

# SYSTEMATIC REVIEW OF DETERMINANTS OF HEALTH-RELATED QUALITY OF LIFE (HRQoL) AFFECTING WELL-BEING OF PULMONARY TUBERCULOSIS (PTB) PATIENTS

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## ABSTRACT

**Background:** Pulmonary Tuberculosis (PTB) is an infectious disease and still a global public health issue. PTB affects not only the patients' physical health, but also on their mental and social wellbeing. The health program in TB management routinely focuses on bacteriological markers of response and on outcomes such as cure, mortality and treatment failure. However, there are various aspects that may lead to a poor HRQoL. Thus, an evaluation of Health-related Quality of Life (HRQoL) and its determinants has become an important health outcome and an area of concern for policy makers, health care professionals and researchers.

The objective of this systematic review is to determine how PTB affects patients' HRQoL and to identify the determinants of affected HRQoL.

**Materials and Methods:** Systematic review of the published literature was conducted. Original studies providing information on PTB affecting the HRQoL were identified. The search terms used were "Health-related Quality of Life", "Determinants", "Pulmonary Tuberculosis" and "Patients". The articles selected were rated using items extracted from the STROBE Statement checklist.

**Result:** After screening, 21 articles were used for the systematic review; findings were discussed in terms of the study design, participants, results, remarks and the quality of the article (Table 1).

**Conclusion:** Pulmonary Tuberculosis (PTB) does impair the Health-related Quality of Life (HRQoL) among the patients; namely the physical, mental and social components.

**Keywords:** Health-related Quality of Life (HRQoL), Determinants, Pulmonary Tuberculosis.

## 1.0 Introduction

Pulmonary Tuberculosis (PTB) is an infectious disease caused by bacteria of the *Mycobacterium* group. Pulmonary tuberculosis affects the lungs and it is the most common active form of tuberculosis (TB). Worldwide, as in year 2016, 52% of total new TB cases were PTB cases, with bacteriological confirmation (WHO, 2017).

Health-related Quality of Life (HRQoL) is defined as “the extent to which patient’s subjective perception of physical, mental and social wellbeing that are affected daily by a specific disease and its treatment (Khan et al., 2017). It is known that patients with chronic diseases, including pulmonary tuberculosis (PTB), in addition to pure physical health also place high value on their mental and social wellbeing. As a result, evaluation of HRQoL has become an important health outcome and an area of concern for policy makers, health care professionals and researchers (Khan et al., 2017).

In clinical research, HRQoL has become an accepted outcome measure. The health program routinely focuses on bacteriological markers of response and on outcomes such as cure, mortality and treatment failure. However, there are various aspects that may lead to a poor HRQoL. These affected domains include physical, mental and social of the patients.

Physical and mental distress is found to be common in PTB patients and as a result leading to poor disease outcome or poor treatment outcome (Louw et al., 2016). Physical functioning reflects the capacity of the patient to carry out basic daily activities, while psychological health deals with the individual's mood and emotional well-being. The disease also moderately affects the daily activities of the patients, as most patients are worried, frustrated, or disappointed by the diagnosis, and almost a quarter in denial of their diagnosis (Louw et al., 2016). Pulmonary tuberculosis patients believe themselves to be at risk of stigma-related social and economic consequences, making the individual feel rejected and isolated from their relatives and friends (Ramkumar et al., 2016).

From the literatures, determinants or factors that affect the patient’s HRQoL in TB include 1) socio-demographic factors like age, gender, marital status, and smoking; 2) socio-economic factors like income, education, home residence, and employment; 3) disease-related factors such as the symptoms, types of TB, and the severity; and 4) therapy-related factors like side effects and adverse events.

The objective of this systematic review is to determine how PTB affects patients’ HRQoL and to identify its determinants.

## 2.0 Materials and Methods

Systematic review of the published literature was conducted. Original studies providing information on PTB affecting the HRQoL were identified through a computerized search using databases of Medline, Pubmed, and Google Scholar with detailed search-strategy and crosschecking of reference lists. The search terms used to search the database were “Health-related Quality of Life”, “Determinants”, “Pulmonary Tuberculosis” and “Patients” were used as a combination of free text and thesaurus terms in different variations.

Eligibility criteria for articles to be included in the systematic review were if they provided information on the HRQoL among PTB patients. Original studies, published from 2009 – 2019, and written in English language were considered. Comments, editorials and reviews were excluded. Studies were excluded from the analysis for any of the following reasons: non-related with the objective of the systematic review; studies on Extra-PTB; studies with other diseases; studies on the development and testing of HRQoL instruments; meta-analyses or systematic reviews; duplicate publication of the same study; and articles available only in abstract form and the inaccessible articles. The selection of articles for review was done in three stages: titles alone, abstracts, and then full-text articles.

The articles selected will be rated, a quality rating score using a 3-point scale (2 being well-described, 1 poorly described, and 0 not described in article) for each of the following eight attributes: study population, sampling mechanism, accounting for potential subjects not included in the analyses, quality check of responses, explicit description of HRQoL instruments, data entry check, training of interviewers, and discussion of study strengths and limitations. These eight items were extracted from the STROBE Statement—checklist of items that should be included in observational studies based on study characteristics anticipated to vary widely across studies, with particular focus on methods and results [48]. Summary quality ratings were calculated by summing the scores for each of these eight categories; the minimum and maximum possible scores were 0 and 16, respectively.

### 3.0 Result

A total of 205 original articles were identified from the search method. Of these, 159 articles were excluded after screened by titles and abstracts. Of the remaining 49 articles, full text screening was done. Those that were duplicated studies, and those that were case reports, reviews, or inaccessible studies were excluded. Finally 21 articles were used for the systematic review. The PRISMA flow diagram below shows the flow of the study selection.

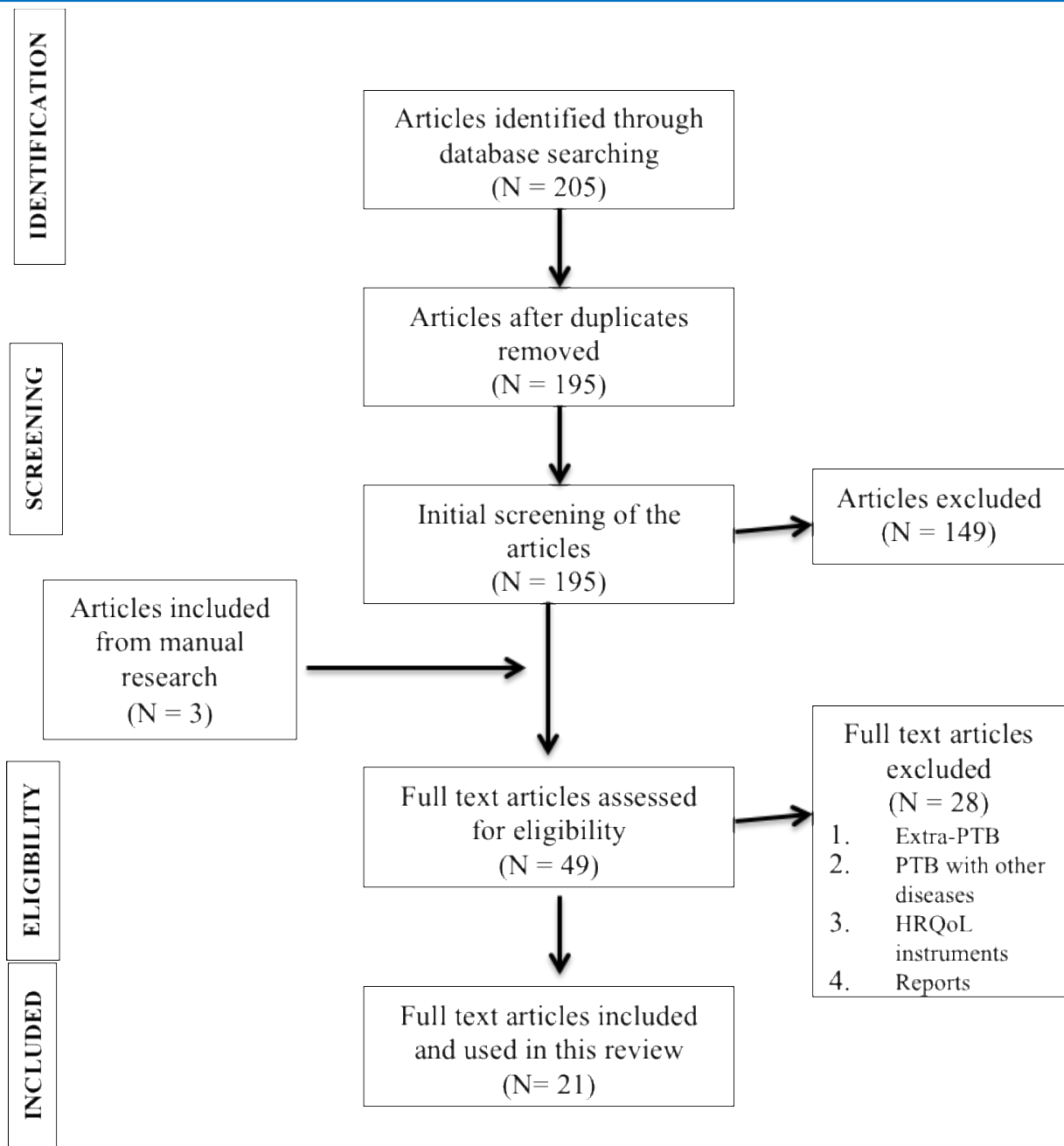


Figure 1: Prisma Flow Diagram for the Systematic Review of PTB affects on HRQoL literatures

The final 21 selected articles were summarized as in the Table 1 shown below.

**Table 1:** Systematic review on how tuberculosis affecting the quality of life

No.	Authors, Year, Country	Title, Study Design, Number of Participants	Results	Remarks	Quality of Article (STROBE Checklist Scores)
1.	Suzuki, T. et al., 2019 Japan	Improved cough- and sputum-related quality of life after initiation of treatment in pulmonary tuberculosis  Prospective cohort study  Hospitalized participants  85	The LCQ and CASA-Q scores were improved from admission until discharged.  The change in the mean LCQ total scores was 2.28 (95% CI: 1.56 - 3.00). The changes in the mean CASA-Q cough symptoms, cough impacts, sputum symptoms and sputum impacts scores were 22.84 (18.44 – 27.25), 10.96 (7.20 – 14.71), 17.25 (13.33 – 21.18), and 5.25 (2.48 – 8.00) respectively.	Younger age, more than two cavitary lesions, and the presence of bronchial TB were associated with reduced LCQ total score.	6/16
2.	Dhelaimi, G. O. et al., 2018 Saudi Arabia	Multidimensional Health-Related Quality-of-Life Among Patients with Pulmonary Tuberculosis in Saudi Arabia  Cross-sectional study  Non-hospitalized participants  87	The overall HRQoL of the respondents was poor, with a mean score of 85.43 (SD = 24.97).  The physical well-being had a mean score of 21.29 (SD = 12.25, range; 0.00 - 44.00); the social and economic well-being, emotional well-being/ stigma of having TB, functional wellbeing, and spiritual well-being had mean scores of 17.12 (SD = 6.33, range; 0.00 - 26.00), 18.74 (SD = 10.35, range; 0.00 - 39.00), 20.69 (SD = 7.56, range; 0.00 - 28.00), and 7.60 (SD	Age, smoking status, TB duration, experience of travelling outside KSA, and education were significant association to HRQoL.	9/16

			= 3.28, range; 0.00 - 12.00).		
3.	Saleem, S. et al., 2018 Pakistan	Health-related quality of life among pulmonary tuberculosis patients in Pakistan  Cohort study  Non-hospitalized participants  226	EQ-5D health utility and EQ-VAS scores increased with treatment progression. The mean EQ-5D utility scores more than doubled from 0.43 to 0.88, $p < .001$ , from treatment initiation to treatment completion.	Females reported lower scores before treatment than males, however, by the end of treatment they reported similar scores.	9/16
4.	Dar, S. A. et al., 2018 India	A prospective study on Quality of Life in Patients with Pulmonary Tuberculosis at a Tertiary Care hospital in Kashmir, Northern India  Cohort study  Non-hospitalized participants  198	Patients scored lowest in the baseline physical ( $8.36 \pm 1.60$ ) followed by the psychological domain ( $10.40 \pm 1.72$ ). At the end of intensive phase both physical ( $11.98 \pm 1.70$ ) and psychological ( $12.75 \pm 1.1$ ) domains improved.	No associating factors with HRQoL were discussed.	8/16
5.	Nair, V. et al., 2018 India	A Cross-Sectional Study On The Health Related Quality Of Life In Patients Who Complete Treatment For Pulmonary Tuberculosis  Cross-sectional study  Non-hospitalized participants  443	PTB patients have poor quality of life scores. St Georges Respiratory Questionnaire (SGRQ) scores were higher in the study subjects. The mean SGRQ scores for symptom, activity and impact were 22.44, 33.02 and 19.44.	HRQoL had good correlation with chest x-ray findings and spirometric analysis. Thus, post treatment pulmonary rehabilitation is important.	9/16
6.	Malik, M. et al., 2018 Pakistan	Health Related Quality of Life among TB Patients: Question Mark on	Highest HRQoL scores for the physical functioning ( $60.03 \pm 25.779$ ), lowest HRQoL scores	The study highlighted that age and literacy affects the HRQoL. Thus,	9/16

		Performance of TB DOTS in Pakistan	for the general health ( $34.97 \pm 14.286$ ).  The disease had a negative impact on HRQoL across all domains.	intervention focusing on health educational programs is recommended.	
		Cross-sectional study			
		Non-hospitalized participants			
		382			
7.	Kastien-Hilka, T. et al., 2017	Health-related quality of life in South African patients with pulmonary tuberculosis	HRQoL was impaired in all physical, mental and psychosocial health domains before treatment.	Younger, higher education and employed patients had a better HRQoL.	11/16
	South Africa				
		Cohort study	HRQoL improved significantly during the TB treatment. The greatest improvement (95%) was observed in mental health.		
		Non-hospitalized participants			
		131			
8.	Ting-Li et al., 2017	Evaluation of health-related quality of life in patients with tuberculosis who completed treatment in Kiribati	PTB patient had a higher physical component summary (PCS) score and mental component summary (MCS) score than the comparison group.	Older age and persistent symptoms after completion of DOTS were related to a lower PCS score.	8/16
	Kiribati				
		Cross-sectional study		Patients who were smear-positive had higher MCS scores than those who were smear-negative.	
		Non-hospitalized participants			
		206			
9.	Singh, S. K. et al., 2016	Improvement in quality of life in pulmonary tuberculosis patients: a prospective study	HRQoL is impaired and shows significant improvement with the treatment.	Socio-demographic variables were comparable in both groups.	5/16
	India				
		Prospective case-control study	All domains scores were significantly low as compared to controls at the 0 and 2 months of treatment, but significant improvement with DOTS treatment.		
		Non-hospitalized participants			
		50			

			At the end of treatment the psychological and social domain scores remained low.		
10.	Kisaka, S. et al., 2016 Uganda	Does health-related quality of life among adults with pulmonary tuberculosis improve across the treatment period? A hospital-based cross sectional study in Mbale Region, Eastern Uganda  Cross-sectional study  Both hospitalized and non-hospitalized participants  210	HRQoL scores were different across treatment phases.  General health ( $38.8 \pm 17.5$ ) and mental health ( $52.7 \pm 18.6$ ) had the lowest and highest sub-scale scores respectively.  Mean PCS scores in pretreatment, intensive and continuation phases were $29.9 \pm 19.4$ , $41.9 \pm 14.2$ and $62.2 \pm 18.8$ respectively.  Mean MCS scores in the pretreatment, intensive and continuation phases were $38.8 \pm 18.3$ , $49.4 \pm 13.1$ and $60.6 \pm 18.8$ respectively.	Having an informal occupation ( $\beta = -28.66$ ( $<0.001$ )) was associated with poor HRQoL.  Unmarried ( $\beta = 11.94$ , $p = 0.028$ ) and had higher socioeconomic status (SES) ( $\beta = 14.56$ , $p = 0.007$ ) were associated with good HRQoL in the intensive phase.  In the continuation phase, SES ( $\beta = 10.83$ , $p = 0.021$ for MCS and $\beta = 13.14$ , $p = 0.004$ for PCS) predicted good HRQoL.  Older age ( $\beta = -0.43$ $p = 0.013$ for PCS and $\beta = -0.36$ $p = 0.040$ for MCS) was associated with poor HRQoL.	9/16
11.	Louw, J. S. et al., 2016 South Africa	Change in Health-Related Quality of Life among Pulmonary Tuberculosis Patients at Primary Health Care Settings in South Africa: A Prospective Cohort Study	After treatment there was a significant improvement in HRQoL with the biggest increase in the PCS.	A higher education had a significant positive effect on the mental HRQoL.  Psychological distress showed a significant negative	9/16



		Prospective cohort study		association with physical and mental HRQoL.	
		Non-hospitalized participants			
		1196			
12.	Ramkumar et al., 2016	Health-related quality of life among tuberculosis patients under Revised National Tuberculosis Control Programme in rural and urban Puducherry	The HRQoL of TB patients were low.  The mean HRQoL scores had improved upon completion of DOTS ( $80.8 \pm 20.3$ ), when compared to HRQoL scores ( $48.3 \pm 30$ ) during treatment.	Socio-demographic characteristics were matched.	5/16
	India	Prospective case-control study	The HRQoL scores of TB patients after DOTS completion ( $80.8 \pm 20.3$ ) had improved to levels comparable to non-TB controls ( $77.5 \pm 29.1$ ).		
		Non-hospitalized participants			
		92			
13.	Kibrisli, E. et al., 2015	High Social Anxiety and Poor Quality of Life in Patients With Pulmonary Tuberculosis	PTB patients reported lower HRQoL scores across all dimensions.	Women rather than men, and the subjective fear of social exclusion seems to be related with perceived illness severity of these patients.	7/16
	Turkey	Case-control study			
		Hospitalized participants			
		193			
14.	Dujaili, J. A. et al., 2015	Health-related quality of life as a predictor of tuberculosis treatment outcomes in Iraq	After treatment, physical well-being, functional well-being, and the overall total scores were increased ( $p < 0.01$ ).	There is a significant relationship between educational level, financial status and smoking with the HRQoL of patients with TB.	8/16
	Iraq	Prospective cohort study	At completion of TB treatment, there were improvements in the overall HRQoL in all subscales, except		
		Non-hospitalized participants			

		305	social and economic well-being and spiritual well-being.		
15.	Bauer, M. et al., 2015 Canada	Health-related quality of life and tuberculosis: a longitudinal cohort study  Cohort study  Non-hospitalized participants  263	TB disease is associated with decrements in HRQoL.  TB patient reported worse mean scores at baseline compared to control participants (mean PCS scores: 50.0 vs. 50.7; mean MCS scores: 46.4 vs. 51.1), with improved mean MCS scores throughout the study period.	The study is the first to evaluate HRQoL of TB patients, LTBI, and an untreated comparison group at each milestone of treatment.  Diagnosis and treatment for LTBI had a minimal impact on HRQoL.	8/16
16.	Kakhki, A. D. et al., 2015 Tehran	Factors Associated with Health-Related Quality of Life in Tuberculosis Patients Referred to the National Research Institute of Tuberculosis and Lung Disease in Tehran  Cross-sectional study  Non-hospitalized participants  205	The HRQoL scores in different domains ranged from $14.68 \pm 11.60$ for role limitations due to emotional problems to $46.99 \pm 13.25$ for general health perceptions.	The variables of sex, marital status, education, job status, place of residence, and cigarette smoking, influenced the HRQoL scores.	5/16
17.	Atif, M. et al., 2014 Penang, Malaysia	Impact of tuberculosis treatment on health-related quality of life of pulmonary tuberculosis patients: a follow-up study  Prospective cohort study  Non-hospitalized participants	The mean PCS scores at the start, after the intensive phase and at the end of treatment were 41.9 (SD 5.1), 45.8 (SD 4.8) and 46.0 (SD 6.9), respectively.  The mean MCS scores were 39.9 (SD 7.3), 45.0 (SD 6.8) and 46.8 (SD 7.8), respectively.  Even HRQoL	Patient's age and being a smoker were predictive of differences in the overall PCS scores.  Monthly income, smoker and number of TB-related symptoms at the start of TB treatment were predictive of the	12/16

	216		improved with the treatment, the scores on component summary measures showed compromised physical and mental health among patients at the end of TB treatment.	overall MCS scores.	
<b>18.</b>	Mirshekari, L. et al., 2014 Iran	Investigate the Quality of Life in Patients with Pulmonary Tuberculosis in Health Centers in Gorgan  Cross-sectional study  Non-hospitalized participants	TB reduces the HRQoL of patients, in the physical, social, general life satisfaction, psychological and familial dimensions ( $p < 0.05$ ).	No significant difference in the consumption of protein, vegetables, dairy products and cereal among the participants.	3/16
	120				
<b>19.</b>	Aggarwal, A. N. et al., 2013 India	Assessment of health-related quality of life in patients with pulmonary tuberculosis under programme conditions  Cohort study  Non-hospitalized participants	HRQoL is impaired in patients with PTB, and improves rapidly and significantly with program-based treatment.	Domain scores were generally better among men, urban residents, younger patients, had higher socio-economic status and those with less severe disease.	8/16
	1034				
<b>20.</b>	Othman, G. Q. et al., 2011 Yemen	Health related quality of life of pulmonary and extrapulmonary tuberculosis patients in Yemen  Prospective cohort study  Non-hospitalized participants	PTB patients had significantly worse HRQoL score compared to EPTB ( $p < 0.05$ ).  The improvement in HRQoL for both PTB and EPTB patients for the three domains, after one month and at the end of intensive phase compared to	The HRQoL scores are lesser in PTB as compared to extra-PTB in Yemen.	7/16

	333		the baseline were statistically significant ( $p < 0.001$ ).	
21.	Chamla, D. 2004 China	The assessment of patients' health-related quality of life during tuberculosis treatment in Wuhan, China	Before treatment, all dimensions except the role emotional, social function and mental health scales of the TB patients were lower than those of the controls ( $p < 0.01$ ); the patients' scores increased significantly during treatment ( $p < 0.01$ ).	Age ( $P = 0.01$ , OR 0.95, 95% CI 0.93–0.97), WBC count ( $P = 0.01$ , OR 0.92, 95% CI 0.87–0.97), and number of symptoms ( $P = 0.05$ , OR 0.97, 95% CI 0.96–0.99) were significantly associated with the total SF-36 score.
		Prospective cohort study		6/16
		Non-hospitalized participants		
	205			

#### 4.0 Discussion

The results suggest that PTB disease has a negative impact on active TB patients' self-perceived health status in physical, psychological, and social aspects. Overall, the TB treatment showed positive effect on improving patients' HRQoL. It appeared that physical health seemed to be more affected by the disease but improved more quickly after the treatment (Dar et al., 2018), while the impairment on mental well-being tended to persist for a longer term (Singh et al., 2016; Atif et al., 2014). However, even after the active TB patients successfully completed the treatment and were considered microbiologically 'cured', their HRQoL remained poor as compared to the general population as proven by a study by Muhammad Atif in 2014.

Most studies have focused on assessing HRQoL in active PTB patients. Although people with Latent TB infection (LTBI) do not present with clinical disease or symptoms, they are likely to be subjected to the same social and psychological impacts as active TB patients. The knowledge of a deadly and stigmatized disease lying dormant in the body may also induce anxiety and fear. However, it had been shown that LTBI had minimal impact on HRQoL, by a study by Bauer et al., 2015. As for the comparison between the PTB and extra-PTB patients, a study in Yemen highlighted that the HRQoL scores are lesser in former as compared to the latter (Othman et al., 2011). That is because pulmonary TB affects the process of respiration and has more systemic manifestation due to inadequate tissue oxygenation (Othman et al., 2011). Regarding the smear-type of the disease, smear-positive TB was related to the mental health aspect of quality of life among participants in the TB group after completing treatment. One possible explanation was that TB patients with positive smear results may feel more stigmatized than those with negative results (Ting-Li et al., 2017).

Tuberculosis impacts physical health, mainly through somatic symptoms and other TB related physiological outcomes, resulting in impaired physical functioning, development of fatigue, adverse events of treatment and increased use of health care services. The impact of TB on mental health related to psychological, emotional and spiritual wellbeing and patients perception of their health. Depression, anxiety, and feelings of anger were reported. Psychiatric co-morbidity may increase the distress of physical illness, prolong recovery time and may also lead to poor treatment compliance.

Diagnosis and treatment of TB can have an impact on social health including reduced social functioning and an increased financial burden as a result of stigmatization. Social functioning often comprises roles at the workplace, in the community and within the family. Many TB patients were unable to work possibly due to the worsening of their physical condition. This may affect the financial and economic situation of TB patients in terms of limited work capacity or inability to work which could lead to a decrease or even a total loss of income.

The systematic review found that TB has a negative impact on patients' HRQoL and overall wellbeing. From this systematic review, factors associated with HRQoL in TB included socio-demographic (age, gender, marital status, smoking) and socio-economic (income, education, home residence, employment) factors, and disease-related (symptoms, types of TB, severity) and therapy-related (side effects, adverse events) factors.

Age of PTB patients was significantly associated with HRQoL as reported by nine studies (Suzuki et al., 2019; Dhelaimi et al., 2018; Malik et al., 2018; Hilka et al., 2017; Ting-Li et al., 2017; Kisaka et al., 2016; Atif et al., 2014; Aggarwal et al., 2013; Chamla, 2004). A lower scores in elderly patients might be associated with their old age and the expected decline in physical health with increasing age (Atif et al., 2014). It was also possible due to the existing of co-morbidities among older population where illnesses such as hypertension and diabetes are more prominent (Dhelaimi et al., 2018).

Female patients were associated with poor HRQoL as compared with male patients (Saleem et al., 2018; Kibrisli et al., 2015; Kakhki et al., 2015; Aggarwal et al., 2013). This might be due to the fact that women are more sensitive to changes in their health and have low levels of physical strength (Malik et al., 2018).

Level of education also play an important roles in affecting HRQoL (Dhelaimi et al., 2018; Malik et al., 2018; Hilka et al., 2017; Louw et al., 2016; Dujaili et al., 2015; Kakhki et al., 2015). Highly educated patients tend to have better health-seeking behavior and thus likely to report for treatment earlier than those who are less educated. They also integrate health-related information at a deeper level (Kisaka et al., 2016). Moreover, high literacy can lead to improved employment status and financial and social matters. It can be assumed that a better education increases the chances for work and financial security which might have a positive effect on HRQoL by improved self-care, improved social interactions, less psycho-social distress and less financial burden (Hilka et al., 2017). Patients in high socio-economic status were associated with better HRQoL possibly due to the ability to afford care while on treatment. Poverty aggravates social and health problems and the TB illness diminishes the motivation in the struggle to provide basic necessities thus the poor HRQoL scores (Kisaka et al., 2016).

Smoking is another factor associated with HRQoL as demonstrated by four articles (Dhelaimi et al., 2018; Dujaili et al., 2015; Kakhki et al., 2015; Atif et al., 2014). Smoking is known to

adversely affect the immune system, and can render the smokers more susceptible to infections. Similarly, smokers tend to have higher bacillary loads because of compromised immune system. A higher bacillary load can augment the severity of disease which may adversely affect the patients' perception about their mental and physical health (Atif et al., 2014). Also, cigarette smoking can cause impaired social function because of a negative perception of others to cigarette smoking and the perceived harmful effects to health (Dhelaimi et al., 2018).

The severity of the disease was significantly associated with HRQoL. Patients with more than two cavity lesion, or the presence of bronchial TB were associated with poorer HRQoL (Suzuki et al. 2019). Severe chest x-ray and bad spirometric analysis were also predictive of poorer HRQoL (Nair et al., 2018; Aggarwal et al., 2013).

Most studies in the findings were cross-sectional, and none reported measurements from a randomized clinical trial. In this systematic review, seven out of 21 articles were cross-sectional study design, and the rest were prospective studies. Longitudinal observational studies can provide valuable insight into changes in HRQoL as patients undergo different phases of treatment, particularly for active TB. A longitudinal design, where subjects with active and LTBI are compared to suitable controls, will be particularly useful in this respect.

The mean quality rating score for the articles used in this systematic review was 7.7, with summary scores ranging from 3.0 to 12.0. The mode was 9.0. The mean quality rating score was almost half of the score (8/16), as the greater the study rating score, the better the perceived quality. The limitation of this systematic review was that only English language literatures were included, which might affect the generalization of the results. In terms of the HRQoL measuring tools used in TB, there was no standardization as it is still a new area, thus a valid and reliable TB-specific instrument is much needed. Currently, a wide range of HRQoL instruments were utilized in the literature. Even with the variety of the instruments, the core domains studied are more or less about the same; the physical, social and mental wellbeing. The SF-36 was the most frequently used instrument and it appeared to be a valid and reliable tool to be used in TB (Atif et al., 2014; Chamla, 2004).

## 5.0 Conclusion and recommendation

Pulmonary Tuberculosis (PTB) does impair the Health-related Quality of Life (HRQoL) among the patients; namely the physical, mental and social components. Age, gender, education level, socio-economic status, smoking and severity of the disease were significant factors that affected HRQoL. Thus, in addition to the physical illness, a successful health program should also address the social and emotional impact of the disease and adopt support strategies to enhance the acceptance. In order to design such a client-oriented comprehensive program for TB, healthcare providers need to understand perceptions of patients regarding their physical, mental and social well being.

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## Declaration

Authors declare that there is no conflict of interests. This manuscript has never been published in any other journal or duplicated in any mean concerned.

## Authors contribution

The first and second authors were responsible for the production of the manuscript. The first author compiled the literatures, analysed and interpreted the information. The first author prepared the first draft of the manuscript. Both authors contributed to the subsequent drafts and approved the final version of the manuscript.

## References

- Aggarwal, A. N., Gupta, D., Janmeja, A. K., Jindal, S. K. (2013). Assessment of health related quality of life in patients with pulmonary tuberculosis under programme conditions. *INT J TUBERC LUNG DIS*. 17(7):947–953.
- Atif, M., Syed Sulaiman, S. A., Shafie, A. A., Asif, M., Sarfraz, M. K., . . . Babar, Z. (2014). Impact of tuberculosis treatment on health-related quality of life of pulmonary tuberculosis patients: a follow-up study. *Health and Quality of Life Outcomes*. 12:19.
- Bauer, M., Ahmed, S., Benedetti, A., Greenaway, C., Lalli, M., . . . Schwartzman, K. (2015). Health-related quality of life and tuberculosis: a longitudinal cohort study. *Health and Quality of Life Outcomes*. 13:65.
- Chamla, D. (2004). The assessment of patients' health-related quality of life during tuberculosis treatment in Wuhan, China. *Int J Tuberc Lung Dis*. 8(9):1100–1106.
- Dar, S. A., Shah, N. N., Wani, Z. A., Nazir, D. (2018). A prospective study on Quality of Life in Patients with Pulmonary Tuberculosis at a Tertiary Care hospital in Kashmir, Northern India, Indian. *Journal of Tuberculosis*.
- Dhelaimi, G. O., Alsaedi, T. S., Alharbi, M. O., Alkaraiem, F., Altarjami, A. S., . . . Inocian, E. P. (2018). Multidimensional Health-Related Quality-of-Life Among Patients with Pulmonary

Tuberculosis in Saudi Arabia. *World Journal of Public Health*. Vol. 3, No. 2, pp. 48-56.

- Dujaili, J. A., Syed Sulaiman, S. A., Hassali, M. A., Awaisu, A., Bredle, J. M. (2015). Health-related quality of life as a predictor of tuberculosis treatment outcomes in Iraq. *International Journal of Infectious Diseases*. (31)4-8.
- Kakhki, A. D. & Masjedi, M. R. (2015). Factors Associated with Health-Related Quality of Life in Tuberculosis Patients Referred to the National Research Institute of Tuberculosis and Lung Disease in Tehran. *Tuberculosis and Respiratory Diseases*. 78:309-314.
- Kastien-Hilka, T., Rosenkranz, B., Sinanovic, E., Bennett, B., Schwenkgenks, M. (2017) Health-related quality of life in South African patients with pulmonary tuberculosis. *PLoS ONE*. 12(4): e0174605.
- Khan, S., Tangiisuran, B., Imtiaz, A., & Zainal, H. (2017). iMedPub Journals Health Status and Quality of Life in Tuberculosis : Systematic Review of Study Design, Instruments , Measuring Properties and Outcomes, 1–10.
- Kibrisli, E., Bez, Y., Yilmaz, A., Aslanhan, H., Taylan, M., . . . Abakay, O. (2015). High Social Anxiety and Poor Quality of Life in Patients With Pulmonary Tuberculosis. *Medicine*. Volume 94, Number 3.
- Kisaka, S., Rutebemberwa, E., Kasasa, S., Ocen, F., Nankya-Mutyoba, J. (2016). Does health- related quality of life among adults with pulmonary tuberculosis improve across the treatment period? A hospital- based cross sectional study in Mbale Region, Eastern Uganda. *BMC Res Notes*. 9:467.
- Li, C. T., Chu, K. H., Reiher, B., Kienene, T., Chien, L. Y. (2017). Evaluation of health-related quality of life in patients with tuberculosis who completed treatment in Kiribati. *Journal of International Medical Research*. Vol. 45(2) 610–620.
- Louw, J. S., Mabaso, M., Peltzer, K. (2016) Change in Health-Related Quality of Life among Pulmonary Tuberculosis Patients at Primary Health Care Settings in South Africa: A Prospective Cohort Study. *PLoS ONE*. 11(5): e0151892.
- Malik, M., Nasir, R., Hussain, A. (2018). Health Related Quality of Life among TB Patients: Question Mark on Performance of TB DOTS in Pakistan. *Journal of Tropical Medicine*.
- Nair, V., Patil, S., Pratinidhi, A., Pawar, B., Jadhav, A. . . . Raje, V. (2018). A cross-sectional study on the health related quality of life in patients who complete treatment for pulmonary tuberculosis. *J. Evolution Med. Dent. Sci*. 7(25):2939-2943.
- Othman, G. Q., Ibrahim, M. I., Raja'a, Y. A. (2011). Health related quality of life of pulmonary and extra-pulmonary tuberculosis patients in Yemen. *African Journal of Pharmacy and Pharmacology*. Vol. 5(4), pp. 547-553.
- Ramkumar, S., Vijayalakshmi, S., Seetharaman, N., Pajanivel, R., Lokeshmaran, A. (2016). Health-related quality of life among tuberculosis patients under Revised National Tuberculosis Control Programme in rural and urban Puducherry. *Indian J Tuberc*.
- Saleem, S., Malik, A. A., Ghulam, A., Ahmed, J., Hussain, H. (2018). Health-related quality of life among pulmonary tuberculosis patients in Pakistan. *Quality of Life Research*. 27:3137–3143.



Singh, S. K., Agrawal, A., Tiwari, K. K. (2016). Improvement in quality of life in pulmonary tuberculosis patients: a prospective study. *Tropical Doctor*. 0(0) 1–4.

Suzuki, T., Shirai, T., Hirai, K., Tanaka, Y., Watanabe, H., . . . Asada, K. (2019). Improved cough- and sputum-related quality of life after initiation of treatment in pulmonary tuberculosis. *Respiratory Investigation*.

WHO. (2017). *Global Tuberculosis Report 2017*. Who. Retrieved from [www.who.int](http://www.who.int)