomes.

Does the TB Information System (TBIS) 10G and DRTBIS 50A-1 data overlap the NTBR? Or are they complimentary? Or even completely different databases?

Data analysis: consider median and IQR (instead of mean) for continuous variables

Add the variables (and how they were measured). In the results, the authors mentioned chest X-rays, comorbidities (such as diabetes), DOT, and substance use (tobacco). How were these variables defined, captured, and used in the analysis?

Results

Page 9: add numbers, percentages, and p values for the authors' results.
• Page 10, line 53 – remove “in Malaysia”

• Which variables the models were controlled for?

Discussion
• Please review the sentence: “facing unpleasant side effects from treatment, high healthcare costs, stigma and discrimination, all of which further impair their quality of life and financial circumstances”. It is out of context – the authors did not measure, or even talk about it before.

• Page 12, line 26, please remove “adjOR 2.38, 95% CI 1.44 to 3.94, p = 0.001”, as well as in line 53, and 57. From my perspective, the discussion section is not a place for numbers from the analysis.

Limitations
• Add Strengths in the subtitle too – “Limitations and Strengths”

this section needs revision, especially the strengths section

• Page 14, lines 26-17: “suggests exploring video-assisted treatment (VOT) as a viable alternative.” This just showed up here. Please review. It sounds out of context.

• Page 14, lines 29-33: “Finally, improving communication on treatment outcome updates between treatment centres and district health offices is essential for effectively tracking defaulters and transfer cases.” Please review.

Conclusion
• Needs careful review.

• How do the authors plan to address the issue of sex? Marital status?

• Implementing a mandatory HIV test does not sound good.

References
• Update the WHO Global TB Report reference

• Add references for DR-TB cases definition and TB treatment outcomes definitions

Figures & Tables
• Figure 1. I suggest removing the last two bars (Data analysis and write-up and research project submission) as they may pollute the figure and be uninformative.

• Suggestion: merge table 1 with table 2, as they provide the characteristics for both groups. Maybe re-wording the title to “Sociodemographic and clinical characteristics”, or even “Characteristics of the study population”

• Table 3. It would be great to see the ROC curves, even if as a supplement file.

Supplements
• Suggest adding the ROC curves and any other models the authors developed.

Overall

• English review is needed – e.g., unfavourable, categorisation
• Improve the discussion, limitations, and especially the conclusions

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**VERSION 1 - AUTHOR RESPONSE**

**Reviewer 1:**

Mr. Fitsum Weldegebreal
Haramaya University, Ghent University Faculty of Sciences

| SECTION: INTRODUCTION |
|-----------------------|
| **Comment** | The introduction not in line with your study i.e. determinant of unfavourable treatment outcomes of drug-resistant tuberculosis cases rather it describes the magnitude of TB and drug resistance TB. So revise properly in line with your study. |
| **Response** | Thank you for your suggestion. I have revised the introduction and focused on the determinants of unfavourable treatment outcomes of drug-resistant tuberculosis cases, including the treatment success rate globally and locally. |
| **Amendment** |

**Deleted paragraph 2 of the introduction:**

India (27%, 130,000 cases), China (14%, 66,000 cases) and the Russian Federation (9%, 41,000 cases) account for more than half of the global DR-TB burden.\(^\text{Error! Reference source not found.}\) The Global Burden of Disease study from 2017 indicates that the incidence of MDR-TB showed a significant upward trend worldwide between 1990 and 1999, with the overall age-standardized incidence rate (ASIR) increasing at an average annual rate of 17.63%.\(^\text{Error! Reference source not found.}\) Meanwhile, Malaysia reported almost 200 DR-TB cases in 2019.\(^\text{Error! Reference source not found.}\) Without targeted interventions, the DR-TB crisis could worsen, leading to increased mortality rates and significant economic impacts on the healthcare system, as well as on affected individuals and their families.

**Amended paragraph (refer to Para 3, Line 102 – 112):**

DR-TB poses significant challenges for treatment due to prolonged therapy, high costs, and drug toxicity, often leading to unfavourable outcomes that strain healthcare systems and negatively impact patients and their families.\(^\text{Error! Reference source not found.}\) Globally, an estimated 400,000 cases were reported in 2023, contributing substantially to TB-related morbidity and mortality.\(^\text{0}\) However, there has been progress in treatment outcomes, with 68% of patients started on treatment in 2021 achieving favourable outcomes, up from 64% in 2020, 60% in 2019, and a steady improvement from 50% in 2012.\(^\text{0}\) Key determinants of treatment outcomes include sociodemographic factors (age, sex, education level, employment), comorbidities such as diabetes mellitus (DM) and human
immunodeficiency virus (HIV) infection, and TB disease characteristics (sputum and radiological findings, site of infection, and history of prior treatment).

2 Comment
Write properly the rationale of the study why you conducted.

Response
Thank you for your feedback. I have revised the introduction to reflect the rationale of the study more clearly.

Amendment
Refer to Para 5 and 6, Line 121 – 132:

The study focuses on Selangor and Wilayah Persekutuan Kuala Lumpur (WPKL), two states in Malaysia with a high burden of DR-TB cases. Moreover, Selangor has the largest population, while WPKL has the highest population density. Understanding the determinants of DR-TB outcomes in these high-burden areas is essential to addressing gaps in treatment success and guiding more effective and targeted public health interventions.

Given the significant economic burden of DR-TB treatment and Malaysia’s low treatment success rate, it is imperative to identify and understand the determinants of unfavourable treatment outcomes. By examining sociodemographic and clinical factors associated with DR-TB cases in Malaysia from 2016 to 2020, this study aims to provide valuable insights that will inform strategies to improve treatment success and strengthen DR-TB control efforts nationwide.

SECTION: METHODS

Study setting and subject recruitment

3 Comment
Describe the number of TB cases.

Response
Thank you for your feedback. I have revised the “Study setting and subject recruitment” section to include the number of TB cases.

Amendment
Refer Para 2, Line 144 – 148:

From a total of 444 DR-TB cases recorded during the study period, 19 were excluded due to missing or incomplete data, ongoing treatment, or a change in diagnosis, resulting in 425 eligible cases for analysis. Among these, 181 DR-TB cases with unfavourable outcomes were included in the case group. To ensure a representative sample of the control group, 222 DR-TB cases with favourable outcomes were selected through simple random sampling.

4 Comment
Define case vs control clearly.

Response
Thank you for your feedback. I have revised the “Study setting and subject recruitment” section to provide a clear definition of cases and controls.

Amendment
Refer Para 1, Line 139 – 143:
Cases were defined as DR-TB patients who experienced unfavourable treatment outcomes, which included treatment failure, death, or loss to follow-up. In contrast, controls were defined as DR-TB patients who achieved favourable treatment outcomes, which comprised cure or treatment completion.

**Study population and sample size determination**

| Comment |
|---------|
| Due to limited number of cases with unfavourable treatment outcomes, no sampling was needed for the case group. This is not clear please elaborate it. |

**Response**

Thank you for your feedback. I have clarified the explanation regarding the inclusion of the case group in the study.

**Amendment**

The original sentence:
Due to the limited number of cases with unfavourable outcomes, no sampling was needed for the case group.

The amended sentence (refer to para 1, Line 156 – 159):
Due to the relatively small number of registered DR-TB cases with unfavourable treatment outcomes (181 cases), no sampling technique was applied to the case group. The study included all these cases to ensure comprehensive representation and avoid loss of valuable data.

| Comment |
|---------|
| Cite with proper reference your operational definitions. |

**Response**

Thank you for your feedback. I have included references for the operational definitions used in the study.

**Amendment**

The references for DR-TB case definition or types of DR-TB:

1) WHO consolidated guidelines on tuberculosis, Module 4: Treatment – drug-resistant tuberculosis treatment, 2022 update. Geneva: World Health Organization; 2022. Available from: [https://iris.who.int/handle/10665/365308](https://iris.who.int/handle/10665/365308).

2) World Health Organization. Meeting report of the WHO expert consultation on the definition of extensively drug-resistant tuberculosis (XDR-TB), 2021. Geneva: World Health Organization; 2021. Available from: [https://www.who.int/publications/i/item/9789240018662](https://www.who.int/publications/i/item/9789240018662).

The reference for DR-TB treatment outcomes categories:

World Health Organization. Companion Handbook to the WHO Guidelines for the Programmatic Management of Drug-Resistant Tuberculosis. Geneva: World Health Organization; 2014. Available from: [https://iris.who.int/bitstream/handle/10665/130918/9789241548809_eng.pdf?sequence=1](https://iris.who.int/bitstream/handle/10665/130918/9789241548809_eng.pdf?sequence=1).
**Data collection**

| Comment | Response |
|---------|----------|
| Data were collected from two primary sources: NTBR and the line listing of DR-TB cases. What are the differences and similarities between the two data sources or clearly state their connection? | Thank you for your valuable feedback. Both sources contain overlapping information but serve different purposes and are collected in distinct ways. |
| | **1. National TB Surveillance Database (MyTB)** is a comprehensive centralised system for managing and monitoring TB cases and contacts across Malaysia. It includes detailed sociodemographic, clinical, laboratory, and treatment outcome information for all TB cases, including drug-resistant TB (DR-TB). The MyTB system is widely used at different levels of the Ministry of Health Malaysia and provides a broad view of TB data across regions. |
| | **2. Line listing of DR-TB cases** is a more specific dataset derived from the Tuberculosis Information System (TBIS) 10G and Drug-Resistant Tuberculosis Information System (DRTBIS) 50A-1. These systems are specialised for tracking DR-TB cases, particularly those who have failed first-line treatment or are undergoing DR-TB treatment. The line listing provides detailed data about the patient's risk factors, laboratory results, and treatment details, focusing on the management of DR-TB cases. |
| | The two sources share similarities, such as providing sociodemographic and clinical information, as well as treatment outcomes. However, the key difference lies in the scope: MyTB covers a broader range of TB cases, including both drug-sensitive and drug-resistant cases, whereas the line listing is focused specifically on DR-TB cases. These two data sources were used complementarily in this study to ensure a comprehensive understanding of the treatment outcomes and factors influencing DR-TB cases and to ensure no missing data. |

**Amendment**

The revised sentences (refer to para 2, line 207 – 216)

NTBR and the line listing share similarities, such as providing sociodemographic and clinical information, as well as treatment outcomes. However, the key difference lies in the scope: MyTB covers a broader range of TB cases, including both drug-sensitive and drug-resistant cases, whereas the line listing focuses specifically on DR-TB cases. These two sources were used complementarily to ensure comprehensive data collection and to avoid missing information.

| Comment | Response |
|---------|----------|
| A structured proforma checklist was used to guide data extraction, what is this not clear or is this relevant to your study? | Thank you for your comment. The use of a structured proforma checklist was indeed relevant and helpful in this study. It was designed to ensure data completeness, guide consistent data extraction, and minimise potential bias during data collection. By following the checklist, we were able to systematically collect and record key... |
information, such as sociodemographic characteristics, clinical details, DR-TB treatment specifics, treatment categories, and smoking history. This approach allows for accurate and organised data extraction, which contributed to the robustness of the study findings.

**Amendment**

**The original sentence:**

A structured proforma checklist was used to guide data extraction, focusing on sociodemographic characteristics, clinical details, DR-TB treatment specifics, treatment categories and smoking history.

**The revised sentence (refer para 3, line 214 – 215):**

A structured proforma checklist was used to guide data extraction, ensuring the completeness and consistency of the data collected.

**SECTION: RESULTS**

**9 Comment**

A total of 444 DR-TB cases were initially recorded in the NTBR database for Selangor and WPKL from 2016 to 2020. After excluding 19 cases due to missing or incomplete data, 425 cases met the study criteria. Among these, 244 cases (58.0%) had favourable treatment outcomes, while 181 cases (42.0%) had unfavourable outcomes. All cases with unfavourable outcomes were included, and 222 cases with favourable outcomes were selected through simple random sampling. Consequently, a total of 403 cases were analysed.

It is not clear how many cases and controls because with the ratio of 1:1.

**Response**

Thank you for your comment. I acknowledge that the ratio of cases to controls and the sampling approach may require further clarification. This study used a slightly unbalanced ratio of cases to controls (181:222) instead of a strict 1:1 ratio. This was due to the smaller number of cases available in the database to fulfil the required sample size 222 per group. Therefore, all registered cases with unfavourable outcomes were included. Meanwhile, a simple random sampling was used to select the controls to meet the calculated sample size 222. I have revised the relevant section for better clarity.

**Amendment**

Refer to Section Results (line 253 – 258):

**RESULTS**

Out of 444 registered DR-TB cases, 425 met the study criteria. Among these, 244 cases (58.0%) had favourable treatment outcomes, while 181 cases (42.0%) had unfavourable outcomes. All cases with unfavourable outcomes were included as the case group, while 222 cases with favourable outcomes were selected through simple random sampling for the control group. Consequently, a total of 403 cases were analysed. Unfavourable outcomes were primarily attributed to loss to follow-up (90 cases, 49.7%) and death (77 cases, 42.6%), as depicted in figure 2.
Figure two you tried to present the categories of unfavourable treatment outcomes among DR-TB cases in Selangor and WPKL. From the cases or control?????

**Response**

Thank you for your comment. I appreciate the need for clarification regarding Figure 2. The pie chart in Figure 2 specifically depicts the categories of unfavourable treatment outcomes among DR-TB cases in Selangor and WPKL from 2016 to 2020. This includes data exclusively from the cases group, as these outcomes are not relevant to the control group, which consists of patients with favourable treatment outcomes.

**Amendment**
The explanation given as above.

**Comment**

Table 3 Multiple logistic regression for factors associated with unfavourable treatment outcomes among DR-TB cases in Selangor and WPKL from 2016 to 2020 (n=403).

This is not clear How many variables run at the beginning?????

**Response**

Thank you for your feedback. I have clarified the number of variables included at the beginning of the analysis.

**Amendment**

Refer to subsection “Factors associated with unfavourable treatment outcomes of DR-TB cases” (line 299 – 303):

Simple and multiple logistic regression analyses were conducted to determine factors associated with unfavourable treatment outcomes among DR-TB cases (table 3). The univariable analysis identified 13 variables for inclusion in the multivariable analysis: age, gender, ethnicity, level of education, marital status, employment status, HIV status, smoking status, treatment category, chest x-ray status, diabetes mellitus, DOTS supervision, and DR-TB category.

**Comment**

This is good but still, it requires to discussion of your findings with current updates and adding possible scientific justifications.

**Response**

Thank you for your insightful comment. We appreciate the suggestion to enhance the discussion.

**Amendment**

In response, we have revised the discussion to provide a more comprehensive interpretation of our findings in the context of existing literature. Specifically, we have added relevant references to support discussion, comparing our findings with those of other studies. We have included scientific justifications for the observed trends. The updated references have been carefully selected to reflect the most current data and align with the evolving understanding of DR-TB treatment outcomes.
|   | Comment                                                                 | Response                                                                 | Amendment                                                                 |
|---|------------------------------------------------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------|
| 1 | Zaman, et al., “Determinants of unfavourable treatment outcomes of drug-resistant tuberculosis cases in Malaysia: a case-control study”  
• Consider reviewing the title wording for “unfavorable”; as in the text, these outcomes are considered adverse treatment outcomes.  
○ In fact, from my perspective, I would go with unfavorable or unsuccessful treatment outcomes. | Thank you for your concern regarding the title wording. We understand the importance of ensuring consistency and clarity between the title and the terminology used in the manuscript.  
**Amendment**  
The title has been maintained with consistent use of "unfavourable," as it aligns with the terminology adopted throughout the manuscript:  "Determinants of unfavourable treatment outcomes of drug-resistant tuberculosis cases in Malaysia: a case-control study." |  |
| 2 | Provide a brief background and include the objective as the last sentence. | Thank you for your constructive feedback. We have revised the section to include a brief background and have added the study objective as the concluding sentence.  
**Amendment**  
The revised introduction including objective (refer to line 22-27):  

The emergence of drug-resistant tuberculosis (DR-TB) complicates TB management and poses significant challenges to achieving favourable treatment outcomes. Treating DR-TB is more complex and costly, requiring extended treatment durations and consideration of drug toxicity and side effects. This study aims to identify the determinants of unfavourable treatment outcomes among drug-resistant tuberculosis (DR-TB) patients in Malaysia. |  |
| 3 | Suggest grouping Design, Setting, participants, and outcomes measures in one section of the methods. | Thank you for your suggestion to group the sections for design, setting, participants, and outcome measures. However, the journal's Instructions for Authors specify a structured abstract format that includes separate sections for these elements. To ensure compliance with these guidelines, we propose to retain the current structure.  
**Amendment**  
For clarity, please refer to the revised abstract sections for Design, Setting, Participants, and Outcome Measures. |  |
| 4 | Comment                                                                 | Response                                                                 | Amendment                                                                 |
|---|------------------------------------------------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------|
Define the cases and controls.

**Response**
Thank you for your feedback. The definitions of cases and controls have been included in the Participants section of the abstract for clarity.

**Amendment**

**The revised definitions for the case and control groups (refer to line 34-37):**

The case group consists of individuals with DR-TB who experienced unfavourable treatment outcomes, while the control group comprises individuals with DR-TB who achieved favourable treatment outcomes.

**Comment**

1. Adjusted OR would be better abbreviated to aOR.

**Response**

Thank you for your concern. The abbreviation "adjusted OR" has been updated to "aOR" throughout the manuscript for consistency and alignment with standard terminology.

**Amendment**

Significant determinants of unfavourable treatment outcomes included being male (aOR 2.38, 95% CI 1.44–3.94), being single or divorced (aOR 1.61, 95% CI 1.03–2.49), having no formal education (aOR 3.09, 95% CI 1.49–6.41), being human immunodeficiency virus (HIV) - positive (aOR 2.87, 95% CI 1.40–5.87), and having DR-TB categorised as RR-TB (aOR 3.34, 95% CI 1.90–5.86) or MDR/Pre-XDR/XDR-TB (aOR 2.57, 95% CI 1.52–4.33).

**Comment**

Prefer Person-First language, such as a person living with HIV instead of being human immunodeficiency virus (HIV)—positive.

**Response**

Thank you for your concern. This revised version incorporates Person-First language to align with inclusive and respectful communication standards.

**Amendment**

Significant determinants of unfavourable treatment outcomes included being male (aOR 2.38, 95% CI 1.44–3.94), being single or divorced (aOR 1.61, 95% CI 1.03–2.49), having no formal education (aOR 3.09, 95% CI 1.49–6.41), being a person living with HIV (aOR 2.87, 95% CI 1.40–5.87), and categorised as RR-TB (aOR 3.34, 95% CI 1.90–5.86) or MDR/Pre-XDR/XDR-TB (aOR 2.57, 95% CI 1.52–4.33).

**Comment**

“Comprehensive public health interventions are needed, including integrated HIV-TB management, community support, and tailored interventions, especially for severe DR-TB cases.”

The authors did not assess this in the study, did they?

**Response**

Thank you for your insightful comment. You are correct that the study did not specifically assess integrated HIV-TB management, community support, or tailored interventions for severe DR-TB cases. The conclusion has been revised to more accurately reflect the scope of the study, focusing on the determinants of unfavourable treatment outcomes in DR-TB patients.

**Amendment**

**The revised conclusion (refer to line 46-48):**
The findings reveal a high proportion of DR-TB cases with unfavourable treatment outcomes and identify their key determinants. Targeted interventions addressing these factors are essential to improving treatment outcomes.

SECTION: INTRODUCTION

8  Comment

Lines 8-12 – updated the WHO Global Report.

Response

Thank you for your suggestion. The manuscript has been updated to reflect the latest data from the WHO Global Tuberculosis Report 2024.

Amendment

The revised text is as below (refer to para 1, line 85-92):

Despite these ambitious goals, progress remains slow, as highlighted in the Global Tuberculosis Report 2024. Between 2015 and 2023, the global net reduction in the TB incidence rate was 8.3%, significantly below the WHO End TB Strategy milestone of a 50% reduction by 2025, while the net reduction in the global number of deaths caused by TB during the same period was 23%, almost one-third of the way to a 75% reduction by 2025. In 2023, an estimated 10.8 million worldwide contracted with TB, with Southeast Asia, including Malaysia, accounting for 45% of the total cases.0

9  Comment

Please clarify the last sentence of the first paragraph – I did not understand what the authors meant.

Response

Thank you for your observation. Under the previous classification, categories such as mono-resistant TB and poly-resistant TB were not mutually exclusive. This means a case could be categorised under more than one label depending on the specific drugs to which resistance was observed. However, in the current classification introduced by WHO in 2021, categories like HR-TB (isoniazid-resistant TB), MDR-TB, pre-XDR TB, and XDR TB are mutually exclusive. Each case of TB falls into only one category based on its resistance pattern. We acknowledge the ambiguity in the phrasing of the sentence and have revised it for better clarity.

Amendment

The revised sentence is as below: (refer to para 2, line 99-101):

This updated classification no longer includes mono- and poly-resistant TB as distinct categories, unlike the previous classification, where these categories overlapped.

10 Comment

Paragraph 3: suggest also adding the value in dollars for the two other values the authors described in MYR.

Response

Thank you for your suggestion. I have included the equivalent values in USD for the two other amounts mentioned in MYR, using the same conversion rate referenced in the other article (1 USD = MYR 3.05) to ensure consistency and facilitate comparison with published studies.

Amendment

By contrast, the economic impact of DR-TB is substantial, with estimated treatment costs of MYR 15,000 (USD 4,918.03) for a multidrug-resistant TB (MDR-TB) patient compared to MYR 250 (USD 81.97) for treating a susceptible TB patient.
In the last paragraph, the authors mentioned the “knowledge gap.” Which gap? Please provide some information in the previous paragraphs and re-word the sentences.

Response

Thank you for your valuable comment. I have revised the paragraph to provide a clearer focus on the study’s objectives.

Amendment

The revised last paragraph (refer to para 6, line 127 – 132):

Given the significant economic burden of DR-TB treatment and Malaysia’s low treatment success rate, it is imperative to identify and understand the determinants of unfavourable treatment outcomes. By examining sociodemographic and clinical factors associated with DR-TB cases in Malaysia from 2016 to 2020, this study aims to provide valuable insights that will inform strategies to improve treatment success and strengthen DR-TB control efforts nationwide.

SECTION: METHODS

12 Comment

Please clarify the study period. In the abstract, it is mentioned that it was from 2016, and 2020 and in methods, from December 2022 to May 2023. I understand that one would be the length of period the authors considered for inclusion and the other when the study was conducted, correct?

Response

Thank you for pointing out the discrepancy. We have clarified the distinction between the study period (2016 – 2020) and the data collection period (December 2022 – May 2023) in the abstract and methods section to avoid confusion.

Amendment

Refer to Study setting and subject recruitment (para 1, line 136 – 139):

The study included DR-TB cases registered in Selangor and Wilayah Persekutuan Kuala Lumpur (WPKL) between 2016 and 2020. Data collection and analysis were performed from December 2022 to May 2023.

Comment

Provide references for DR-TB case definitions and TB treatment outcomes definitions.

Response

Thank you for your comment. I have now included the appropriate references for the case definitions of DR-TB and treatment outcomes.

Amendment

The references for DR-TB case definition or types of DR-TB:

3) WHO consolidated guidelines on tuberculosis, Module 4: Treatment – drug-resistant tuberculosis treatment, 2022 update. Geneva: World Health Organization; 2022. Available from: https://iris.who.int/handle/10665/365308.

4) World Health Organization. Meeting report of the WHO expert consultation on the definition of extensively drug-resistant tuberculosis (XDR-TB), 2021. Geneva: World Health Organization; 2021. Available from: https://www.who.int/publications/i/item/9789240018662.

The reference for DR-TB treatment outcomes categories:
Comment
Please be consistent with the grouping definition: unfavorable or adverse treatment outcomes.

Response
Thank you for your valuable feedback. In response, I have standardised the terminology throughout the manuscript by replacing the term “adverse treatment outcomes” with “unfavourable treatment outcomes” to ensure consistency.

Amendment
Replacement of “adverse treatment outcomes” with “unfavourable treatment outcomes”

Comment
Does the TB Information System (TBIS) 10G and DRTBIS 50A-1 data overlap the NTBR? Or are they complimentary? Or even completely different databases?

Response
Thank you for your feedback. The TB Information System (TBIS) 10G and DRTBIS 50A-1 complement the National TB Registry (NTBR). While there is some overlap in the data provided by both systems—such as sociodemographic, clinical details, and treatment outcomes—each system serves a specific purpose. The NTBR provides a comprehensive database covering all TB cases across Malaysia, including drug-sensitive and drug-resistant TB. In contrast, TBIS 10G focuses on TB cases that have failed first-line treatment, and DRTBIS 50A-1 specifically registers DR-TB cases, regardless of treatment initiation. The line listing of DR-TB cases, derived from these two systems, offers more specific data for DR-TB management, which complements the broader data collected in the NTBR. These data sources were used complementarily to ensure completeness and accuracy, especially for DR-TB cases.

Amendment
Refer to Data collection (para 2, line 207 – 212):

NTBR and the line listing share similarities, such as providing sociodemographic and clinical information, as well as treatment outcomes. However, the key difference lies in the scope: MyTB covers a broader range of TB cases, including both drug-sensitive and drug-resistant cases, whereas the line listing focuses specifically on DR-TB cases. These two sources were used complementarily to ensure comprehensive data collection and to avoid missing information.

Comment
Data analysis: consider median and IQR (instead of mean) for continuous variables.

Response
Thank you for your valuable comment. I agree that the median and interquartile range (IQR) are more appropriate measures for continuous variables, especially in cases where the data is not normally distributed. As suggested, I have revised the analysis to report the median and IQR for age instead of the mean and standard deviation. This change reflects the non-normality of the data, as confirmed by the Shapiro-Wilk and Kolmogorov-Smirnov tests, both of which indicated a p-value < 0.001.
Refer to Statistical analysis (line 221 – 224):

Categorical variables were presented as frequency (n) and percentage (%). For continuous variables, the measures of central tendency and dispersion were selected based on the data distribution: mean and standard deviation (SD) were used for normally distributed data, while median and interquartile range (IQR) were reported for non-normally distributed data.

Refer to Results section under sociodemographic characteristics of DR-TB cases (line 261):

The median age of the patients was 39.00 years (IQR = 24.00).

Add the variables (and how they were measured). In the results, the authors mentioned chest X-rays, comorbidities (such as diabetes), DOT, and substance use (tobacco). How were these variables defined, captured, and used in the analysis?

Response

Thank you for your feedback. I have added the variable definitions and measurements in the manuscript.

Variable definitions and measurements

The variables captured in this study were obtained from the NTBR and line listings, with information provided by notifiers or medical practitioners. Chest x-ray results were classified into four categories: no lesion, minimal, moderate, and far advanced, based on radiological findings during diagnosis. Comorbidities data were extracted from medical records or history taking, with diabetes defined as a history of physician-diagnosed diabetes or ongoing diabetic treatment. Adherence to directly observed treatment (DOT) was categorised as supervised by healthcare workers, family members, no supervision, or others such as by non-governmental organisations (NGOs). Tobacco use was documented in the NTBR or line listings based on the patient's self-reported smoking history during history taking or existing clinical documentation by medical practitioners.

SECTION: RESULTS

Page 9: add numbers, percentages, and p values for the authors' results.

Response

Thank you for your feedback. I have added numbers, percentages, and p-values in the narrative part of the results section.

Refer to Results section under sociodemographic characteristics of DR-TB cases (line 261 - 287):

The median age of the patients was 39.00 years (IQR=24.00). Male patients constituted the majority (71.2%, p<0.001), and most were Malaysian citizens (79.7%). The Malay ethnic group made up the largest portion (49.6%), with no significant association observed between ethnicity and treatment outcomes (p=0.551). A significant proportion
of patients had education up to the secondary school level (51.6%), with a significant association between education level and treatment outcomes (p=0.047). Marital status (56.6% married, p=0.002) and employment status (52.6% employed, p=0.024) were also significantly associated with treatment outcomes. Specifically, unmarried and unemployed patients had a higher proportion of unfavourable outcomes.

Clinically, diabetes was slightly prevalent in the unfavourable outcome group (24.9%) compared to the favourable outcomes group (22.5%), but the association between diabetes and treatment outcomes was not significant (p=0.582). DR-TB cases among person living with HIV were more likely to experience unfavourable outcomes, with 18.2% of the unfavourable group being HIV-positive, compared to 5.9% in the favourable group (p<0.001). Smokers were also more prevalent among those with unfavourable outcomes (42.5%) than those with favourable outcomes (30.2%) (p=0.010). The favourable outcome group had a higher proportion of new cases compared to retreatment cases, whereas the unfavourable outcome group had more retreatment cases (56.4%) (p=0.024). Smear positivity was common in both groups, with a slight tendency towards more negative smear results in the favourable outcome group, though this difference was not significant (p=0.731). Regardless of the outcome, most patients had minimal lesions on chest X-rays; however, those with unfavourable outcomes exhibited more moderate to advanced lesions compared to the favourable outcome group (p=0.017). HR-TB cases were predominant in the favourable outcome group, while MDR/Pre-XDR/XDR-TB cases were more common in the unfavourable outcome group (p<0.001). Directly observed treatment (DOT) supervision was mainly provided by healthcare workers. Both the sociodemographic and clinical characteristics are detailed in table 1.
Refer to subsection *Factors associated with unfavourable treatment outcomes of DR-TB cases* (para 2, line 306 – 307):  
Confounding variables, including age, sex, HIV status, and DR-TB category, were controlled to ensure robust findings.

**SECTION: DISCUSSION**

**Comment**

Please review the sentence: “facing unpleasant side effects from treatment, high healthcare costs, stigma and discrimination, all of which further impair their quality of life and financial circumstances”. It is out of context – the authors did not measure, or even talk about it before.

**Response**

Thank you for your feedback. I have replaced it with a more relevant context of the study.

**Amendment**

The revised text (refer to para 1, line 329 – 332):

The most vulnerable and underprivileged people in society are frequently affected by DR-TB, with sociodemographic factor plays a significant role in treatment outcomes. These factors, alongside clinical considerations, should be thoroughly addressed to improve patient care and achieve better treatment outcomes.

**Comment**

Page 12, line 26, please remove “adjOR 2.38, 95% CI 1.44 to 3.94, p = 0.001”, as well as in line 53, and 57. From my perspective, the discussion section is not a place for numbers from the analysis.

**Response**

Thank you for your feedback. I understand your concern regarding the inclusion of specific numerical values in the discussion section. Based on your suggestion, I have removed the statistical details from the discussion. The revised text now focuses on the key findings and their implications without the inclusion of specific numbers.

**Amendment**

There are four places with statistical values in the discussion, as listed below:

1) Male patients had a higher risk of unfavourable treatment outcomes compared to females. (Para 2, Line 337 – 338)
2) Being single or divorced increases the odds of unfavourable treatment outcomes compared to married patients. (Para 3, 352 – 354)
3) DR-TB patients with no formal education have higher odds of unfavourable outcomes compared to those with a tertiary education level. (Para 4, Line 362 – 363)
4) Our study highlights that DR-TB cases with HIV co-infection are more likely to experience unfavourable treatment outcomes compared to HIV-negative cases. (Para 5, Line 371 – 372)

**LIMITATIONS**

**Comment**

Add Strengths in the subtitle too – “Limitations and Strengths”  
- this section needs revision, especially the strengths section

**Response**
Thank you for your valuable feedback. I have revised the "Limitations" section and added a "Strengths" section to provide a more balanced view of the study. The revised section now includes both limitations and strengths, as requested.

**Amendment**

**Added points for “strengths”:**

The study has several key strengths. The study's focus on Selangor and WPKL, two states in Malaysia with a high DR-TB burden, makes the findings particularly relevant and offers valuable insights applicable to other regions. The study's design enabled the identification of critical sociodemographic and clinical determinants associated with unfavourable treatment outcomes. Using multiple logistic regression, the analysis effectively controlled for confounding variables and identified independent factors associated with DR-TB treatment outcomes through a stepwise selection and refinement process. This study significantly contributes to the expanding literature on DR-TB in Malaysia and globally, offering a model that can be replicated in other contexts.

**Comment**

Page 14, lines 26-17: “suggests exploring video-assisted treatment (VOT) as a viable alternative.” This just showed up here. Please review. It sounds out of context.

**Response**

Thank you for pointing this out. I understand that the mention of video-assisted treatment (VOT) may appear out of context, as it was not discussed earlier in the manuscript. I will remove this suggestion or provide a clearer justification for its inclusion, ensuring that it aligns with the study’s objectives and findings.

**Amendment**

The following sentence has been removed from Limitations and strengths section:

“Nonetheless, the study highlights the importance of DOT supervision and suggests exploring video-assisted treatment (VOT) as a viable alternative.”

**Comment**

Page 14, lines 29-33: “Finally, improving communication on treatment outcome updates between treatment centres and district health offices is essential for effectively tracking defaulters and transfer cases.” Please review.

**Response**

Thank you for your feedback. I acknowledge that the sentence about improving communication between treatment centres and district health offices might not be fully connected to the rest of the discussion. The sentence has been removed from the limitations and strengths section.

**Amendment**

The following sentence has been removed from Limitations and strengths section:

“Finally, improving communication on treatment outcome updates between treatment centres and district health offices is essential for effectively tracking defaulters and transfer cases.”

**SECTION: CONCLUSION**

**Comment**

Needs careful review.

**Response**

Thank you for your concern. I have carefully reviewed and refined the conclusion to ensure clarity and relevance to the study findings.
The revised conclusion (refer to line 444-452):

This study identifies key factors associated with unfavourable treatment outcomes in DR-TB cases in Malaysia, including sex, education level, marital status, HIV co-infections, and DR-TB categories. Addressing these determinants is crucial for improving treatment outcomes. Implementing male-friendly approaches and providing tailored support for single or divorced patients can enhance treatment adherence. Strengthening health education through advanced technology, diverse platforms, and community partnership, alongside routine HIV testing for TB patients and TB screening for person living with HIV, can support early diagnosis and integrated care. These findings offer valuable insights to guide policymakers in enhancing TB control efforts and patient management strategies.

Comment

How do the authors plan to address the issue of sex? Marital status?

Response

Thank you for raising these important points. I have elaborated on specific, actionable strategies to address these issues, such as implementing male-friendly approaches to improve access and support and tailoring interventions to provide additional support for single or divorced patients.

The points to address the issue of sex (specifically male patients) and marital status (single or divorced patients) (refer to line 447-448):

Implementing male-friendly approaches and providing tailored support for single or divorced patients can enhance treatment adherence.

Comment

Implementing a mandatory HIV test does not sound good.

Response

Thank you for your comment. I understand the sensitivity of mandatory testing. The recommendation has been revised to focus on encouraging routine HIV testing for TB patients and vice versa, in line with existing WHO guidelines and best practices, while respecting patient autonomy and confidentiality.

The revised sentence for HIV testing (refer to line 448-451):

Strengthening health education through advanced technology, diverse platforms, and community partnership, alongside routine HIV testing for TB patients and TB screening for persons living with HIV, can support early diagnosis and integrated care.

REFERENCES

Comment

Update the WHO Global TB Report reference.

Response

Thank you for your feedback. I have updated the reference to the latest WHO Global TB Report 2024.

This is the updated reference:

World Health Organization. Global Tuberculosis Report 2024. Available from:
Add references for DR-TB cases definition and TB treatment outcomes definitions.

Response
Thank you for your feedback. I have added the references as suggested.

Amendment
The reference for DR-TB case definition or types of DR-TB:

WHO consolidated guidelines on tuberculosis, Module 4: Treatment – drug-resistant tuberculosis treatment, 2022 update. Geneva: World Health Organization; 2022. Available from: https://iris.who.int/handle/10665/365308.

The reference for DR-TB treatment outcomes categories:

World Health Organization. Companion Handbook to the WHO Guidelines for the Programmatic Management of Drug-Resistant Tuberculosis. Geneva: World Health Organization; 2014. Available from: https://iris.who.int/bitstream/handle/10665/130918/9789241548809_eng.pdf?sequence=1.

FIGURES AND TABLES

Comment
Figure 1. I suggest removing the last two bars (Data analysis and write-up and research project submission) as they may pollute the figure and be uninformative.

Response
Thank you for your suggestion. We agree that the last two bars should be removed.

Amendment
The last two bars have been removed from “Figure 1 Flow chart of the study”.

Comment
Suggestion: merge table 1 with table 2, as they provide the characteristics for both groups. Maybe re-wording the title to “Sociodemographic and clinical characteristics”, or even “Characteristics of the study population”.

Response
Thank you for your suggestion. We agree that merging Tables 1 and 2 would streamline the presentation of the study population’s characteristics. We will combine the two tables and revise the title to “Characteristics of the study population” to more accurately reflect the content.

Amendment
Table 1 and 2 have been merged into one table. The title has been revised to “Characteristics of DR-TB cases in Selangor and WPKL from 2016 to 2020 (n=403)”.

Comment
Table 3. It would be great to see the ROC curves, even if as a supplement file.

Response
Thank you for your suggestion. We understand the importance of including the ROC curves to visualise the model’s performance. We will include the ROC curves as a supplementary file for a more comprehensive presentation of the analysis.

Amendment
The ROC curve has been included in the supplementary file.

SUPPLEMENTS
34 Comment
Suggest adding the ROC curves and any other models the authors developed.
Response
Thank you for your suggestion. We appreciate your input. In response, we will add the ROC curve to the supplementary file.
Amendment
The ROC curve has been included in the supplementary file.

OVERALL
35 Comment
English review is needed – e.g., unfavourable, categorisation.
Response
Thank you for highlighting this. We will have the manuscript undergo a thorough English review to address any terminology, grammar, and clarity issues. This will ensure that the language is clear and consistent throughout the manuscript.
Amendment
A thorough English review has been completed.
36 Comment
Improve the discussion, limitations, and especially the conclusions.
Response
Thank you for your constructive feedback. We will revise the discussion to more effectively interpret and discuss the findings in light of existing literature. The limitations section will be clarified, and the conclusions will be refined to make it more concise and relevant. We will emphasise the practical implications of the study’s findings for policy and future research directions.
Amendment
The discussion, limitations and conclusions sections have been revised.

VERSION 2 - REVIEW

Reviewer 1
Name Weldegebreal, Fitsum
Affiliation Haramaya University, Medical Laboratory Sciences
Date 06-Jan-2025
COI
All address properly

Reviewer 2
Name Ridolfi, Felipe
Dear authors,

Thank you for submitting your revised study. It has significantly improved! The reading flows more easily now, and the information is clear and well-written. Great job! However, I still have some minor suggestions, as outlined below:

Overall

• Suggest being consistent with the abbreviations and definitions (such as people living with HIV vs HIV-positive) throughout the text. Prefer person-first language.
• Minor English review needed.

Results

• Figure 1. Review the numbers in the last boxes (Study sample).
• Figure 2. Suggest adding an “n” close to the number of participants. Such as: “N=77, 42.6%”
• Review IQR for age median
• Lines 268-269: suggest adding the proportions of unfavorable outcomes among unmarried and unemployed.
• Table 1. Review the IQR for age. Highlight the significant p-values (maybe bold?)

Discussion

• I suggest removing this sentence: “Shorter treatment durations, when appropriate, may improve adherence and treatment outcomes by reducing side effects and preventing further transmission.”

Conclusion

• Review the conclusion. I suggest focusing on what the authors found in the study. It’s tricky to propose solutions based on the results of a retrospective case-control study.

VERSION 2 - AUTHOR RESPONSE
Reviewer 1:
Mr. Fitsum Weldegebreal
Haramaya University, Ghent University Faculty of Sciences

| OVERALL |
|---------|
| 1       |
| **Comment**       | All address properly. |
| **Response**       | Thank you for your insightful comments and constructive feedback, which have greatly contributed to improving the manuscript. |
| **Amendment**    | No further amendments were made for this section as all comments have been addressed in the revised submission. |

Reviewer 2:
Dr. Felipe Ridolfi
Vanderbilt University Medical Center, Fundação Oswaldo Cruz

| OVERALL |
|---------|
| 1       |
| **Comment**       | Suggest being consistent with the abbreviations and definitions (such as people living with HIV vs HIV-positive) throughout the text. Prefer person-first language. |
| **Response**       | Thank you for your suggestion. We have revised the manuscript to ensure consistency in the use of abbreviations and definitions, particularly with respect to HIV terminology. |
| **Amendment**    | In line with the preference for person-first language, we have replaced “HIV-positive” with “people living with HIV” throughout the manuscript. This change ensures respectful and consistent language when referring to individuals with HIV. |
| 2       |
| **Comment**       | Minor English review needed. |
| **Response**       | Thank you for your feedback. We carefully reviewed the manuscript for language and clarity, and made the necessary amendments. The research team members conducted the review. |
| **Amendment**    | We have conducted a final review of the manuscript, addressing any minor English language issues for better clarity and readability. |

SECTION: RESULTS

| 3       |
| **Comment**       | Figure 1. Review the numbers in the last boxes (Study sample) |
| **Response**       | |

Thank you for pointing this out. We apologise for the mistake. We incorrectly put the number of unfavourable group cases in the last box at 222. The accurate number of cases is 181.

**Amendment**

We have amended Figure 1 to reflect the correct number of unfavourable group cases, now put as 181 instead of the previously incorrect 222.

**Comment**

Figure 2. Suggest adding an “n” close to the number of participants. Such as: “N=77, 42.6%”

**Response**

Thank you for your suggestion. We have added “N” close to the number of participants in Figure 2 as recommended for clarity.

**Amendment**

We have amended Figure 2 to include “N” next to the number of participants, as suggested.

**Comment**

Review IQR for age median.

**Response**

Thank you for pointing this out. After thoroughly reviewing the dataset and statistical outputs, we confirm that the reporting the age using the median (IQR) is appropriate. In addition to histogram, the Shapiro-Wilk test (statistic = 0.975, p<0.001) and Kolmogorov-Smirnov test (statistic = 0.087, p<0.001) both indicate the data is not normally distributed. In this context, the median (39 years) and the interquartile range (IQR = 24 years, calculated as 52 - 28) provide robust measures of central tendency and variability that are less influenced by outliers or non-normality in the data.

**Amendment**

We have ensured that the correct IQR (24 years) is used in reporting age, which is derived from 25th percentile (28 years) and 75th percentile (52 years) values in the dataset. The updated reporting uses whole numbers for clarity: “The median age of the patients was 39 years (IQR=24 years).”

**Comment**

Lines 268-269: suggest adding the proportions of unfavourable outcomes among unmarried and unemployed.

**Response**

Thank you for your suggestion. We appreciate the feedback and have revised the text accordingly to include the proportions of unfavourable outcomes among unmarried and unemployed cases for a more comprehensive view.

**Amendment**
We have included the specific proportions for unmarried (51.4%) and unemployed (53.6%) individuals to highlight their higher proportions of unfavourable treatment outcomes.

Amended sentence (refer to line 268-269)

“Specifically, unmarried (51.4%) and unemployed (53.6%) patients had higher proportions of unfavourable outcomes.”

Table 1. Review the IQR for age. Highlights the significant p-values (maybe bold?)

Response
Thank you for your concern. We have thoroughly reviewed the age data and confirm that the median (IQR) values are correctly reported as follows:

- Favourable group: 37.50 years (IQR = 25.00 years)
- Unfavourable group: 42.00 years (IQR = 22.00 years)

To enhance clarity and consistency, we have updated the median (IQR) values to whole numbers.

Significant p-values (<0.05) in the table have been highlighted in bold for better visibility.

Amendment
1) Highlighted significant p-values (<0.05) in bold for clarity in Table 1.
2) Rounded the median (IQR) values to whole numbers for consistency:
   - Favourable group: 38 years (IQR = 25)
   - Unfavourable group: 42 years (IQR = 22)

SECTION: DISCUSSION

Comment
I suggest removing this sentence: “Shorter treatment durations, when appropriate, may improve adherence and treatment outcomes by reducing side effects and preventing further transmission.”

Response
Thank you for your suggestion. We have removed the sentence as recommended.

Amendment
The sentence has been removed from the discussion section in accordance with the reviewer’s suggestion.

SECTION: CONCLUSION

Comment
Review the conclusion. I suggest focusing on what the authors found in the study. It’s tricky to propose solutions based on the results of a retrospective case-control study.

Response
Thank you for your valuable feedback. We have revised the conclusion to focus on the key findings of the study while avoiding direct proposals for solutions.

Amendment
The conclusion has been updated as follows:

This study identifies key factors associated with unfavourable treatment outcomes in DR-TB cases in Malaysia, including sex, education level, marital status, people HIV status, and DR-TB categories. These findings highlight the importance of addressing both sociodemographic and clinical determinants to improve treatment outcomes. The insights gained from this study can assist policymakers in understanding the challenges faced by patients with DR-TB and guide future strategies for tuberculosis control and prevention efforts.