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Employment Status, Visual Impairment, and Health Insurance Status as Predictors of Common Mental Health Disorders Among Tuberculosis Patients: A Community-Based Study

Muhamad Zakki Saefurrohim[1*], Gasella Aurelia Azzahra[1], Yunda Yuardani[1], Izmil Ilmawari[1], Muhammad Aidil Fitrah[1], Irma Desylia Maharani[2]
[1]Public Health, Faculty of Public Health, Universitas Mulawarman, Indonesia
[2]Department of Health Promotion, Poltekkes Kementerian Kesehatan, Kalimantan Timur, Indonesia
*Corresponding Author: Email: saefurrohim@fkm.unmul.ac.id

Abstract
Introduction: Tuberculosis (TB) remains a major global health concern with substantial physical and psychological effects on patients. Studies have shown that the prevalence of depression is higher among patients with multidrug-resistant (MDR-TB)-TB than among non-MDR-TB patients and among females than among males. These findings underscore the importance of addressing mental health issues in patients with TB. This study aimed to analyze the predictors of Common Mental Health Disorders (CMHD) among patients with TB in Indonesia.
Methods: Data were derived from the 2023 Indonesia Health Survey (SKI 2023). A subsample of 830 patients with active TB and complete data was analyzed. The variables included sex, marital status, educational attainment, employment status, health insurance ownership, other infectious diseases, history of chronic diseases, visual impairment, hearing impairment, smoking status, engagement in vigorous physical activity, residential classification, primary household drinking water source, and home ownership status. CMHD status was assessed using the Self-Reporting Questionnaire (SRQ-20). The analyses were performed using chi-square tests and logistic regression models.
Results: The CMHD prevalence was 7.3%. Unemployment (OR=3.074; 95% CI: 1.791–5.274; p<0.001), lack of health insurance, and visual impairment (OR=2.456; 95% CI: 1.430–4.220; p=0.001) were significant predictors, whereas ownership of subsidized (OR=0.343; 95% CI: 0.140–0.837; p=0.019) and non-subsidized or private insurance (OR=0.402; 95% CI: 0.225–0.718; p=0.002) were protective.
Conclusion: Routine mental health screening and socioeconomic support should be integrated into TB control programs.

Keywords: Employment Status, General Mental Disorder, Health Insurance, Tuberculosis, Visual Impairment

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Introduction

Tuberculosis (TB) remains a major infectious disease that imposes a significant health and social burden worldwide. According to the Global Tuberculosis Report 2024 by the World Health Organization (WHO), there are more than 10.6 million new TB cases and 1.3 million deaths annually, making TB the second leading cause of death from infectious diseases after COVID-19. Indonesia ranks second among countries with the highest TB burden globally, after India, and accounts for approximately 9% of all global cases. In addition to its severe physical impact, [1] Tuberculosis poses a substantial psychological burden that is often inadequately addressed. TB patients are at high risk of developing Common Mental Health Disorders (CMHDs) such as depression, anxiety, post-traumatic stress disorder (PTSD), and sleep disturbances due to social stigma, uncertainty of recovery, and economic and social pressures.[2]

A meta-analysis of 25 studies conducted across seven countries involving 4,903 participants reported a prevalence of depression of 45.19% (95% CI: 38.04–52.55). The prevalence was higher among patients with multidrug-resistant tuberculosis (MDR-TB) (52.34%) than among those with non-MDR-TB (447 %) and was also higher among females (51.54%) than among males (45.25%).[3] These findings underscore the importance of paying close attention to the mental health of patients with TB. Mental health is closely linked to the clinical course and treatment outcomes of tuberculosis (TB). Patients with mental disorders tend to exhibit lower treatment adherence and a higher risk of relapse than those without psychological disturbances.[4] Moreover, social factors, such as employment status and income level, influence patients' psychological well-being. Unemployed individuals are at greater risk of developing mental disorders due to the loss of social roles, financial stress, and decreased self-esteem.[5]

The study by Wells et al. (2019) emphasized that an inclusive health insurance system can serve as a protective factor against the mental burden experienced by TB patients, primarily through reducing financial strain and enhancing the sense of security during treatment.[6] In addition to socioeconomic factors, sensory impairments such as visual and hearing disorders have also been shown to increase the risk of mental health problems.[7] A study conducted by Alene et al. (2021) reported that approximately 9.8% of TB patients experienced visual impairment, most of which was attributed to the toxic effects of second-line anti-TB drugs, including kanamycin and capreomycin.[8]

Considering the complexity of the interrelationship between socioeconomic factors, sensory disabilities, and mental health, it is crucial to develop a comprehensive understanding of the psychosocial determinants affecting individuals with TB. Accordingly, this study aimed to examine the determinants associated with the occurrence of CMHDs among patients with TB, with a particular focus on employment status, visual impairment, and health insurance coverage as primary predictors. The results of this study are expected to provide a robust scientific foundation for the integration of mental health services into national TB control programs, thereby supporting a holistic and patient-centered approach that enhances the overall quality of life of individuals affected by TB.

Methods

Design and Sample

This study employed a cross-sectional design using secondary data from the 2023 Indonesian Health Survey (SKI-*Survei Kesehatan Indonesia*) conducted by the Health Development Policy Agency of the Ministry of Health of the Republic of Indonesia. Data were collected through face-to-face interviews using standardized questionnaires administered by trained enumerators. The survey applied a multistage stratified cluster sampling method, stratified by province and urban–rural classification, with census blocks from the 2020 Population Census serving as primary sampling units.[9]

Figure 1 illustrates the sample selection process. Among the 630,827 respondents who completed the CMHD-related questions, 1,117 reported a history of TB lasting more than six months. After applying the inclusion criteria and excluding incomplete records, 830 respondents with TB were included in the final analyses. Of these, 61 (7.3%) were identified as having CMHD, whereas the remaining 769 (92.7%) did not.

Data Collection and Measurement

Data were collected using a validated and structured questionnaire. The dependent variable was CMHD, assessed using the validated World Health Organization Self-Reporting Questionnaire (WHO-SRQ-20). The SRQ-20 consists of 20 dichotomous (yes/no) items, with total scores ranging from 0 to 20. In this study, a cutoff score of >6 was used to indicate the presence of CMHD, whereas scores ≤6 were classified as not having CMHD. The SRQ-20 has demonstrated strong validity and reliability in large scale population studies in Indonesia, with excellent discriminative ability (area under the curve >0.90), high sensitivity and specificity, and strong agreement statistics (kappa >0.80).[10] Other variables were obtained from self-reports and medical diagnoses, including a history of infectious and chronic diseases. Enumerators underwent standardized training, and data quality was ensured through spot checks and reinterviews. The independent variables included sociodemographic characteristics (gender, marital status, education, and employment), access to healthcare services (insurance ownership: uninsured, subsidized Indonesian National Health Insurance (*BPJS Kesehatan)*, or non-subsidized/private insurance), and health status (history of infectious disease, chronic illness, visual and hearing impairment, smoking habits, and vigorous physical activity). Environmental factors included residential classification (urban/rural), main drinking water source (improved/unimproved), and housing ownership (owned/not owned). All variables were coded according to their respective categories for regression analysis.

Data Analysis

A descriptive analysis was conducted to present the variable distributions, and bivariate associations were examined using the chi-square test. Multivariate analysis employed binary logistic regression to estimate adjusted odds ratios (aOR) with 95% confidence intervals (CI), applying survey weights to ensure national representativeness of the sample. Statistical significance was set at $\alpha<0.05$, and all analyses were performed using R Studio.

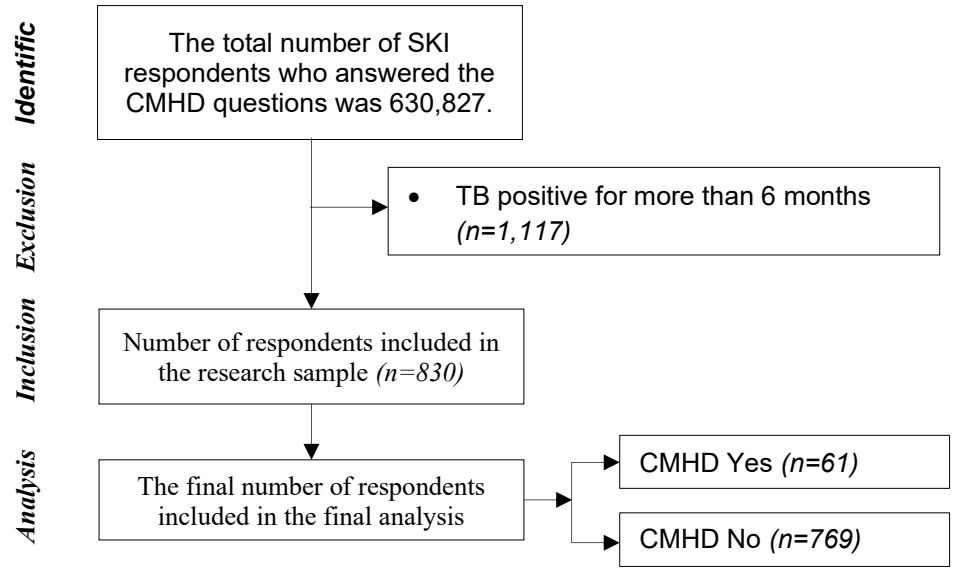

Figure 1. Flowchart of Sample Selection

Results

Among the 830 patients with TB, the pr5%of CMHD was 7.3%. Most respondents were male (58.8%), married (74.2%), educated above the high school level (58.9%), and employed (69.5%). A higher proportion of CMHD was observed among women (41.2%) and unemployed respondents (30.5%). Most participants had subsidized BPJS insurance (63%), whereas CMHD was more frequently reported among those with non-subsidized or private insurance (21%). Approximately 26.5% of respondents reported chronic conditions, primarily diabetes (11.9%) and hypertension (9.6%). Infectious diseases were reported by 20.1% of patients, most commonly pneumonia (11.7%) and acute respiratory infections (8.3%). Visual (29.2%) and hearing (9.5 %) impairments were also reported and were significantly associated with CMHD. The majority of participants did not engage in heavy physical activity (78%) and were non-smokers (69.4%); however, these behavioral factors were not significantly associated with CMHD. The respondents were almost evenly distributed between urban (50.6%) and rural (49.4%) areas of the country. Most participants had access to safe drinking water (86.3%) and owned their homes (90.5%).

The analysis revealed that health and sociodemographic factors significantly contributed to the risk of CMHD in patients with tuberculosis (TB). Overall, female patients had twice the risk of CMHD compared to male patients (10.5% vs. 5.1%; OR = 0.459; 95% CI: 0.270–0.780; p = 0.005). Unemployment was also a strong risk factor, with a CMHD prevalence of 13.0% compared to 4.9% among employed individuals (OR = 2.941; 95% CI: 1.736–4.983; p < 0.001). From a health perspective, individuals with a history of chronic disease had twice the risk of CMHD (11.4% vs. 5.9%; OR = 2.044; 95% CI: 1.197–3.492; p = 0.012). Similarly, visual impairment (12.0% vs. 5.4%; OR = 2.366; p = 0.002) and hearing impairment (15.2% vs. 6.5%; OR = 2.566; p = 0.010) were significantly associated with an increased risk of CMHD. In contrast, marital status, educational level, physical activity, smoking status, residential area (urban/rural), drinking water source, and home ownership showed no significant associations (p > 0.05), although some indicated a directional trend. An interesting finding emerged regarding health insurance ownership: individuals with non-subsidized BPJS or private insurance had the highest CMHD prevalence (13.8%) and a significant association (OR = 0.347; 95% CI: 0.145–0.833; p = 0.023) compared with the uninsured group (5.3%). This may reflect either greater mental health awareness or higher occupational stress in this group of nurses.

In the final multivariable model (Model 5), after simultaneously adjusting for health insurance ownership, hearing impairment, current employment status, other infectious diseases, history of chronic diseases, vision impairment, and respondents' gender, employment status, health insurance ownership, and vision impairment emerged as the strongest predictors of CMHD among patients with TB. Unemployed individuals had approximately three times higher odds of CMHD than employed individuals (aOR = 3.1; 95% CI: 1.8–5.3; p < 0.001). Health insurance ownership was associated with lower odds of CMHD, both for subsidized BPJS (aOR = 0.34; 95% CI: 0.14–0.84; p = 0.019) and non-subsidized BPJS or private insurance (aOR = 0.40; 95% CI: 0.23–0.72; p = 0.002) compared with no insurance coverage. Additionally, respondents with vision impairment had 2.5 times higher odds of CMHD (aOR = 2.5; 95% CI: 1.4–4.2; P = 0.001). These results indicate that Model 5 is the most parsimonious and statistically robust model for explaining the factors associated with CMHD in this population.

Figure 1 illustrates the Adjusted Odds Ratios (aOR) with 95% Confidence Intervals (CI) for the key predictors of CMHD among patients with tuberculosis (TB). Current employment status showed the highest aOR (approximately 3.07, range 1.79–5.27, p < 0.001), indicating that unemployed or unstable workers were approximately three times more likely to

experience mental health disorders than those who were employed were. However, the relatively wide confidence interval suggests high data variability or a limited sample size. Patients with subsidized BPJS insurance had a notably lower aOR (approximately 0.34, range 0.14–0.84, p = 0.019), and those with non-subsidized BPJS or private insurance showed a similar reduced risk (approximately 0.40, range 0.23–0.72, p = 0.002). These findings indicate that health insurance ownership functions as a protective factor, reducing the likelihood of experiencing CMHD. Patients with visual impairment exhibited an aOR of 2.46 (range 1.43–4.22, p = 0.001), suggesting that they were more than twice as likely to experience CMHD. This association implies that visual impairment contributes significantly to mental health vulnerability among patients with TB, possibly through its impact on functional limitations, social isolation, and a reduced quality of life.

Table 1. Characteristic respondent

Variables	Category	N	%
Status of Common Mental Health Disorders	Yes	61	7.3
	No	769	92.7
Respondent's Gender	Male	488	58.8
	Female	342	41.2
Marital/Partner Status	Without Partner	214	25.8
	With Partner	616	74.2
Highest Educational Attainment	≤ Senior High School	341	41.1
	> Senior High School	489	58.9
Current Employment Status	Unemployed	253	30.5
	Employed	577	69.5
Health Insurance Ownership	None	133	16
	BPJS (Subsidized)	523	63
	BPJS (Non-Subsidized) or Private Insurance	174	21
Other Infectious Diseases	Yes		
	Diarrhea (Last Month)	44	5.3
	ARI (Last Month)	69	8.31
	Pneumonia (Last Year)	97	11.69
	Hepatitis (Last Year)	12	1.45
	Malaria (Diagnosed, Blood Test)	29	3.49
	Dengue (Last Year)	17	2.05
	No	663	79.9
History of Chronic Diseases	Yes		
	Asthma	65	7.83
	Cancer	5	0.6
	Diabetes Mellitus	99	11.93
	Heart Disease	23	2.77
	Hypertension	80	9.64
	Stroke	9	1.08
	Chronic Kidney Disease	5	0.6
	No	610	73.5
Visual Impairment	Yes	242	29.2
	No	588	70.8

Table 1. Characteristic respondent

Variables	Category	N	%
Hearing Impairment	Yes	79	9.5
	No	751	90.5
Smoking Status	Yes	254	30.6
	No	576	69.4
Engagement in Vigorous Physical Activity	Yes	183	22
	No	647	78
Classification of Residential Area	Rural	410	49.4
	Urban	420	50.6
Type of Main Household Drinking Water Source	Unimproved	114	13.7
	Improved	716	86.3
Home Ownership Status	Not Owner	79	9.5
	Owner	751	90.5

Table 2. Association Between Sociodemographic and Health Factors and the Risk of CMHD Among Tuberculosis Patients

Variables	Yes N (%)	No N (%)	OR	95%CI (Low–Up)	p-value
Respondent's Gender					
Male	25 (5.1)	463 (94.9)	Ref		
Female	36 (10.5)	306 (89.5)	0.459	0.270–0.780	0.005
Marital/Partner Status					
Without Partner	15 (7.0)	199 (93.0)	Ref		
With Partner	46 (7.5)	570 (92.5)	0.934	0.510–1.710	0.945
Highest Educational Attainment					
≤ Senior High School	29 (8.5)	312 (91.5)	Ref		
> Senior High School	32 (6.5)	457 (93.5)	1.327	0.787–2.239	0.353
Current Employment Status					
Unemployed	33 (13.0)	220 (87.0)	Ref		
Employed	28 (4.9)	549 (95.1)	2.941	1.736–4.983	<0.001
Health Insurance Ownership					
None	7 (5.3)	126 (94.7)	Ref		
BPJS (Subsidized)	30 (5.7)	493 (94.3)	0.913	0.392–2.127	0.999
BPJS (Non-Subsidized)/Private Insurance	24 (13.8)	150 (86.2)	0.347	0.145–0.833	0.023
Other Infectious Diseases					
Yes	18 (10.8)	149 (89.2)	Ref		
No	43 (6.5)	620 (93.5)	1.742	0.977–3.107	0.083
History of Chronic Diseases					
Yes	25 (11.4)	195 (88.6)	Ref		
No	36 (5.9)	574 (94.1)	2.044	1.197–3.492	0.012
Vision Impairment					
Yes	29 (12.0)	213 (88.0)	Ref		
No	32 (5.4)	556 (94.6)	2.366	1.397–4.006	0.002
Hearing Impairment					
Yes	12 (15.2)	67 (84.8)	Ref		
No	49 (6.5)	702 (93.5)	2.566	1.301–5.061	0.010

Table 2. Association Between Sociodemographic and Health Factors and the Risk of CMHD Among Tuberculosis Patients

Variables	Yes N (%)	No N (%)	OR	95%CI (Low–Up)	p-value
Smoking Status					
Yes	14 (5.5)	240 (94.5)	Ref		
No	47 (8.2)	529 (91.8)	0.657	0.355–1.216	0.229
Engagement in Vigorous Physical Activity					
Yes	10 (5.5)	173 (94.5)	Ref		
No	51 (7.9)	596 (92.1)	0.676	0.336–1.358	0.344
Classification of Residential Area					
Rural	32 (7.8)	378 (92.2)	Ref		
Urban	29 (6.9)	391 (93.1)	1.141	0.677–1.924	0.716
Main Drinking Water Source (Household)					
Unimproved	11 (9.6)	103 (90.4)	Ref		
Improved	50 (7.0)	666 (93.0)	1.423	0.717–2.822	0.412
Home Ownership Status					
Not Owner	5 (6.3)	74 (93.7)	Ref		
Owner	56 (7.5)	695 (92.5)	0.839	0.326–2.159	0.890

Table 3. Multivariate Analysis of Predictors of CMHD Among Tuberculosis Patients

Variables	B	S.E.	Wald	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Current Employment Status	1.123	0.276	16.609	<0.001	3.074	1.791	5.274
Health Insurance Ownership			11.106	0.004			
Health Insurance Ownership (BPJS (Subsidized))	-1.071	0.456	5.524	0.019	0.343	0.140	0.837
Health Insurance Ownership (BPJS (Non-Subsidized) or Private Insurance)	-0.912	0.296	9.475	0.002	0.402	0.225	0.718
Visual Impairment	0.899	0.276	10.588	0.001	2.456	1.430	4.220
Constant	-2.658	0.299	79.024	<0.001	0.070		

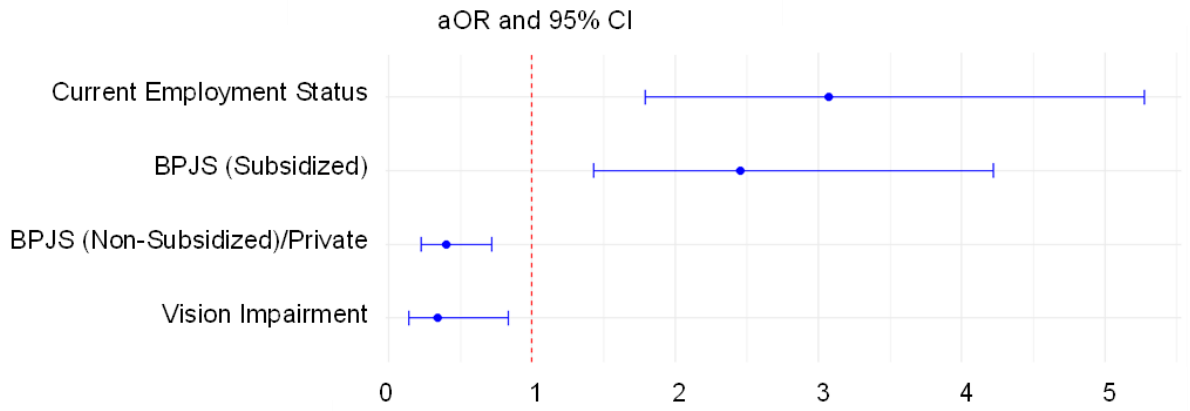

Figure 1. Adjusted Odds Ratios (aOR) and 95% Confidence Intervals for Factors Associated with CMHD Among Tuberculosis Patients

Discussion

Unemployed patients with TB had approximately three times higher odds of developing CMHD than employed patients (AOR = 3.07; 95% CI: 1.79–5.27; p < 0.001), indicating a strong association between unemployment and poor mental health. This finding is consistent with previous studies showing that unemployed individuals are more likely to experience anxiety and depression, often related to financial hardship and unstable living conditions.[11] Economic insecurity, limited social support, and reduced control over daily life may increase psychological stress and vulnerability to mental disorders.[5,1] However, some studies have reported no significant relationship between employment status and quality of life among TB patients, suggesting that the impact of employment may vary depending on social and contextual factors.[13]

The association between sex and CMHD is noteworthy, as female patients with TB showed approximately twice the risk compared with males. This finding may be explained by both biological and sociocultural factors,[2] as discussed in the following section. Women are generally more vulnerable to depression and anxiety because of hormonal influences, greater exposure to caregiving burdens, and higher sensitivity to social stressors than men. In the context of TB, women may experience stronger stigma, limited autonomy in healthcare decision-making, and additional domestic or economic pressures that can exacerbate psychological distress. Although most respondents in this study were male and of working age, the elevated risk among women highlights the need for gender-sensitive mental health screening in TB programmes. Given that comorbid mental disorders negatively affect treatment adherence and outcomes, integrating mental health services into TB care is particularly important for female patients.[14]

Individuals with a history of chronic disease had approximately twice the odds of developing CMHD compared to those without such a history (11.4% vs. 5.9%; OR = 2.044; 95% CI: 1.197–3.492; p = 0.012). This finding is supported by Hung et al. (2025), who reported that patients with chronic mental illness had a 1.48-fold higher risk of developing TB than the general population (95% CI: 1.38–1.59; p < 0.001), even after adjusting for age, sex, socioeconomic status, diabetes, and chronic kidney disease. Biologically, chronic mental disorders, such as schizophrenia and depression may impair immune function, including reduced T-cell responses and increased proinflammatory cytokine activity, thereby increasing susceptibility to Mycobacterium tuberculosis infections.[4] Furthermore, social determinants, such as poverty, malnutrition, and limited access to healthcare, may compound this vulnerability. These findings underscore the importance of integrating TB prevention and screening into mental health and chronic disease service provision.

No significant relationship was found between smoking status and CMHD among patients with TB in this study. However, unemployment, a history of chronic disease, and sensory (visual and hearing) impairments were strongly associated with a higher likelihood of CMHD. In practical terms, patients with TB who were not working, had other chronic health conditions, or experienced vision or hearing problems were more vulnerable to experiencing psychological distress. Although smoking was not statistically linked to CMHD, it remains clinically important in TB care because it can worsen overall health and recovery.

Conversely, marital status, education level, physical activity, smoking, area of residence, water source, and home ownership showed no significant associations (p>0.05). Physical activity and mental health status may indirectly affect TB risk through immunological and behavioral mechanisms, as TB patients with mental disorders often exhibit reduced activity levels, leading to slower immune recovery and delayed healing.[15] Urban areas with high poverty and economic inequality demonstrated the highest prevalence, whereas broader primary healthcare coverage showed a protective effect (β = -0.005; p=0.03).[16]

Water source and home ownership were also not significantly related to CMHD (p>0.05), although a risk trend was observed. Among the 830 patients, most households had access to safe drinking water (86.3%) and owned their homes (90.5%). Shi et al. (2024) found that among 622 patients (314 with NTM-PD and 308 with pulmonary TB), 64.8% used tap water, which was associated with a higher NTM-PD prevalence (42.3%) than bottled (4.8%) or filtered water (3.4%).[17] The combination of contaminated water exposure and psychological distress may further weaken the immune responses. Bivariate analysis revealed that persons with TB living in rented or shared housing had more than twice the risk of CMHD compared to homeowners (AOR = 2.34; 95% CI: 1.42–3.86; p<0.05). Housing insecurity, economic stress, and social instability may contribute to emotional distress, depression, and anxiety during prolonged TB treatment.

Health insurance ownership, including both subsidized and non-subsidized BPJS or private insurance, significantly reduced CMHD risk compared to having no insurance, suggesting that health coverage serves as a psychological protective factor (Exp(B)=0.343; 95% CI: 0.140–0.837; p=0.019; Exp(B)=0.402; 95% CI: 0.225–0.718; p=0.002). A well-functioning SHI system can expand healthcare access, reduce financial burdens, and improve mental well-being among patients with TB by mitigating cost-related stress.[6] However, the SHI system does not cover all stages of TB care, particularly primary care, laboratory services, and pharmacy access, leaving patients vulnerable to additional financial burdens and psychological stress that may worsen their mental health condition. Therefore, a comprehensive and inclusive improvement of the SHI system is essential to support the physical and mental well-being of patients with TB. The lack of insurance ownership among patients is often attributed to limited awareness of enrollment procedures, high premium costs, and household-based registration policies, which collectively hinder access to adequate health coverage.[19] Most uninsured TB patients can still obtain financial protection through full subsidies and registration assistance; however, a coverage gap remains for individuals without official documentation.

Visual impairment increased the risk of CMHD by 2.46 times (Exp(B)=2.456; 95% CI: 1.430–4.220; p=0.001), likely due to reduced quality of life, functional limitations, and social isolation. This finding aligns with Alene et al. (2021), who reported a 9.8% prevalence of visual impairment among 217,475 patients with TB analyzed across 131 studies in 49 countries. Such sensory impairments are commonly attributed to the toxic side effects of second-line anti-TB drugs, including kanamycin and capreomycin, which are frequently used in older multidrug-resistant TB (DR-TB) regimens.[8] Visual impairment can contribute to psychological stress and mental disorders due to the loss of visual function and the accompanying social impact. Individuals with visual impairment had twice the risk of developing common mental health disorders (CMHD) (12.0% vs. 5.4%; OR=2.366; p=0.002), while hearing impairment also significantly increased CMHD risk (15.2% vs. 6.5%; OR=2.566; p=0.01).

Visual impairment affects not only the neurological system but also imposes a substantial mental burden, underscoring the importance of early diagnosis and intervention to prevent permanent damage to both vision and mental health. A case study by Lin et al. (2024) demonstrated that visual impairment among patients with TB —particularly those with tuberculous meningitis (TBM)—was closely associated with neurological dysfunction and mental health deterioration. In this study, a 35-year-old woman developed permanent blindness following a 10-day delay in TBM diagnosis, leading to hydrocephalus and optic nerve compression, which resulted in optic atrophy and opticochiasmatic arachnoiditis.[20] Magnetic resonance imaging (MRI) findings revealed enhancing basal exudates, oculomotor nerve thickening, and small vessel ischemic changes, indicating central nervous system involvement.[21] The resulting loss of vision

triggered significant cognitive and emotional dysfunction, potentially leading to psychological distress, anxiety, and depression due to the loss of independence and the inability to perform daily activities.[22]

Nian et al. (2024) reported that 15.42% of patients with hearing impairment experienced psychiatric disorders compared to 9.03% among those without hearing impairment ($p < 0.001$). Multivariate Cox regression analysis showed that hearing impairment increased the risk of psychiatric disorders by 2.59 times (Adjusted Hazard Ratio = 2.587; 95% CI: 1.723–3.346). The most common psychiatric conditions were depression, anxiety, PTSD, and sleep disorders, with PTSD presenting the highest risk (HR = 3.37). [23] The risk of mental disorders increases with age and is higher among patients with comorbidities, such as diabetes or hypertension. Hearing loss significantly exacerbates psychological burden and reduces long-term cognitive function. Therefore, healthcare providers should conduct regular mental health screenings and implement early interventions, including the use of hearing aids and referrals to psychiatrists, to prevent the progression of severe mental disorders.

Conclusion

This study revealed that 7.3% of patients with TB experienced CMHD, with key risk factors including unemployment, lack of health insurance, and sensory impairments, such as vision and hearing loss. Unemployed patients were three times more likely to develop CMHD, whereas having BPJS health insurance served as a protective factor. Visual and hearing impairments also doubled the risk due to the psychological impact of functional loss and social isolation. These findings emphasize the need to integrate mental health services into TB control programs through routine screening, socioeconomic support, expanded insurance coverage, and multidisciplinary approaches to improve the psychological well-being and treatment adherence of patients with TB.

Ethics approval

All research procedures complied with ethical standards and were approved by the Research Ethics Committee of Universitas Dian Nuswantoro under the ethical clearance number 003369/UNIVERSITAS DIAN NUSWANTORO/2025.

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Author Contribution

M.Z.S. conceptualized the study, supervised the data analysis, and wrote the manuscript. G.A.A. contributed to data collection, literature review, and statistical analysis. I.I. assisted with data interpretation and visualization, and Y.Y. contributed to the manuscript revision and editing. M.A.F. assisted with additional data interpretation, visualization, and manuscript revision. All authors have reviewed and approved the final version of the manuscript.

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