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Quality of Life among Tuberculosis Patients: The Role of Mindfulness

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Abstract: Background: Tuberculosis is one of the most severe infectious diseases of the twentieth century, resuming everyday living activities and lead to poor quality of life. Mindfulness is believed to improve QOL in various populations, but its unique association with QOL in patients with tuberculosis has yet to be established. Thus, this study aimed to examine the relationship between mindfulness and quality of life among patients with tuberculosis and answered the following research questions" What are the levels of mindfulness and QOL among patients with TB?" "Is there a difference in the QOL based on demographic characteristics and clinical variables among patients with TB?" "Is there a relationship between QOL and mindfulness among patients with TB?" "What are the predictors of QOL among patients with TB?" **Method:** A descriptive correlational design was used in this study. A convenience sample of 100 adult patients with TB who were in the continuing phase of treatment that underwent treatment at respiratory outpatient clinics at Chest Diseases Unit for TB and from one private agency from various nationalities was selected. Independent sample t-test was used to examine the mean differences in QOL according to the categorical demographic variables with two categories, while one-way ANOVA was used to examine the mean differences in QOL according to the demographic variables with more than two categories. Pearson's correlation, Spearman Rho, and Point biserial correlations were used to determine the relationship between the variables. Simple linear regression was employed to examine the relationship between mindfulness and QOL. **Results:** The findings showed that the perceived quality of life among patients with TB was high (M=4.22 ±SD = 0.27) and the lowest mean was for physical domain (M=4.0, SD±0.36) and the highest mean was for the social relationship variable (M= 4.41, SD±0. 0.57). There were no statistically significant differences in the levels of QOL according to age (F=1.058, p=0.35) and educational levels (F=0.168, p =0.85). The overall mean for mindfulness was high as well (M= 5.25, SD ±0.27). Furthermore, there was a significant positive correlation between the total score of mindfulness and quality of life. Results demonstrated a significant positive relationship between total MASS score and psychological QOL only (r= 0.211, *P ≤ 0.05).* The entire model explained 4.5% of the variance in psychological QOL. **Conclusion:** Providing support to patients with TB through mindfulness is essential to improve their QOL.: The current study provided primary evidence for the relationship mindfulness and QOL among tuberculosis patients. Future research may want to tailor an intervention that combines mindfulness-based interventions and identify their benefits to support tuberculosis patients.

Keywords: Tuberculosis; Mindfulness; Quality of Life.

INTRODUCTION

Globally, TB is the 13th leading cause of death and the second most common infectious killer.[1] Around 1,500,000 people died from TB in 2020. In 2020, TB extended to a larger cluster of cases, focused inside the Southeast Asia Region. [1] In 2020, Jordan recorded 4.7 cases of TB per 100,000 persons; Jordan's incidence of TB has fluctuated drastically in recent years, and all forms of TB have been included. [1]

The quality of care provided to patients with TB still needs to be improved; there are significant delays in diagnosing TB, and many patients die before treatment can begin.[2] All patients must have a centered strategy to enhance adherence and alleviate suffering to improve their QOL.[3] The QOL among patients with TB is influenced by several factors, such as taking several drugs, the side effects of drugs, and taking medications for a long time.[2]

According to the WHO, health outcomes should be measured in terms of saving lives and increasing QOL. [4, 5] Febi et al. and Sartika et al. examined the level of psychological distress and health-related quality of life (HRQOL) among patients with TB. [6, 7] The prospective cohort study indicated that newly diagnosed patients with pulmonary and extra-pulmonary TB had high levels of anxiety and depression and low levels of HRQOL. However, it is notable in the literature that serious diseases have adverse effects on HRQOL, with the physical and psychological domains being the most affected. [6-10]

Jaber et al. reported that patients with TB have poor QOL and a high probability of developing depression.[11] Thus, efforts should be directed at increasing QOL among patients with TB, as it may improve patients' final clinical outcomes. Jo et al. assessed the HRQOL pathway throughout treatment in rural Malawi. HRQOL scores varied among patients receiving treatment for TB in rural Malawi according to the clinical setting and duration of treatment, with greater impairment between inpatients and those who started their treatment newly.[12].

Healthcare providers have understood that observing the physical features of the disease is not enough alone, and the most effective treatments should be encouraged to achieve an everyday life with good QOL. [13,14] Thus, patients with TB need interventions that can reduce their distress, promote disease acceptance, improve their behaviors, promote self-control and tolerance, improve flexibility, increase emotional intelligence, support mental health, enhance relationships with others and self through kindness, and increase acceptance and affection. Mindfulness is one of the most critical psychological

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interventions that can address all the variables mentioned earlier. According to Davis & Hayes, the purpose of mindfulness is to assist persons in becoming fully aware of experiences that occur regularly.[15] According to Cardaciotto et al., mindfulness promotes an individual's acceptance of consciousness. [16]

Only one study concerning mindfulness and QOL among patients with TB has been found in the literature. The study was conducted by Nakhaei et al., who determined the role of mindfulness, spiritual experiences, and coping strategies in predicting the QOL of patients' TB.[17] The results showed a significant positive relationship between mindfulness and QOL, as well as a significant positive relationship between emotional coping strategies and QOL. Given that psychological factors can predict QOL, they must be considered in the treatment plan. However, this study was conducted in Iran, which did not reflect the situation in Arab countries, especially in Jordan, which had different cultures, economic statuses, lifestyles…etc.

In general, the QOL among patients with TB is an important issue, and there still needs to be more knowledge on the unique role of mindfulness and whether it has an effect on improving the QOL of patients with TB or not. This study aimed to fill in the gap by answering the following research questions:

1. What is the mindfulness and QOL levels among TB patients?
2. Does the QOL differ based on demographic characteristics and clinical variables among patients with TB?
3. Is there a relationship between QOL and mindfulness among patients with TB?
4. What are the predictors of QOL among patients with TB?

METHODS

Study design: This study used a cross-sectional, correlational design. Using the G*power program, assuming a small-medium effect size (Cohen's d = 0.30) and alpha 0.05, a sample size of 100 patients was needed to provide a power of 0.8.

Settings and sampling: A convenience sample of adult patients with TB from various nationalities was selected from the Chest Diseases Unit for TB and one private agency. Inclusion criteria include patients in the continuing phase of treatment who underwent treatment at respiratory outpatient clinics and had no psychiatric illness.

Ethical consideration: Ethical approval was obtained from the Institutional Review Board of Al-Zaytoonah University, the Ministry of Health, and Al Noor Clinic (IRB # 2022-2021/07/76). Each participant was provided with an information sheet that included essential information about the study and the participant's rights. Written consent was also enclosed with the information sheet, signed by the participants who agreed to participate in the study. Participants were instructed that they had the right to withdraw from the study at any time without giving a reason and that doing so would have no negative consequences for the care they received. The researcher stored all study documents in a locked cabinet, and all electronic data were stored in password-protected files.

Study instruments

Three instruments were used in the study:

Demographic information sheet: The researcher developed this sheet based on similar studies. It included predictors affecting the study variable, such as (age, gender, nationality, employment status, educational level, marital status, and income), and clinical variables (duration of illness, TB type, side effect for treatment, and hospitalizations admission) based on previous studies.

The Mindful Attention Awareness Scale (MAAS): The Mindful Attention Awareness Scale (MAAS) was developed to evaluate how attentive people are in the present moment in their daily lives, and it included 15 items.[18] Participants were asked to rate how often they executed behaviors without realizing them on a 6-point Likert scale for each item ranging from (1: almost always) to (6: rarely). MAAS has been validated in clinical and non-clinical patients. [19] The Cronbach's alpha for the scale was < 0.80.[18, 20]

Greater mindfulness is associated with higher MAAS scores. Carlson and Brown primarily characterized the Arabic version's Cronbach's alpha coefficient, which was reported at 0.95.[19]

The WHOQOL-BRIEF (World Health Organization Quality of Life-Brief): The 25-item WHOQOL-BRIEF questionnaire evaluates QOL scores for each aspect, which would be between four and 20, while a score of 4 is the worst and 20 is the best QOL condition. These scores are convertible to another score of 0-100. Negatively phrased items in WHOQOL-BRIEF (Q3, Q4 and Q25) were reversed (1 = 5, 2 = 4, 3 = 3, 4 = 2, 5 = 1).[21]

This questionnaire is a short-form scale developed by the World Health Organization Quality of Life group. The WHOQOL-BREF scale is validated to assess the QOL and is available in Arabic. The questionnaire comprises four domains: physical health (7 items), psychological health (6 items), environmental health (8 items), and social relationships (3 items), in addition to 2 questions that evaluate the overall perception of the QOL and health separately. For 26 questions, the result is expressed in percentage 5-point Likert scale for each item ranging from 1 (not at all, inferior, very dissatisfied, never) to 5 (completely, very good, very satisfied, an extreme amount, extremely, always) (WHOQOL Group, 1998). Consequently, the WHOQOL-BRIEF questionnaire has been demonstrated to predict patients with TB with worse QOL accurately. The Arabic version used in this study has considerable reliability and validity indices; Cronbach's alpha was .92.[22] The WHOQOL-BREF questionnaire was declared trustworthy for measuring the QOL of patients with TB, with a Cronbach alpha value of 0.93.[23].

Data collection procedure: After receiving ethical approvals, the researcher met with the heads of the TB clinics in the selected chest disease directorates and Al Noor clinic. These clinics are open only on "A" shifts, and patients from different nationalities are treated in these clinics with no impact on the sample representativeness. All eligible participants were informed of the purpose and significance of the study. Each participant was provided with all questionnaires. The completed questionnaires were coded for analysis and saved in envelopes.

Data management and analysis: Before the data analysis, the researchers screened preliminary data to detect missing, outliers, and impossible values. No missing values were observed. Data screening using histograms, skewness, and kurtosis values was performed to assess the normality of the data distribution, which is considered an assumption for the parametric tests used in the current study.

Frequencies, percentages, means, and standard deviations were used to describe sample characteristics. Data analysis was performed using SPSS v.26. Participants' mindfulness levels and health-related QOL were analyzed using descriptive statistics (minimum, maximum, mean, and standard deviation). An independent sample t-test was used to examine the mean differences in QOL according to the categorical demographic variables with two categories, such as gender. In comparison, one-way ANOVA was used to examine the mean differences in QOL according to the demographic variables with more than two

categories. Pearson's correlation, Spearman Rho, and Point biserial correlations were used to determine the relationship between the variables. Simple linear regression was employed to examine the relationship between mindfulness and QOL. Demographic characteristics and clinical variables significantly associated with QOL and mindfulness among patients with TB were included in subsequent regression analyses.

RESULTS

Demographic and Clinical Characteristics of the Participants: One hundred twenty-five questionnaires were distributed to eligible participants. However, 100 questionnaires were returned with a response rate of 80%.

85% of participants were at the complementary phase of the treatment stage, while the remaining (n=15, 15%) were in the intensive phase of the treatment stage. Most of the participants (n=73, 73%) reported no side effects of treatment, and most of them, 79%, were non-Jordanian people (from other nationalities)). The authors collected data by asking the questions directly to patients, and they asked them according to their language and the two versions of the questionnaires available (Arabic and English)

TB in Jordan is a rare disease, and most cases come from refugees and other nationalities who come to Jordan to work in Factories. 73% of patients were admitted to the hospital only once, while 27% were admitted to the hospital twice to three times related to TB.

Table (1): Sociodemographic and clinical variables (n=100).

Demographic Characteristics	N	%
Educational level:		
Less than high school	36	36%
High school education	39	39%
Bachelor's degree or more	25	25%
Health Insurance		
Yes	75	75%
No	25	25%
Relationships with their relatives and friends after illness		
Good	71	71%
Moderate	29	29%
Clinical Variables		
Frequency of hospital Admissions because of TB		
Once	73	73%
2-3 times	27	27%
Type of TB		
Pulmonary	48	48%
Extra pulmonary	52	52%
Infection from TB patient		
Yes	34	34%
No	66	66%
Type of Treatment		
Self-administered	100	100%
Hospital -Based	0	0
Adherence to treatment		
Yes	100	100%
No	0	0
Adherence to Personal Protective Equipment (PPE)		
Yes	100	100%
No	0	0
Side effects of treatment		
Yes	27	27%
No	73	73%

*N: number, %: Percentage, Values are rounded to the **nearest 0.01** or the **Hundredths Place***

Levels of Mindfulness and QOL among Patients with TB: The results of the mindfulness and QOL levels among patients with TB showed that the lowest mean for QOL was for physical (M=4.0, SD±0.36) and the highest mean of QOL was for the social relationship variable (M= 4.41, SD±0. 0.57). The overall QOL was high (M=4.22, SD ± 0.27). In addition, the results showed that the overall mean for mindfulness was high (M= 5.25, SD ±0.27); therefore, the level of evaluation of the study questions on the levels of mindfulness and QOL was high from the point of view of patients with TB in Jordan.

Table (2): Levels of MAAS, WHOQOL scale, and subscales (N=100).

Variable	M±SD	Range
MAAS. Total	5.25±0.27	4.47 – 6
WHOQOL. Total	4.22±0.27	3.62-4.77
WHOQOL.Physical	4.0±0.36	3.14 - 4.71
WHOQOL.Psychological	4.4±0.33	3.33 – 5.00
WHOQOL.Social	4.41±0.57	3.00- 5.00
WHOQOL.Environmental	4.2±0.29	3.50 - 4.88
WHOQOL.Overall	4.2±0.5	3.00- 5.00

M: Mean, SD: Standard Deviation
*Values are rounded to the **nearest 0.01** or the **Hundredths Place.***

The Differences in QOL of Patients with TB Based on Demographic and clinical variables/ more than two categories: As shown in Table 3, the one-way ANOVA analysis results indicated no statistically significant differences in the levels of QOL in patients with TB according to age (F=1.058, p=0.35) and educational levels (F=0.168, p =0.85).

Table (3): Differences in QOL of Patients with TB Based on variables of more than two categories (n=100).

Variable	Categories	N	M±SD	DF	F-value	P-value
Educational level	Less than high school	36	4.21±0.28	2	0.168	0.85
	High school education	39	4.21±0.29			
	Bachelor degree	25	4.25±0.23			
Age (years)	18-30 (years)	27	4.198±0.29	2	1.058	0.35
	31-45 (years)	30	4.287±0.29			
	46-70 (years)	43	4.201±0.25			

*N: number, %: Percentage, M: Mean, SD: Standard Deviation, DF: degree of freedom between groups. Values are rounded to the **nearest 0.01** or the **Hundredths Place***

The Differences in QOL of Patients with TB Based on Demographic and clinical variables with two categories: The results showed no statistically significant differences in QOL according to selected sociodemographic and clinical variables. See **Table 4** for more details.

Table (4): Comparison of QOL levels based on sociodemographic characteristics and clinical variables with two categories (N=100).

Variable	Category	N	M±SD	T-value	DF	P- Value
Gender	Male	47	4.250±0.26	0.82	98	0.99
	Female	53	4.204±0.28			
Marital status	Married	68	4.22±0.28	0.115	98	0.797
	Unmarried	32	4.23±0.27			
Employment Status	Employed	21	4.20±0.274	- 0.461	98	0.913
	Unemployed	79	4.23±0.276			
Monthly Income	Less than 250	79	4.22±0.27	0.12	98	0.703
	More than 250	21	4.21±0.29			

Variable	Category	N	M±SD	T-value	DF	P- Value
Nationalities'	Jordanian	21	4.21±0.29	- 0.089	97	0.717
	Non-Jordanian	78	4.22±0.27			
Relationships with their relatives and friends after illness	Good	71	4.23±0.28	0.108	98	0.602
	Moderate	29	4.22±0.26			
Hospital Admissions	Once	73	4.23±0.28	0. 59	98	0.495
	2-3 times	27	4.20±0.27			
Type of TB	Pulmonary	48	4.21±0.26	- 0.51	98	0.247
	Extra pulmonary	52	4.24±0.29			
Duration of Illness	6-9 months	59	4.24±0.29	0.48	98	0.064
	over one year	41	4.21±0.24			
Side effects of treatment	Yes	27	4.24±0.30	0.47	98	0.476
	No	73	4.21±0.27			

N: number, M: Mean, SD: Standard Deviation, DF: degree of freedom between groups.
*Values are rounded to the **nearest 0.01** or the **Hundredths Place.***

The relationship between mindfulness, sociodemographic, clinical variables, and QOL among patients with TB: Table 5 explains the relationships between mindfulness, QOL, and sociodemographic variables**.** The results demonstrated no significant relationships between the variables. For more details, see Table 5.

Table (5): Pearson correlation of total MAAS, sociodemographic, clinical variables, and total WHOQOL (n=100).

Variable	Total WHOQOL	
	R	P – value
Total MAAS	0.170	0.09
Age (Years)	-0.062	0.540
Income	-0.020	0.845
Gender	-0.083	0.409
Marital status	-0.012	0.909
Educational level	0.045	0.658
Employment status	0.047	0.646
Nationalities'	0.009	0.929
Relationships with their relatives and friends after illness	-0.011	0.914
Hospital Admissions	-0.059	0.557
Type of TB	0.051	0.612
Duration of illness	-0.049	0.630
Side effects of treatment	-0.045	0.656

*Correlation is significant at the P ≤ 0.01. * Correlation is significant at the P ≤ 0.05*
*Values are rounded to the **nearest 0.01** or the **Hundredths Place.***

The relationship between mindfulness and QOL subscales among patients with TB: The correlations between the total score of the Mindful Attention Awareness Scale (MAAS) and WHOQOL subscales are explained in **Table 6**. Results demonstrated a significant positive relationship between total MAAS score and psychological QOL only (r= 0.211, *P ≤ 0.05)*.

Table (6): Pearson correlation between total MAAS score and QOL subscales.

Variable	Total MAAS	
	R	P – value
WHOQOL. Physical	0.116	0.252
WHOQOL. Psychological	0.211*	0.035
WHOQOL. Social	0.084	0.405
WHOQOL. Environmental	0.171	0.89
WHOQOL. Overall	-0.048	0.636

Correlation is significant at the P ≤ 0.01. correlation is significant at the P ≤ 0.05*
*Values are rounded to the **nearest 0.01** or the **Hundredths Place***

Predictors of QOL among TB patients: The only positive relationship was found between mindfulness and the psychological subscale of the WHOQOL. Simple linear regression was used to predict the psychological aspect of QOL from mindfulness.

As explained in **Table 7**, the model was statistically significant (F =4.584; p = 0.035; R = 0.211; R^2 = 0.045; adjusted R^2 = 0.035). This means the entire model explained 4.5% of the variance in psychological QOL. A one-point increment in the MASS was correlated with a 0.259 increment of psychological QOL among TB patients.

Table (7): Predictors of psychological QOL

Predictors	B	B	t-test	p-value	95.0% CI		Correlations	
					Lower	Upper	correlation partial	part
Total MAAS	0.211	0.259	2.141	0.035	0.019	0.499	0.211	0.211

Regression analysis for predictors of psychological QOL
B: Unstandardized beta; B: Standardized beta; CI: Confidence Interval
*Values are rounded to the **nearest 0.01** or the **Hundredths Place***

DISCUSSION

The results showed that the lowest mean QOL score was for the physical domain, the highest QOL score was for the social domain, and the overall QOL was high from the point of view of patients with TB in Jordan. In addition, the results showed that the overall mean of mindfulness was high from the patients' point of view. The results of this study agree with the results of Febi et al., which indicated a high level of QOL among patients with TB; the social domain was the most affected, and all domain scores marked improvement upon completion of treatment.[6] Furthermore**,** this study's results align with those of Dires et al., who conducted a study in Ethiopia; the overall QOL of patients was relatively high.[24] Notably, social domains were more affected than the other domains. Moreover, the results agreed with a study conducted by Noorratri et al. in Indonesia, which reported high mindfulness scores among patients with TB.[25]

The levels of mindfulness and QOL among patients with TB were high in this study because most of them were non-Jordanian nationality, some of them were expatriates to work, and others were refugees. They were living in fear and instability in their countries because of war. Once they left their country and were in a safe country, patients had faith. By fate and destiny, and when taking the sample, the patients were interrupting a period of treatment and accepting their pathological condition. For this reason, the two variables were high in patients with TB.

The analysis results showed non-statistically significant differences in levels of QOL in patients with TB based on sociodemographic variables. These results agree with the findings of previous studies.[26] On the other hand, the findings of this study contradict Yadav et al. and Juliasih et al. studies, which showed statistically significant differences in the levels of QOL based on the sociodemographic variables (age and education). [27, 28] These studies found that the level of

education affects physical functioning and role limitations due to emotional problems. The educational level plays a role in enhancing vitality because education results in additional life resilience and stimulates self-care, resulting in a reduction in physical problems and an improvement in vitality, thus improving physical performance.

This study found a significant positive correlation between the total MASS score and psychological QOL. This study agreed with Keng et al. and Nakhaei et al.; their results showed a significant and positive relationship between mind awareness and quality of life, and this variable predicted 38% in Nakhaei et al. study, while the spiritual experiences 27% and problem-oriented coping strategies only predicted 5.2% of the life quality variance. [17, 29] However, it is concluded in the literature that mindfulness has a variety of positive psychological impacts, such as greater behavioral control, a rise in subjective well-being, and a decrease in psychological symptoms and emotional reactivity. Mindfulness might lead to a positive attitude and life satisfaction by influencing the individual's emotions and feelings. By reducing stress, mindfulness provides people with satisfaction and promotes QOL. Mindfulness requires planful awareness, the growth of judgment avoidance, and focus on the present moment by individuals. The individual's attention to the present moment processes all aspects of immediate experience, including cognitive, physiological, and behavioral activities.

The regression model was significant only for predicting psychological QOL from MASS; MSSS accounted for 4.5% of the variance in psychological QOL. The beta coefficient for the total scores of MASS was 0.259, representing that a one-point increment in the MASS was correlated with a 0.259 increment in psychological QOL among TB patients.

Implications: It is indicated that increased engagement in mindfulness is associated with increased trait mindfulness, suggesting important implications for both the use of mindfulness interventions and the measurement of mindfulness capacity as a measure of the process. This suggests that efforts to affect mindfulness may lead to an increased capacity for mindfulness. Understanding the necessary factors that increase mindfulness capacity (e.g., time in practice, interventions, practice) can significantly impact providing appropriate treatments and understanding changes through the lens of mindfulness to patients with TB.

The result of this study might increase the awareness of practitioners, administrators, and policymakers about the importance of integrating mindfulness into the treatment plan of patients with TB. Furthermore, the study's results open the window of ideas for researchers to initiate new research concerning different variables, samples, and conditions.

CONCLUSION

Treating patients with TB is a complicated process that needs to be improved. This study shed light on the predictors of QOL among patients with TB, with mindfulness being the only predictor. Based on the findings of this study, it is highly recommended that mindfulness be integrated into the treatment plan of patients with TB.

Disclosure Statements

- **Ethics approval and consent to participate:** The study was undertaken with the understanding and written consent of each subject. The study has been independently reviewed and approved by an ethical board of Ministry of Health.
- **Consent for publication**: Not applicable.
- **Data Availability Statement:** Data are available on request due to privacy/ethical restrictions.
- **Authorship contribution: Suhair Al-Ghabeesh**: Conceptualization, Formal Analysis, Methodology, Validation, Writing original draft, review, Supervision & editing. **Hadeel Al-Hawatmeh**: Conceptualization, Formal Analysis, Data curation, Methodology, Writing, review & editing. **Hasan Abualruz**: Conceptualization, Methodology, Project administration, Supervision, Validation, Writing original draft. **Batool Qutami:** Data curation, Formal analysis, Funding acquisition, Writing - review & editing
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