ORIGINAL ARTICLE

Association between Tuberculosis Treatment-Related Financial Burden and Social Support for Patients: A Multicenter Cross-Sectional Study from Lahore, Pakistan

Ruhamah Yousaf[1,2], Asita Elengoe[1*] and Muhammad Riaz[1,3]

[1]School of Health & Applied Science, Lincoln University College, Petaling Jaya, Selangor, Malaysia
[2]Department of Health Professional Technologies, Faculty of Allied Health Sciences, The University of Lahore, Lahore, Pakistan
[3]Department of Allied Health Sciences, University of Sargodha, Sargodha, Pakistan

Abstract

Background: Tuberculosis (TB) continues to be a significant public health challenge, with many patients facing financial barriers to treatment. Social support is essential for treatment adherence.

Objective: To examine the association between the financial burden (FB) of treatment and the social support (SS) received by tuberculosis patients.

Methods: An analytical cross-sectional study was conducted by the School of Health & Applied Science, Lincoln University College, Malaysia, from September 2023 to September 2024. 330 TB patients aged 18-75 years were selected using non-probability convenience sampling from four public hospitals, one private hospital, and three TB associations in Lahore, Pakistan. Patients with confirmed pulmonary TB actively receiving treatment were included. Exclusion criteria included pregnant women, extrapulmonary TB, other respiratory conditions, mental illness, or severe comorbidities. Data were collected through face-to-face interviews.

Results: Most participants were male 64.8%, aged 55-64 (21.2%), with 70.3% from lower-income households and 71.2% married. A significant proportion (46.4%) were unemployed. The structured questionnaire had good reliability (0.779). Patients with high FB burden were more likely to report low SS (χ^2=54.754, p <0.001). Logistic regression showed high FB reduced the likelihood of high SS (adjusted OR=0.091, 95% CI: 0.043-0.192, p<0.001). After adjustment, females, younger patients, married individuals, and individuals living in joint families had higher SS.

Conclusion: These findings indicate that higher financial strain reduces the likelihood of receiving adequate support, highlighting the need for targeted interventions to address financial barriers and strengthen social support systems to improve treatment adherence and outcomes.

Keywords: *Financial burden, social support, tuberculosis, treatment adherence, Pakistan.*

INTRODUCTION

Tuberculosis (TB) remains prevalent in low- and middle-income countries (LMICs). Poor access to healthcare services increases the financial burden (FB) and reduces social support (SS) during treatment [1]. According to the World Health Organization (WHO), the global incidence is 134 cases per 100,000 people. Pakistan, with 6.3% of global TB cases, stands 5th among the 30 high-burden countries globally [2]. Although the National TB Control Program (NTP) provides free treatment and free or low-cost investigations, patients still incur out-of-pocket expenses for transport, food, pre-diagnostic investigations, and accommodation. Median household TB-related cost has been reported at USD 129.2 (PKR 14,919), with indirect costs such as income loss due to illness contributing significantly to FB in some contexts, leading to impoverishment, nonadherence, and deterioration in quality of life [3]. The emotional and practical assistance provided by the family, friends, and the wider community, termed SS, is crucial for treatment adherence [4].

However, financial hardships often limit families' capacity to provide the necessary support. Strong SS improves patient confidence, reduces stress related to role changes, and enhances coping during illness [5]. Joint family structures provide support that facilitates adherence and well-being. On the other hand, low-income family support leads to stigma, isolation, and poor outcomes [6].

SS and care-seeking behavior are compromised due to TB-related stigma about the perception of contagiousness [7]. Addressing economic and social issues is essential for ensuring successful treatment. While these challenges are familiar, research on the interaction of factors remains limited. This study aimed to examine the association between the financial burden (FB) of treatment and the social support (SS) received by tuberculosis patients.

MATERIAL AND METHODS

An analytical cross-sectional quantitative study design was used to gather data from TB patients. The study was

*Corresponding author: Asita Elengoe, School of Health & Applied Science, Lincoln University College, Selangor, Malaysia; E-mail: asita@lincoln.edu.my
Received: February 02, 2026; Revised: June 25, 2026; Accepted: July 21, 2026
DOI: https://doi.org/10.37184/lnjpc.2707-3521.8.79

conducted over a period of one year from September 2023 to September 2024. The Ethics Review Committee of Lincoln University College, Malaysia (ERC# LUC/RMC/2023/014) approved this study. This study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies. The selection of TB centers was based on the Directory of TB Centers (Ministry of National Health Services, 2001) and the records of the Pakistan Anti TB Association (PATA), 1955) [8, 9]. Of the 50 available centers, health facilities were selected for high patient turnover and attendance across different socioeconomic strata. These included four public hospitals, namely Sir Ganga Ram Hospital, Social Security Hospital, Mayo Hospital, and Services Hospital, and three Lahore District TB Association centers, namely Lahore District Tuberculosis (TB) Association, 33-F, Gulberg II, Lahore, Lahore District Tuberculosis (TB) Association, 28 Nisbat Road, Lahore, Lahore District Tuberculosis (TB) Association, Kaura Pind Walton, Lahore, along with one private hospital the University of Lahore Teaching Hospital. Administrative permission for data collection was obtained from all participating institutions before the study commenced.

Inclusion criteria included: Patients with confirmed pulmonary TB based on clinical, radiological, or laboratory examination; aged between 18 and 75 years; admitted to the selected public and private hospitals with a confirmed diagnosis of TB; and actively accessing healthcare services for TB diagnosis and treatment. Exclusion criteria included pregnant patients and those with extrapulmonary TB or respiratory conditions other than pulmonary TB, as well as patients with comorbidities such as diabetes mellitus, cardiovascular disease, renal disease, and liver disease.

A convenience sampling method was used to recruit the participants for face-to-face interviews. No fixed number of participants was predetermined for each healthcare facility, and recruitment numbers varied according to patient availability. Recruitment continued until the required sample size of 330 participants was achieved. Participant distribution across healthcare facilities is shown in Table **S1**. Because convenience sampling was employed, the number of individuals screened for eligibility, excluded, or who declined participation was not systematically recorded during recruitment. Patients were recruited with their written informed consent.

The sample size for this study was determined using G*Power (version 3.1). A minimum sample size of 328 participants was calculated to detect a small effect (Cohen's w = 0.20) for a chi-square test (df = 4) with 80% power and α = 0.05. This conservative small effect size was selected to ensure adequate power, as a large real-world effect (OR = 5.8) has been demonstrated for financial social support [10]. A total of 330 TB patients were included in this study.

The questionnaire used in this study was a structured survey developed to assess the SS and FB experienced by TB patients, comprising three main sections: sociodemographic characteristics, SS, and FB. The first part identified sociodemographic information including age, marital status, family type, education, income, occupation, and daily working hours. Given the lack of a validated scale designed for TB patients in Pakistan that captures these culturally relevant domains, a new scale was developed for this study. The SS section was newly developed, comprising five domains of 15 items: family behavior, financial support, transportation, nutritional support, and household work support. A literature review informed content validity. Items assessed included perceived stigma, family care and encouragement, financial help, assistance with transportation to healthcare facilities, nutritional support, and help with household responsibilities such as childcare and chores. Responses were gathered using a 5-point Likert scale (ranging from strongly agree to disagree strongly). Responses were coded from 1 (strongly disagree) to 5 (strongly agree), and the scores of the 15 items were summed to obtain a total SS score, with higher scores indicating greater perceived SS. Scoring interpretation: Total SS score ranged from 15 to 75. For descriptive purposes, scores were categorized into tertiles: low (sum 15-35), moderate (36-55), and high (56-75). Tertiles were chosen to create approximately balanced groups for descriptive and regression analyses because no established clinical cut-offs were available for the newly developed. The study questionnaire is provided in a supplementary file.

The third part assessed FB developed by using 15 treatment-related economic items drawn from domains suggested in the WHO tuberculosis patient cost survey protocol and further detailed in the subsequent handbook, including direct medical costs (professional fee, medicines, laboratory tests), direct non-medical costs (transportation and food/supplements), indirect costs (loss of work or income), and coping strategies related to treatment expenses. Content validity was established through adaptation of these standardized WHO domains and was supported by a literature review. As the FB items represent distinct cost components rather than a unidimensional latent construct, internal consistency measures such as Cronbach's α were not deemed appropriate [11, 12].

The FB index was constructed using a step-wise approach. First, 15 TB-related expenditure items were grouped into six analytical domains (professional fee, medicines, laboratory tests, transportation, food/supplements, and work loss). The original expenditure variables were recorded using domain-specific response structures with varying numbers of categories across domains (professional fee = 7, medicine = 4, laboratory test = 4, transportation = 4, food/supplements = 5, work loss = 3). For constructing the FB index, the original expenditure

response categories within each domain were grouped into low-, moderate-, and high-expenditure-intensity categories using domain-specific cut-offs derived from the observed expenditure distribution (**Table S2**). Because the original expenditure domains contained different numbers of response categories, each domain was recoded using its own expenditure cut-offs before the composite FB index was calculated. The FB index is a composite proxy for relative TB-related expenditure intensity across the six domains, with higher scores indicating greater FB, reflecting increasing expenditure intensity rather than an absolute monetary burden. Although the FB index primarily captures expenditure intensity, it is complemented by the cost-to-income ratio and catastrophic cost analysis, which reflect affordability constraints relative to household income. Although coping-related items (*e.g.*, asset sales) were assessed, most responses showed minimal variability; therefore, these items were excluded from the composite FB index, which was based on six expenditure-related domains. A cost-to-income ratio (%) was calculated as the total TB cost divided by the monthly household income, multiplied by 100, using midpoint values for both. Catastrophic cost was defined as >20% of household income (the WHO threshold).

For analytical purposes, total FB scores were categorized into tertiles representing low, moderate, and high levels. FB tertiles, based on the observed distribution of total FB scores in the study sample, were defined as: low (6-11), moderate (12-16), and high (17-21). These thresholds represent relative burden based on the sample distribution and do not correspond to absolute cost ranges, as no validated clinical thresholds are available for the composite FB index. The complete study questionnaire is provided in a supplementary file.

Face validity for both SS and FB was assessed during pilot testing with 50 TB patients; minor refinements were made to improve clarity, relevance, and contextual appropriateness of the items.

A pilot test conducted on 50 TB patients at Sir Ganga Ram Hospital showed good internal consistency, with SS Cronbach's α = 0.773. The 50 participants included in the pilot study were not included in the final analytical sample. After minor refinement, the scale was applied to the full sample; Cronbach's α was 0.779, indicating acceptable internal consistency. By using exploratory factor analysis (EFA) (principal axis factoring with Promax rotation), construct validity was assessed, with factor retention based on eigenvalues, scree plot inspection, and interpretability.

FB was summarized using descriptive statistics and analyzed as a covariate in logistic regression analysis.

SPSS version 27 was used for data analysis. Data were complete for all variables included in the analysis; therefore, no imputation procedures were required. Normality of age was examined using skewness, kurtosis, and the Shapiro-Wilk test. Descriptive statistics included frequencies and percentages, which summarized sociodemographic and socioeconomic characteristics of the participants, including gender, age, occupation, marital status, family type, education, and monthly household income category. Monthly household income was categorized as lower income (<50,000 PKR/month) and middle income (50,000- 100,000 PKR/month), based on self-reported data. A Chi-square test was performed to determine associations between FB and SS to assess whether the distribution of SS levels differed by FB category.

For binary logistic regression analysis, the outcome variable SS was categorized into high SS (56-75) and low/moderate SS (15-55). FB was dichotomized into high FB (17-21) *versus* low/moderate (6-16), with low/moderate as the reference category. Univariate and multivariable binary logistic regression analyses were performed to examine the association between FB and the likelihood of experiencing high SS. The multivariable model included FB and sociodemographic variables (gender, age, marital status, and family type) as covariates. Preliminary analyses examined qualification, occupation status, and daily working hours. Still, these factors did not contribute to the final multivariable model because sparse subgroup frequencies led to unstable parameter estimates and poor model convergence. Model significance was assessed using the Omnibus Tests of Model Coefficients. All statistical tests were two-tailed, and a p-value of <0.05 was considered statistically significant.

RESULTS

A total of 330 TB patients were included, and no missing data were observed for any study variables. The majority were male (64.8%) and married (71.2%). The mean age was 42.4 years (SD = 15.99), and the largest age group was 55-64 years (21.2%). Most lived in joint families (62.7%) and belonged to lower-income households (70.3%). The majority 38.5% had education below matriculation, while 32.7% were illiterate. Nearly half of the participants were unemployed (46.4%). Daily working hours were reported as categorical data, with the largest proportion not working (59.4%), followed by those working 7-9 hours per day (22.7%) (**Table 1**).

Table 1: Demographic characteristics of participants.

Variables	Frequency (%)
Gender	
Male	214 (64.8)
Female	116 (35.2)
Age groups (in years)	
18-24	59 (17.9)
25-34	68 (20.6)
35-44	42 (12.7)
45-54	65 (19.7)
55-64	70 (21.2)
65-75	26 (7.9)

Variables	Frequency (%)
Marital status	
Single	95 (28.8)
Married	235 (71.2)
Family type	
Nuclear	123 (37.3)
Joint	207 (62.7)
Qualification	
Illiterate	108 (32.7)
Under matriculation	127 (38.5)
Matriculation (10th Grade)	30 (9.1)
Intermediate (12th Grade)	37 (11.2)
Graduation	28 (8.5)
Monthly household income category	
Lower income (<50,000 PKR/ month)	232 (70.3)
Middle income (50,000- 100,000 PKR/ month)	98 (29.7)
Occupation	
Unemployed	153 (46.4)
Student	37 (11.2)
Police official	8 (2.4)
Factory worker	52 (15.8)
Factory owner	3 (0.9)
Retired	16 (4.8)
Security guard	20 (6.1)
Teacher	7 (2.1)
Driver	30 (9.1)
Mechanic	4 (1.2)
Daily working hours	
Not working	196 (59.4)
4 - 6 hours	24 (7.3)
7-9 hours	75 (22.7)
10-13 hours	17 (5.2)
14-16 hours	18 (5.5)

Construct Validity of the Social Support Scale

EFA showed acceptable construct validity (KMO=0.602; Bartlett's test: χ^2=5017.059, df=105, p<0.001). A three-factor solution explaining 61.75% of the variance was retained, representing household support, family and treatment support, and financial support. Most items loaded > 0.50, while stigma-related items showed weaker loadings and communalities (**Table S3**).

Level of Social Support Received by Tuberculosis Patients

Total scores for SS were approximately normally distributed, with a mean of 41.69 (SD=7.29), median=42.50 (IQR=35.00-47.00; possible score range 15-75). Most participants, when categorized into tertiles, reported moderate social support (42.4%), with low (32.1%) and high (25.5%) support less frequent (**Fig. 1**). Family care and encouragement for treatment were widely reported, financial support was primarily provided by relatives, and household, childcare, and work-related support were moderate to low (**Table S4**).

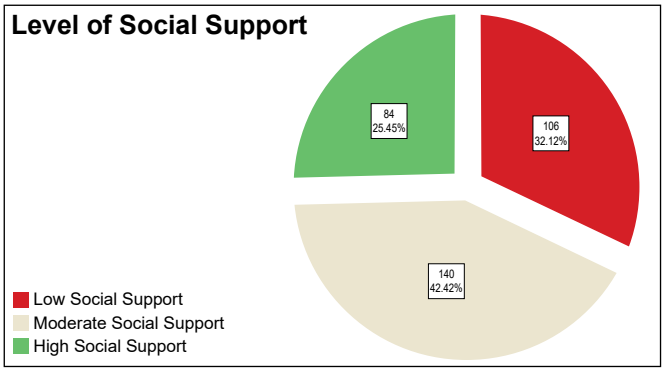


Fig. (1): Level of social support.

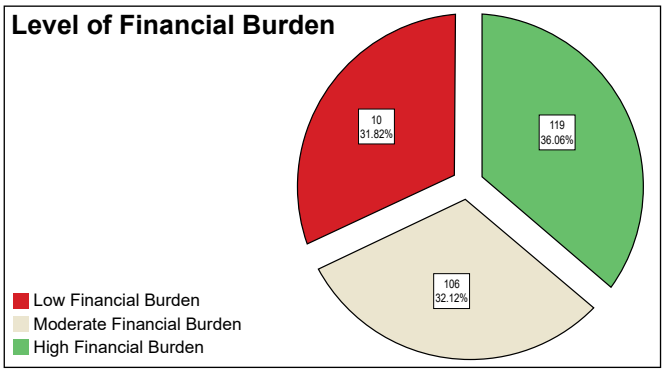


Fig. (2): Level of financial burden.

Level of Financial Burden on Tuberculosis Patients

The total FB score had a mean of 10.31 ± 3.51, a median of 9.00 (IQR=8.00-12.00), and ranged from 6 to 21. The majority of participants reported spending between 1,000 and 10,000 PKR on health professional fees, medicines, lab costs, and transportation. Food/ supplement costs were generally lower. Most (91.8%) reported no work loss, which may be partially explained by the high unemployment (46.4%) (**Table 1** and **S5**). Overall, FB, categorized into tertiles, showed that 36.1% of participants experienced low burden, 32.1% moderate burden, and 31.8% high burden (**Fig. 2**). All participants (100%) experienced catastrophic health expenditure, with cost-to-income ratios ranging from 25% to 187%.

Table 2: Univariate and multivariate logistic regression analysis.

Variables	Crude β	Crude OR (95% CI)	p-value	Adjusted β	Adjusted OR (95% CI)	p-value
Gender (Female)	-0.180	0.836 (0.439-1.414)	0.540	1.665	3.149 (1.473-6.734)	*0.003
Age (18-34 years)	1.431	4.185 (1.840- 9.519)	*0.001	2.330	7.590 (2.663-21.630)	*<0.001
Age (35-54 years)	1.922	6.833 (3.004-15.547)	*<0.001	2.911	17.953 (6.544-49.254)	*<0.001
Marital Status (Married)	0.898	2.455 (1.304-4.615)	*0.005	0.753	2.491 (1.150-5.394)	*0.021
Family Type (Joint)	0.754	2.125 (1.220-3.702)	*0.008	1.087	2.906 (1.428-5.915)	*0.003
Financial Burden (High)	-1.929	0.145 (0.084-0.250)	*< 0.001	-2.700	0.091 (0.043-0.192)	*<0.001

β Coefficients, beta coefficients; OR: odds ratio; CI: confidence interval.
*Significant at p<0.05.
Reference categories: Male (gender), ≥ 55 years (age), Single (marital status), Nuclear family (family type), Low/moderate financial burden.

Sensitivity analysis using alternative thresholds (10% and 25%) showed consistent results, with all participants exceeding both cut-offs.

Impact of Financial Burden on Social Support

The association between FB and SS was first examined using a Chi-square test (**Table S6**). Patients with high FB were more likely to report low SS compared to those with low/ moderate FB (χ^2=54.754, p <0.001). Table **2** shows the univariate and multivariable logistic regression results. Univariate analysis revealed that patients with high FB had significantly reduced odds of high SS compared to those with low/moderate FB (OR=0.145, p<0.001). Other significant univariate predictors were younger age (18-34 years), marriage, and joint family, whereas gender was not (p = 0.540). After adjustment, FB remained a strong negative predictor (adjusted OR= 0.091, p < 0.001). Younger age, being married, living in joint families, and female gender were independently associated with higher SS (adjusted OR = 3.149, p = 0.003). The multivariate logistic regression model was statistically significant (χ^2 = 110.597, p < 0.001) and showed good classification accuracy, correctly classifying 82.4% of cases.

DISCUSSION

TB is a threat to high-risk populations who face social barriers to timely and effective treatment. Programmatic actions have been emphasized in the WHO's End TB Strategy, which considers patients' socioeconomic needs [13]. TB extends beyond clinical illness. It imposes physical, emotional, financial, social, and psychosocial burdens on patients and families. Thus, a comprehensive support system is required [14].

The study indicated that FB was strongly associated with reduced SS. Ethiopian research has shown that over half of drug-sensitive TB patients faced catastrophic costs limiting SS [15]. Thailand reported that 29.5% of TB-affected households faced catastrophic costs, whereas data from Shanghai indicate that financial support programs improve outcomes [16, 17].

Even though gender was not a significant predictor in the univariate analysis, the multivariate analysis revealed that females had higher odds of receiving SS than males (adjusted OR = 3.149, p = 0.003) after adjustment for other covariates. A previous study also identified gender as a determinant of SS [6]. Additional sequential-adjustment analysis did not identify any single covariate acting as a classical suppressor variable; instead, the association between female gender and higher SS emerged only after simultaneous adjustment for FB and other sociodemographic variables, suggesting that the finding reflected joint confounding rather than a classical suppressor effect. TB usually affects women in their economically and reproductively active years of life [18]. Men also face substantial SS and FB barriers [19].

Younger patients received more SS, though some studies have reported contrasting findings [20]. In China, younger patients (27.5) received less SS than older patients (31.60), with those aged 40-59 receiving the highest support (33.60) [21].

Married participants and those living in joint families reported higher SS and lower FB, in consonance with evidence that family support, including financial support and emotional encouragement, plays a crucial role in treatment adherence [22]. Joint multi-earner households provide financial resilience [23]. Poorer households with weak social networks struggle more with financial support [21].

Globally, patients are affected by catastrophic costs due to TB, with indirect and non-medical costs being major cost components [24]. A multi-country analysis found that productivity loss and non-medical expenditures, such as transportation and food, are the key burdens [25]. In this study, all participants exceeded the WHO catastrophic-cost threshold (>20% of household income), and sensitivity analyses using 10% and 25% thresholds yielded identical results. This finding may reflect the predominantly low-income study population, the inclusion of indirect costs, recruitment from high-volume urban TB centers, and estimation of household income using category midpoint values.

Generally, TB patients reported strong family support, with most receiving care after diagnosis and being encouraged to seek treatment, reflecting the fact that family support aids adherence and psychological well-being [21, 22]. Support for continuing treatment shows that kinship ties enhance treatment adherence and coping capacity [22]. Stigma is negatively associated with SS and reflects cultural differences [26].

Financial support was low, as responses from relatives, friends, and neighbors demonstrated reliance on family and weak community support in resource-limited settings [20].

Transportation, nutritional, and household support vary, creating barriers such as travel costs, food insecurity, and household workload that reduce adherence and well-being [27].

SS was negatively associated with stigma, including its economic aspects [28]. Better utilization of professional services correlates with lower perceived stigma, showing that supportive atmospheres facilitate healthcare utilization despite financial restraints. Supportive families encourage care-seeking behavior and decrease direct expenses through improved adherence and shared resources. Healthcare and transportation costs are positively correlated with family-support items but negatively correlated with medication costs. Similarly, Polat and Turan reported that patients receiving lower support from family, friends, and their communities

experienced higher stigma, emphasizing the protective role of social networks [26].

Encouragement, financial assistance, and transportation support from friends and neighbors were associated with more efficient healthcare utilization and lower healthcare expenditures [27]. Household support facilitated access to healthcare services and alleviated economic strain [29]. Nutritional support was associated with higher costs, likely reflecting greater disease severity [30].

This multicenter study provides novel insights into the interrelationship between FB and SS in TB care. Strengths include coverage of various domains of support, such as stigma and pilot-tested measures, as well as the inclusion of patients from diverse clinical settings. The EFA supported preliminary construct validity, though the SS scale was newly developed, with a modest KMO value and low communalities of stigma-related items suggesting the need for further scale refinement and confirmatory validation in independent samples. Limitations include the exclusion of extrapulmonary TB cases and patients with major comorbidities, which may have introduced selection bias and limited generalizability. Additionally, the use of non-probability convenience sampling may introduce selection bias, limiting representativeness. Screened or excluded patients were not recorded, limiting the assessment of selection bias. As FB and SS were self-reported, recall and social desirability bias may have occurred. The FB index primarily assessed measurable cost components and did not fully reflect broader financial hardship. The FB index may underestimate indirect costs because the work-loss measure captures only income loss among formally employed individuals and does not reflect opportunity costs for unemployed or informal workers. Moreover, the cross-sectional design does not allow causal inferences. Further studies should incorporate subjective indicators of financial distress, such as borrowing behavior, treatment delays, and difficulty meeting household expenses, to capture broader dimensions of financial hardship.

Integrated medical, social, and economic support is essential. These findings highlight that even when absolute costs appear modest, their proportional impact on income is substantial, supporting the argument that affordability, not just cost magnitude, determines FB. Apart from free medications, TB programs should also address transportation, nutrition, and other indirect costs, alongside community-based stigma reduction initiatives. The incorporation of family and community dynamics into TB care is essential for improving treatment compliance, reducing hardship, and optimizing outcomes.

CONCLUSION

This study underscores the significant role that family, friends, and neighbors play in providing emotional and practical support. Joint families provided considerable care, but financial assistance was scarce. Patients from nuclear families faced greater challenges. Higher FB was significantly associated with lower perceived social support. This highlights the interrelated nature of economic challenges and social experiences and their combined influence on patient well-being and treatment trajectories. The study emphasizes the importance of considering both financial and social dimensions when examining the lived experiences of patients with TB.

ETHICS APPROVAL

The Ethics Review Committee of Lincoln University College, Malaysia (ERC# LUC/RMC/2023/014) approved this study. All procedures performed in studies involving human participants were conducted in accordance with the ethical standards of the institutional research committee and the Declaration of Helsinki.

CONSENT FOR PUBLICATION

Patients were recruited after being fully informed about the purpose of the research. Written informed consent was obtained. Permission to conduct the study was also granted by public and private hospitals and the Lahore District Tuberculosis (TB) Associations in Pakistan.

AVAILABILITY OF DATA

The data are available upon reasonable request to the corresponding author.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ACKNOWLEDGEMENTS

We want to acknowledge the administrators and staff of healthcare facilities (Sir Ganga Ram Hospital, Social Security Hospital, Mayo Hospital, and Services Hospital, Lahore District Tuberculosis (TB) Association, 33-F, Gulberg II, Lahore, Lahore District Tuberculosis (TB) Association, 28 Nisbat Road, Lahore, Lahore District Tuberculosis (TB) Association, Kaura Pind Walton, Lahore, and the University of Lahore Teaching Hospital.) and all the patients who participated in this study.

AUTHORS' CONTRIBUTION

RY: Conception, data acquisition, drafting the manuscript, and approval of the final version.

AE: Study design, data analysis, critical review, revision, and approval of the final version.

MR: Study design, data interpretation, and approval of the final version.

SUPPLEMENTARY MATERIAL

Supplementary material is available on the journal's website.

REFERENCES

1. World Health Organization. Tuberculosis. 2025. Available from: https://www.who.int/news-room/fact-sheets/detail/tuberculosis (Accessed 1 October 2025).
2. Floyd K, Glaziou P, Houben RMGJ, Sumner T, White RG, Raviglione M. Global tuberculosis targets and milestones set for 2016-2035: definition and rationale. Int J Tuberc Lung Dis 2018; 22: 723-30. DOI: https://doi.org/10.5588/ijtld.17.0835
3. Ikram A, Ali A, Abbasi SH, Ashraf N, Wali S, Salman M, *et al.* Is tuberculosis treatment truly free? A study to identify key factors contributing to the catastrophic cost of TB care in Pakistan. J Tuberc Res 2020; 08: 181-98. DOI: https://doi.org/10.4236/jtr.2020.84017
4. Li H, Ji Y, Chen T. The roles of different sources of social support on emotional well-being among Chinese elderly. PLoS One 2014; 9(3): e90051. DOI: https://doi.org/10.1371/journal.pone.0090051
5. Dana NR, Chiau ML, Rahman AD. Family support, motivation, and patient adherence to tuberculosis treatment: insights from Indonesia. Afr J Infect Dis 2025; 19(2): 43-9. DOI: https://doi.org/10.21010/Ajidv19i2.5
6. Alinaitwe B, Shariff NJ, Madhavi Boddupalli B. Level of family support and associated factors among pulmonary tuberculosis patients in Eastern Uganda. A baseline cross-sectional study. J Multidiscip Healthc 2025; 18: 2057-73. DOI: https://doi.org/10.2147/JMDH.S511615
7. Chen X, Du L, Wu R, Xu J, Ji H, Zhang Y, *et al.* Tuberculosis-related stigma and its determinants in Dalian, Northeast China: a cross-sectional study. BMC Public Health 2021; 21(1): 6. DOI: https://doi.org/10.1186/s12889-020-10055-2
8. Ministry of National Health Services Regulations and Coordination, Government of Pakistan. Ministry of National Health Services Regulations and Coordination: About Us. Available from: https://www.nhsrc.gov.pk (Accessed 2 October 2025)
9. Pakistan Anti TB Association (PATA). Member associations. Available from: https://patba.org/member-associations/ (Accessed 2 October 2025).
10. Sahan S, Topluoglu S, Temel F, Gokler ME, Kaygusuz S. Did financial social support for tuberculosis patients lead to better treatment outcomes in Türkiye during 2018-2019? Jpn J Infect Dis 2023; 76(6): 365-71. DOI: https://doi.org/10.7883/yoken.JJID.2023.196
11. World Health Organization. Protocol for survey to determine direct and indirect costs due to TB and to estimate proportion of TB-affected households experiencing catastrophic total costs due to TB. Available from: https://www.who.int/publications/m/item/protocol-for-survey-to-determine-direct-and-indirect-costs-due-to-tb-and-to-estimate-proportion-of-tb-affected-households-experiencing-catastrophic-total-costs-due-to-tb (Accessed 2 October 2025).
12. World Health Organization. Tuberculosis patient cost surveys: a handbook. Available from: https://iris.who.int/server/api/core/bitstreams/e2ed2136-7bdf-48c5-bfb8-68f074e43b45/content (Accessed 2 October 2025).
13. World Health Organization. Global Programme on Tuberculosis and Lung Health: The End TB Strategy. Available from: https://www.who.int/teams/global-programme-on-tuberculosis-and-lung-health/the-end-tb-strategy (Accessed 6 October 2025).
14. Aggarwal AN. Quality of life with tuberculosis. J Clin Tuberc Other Mycobact Dis 2019; 17: 100121. DOI: https://doi.org/10.1016/j.jctube.2019.100121
15. Assefa DG, Dememew ZG, Zeleke ED, Manyazewal T, Bedru A. Financial burden of tuberculosis diagnosis and treatment for patients in Ethiopia: a systematic review and meta-analysis. BMC Public Health 2024; 24(1): 260. DOI: https://doi.org/10.1186/s12889-024-17713-9
16. Youngkong S, Kamolwat P, Wongrot P, Thavorncharoensap M, Chaikledkaew U, Nateniyom S, *et al.* Catastrophic costs incurred by tuberculosis affected households from Thailand's first national tuberculosis patient cost survey. Sci Rep 2024; 14 (1): 11205. DOI: https://doi.org/10.1038/s41598-024-56594-1
17. Chen Y, Shen X, Zhang Y, Wu Z, Xu B, Chen J, *et al.* Impact of financial support on treatment outcomes of multidrug-resistant tuberculosis: a population-based, retrospective cohort study in Shanghai, China. J Clin Tuberc Other Mycobact Dis 2024; 37: 100500. DOI: https://doi.org/10.1016/j.jctube.2024.100500
18. Harvey IS, Alexander K. Perceived social support and preventive health behavioral outcomes among older women. J Cross Cult Gerontol 2012; 27(3): 275-90. DOI: https://doi.org/10.1007/s10823-012-9172-3
19. Mendoza-Hisey EC, Dier A, Marquez NV, Bumanglag LV, Cadiao SB, Guirgis SF. Gender-related factors affecting access to TB services and treatment outcomes in the Philippines. Public Health Action 2023; 13(3): 107-11. DOI: https://doi.org/10.5588/pha.23.0021
20. Saqib SE, Ahmad MM, Panezai S. Care and social support from family and community in patients with pulmonary tuberculosis in Pakistan. Fam Med Community Health 2019; 7(4): e000121. DOI: https://doi.org/10.1136/fmch-2019-000121
21. Chen B, Peng Y, Zhou L, Chai C, Yeh HC, Chen S, *et al.* Social support received by multidrug-resistant tuberculosis patients and related factors: a cross-sectional study in Zhejiang Province, People's Republic of China. Patient Prefer Adherence 2016; 10: 1063-70. DOI: https://doi.org/10.2147/PPA.S105655
22. 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): 623. DOI: https://doi.org/10.1186/s12879-020-05354-3
23. Wang Y, McNeil EB, Huang Z, Chen L, Lu X, Wang C, *et al.* Household financial burden among multidrug-resistant tuberculosis patients in Guizhou province, China: a cross-sectional study. Medicine 2020; 99(28): e21023. DOI: https://doi.org/10.1097/MD.0000000000021023
24. Tanimura T, Jaramillo E, Weil D, Raviglione M, Lönnroth K. Financial burden for tuberculosis patients in low- and middle-income countries: a systematic review. Eur Respir J 2014; 43(6): 1763-75. DOI: https://doi.org/10.1183/09031936.00193413
25. Ngadaya FD, Philbert D, Wilfred A, Mshiu JJ, Binyaruka P, Mnyambwa NP, *et al.* Incidence and determinants of households' catastrophic payments for TB care: evidence from a multi-country trial (EXIT-TB project) implemented in East Africa. BMJ Public Health 2025; 13(3): e001543. DOI: https://doi.org/10.1136/bmjph-2024-001543
26. Polat H, Turan GB, Tan M. Determining the relationship between stigmatization and social support in tuberculosis patients. J Clin Tuberc Other Mycobact Dis 2024; 37: 100502. DOI: https://doi.org/10.1016/j.jctube.2024.100502
27. Kilima SP, Mubyazi GM, Moolla A, Ntinginya NE, Sabi I, Mwanyonga SP, *et al.* Perceived access to social support during and after TB treatment in Mbeya and Songwe regions, Tanzania: perspectives from TB patients and survivors set against health care providers. Front Health Serv 2024; 4: 1273739. DOI: https://doi.org/10.3389/frhs.2024.1273739
28. Chen X, Xu J, Chen Y, Wu R, Ji H, Pan Y, *et al.* The relationship among social support, experienced stigma, psychological distress, and quality of life among tuberculosis patients in China. Sci Rep 2021; 11(1): 24236. DOI: https://doi.org/10.1038/s41598-021-03811-w
29. Priedeman Skiles M, Curtis SL, Angeles G, Mullen S, Senik T. Evaluating the impact of social support services on tuberculosis treatment default in Ukraine. PLoS One 2018; 13(8): e0199513. DOI: https://doi.org/10.1371/journal.pone.0199513
30. Inthavong D, Elsayed H, Keonakhone P, Seevisay V, Souksanh S, Suthepmany S, *et al.* Does nutritional support contribute to mitigating the financial burden faced by TB-affected households? IJTLD Open 2025; 2(5): 260-8. DOI: https://doi.org/10.5588/ijtldopen.25.0079