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Health-related quality of life of persons living with tuberculosis: A cross-sectional study

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ABSTRACT

Background: Tuberculosis is a chronic infectious disease that can affect the quality of life of persons living with tuberculosis in resource-limited settings. There is a dearth of research on the quality of life of persons living with tuberculosis within Greater Accra, Ghana.

Purpose: This study investigated the quality of life and its related factors among persons living with tuberculosis in the Greater Accra region of Ghana.

Methods: This descriptive cross-sectional survey assessed the physical, psychological, social relationship and environmental quality of life of 250 persons living with tuberculosis in four public health facilities using the World Health Organization's Quality of Life Brief Questionnaire instrument.

Results: Respondents' mean (standard deviation) physical, psychological, social relationship and environmental health-related quality of life domain scores were 46.19 (21.27), 50.67 (23.95), 40.9 (21.74) and 51.91 (20.13) respectively out of 100. Sociodemographic factors which influenced all four quality of life domains were their marital and employment statuses. Respondents' site of TB infection (pulmonary or extrapulmonary) and phase of treatment influenced their physical, psychological and social domains. Other determinants of the quality of life were their sex, highest level of education and average monthly income.

Conclusions: The quality of life of persons living with tuberculosis was found to be poor and influenced by the patients' socioeconomic status. Strategies that identify and address any deterioration in the quality of life of persons living with TB are required throughout their management.

1. Introduction

Tuberculosis (TB) is a deadly infectious disease caused by *Mycobacterium tuberculosis*. The primary site of TB infection is the lungs, termed pulmonary tuberculosis, but TB may be situated in other parts of the body (extrapulmonary TB) [23]. An estimated 10 million persons developed TB globally in 2019, however, prevalence rates in resource-limited settings around the world remain high and may have been worsened by the disruption of healthcare on account of the Corona Virus Disease (COVID-19) pandemic [27]. In 2020, the approximate national TB prevalence in Ghana, a low to middle-income country in Africa, was 143 per 100,000 persons, which was higher than global estimates (127 per 100,000 persons) [28]. As part of efforts to control TB, Ghana adopted the World Health Organization (WHO)'s Directly Observed Treatment Short-course (DOTS) strategy in 1997. Since its inception, the strategy had involved standardized supervision of TB treatment by

healthcare providers for all persons diagnosed with TB with treatment spanning at least 6 months [11].

Despite the availability of treatment, TB can have deleterious consequences on the physical, psychological, social and environmental health-related quality of life (HRQoL) of persons living with TB [3,10,21,29]. Quality of life refers to "individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" [25]. Whereas the physical HRQoL relates to an individual's pain experience, sleep, daily function and energy levels, psychological HRQoL addresses the patients' ability to live an enjoyable and meaningful life without negative feelings such as anxiety and depression [26]. Satisfaction with personal relationships, sex and social support from relations underpins the Social HRQoL of patients while environmental HRQoL encompasses a person's feeling of safety in a healthy environment with adequate information, money and transportation including

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leisure [26].

The high prevalence of TB in a COVID-19 pandemic era implies that healthcare providers will need to continue providing holistic care which addresses the HRQoL needs of persons living with TB who are under their care. Previous studies in Iran, India, Pakistan, Nepal and Ethiopia have examined the HRQoL of persons living with TB and how they are influenced by patients' sociodemographic characteristics such as sex, site of TB infection, level of education and income [3,10,21,29]. However, there is a paucity of research which have investigated the physical, psychological, social relationship and environmental HRQoL of persons living with TB and its related factors within resource-limited African settings like Ghana. Such a study can inform healthcare providers within low to middle-income countries comparable to Ghana to holistically identify gaps in the HRQoL of persons living with TB in their care for prompt redress. Furthermore, the findings of the study can inform health policy formulation on the care of persons with TB as well as the pre-service and in-service training of healthcare providers caring for persons with TB. This study, therefore, investigated the quality of life and its related factors among persons living with TB in the Greater Accra region of Ghana.

2. Materials and method

2.1. Study design and setting

A descriptive cross-sectional survey design was used to assess the HRQoL of persons living with TB from March 2021 to October 2021. Persons living with TB who were seeking health care in four (4) public health facilities within the Greater Accra, Ghana were involved in the study. The health facilities included one (1) teaching hospital, one (1) general hospital and two (2) municipal hospitals within the Greater Accra region of Ghana. Sampling from the four (4) health facilities ensured that different categories of persons living with TB who were seeking care in public health facilities within the region were involved in the study.

2.2. Sample

Persons living with TB within Greater Accra, Ghana were included in the study if they were (1) aged 15 years and older, (2) diagnosed with TB and (3) receiving antituberculosis medication. Persons with drug-resistant TB were excluded from the study. Using G*Power software, power analysis of 80%, an alpha of 0.05 (two-tailed test) and a medium effect size of 0.5, a minimum of 128 respondents was required for the study. However, 250 respondents were recruited to cater for non-responses and ensure the inclusion of different categories of persons living with TB in the study.

2.3. Ethical consideration

Ethical approval for the conduct of the study was obtained from the Ghana Health Service Ethics Review Committee (GHS-ERC 027/01/21) as well as the management of the four (4) health facilities. Ethical principles of voluntary participation, beneficence and non-maleficence, privacy and confidentiality were ensured in the study by recruiting only informed and willing respondents who had provided their written informed consent. The respondents could withdraw from this study at any time without explanation.

2.4. The instrument

The English language version of the World Health Organization's Quality of Life Brief Questionnaire (WHOQoL-BREF) instrument [25] was used to assess the Physical, Psychological, Social relationship and Environmental HRQoL of the persons living with TB. The researchers assessed respondents' sociodemographic characteristics (such as age,

sex, religion and TB infection site) to identify variations among the respondent groups. The 26-item WHOQoL-BREF instrument has four domains that assess respondents' physical (7 items), psychological (6 items), social relationship (3 items) and environmental (8 items) domains of their quality of life. Two (2) general questions assess respondents' general HRQoL and their satisfaction with their health. Respondents' responses were scored on a 5-point Likert scale. In line with the instrument authors' guidelines, respondents' raw domain scores were transformed into a range from zero (0) to 100, with higher scores indicating higher quality of life in that domain [25]. The WHOQoL-BREF instrument has been used globally as a valid and reliable tool for the assessment of the HRQoL of persons living with TB [8,10,29]. The WHOQoL-BREF QoL tool has also been used for its validity among the Ghanaian adult population [2,4,6]. The WHOQoL-BREF QoL instrument was found to have acceptable reliability since an overall Cronbach's alpha coefficient of 0.95 was recorded in this study [20].

2.5. Data collection procedure

The researchers identified and recruited prospective respondents with the aid of trained professional nurses caring for persons with TB in the four (4) health facilities. Respondents were approached individually in their health facilities on their hospital visit dates after they had received their healthcare service. The professional nurses explained the purpose and procedures of the study to each prospective respondent and questions about the study were answered by the researcher (L.Q). Volunteering participants were offered informed consent forms to complete. Out of 256 persons living with TB who were approached, six (6) participants opted out of the study on account of not being interested. The 250 (97.66%) willing respondents signed their informed consent forms and completed their hardcopy questionnaires. The researcher administered the questionnaire to nine (9) respondents who were not literate by reading it out and recording their responses on their questionnaires. The questionnaires were completed within sixty (60) minutes and collected immediately by the researcher for analysis.

2.6. Data analysis

The Windows version of the Statistical Package for Social Sciences (SPSS) was used to analyse the data (version 23, IBM Inc). Frequencies and percentages of items relevant to the quality of life of the persons living with TB sampled were reported using means and standard deviations. Independent *t*-tests were conducted to identify differences between two (2) respondent groups based on their socio-demographic characteristics. Kruskal-Wallis tests were conducted to compare HRQoL domain scores differences among 3 or more respondent groups. Chi-square tests were conducted to assess associations between respondents' socio-demographic characteristics. A $p < 0.05$ level of significance was used for all statistical tests.

3. Results

3.1. Socio-demographic characteristics

A total of 250 persons living with TB aged 16 to 88 years participated in the study. Majority of the respondents were Males (150, 60%), Singles (94, 37.6%) and diagnosed with Pulmonary Tuberculosis (182, 72.8%). Table 1 summarizes the respondents' socio-demographic characteristics based on their sex. Respondents' highest level of education was significantly associated with their employment status ($\chi^2 = 45.57, p < .001$) and average monthly income ($\chi^2 = 34.16, p < .001$).

3.2. Health-related quality of life of persons living with tuberculosis

Respondents were asked "How would you rate your quality of life?", 24% (60) indicated *Poor*, 20.8% (52) indicated *Neither poor nor good*,

Table 1
Sociodemographic characteristics of persons living with Tuberculosis (N = 250).

Characteristic	Female (n = 100) (n, %)	Male (n = 150) (n, %)	Total
Age			
15 – 34 years	52 (52)	72 (48)	124
35 – 64 years	40 (40)	69 (46)	109
>65 years	8 (9)	9 (6)	17
Marital Status			
Single	36 (36)	58 (38.7)	94
Married	24 (24)	60 (40)	84
Separated	33 (33)	32 (21.3)	65
Widow	7 (7)	0 (0)	7
Religion			
Christianity	84 (84)	102 (68)	186
Islam	16 (16)	48 (32)	64
Highest Level of Education			
No formal education	16 (16)	19 (12.7)	35
Primary	40 (40)	38 (25.3)	78
Secondary	29 (29)	67 (44.7)	96
Tertiary	15 (15)	26 (17.3)	41
Employment status			
Unemployed	18 (18)	32 (21.3)	50
Student	23 (23)	19 (12.7)	42
Employed	59 (59)	99 (66)	158
Average monthly income			
Below Ghc1,000	50 (50)	61 (40.7)	111
Ghc1,000 – Ghc2,000	48 (48)	75 (50)	123
Ghc2,001 – Ghc3,000	2 (2)	14 (9.3)	16
TB Site			
Pulmonary	69 (69)	113 (75.3)	182
Extrapulmonary	31 (31)	37 (24.7)	68
Category of TB case			
New case	100 (100)	147 (98)	247
Retreatment	0 (0)	3(2)	3
Phase of TB treatment			
Intensive	61 (61)	100 (66.7)	161
Continuation	39 (39)	50 (33.3)	89

TB = Tuberculosis.

54.4% (136) indicated *Good* and 0.8% (2) indicated *Very Good*. When asked “How satisfied are you with your health?”, 47.2% (118) of the respondents representing the majority indicated that they were *Dissatisfied*. The remaining responses were *Very dissatisfied* (27, 10.8%), *Neither satisfied nor satisfied* (59, 23.6%) and *Satisfied* (46, 18.4%).

Table 2 summarizes respondents’ Physical, Psychological, Social Relationship and Environmental HRQoL Domain scores. Respondents’ average physical, psychological, social relationship and environmental

Table 2
Respondents’ Health-related Quality of Life Domain Scores.

HRQoL Domain	Total	Quality of Life Score			95% Confidence Interval	
		Minimum	Maximum	Mean		
Physical	250	0	86	46.19	21.27	43.53 – 48.84
Psychological	250	0	83	50.67	23.95	47.68 – 53.65
Social Relationship	250	0	75	40.9	21.74	38.19 – 43.61
Environmental	250	3	94	51.91	20.13	49.4 – 54.42

HRQoL: Health-related Quality of Life.

HRQoL domain scores were 46.19 (SD = 21.27), 50.67 (SD = 23.95), 40.9 (SD = 21.74) and 51.91 (SD = 20.13) out of 100. Among all four (4) HRQoL domains, the Social relationship HRQoL Domain recorded the least average score.

3.3. Factors influencing the health-related quality of life of persons living with tuberculosis

From Table 3, respondent characteristics which accounted for significant difference in their Physical HRQoL Domain scores included their TB infection site (p =.003), phase of treatment (p =.010), employment status (p < .001), average monthly income (p =.026) and marital status (p < .001). Kruskal-Wallis test based on their respondents’ marital status revealed statistically significant difference in Physical HRQoL Domain scores [$\chi^2_{kw}(3, n = 250) = 29.414, p < .001$] among persons with TB who were Single (mean rank = 141.36), Married (mean rank = 135.84), Separated (mean rank = 100.73) and Widows (mean rank = 18.43) (Table 3). Widows (Md = 3.57) recorded significantly lower Physical HRQoL Domain scores when compared with respondents who were Single (Md = 57.14, p < .001), Married (Md = 57.14, p < .001) or Separated (Md = 42.86, p =.025).

Respondent characteristics which accounted for significant difference in their Psychological HRQoL Domain score included their TB site (p =.014), sex (p =.028), marital status (p =.027), employment status (p < .001), average monthly income (p =.004) and phase of treatment (intensive vrs continuation) (p =.028).

Significant difference in Social relationship HRQoL Domain scores was recorded among respondents based on their TB infection site (p =.035), highest level of education (p < .001), employment status (p =.003), phase of treatment (p < .001) and marital status (p =.005). Adults living with TB who were married (mean rank = 143.45) recorded significantly higher Social relationship Domain score compared to those who were separated (mean rank = 103.87). Respondents’ religion did not significantly influence their social (p =.931) as well as other HRQoL domains.

Factors which accounted for significant difference in respondents’ Environmental Health Domain included their sex (p =.004), marital status (p < .001), highest level of education (p < .001) and average monthly income (p < .001).

4. Discussion

This study investigated the HRQoL of persons living with TB in the Greater Accra Region of Ghana using a globally validated and reliable instrument (WHOQoL-BREF). The WHOQoL-BREF tool was used in this study because it is an internationally accepted and reliable instrument which has been used to assess the HRQoL of persons living with health conditions which impact their quality of life [2,6,8,18,29]. The findings can therefore be considered in relation to other persons living with health conditions (such as TB) within comparable settings as Greater Accra, Ghana. The study revealed that more than half of the persons living with TB involved in the study felt their overall quality of life was good. Nonetheless, the majority of them were dissatisfied with their health. This finding is reinforced by the observation that the average Physical HRQoL score fell below 50% of the highest possible rating

Table 3
Health-related Quality of Life Domain Score Differences among persons living with Tuberculosis (N = 250).

	N	Physical Health		Psychological Health		Social relationship		Environmental	
		Mean (SD)/Mean rank	p-value	Mean (SD)/Mean rank	p-value	Mean (SD)/Mean rank	p-value	Mean (SD)/Mean rank	p-value
Sex									
Male	150	48.2 (20.011)	0.204	54.5 (19.05)	0.028	44 (20.688)	0.062	47.47 (20.445)	0.004
Female	100	44.79 (22.007)		48.11 (26.483)		38.83 (22.244)		54.88 (19.431)	
Marital Status									
Single	94	141.36	<0.001	129.37	0.027	122.24	0.005	110.55	<0.001
Married	84	135.84		137.73		143.45		160.85	
Separated	65	100.73		108.44		103.87		100.02	
Widow	7	18.43		80.36		154.71		138.57	
Religion									
Christianity	186	46.81 (20.989)	0.429	50.58 (22.728)	0.931	40.37 (20.853)	0.541	50.92 (19.877)	0.186
Islam	64	44.36 (22.234)		50.91 (27.403)		42.45 (24.249)		54.79 (20.751)	
Highest Level of Education									
No formal education	35	114.43	0.549	102.04	0.113	95.84	<0.001	79.49	<0.001
Primary	78	125.37		121.07		154.19		125.65	
Secondary	96	124.26		133.36		117.60		131.31	
Tertiary	41	138.12		135.55		114.73		150.88	
Employment status									
Unemployed	50	81.40	<0.001	73.07	<0.001	94.51	0.003	69.66	<0.001
Student	42	171.46		165.27		133.74		143.07	
Employed	158	127.24		131.52		133.12		138.5	
Average monthly income									
Below Ghc1,000	111	120.21	0.026	113.99	0.004	115.18	0.86	103.50	<0.001
Ghc1,000 – Ghc2,000	123	124.21		129.28		131.93		137.82	
Ghc2,001 – Ghc3,000	16	172.09		176.25		147.72		183.41	
Tuberculosis Site									
Pulmonary	182	48.84 (19.669)	0.003	53.21 (21.961)	0.014	42.67 (21.505)	0.035	53.40 (19.432)	0.056
Extrapulmonary	68	39.08 (23.873)		43.87 (27.662)		36.15 (21.817)		47.93 (21.547)	
Category of Case									
New case	247	45.91 (21.115)	0.061	50.49 (23.997)	0.289	40.69 (21.632)	0.163	51.75 (20.104)	0.236
Re-treatment	3	69.05 (28.868)		65.28 (16.839)		58.33 (28.868)		65.63 (21.651)	
Phase of Treatment									
Intensive	161	43.61 (20.331)	0.010	48.19 (22.5)	0.028	36.34 (18.786)	<0.001	51.24 (19.331)	0.48
Continuation	89	50.84 (22.310)		55.15 (25.915)		49.16 (24.265)		53.13 (21.568)	

suggesting that persons living with TB experienced health challenges related to physical pain, sleep, daily function and energy levels. In congruence with previous studies conducted by Dires et al., [8], the Social relationship HRQoL domain recorded the least average score indicating that it was the most negatively affected HRQoL among the persons living with TB sampled in this study. This finding was not surprising as previous studies in Ghana have reported that persons living with TB experience avoidant or stigmatising behaviours from others and may not receive adequate social support from their significant others on account of fear of contagion or inadequate knowledge [1,13]. The finding that persons living with TB who were married recorded higher Social relationship HRQoL levels than those who were separated further emphasises the need for healthcare providers to involve significant others such as spouses of persons with TB in their care [7,15]. Importantly, persons living with TB who either have low levels of education, are unemployed or have been diagnosed with extrapulmonary TB could be supported to garner adequate social support to elevate their Social Relationship HRQoL. Religion facilitates social networks and has the

potential to contribute to the social well-being of persons living with chronic conditions like TB [29]. It was therefore interesting to observe in this study that in Ghana, a country described as the most religious in the world [5], the religious affiliation of persons living with TB neither influenced their Social relationship nor other HRQoL domains. The limited number of religious affiliations compared in this study may account for this result which necessitates further research.

About 64% of the persons living with TB in Ghana in the year 2016 were estimated to be facing catastrophic expenses on account of TB despite TB diagnosis and treatment being free under the DOTS program [28]. The persons living with TB have to pay directly for their transportation, laboratory investigations and other prescribed medications which are not covered under the DOTS program [19]. Furthermore, the median expenditure among persons living with non-drug resistant TB in Ghana was estimated to be US\$426.6 in 2018 which was above the average monthly income of about half of the persons living with TB in this study [Gh1,000 (\$162.29) to Gh2,000 (\$324.57)] [19]. It was therefore alarming to find in this study that the employment status of

persons living with TB influenced all four (4) domains of their HRQoL, with patients who were unemployed being the most negatively affected [17]. Even though the HRQoL of persons living with TB is not determined solely by their healthcare expenditure or socioeconomic status, these findings suggest that interventions that reduce or eliminate patients' hidden cost of treatment may have to be prioritized in low-to-middle income settings like Ghana to promote the HRQoL of persons living with TB. This study's results also imply that persons living with TB who were widows or were in the intensive phase (first 2 months) of their treatment require healthcare providers' help to address their distressing physical symptoms such as pain and persistent cough [14].

The low Psychological HRQoL observed among persons with extrapulmonary TB in this study is at variance with findings of a previous study originating outside Ghana [8]. Additionally, the low Psychological HRQoL recorded among persons with TB who were female, widowed or unemployed with low income suggests that vulnerable sub-populations among persons living with TB may be at a higher risk for psychological challenges which may affect their HRQoL. Thus, treatment for TB may have to consider regular assessment and management of psychological issues related to the meaningfulness of patients' lives as well as negative feelings such as anxiety or depression [10]. The psychosocial concerns of persons living with TB can also be addressed through counselling services and linkages of the vulnerable to welfare schemes that would provide them with financial protection and social security measures in Ghana [9]. Furthermore, healthcare providers and health facility managers could consider implementing measures which promote the acceptability and effectiveness of comprehensive psychosocial services in addition to the medical services for the persons living with TB [16,24]. Beyond the individual level comprehensive services, structural broad-based interventions which could enhance the HRQoL of persons living with TB should be considered by healthcare policy-makers. Thus, to ensure social protection for persons living with TB, the list of health services covered by the national health insurance scheme should be expanded to cover more TB-related health services. Furthermore, patients receiving treatment for TB could be provided regular allowances to cover their indirect and non-medical costs such as transportation and food-related expenses [9,19].

The observation in this study that female sex, being married, having higher education and having high income were associated with better Environmental HRQoL was comparable to studies conducted in Nepal and Indonesia [22,29]. The results suggest that access to higher formal education as well as employment with income may contribute to better environmental conditions for persons with TB. The urbanized setting of this study may have contributed to respondents' easy access to healthcare and transportation. Public transportation and primary health centres are readily available in Greater Accra to cater to the basic transportation and healthcare needs of persons with TB. As of the year 2000, Ghana had recorded a 100% DOTS coverage nationwide with over 9,380 DOT centres around its 16 administrative regions (including the Greater Accra) providing health services to persons living with TB [12]. Consequently, healthcare providers in these health centres would have to continue providing accurate health information to persons living with TB in their care to inform patients' decision-making and improve their HRQoL.

5. Limitation and strength

The study was conducted in a predominantly urban setting of the Greater Accra region with a relatively small sample hence the findings may not represent the entire HRQoL of persons living with TB in rural contexts of Ghana. Additionally, the respondents in this study were sampled from selected hospitals. It is possible that potential respondents who were not satisfied with the health services or not regular in follow-up to hospitals were not sampled and thus may be under-represented in the study. Nonetheless, this study provides researchers, policymakers and healthcare providers caring for persons living with TB further

insight into the HRQoL and its related factors among persons living with TB in Ghana and comparable low resource settings globally.

6. Conclusion

It was evident in this study that the HRQoL of persons living with TB can be affected by the sociodemographic characteristics of persons living with TB which include their sex, marital status, TB treatment phase and socioeconomic status (education, employment status and average income). Efforts ought to be made by healthcare providers (such as professional nurses and treatment supporters) to provide adequate information and support to the persons living with TB and their significant others in their care.

Ethical statement.

Ethical approval for the conduct of this study was obtained from the Ghana Health Service Ethics Review Committee (GHS-ERC 027/01/21) as well as the management of the four (4) health facilities.

The privacy rights of the participants were always observed in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki). Ethical principles of voluntary participation, beneficence and non-maleficence, privacy and confidentiality were ensured in the study by recruiting only informed and willing respondents who had provided their written informed consent. The respondents could withdraw from this study at any time without explanations.

Appendices.

Participants Informed Consent.

The researchers obtained written informed consent from the participants for the publication of this study. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

- [1] Addy SA, Osei E, Komesuor J, Acquah E, Anku PJ, Tarkang EE, et al. Community Contribution to Tuberculosis Care in the Krachi West District of Ghana: A Qualitative Study. *Tuberculosis Research and Treatment* 2019;2019:1–8. <https://doi.org/10.1155/2019/5039197>.
- [2] Alaazi DA, Menon D, Stafinski T, Hodgins S, Jhangri G. Quality of life of older adults in two contrasting neighbourhoods in Accra. *Ghana Social Science & Medicine* 2021;270:113659. <https://doi.org/10.1016/J.SOCSCIMED.2020.113659>.
- [3] Araia ZZ, Mesfin AB, Mebrahtu AH, Tewelde AG, Tewelde AT, Ngusbrhan Kidane S. Health-Related Quality of Life in Tuberculosis Patients in Eritrea: Comparison Among Drug-Susceptible and Rifampicin/Multidrug-Resistant Tuberculosis Patients. *Patient Related Outcome Measures* 2021;12:205–12. <https://doi.org/10.2147/PROM.S316337>.
- [4] Attafuah PYA, Everink I, Abuosi AA, Lohrmann C, Schols JMGA. Quality of life of older adults and associated factors in Ghanaian urban slums: a cross-sectional study. *BMJ Open* 2022;12(2):e057264.
- [5] Beck SV, Gundersen SJ. A Gospel of Prosperity? An Analysis of the Relationship Between Religion and Earned Income in Ghana, the Most Religious Country in the World*. *Journal for the Scientific Study of Religion* 2016;55(1):105–29. <https://doi.org/10.1111/JSSR.12247>.
- [6] Boima V, Yeboah AK, Kretchy IA, Koduah A, Agyabeng K, Yorke E. Health-related quality of life and its demographic, clinical and psychosocial determinants among male patients with hypertension in a Ghanaian tertiary hospital. *Ghana Medical Journal* 2022;56(1):5–14. <https://doi.org/10.4314/gmj.v56i1.2>.
- [7] Chen X, Du L, Wu R, Xu J, Ji H, Zhang Y, et al. The effects of family, society and national policy support on treatment adherence among newly diagnosed tuberculosis patients: A cross-sectional study. *BMC Infect Dis* 2020;20(1):1–11. <https://doi.org/10.1186/S12879-020-05354-3/FIGURES/1>.

- [8] Dires A, Hagos T, Yitayal M, Amare G, Aschalew AY. Quality of life and associated factors among patients with tuberculosis at the University of Gondar comprehensive specialized hospital. Ethiopia *Quality of Life Research* 2021;30(4): 1173–81. <https://doi.org/10.1007/s11136-020-02717-w>.
- [9] Dixit K, Biermann O, Rai B, Aryal TP, Mishra G, De Siqueira-Filha NT, et al. Barriers and facilitators to accessing tuberculosis care in Nepal: a qualitative study to inform the design of a socioeconomic support intervention. *BMJ Open* 2021;11(10):49900. <https://doi.org/10.1136/BMJOPEN-2021-049900>.
- [10] Febi AR, Manu MK, Mohapatra AK, Prahara SK, Guddattu V. Psychological stress and health-related quality of life among tuberculosis patients: a prospective cohort study. *ERJ Open Research* 2021;7(3):00251–2021. <https://doi.org/10.1183/23120541.00251-2021>.
- [11] Ghana National TB Control Programme. (2021a). *Background of Programme*. <http://www.tbghana.gov.gh/history.php>.
- [12] Ghana National TB Control Programme. (2021b). *Directly Observed Treatment Centres*. <http://www.tbghana.gov.gh/dotcenters.php>.
- [13] Gyimah, F. T., & Dako-Gyeke, P. (2019). Perspectives on TB patients' care and support: A qualitative study conducted in Accra Metropolis, Ghana. *Globalization and Health*, 15(1), 1–9. [10.1186/s12992-019-0459-9](https://doi.org/10.1186/s12992-019-0459-9).
- [14] Harandi, T. F., Mahmoodi, Z., Ghavidel, N., & Sharifipour, Z. (2021). Factors affecting self-management in Iranian tuberculosis patients: A path analysis model. *Canadian Journal of Respiratory Therapy: CJRT = Revue Canadienne de La Thérapie Respiratoire : RCTR*, 57, 73. [10.29390/CJRT-2021-009](https://doi.org/10.29390/CJRT-2021-009).
- [15] Kamilah N, Pratiwi IN, Hidayati L, Smith GD. The effect of family psychoeducation on anxiety, support and self efficacy on the family of patients with tuberculosis. *International Journal of Psychosocial Rehabilitation* 2020;24(7):8703–11. <https://doi.org/10.37200/IJPR/V24I7/PR270850>.
- [16] Li X, Wang B, Tan D, Li M, Zhang D, Tang C, et al. Effectiveness of comprehensive social support interventions among elderly patients with tuberculosis in communities in China: a community-based trial. *J Epidemiol Community Health* 2018;72(5):369–75. <https://doi.org/10.1136/JECH-2017-209458>.
- [17] Malik M, Nasir R, Hussain A. Health Related Quality of Life among TB Patients: Question Mark on Performance of TB DOTS in Pakistan. *Journal of Tropical Medicine* 2018;2018:1–7.
- [18] Memon, A. B., Rahman, A. A. U., Channar, K. A., Zafar, M. S., & Kumar, N. (2021). Assessing the Quality of Life of Oral Submucous Fibrosis Patients: A Cross-Sectional Study Using the WHOQOL-BREF Tool. *International Journal of Environmental Research and Public Health* 2021, Vol. 18, Page 9498, 18(18), 9498. [10.3390/IJERPH18189498](https://doi.org/10.3390/IJERPH18189498).
- [19] Pedrazzoli, D., Siroka, A., Boccia, D., Bonfu, F., Nartey, K., Houben, R., & Borghi, J. (2018). How affordable is TB care? Findings from a nationwide TB patient cost survey in Ghana. *Tropical Medicine & International Health*, 23(8), 870–878. [10.1111/TMI.13085](https://doi.org/10.1111/TMI.13085).
- [20] Polit, D. F., & Beck, C. T. (2017). *Nursing Research: Generating and Assessing Evidence for Nursing Practice*. Wolters Kluwer Health. <https://books.google.com.gh/books?id=O7HRoQEACAAJ>.
- [21] Salehitali S, Noorian K, Hafizi M, Dehkordi AH. Quality of life and its effective factors in tuberculosis patients receiving directly observed treatment short-course (DOTS). *Journal of Clinical Tuberculosis and Other Mycobacterial Diseases* 2019; 15:100093. <https://doi.org/10.1016/j.jctube.2019.100093>.
- [22] Sartika I, Insani W, Abdulah R. Assessment of health-related quality of life among tuberculosis patients in a public primary care facility in Indonesia. *Journal of Global Infectious Diseases* 2019;11(3):102–6. https://doi.org/10.4103/jgid.jgid_136_18.
- [23] Sharma SK, Mohan A, Kohli M. Extrapulmonary tuberculosis. *Expert Review of Respiratory Medicine* 2021;15(7):931–48. <https://doi.org/10.1080/17476348.2021.1927718>.
- [24] Venkatesan P. A role for psychosocial support in the management of respiratory disorders. *The Lancet Respiratory Medicine* 2019;7(6):482. [https://doi.org/10.1016/S2213-2600\(19\)30113-4](https://doi.org/10.1016/S2213-2600(19)30113-4).
- [25] World Health Organization. (1996). *WHOQOL-BREF : introduction, administration, scoring and generic version of the assessment : field trial version, December*. World Health Organization. <http://apps.who.int/iris/bitstream/handle/10665/63529/WHOQOL-BREF.pdf?sequence=1&isAllowed=y>.
- [26] World Health Organization. (1998). *Programme on mental health: WHOQOL user manual*. World Health Organization.
- [27] World Health Organization. (2020). *Global Tuberculosis Report 2020*. <https://apps.who.int/iris/bitstream/handle/10665/336069/9789240013131-eng.pdf?ua=1>.
- [28] World Health Organization. (2021). *Ghana Tuberculosis Profile, 2021*. https://worldhealthorg.shinyapps.io/tb_profiles/?_inputs_&entity_type=%22country%22&lan=%22EN%22&iso2=%22GH%22.
- [29] Yadav RK, Kaphle HP, Yadav DK, Marahatta SB, Shah NP, Baral S, et al. Health related quality of life and associated factors with medication adherence among tuberculosis patients in selected districts of Gandaki Province of Nepal. *Journal of Clinical Tuberculosis and Other Mycobacterial Diseases* 2021;23:100235. <https://doi.org/10.1016/J.JCTUBE.2021.100235>.