



Sociodemographic Determinants Of The Health Belief Model Among Tuberculosis Patients In The Karo Regency

Rory Pepayoza Br Bangun¹ , Rini Savitry Daulay² , Evita Mayasari*³ , Arlinda Sari Wahyuni⁴ , Fathia Meirina²

¹Master's Program in Tropical Medicine, Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia

²Department of Pediatrics, Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia

³Department of Microbiology, Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia

⁴Department of Community Medicine, Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia

*Corresponding Author: evita@usu.ac.id

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ABSTRACT

Background: Tuberculosis (TB) is a highly infectious disease with a significant health burden in Indonesia. Despite the availability of effective treatment, non-adherence to it continues to hinder control efforts. The Health Belief Model (HBM) posits that an individual's perceptions of susceptibility, severity, benefits, barriers, and cues to action influence their health behavior. Understanding the relationship between patients' socio-demographic factors and HBM perceptions is crucial to improving adherence to TB treatment and reducing disease transmission.

Method: Seventy-six TB patients in the early stages of therapy participated in a cross-sectional study that was carried out in Karo Regency between October and December 2024. A standardized questionnaire that had undergone validity and reliability testing was used to gather data. SPSS 26 was used for the statistical analysis, which included the chi-square test with a 95% CI and significance level of $p < 0.05$. Fisher's exact test was used for analysis if the data did not satisfy the conditions of the chi-square test.

Results: Knowledge had a significant relationship with perception of HBM ($p = 0.001$, OR 95%, CI = 5.250), as did the distance from home to the health center ($p = 0.017$, OR 95%, CI = 3.500).

Conclusion: To increase the perspective of HBM among TB patients, HBM-based education must be strengthened and access to health services improved.

Keywords: Tuberculosis, Health Belief Model, sociodemographic, Karo Regency

ABSTRAK

Latar Belakang. Tuberkulosis (TB) adalah penyakit menular dengan beban kesehatan yang tinggi di Indonesia. Meskipun pengobatan yang efektif tersedia, ketidakpatuhan terhadap pengobatan terus menghambat upaya pengendalian penyakit. Health Belief Model (HBM) menjelaskan bahwa persepsi individu terhadap kerentanan, keparahan, manfaat, hambatan, dan dorongan untuk bertindak memengaruhi perilaku kesehatan. Memahami hubungan antara faktor sosiodemografis pasien dan persepsi HBM sangat penting untuk meningkatkan kepatuhan terhadap pengobatan TB dan mengurangi penularan penyakit.

Metode. Sebanyak 76 pasien TB pada fase awal pengobatan berpartisipasi dalam penelitian iris-lintang yang dilakukan di Kabupaten Karo antara bulan Oktober dan Desember 2024. Kuesioner terstruktur yang telah diuji validitas dan reliabilitasnya digunakan untuk mengumpulkan data. Analisis statistik dilakukan menggunakan SPSS 26, yang mencakup uji chi-square, dengan interval kepercayaan (CI) 95% dan tingkat signifikansi $p < 0,05$. Uji Fisher digunakan untuk analisis jika data tidak memenuhi syarat uji chi-square.

Hasil. Pengetahuan memiliki hubungan yang signifikan dengan persepsi HBM ($p = 0,001$; OR 95%; CI = 5.250), dan jarak dari rumah ke puskesmas memiliki



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hubungan yang signifikan dengan persepsi HBM ($p = 0,017$; OR 95%; CI = 3,500).

Kesimpulan. Peningkatan pendidikan berbasis HBM dan perbaikan akses ke layanan kesehatan diperlukan untuk meningkatkan persepsi pasien TB terhadap HBM.

Kata Kunci. Tuberkulosis, Health Belief Model, sosiodemografi, Kabupaten Karo

1. Introduction

Tuberculosis (TB) remains a major global health problem, with an estimated 10.8 million new cases and 1.25 million deaths worldwide in 2023 [1]. Indonesia is among the high-burden countries, with an estimated 1,090,000 TB cases in 2023, corresponding to an incidence of 387 per 100,000 population [2]. In North Sumatra Province, 34,714 TB cases were reported in 2022, with 852 deaths during treatment. Meanwhile, in Karo Regency, 1061 TB cases were found in 2023, 101 cases were cured, 896 cases were fully treated, 2 cases failed, 28 cases died, 30 cases were lost to follow-up (LTFU), 1 case was not evaluated/moved, and 9 cases of drug-resistant TB (DR-TB) [4]. This statistic shows that TB is still a significant threat, especially in developing countries. Indonesia is one of the 30 countries with the highest TB burden in the world and ranks second after India [1].

Tuberculosis is caused by *Mycobacterium tuberculosis* (*M. tuberculosis*), which primarily affects the lungs but can also affect other organs [5]. Transmission occurs through the air when an infected individual coughs, sneezes, or talks [6]. TB treatment requires a long-term, multidrug regimen, typically lasting six to nine months, to ensure the eradication of the bacteria and prevent the development of drug resistance [5]. Medication adherence is a crucial factor in the successful treatment of TB. Non-adherence to treatment can lead to treatment failure, relapse, drug resistance, increased risk of community transmission, and a cost burden [7]. Adherence to TB treatment remains a challenge, as various socio-economic, cultural, and psychological factors influence it [8].

One psychological aspect that plays an important role in treatment adherence is an individual's perception of TB. The HBM is a theory of health behavior change and a belief-driven psychological model developed by Rosenstock in 1950 [9]. The theory analyzes an individual's perception of health threats, including susceptibility and severity, advantages and disadvantages of preventive or treatment measures, as well as motivating factors and beliefs in self-efficacy in health-related decision-making [10]. In the context of TB, perceived susceptibility includes an individual's beliefs about the likelihood of contracting it, the risk of disease severity if left untreated, and the potential complications that can arise [11]. These perceptions are highly personalized and can vary between individuals, influenced by personal experience, information received, and social environment. Individuals who perceive less susceptibility to TB or underestimate the severity of the disease are likely to have lower motivation to adhere to the strict treatment regimens. Therefore, improving TB patients' perceptions of HBM components is needed as an important strategy to encourage adherence to taking anti-TB drugs regularly to accelerate recovery and prevent disease transmission.

2. Methods

This cross-sectional study involved a total of 76 TB patients (respondents) in Karo Regency, North Sumatra Province, Indonesia. All TB patients in the early phase of treatment between October and December 2024 were part of the study group. The study included TB patients over the age of 18 who had been confirmed using rapid molecular testing and underwent clinical examinations throughout the early stages of treatment. Patients with MDR-TB, TB-HIV patients, those with impaired liver function, and those who declined to participate in the study were all excluded. The commencement of the study was approved by the Universitas Sumatera Utara Health Research Ethics Committee in accordance with the Declaration of Helsinki.

The collected data included respondents' Health Belief Model (HBM) perceptions, sociodemographic characteristics including gender, age, education level, and occupation, as well as knowledge and distance from home to the health center. A questionnaire that has been tested for validity and reliability was used to assess the level of understanding and perception of HBM. The knowledge questionnaire used the median as the cut-off point and had 12 questions on a Gutmann scale. The survey on HBM impressions, on the other hand, has 25 Likert scale questions, with the median serving as the cut-off point. A score of 29 or higher indicates good knowledge, whereas a score of less than 29 indicates poor knowledge. The age variable is divided into three groups: 18-39 years old, 40-59 years old, and 60 years or older. The respondent's education levels are classified into three categories based on formal levels: primary education (individuals who completed elementary school and junior high school), secondary education (senior high school), and higher education (diploma or bachelor's

degree). Furthermore, we classified the respondents who live close to the health center where they received treatment for TB as no more than 3 km away. The data were analyzed statistically by bivariate analysis (chi-square test) at a 95% confidence interval, $p < 0.05$. The statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) version 26. If the data did not meet the chi-square test requirements, Fisher's exact test was used to analyze them.

3. Results

The respondents who participated in this study consisted of 68.4% male and 31.6% female (Figure 1). The majority of respondents were 40-59 years old (42.1%), followed by those aged 60 and above (28.9%) and the 18-39-year-old age group (28.9%). Most of the respondents had completed their secondary education (42.1%), followed by those who had completed their education level up to primary education (50.0%) and those who had completed their higher education (10.5%). More than half of the respondents were categorized as having good knowledge (57.9%). However, 42.1% of the respondents had poor knowledge. Respondents who have an occupation (80.3%) overpowered the unemployed individuals (19.7%). Individuals who have their residence at a short distance (less than 3 km) from the health center were dominant (63.2%) over the respondents who live at a farther distance (more than 3 km) from the health center.

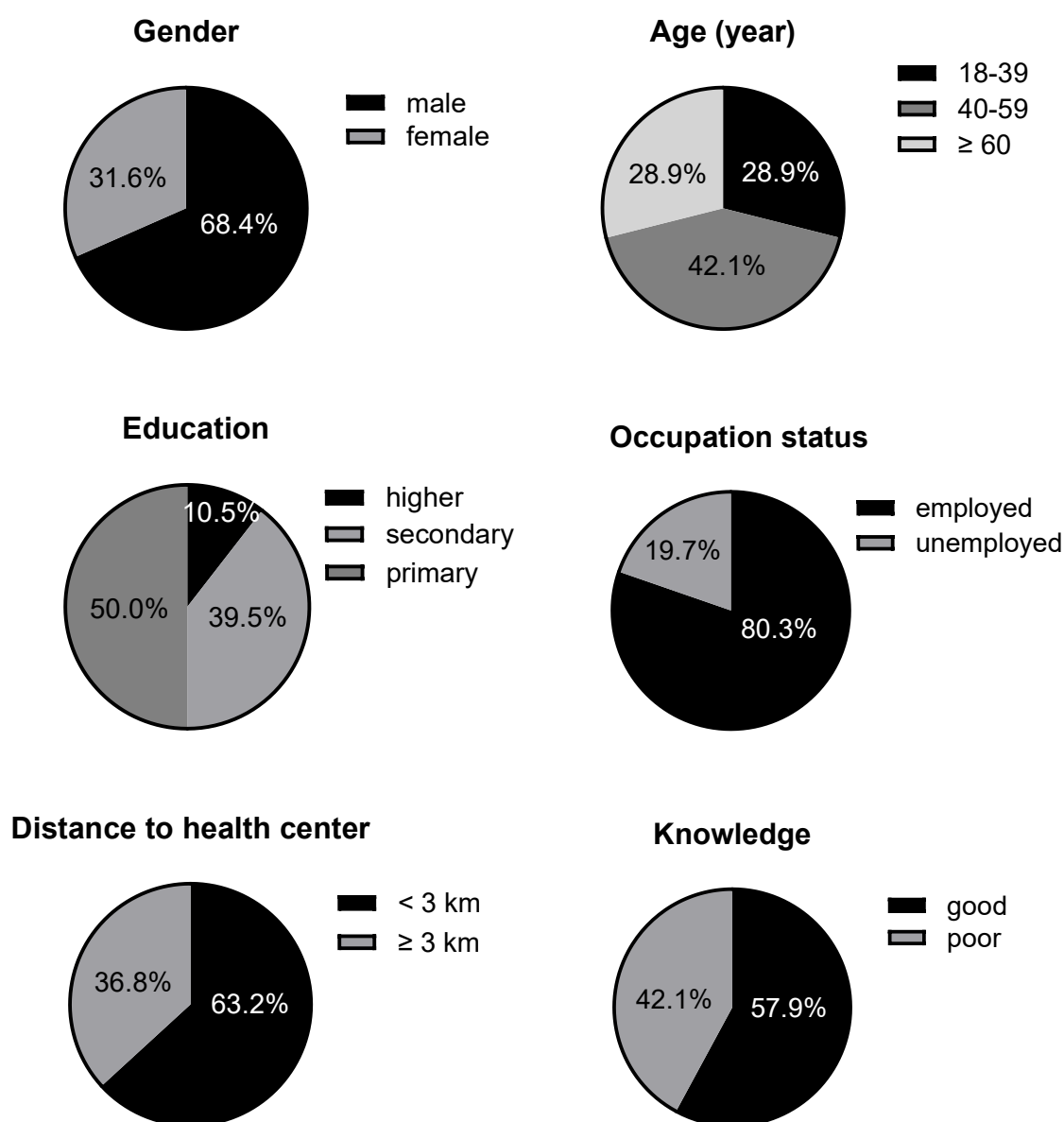


Figure 1. Characteristics of respondents. The demographic data were presented as parts of a whole in diagrams by presenting the percentage values.

The frequency distribution of respondents' perception of TB according to the HBM framework (Table 1) revealed that the majority of respondents (52.6%) had low HBM perception. However, 47.4% of respondents had high HBM perception.

Table 1. Frequency Distribution of Health Belief Model Perception		
HBM perception	n	%
High	36	47.4
Lower	40	52.6
Total	76	100.0

The Fisher's exact test that examined the association between various sociodemographic characteristics and respondents' perception of tuberculosis according to the HBM framework revealed that knowledge had a significant relationship with HBM perception ($p = 0.001$, OR 95%, CI = 5.250). Furthermore, the distance between the respondent's residential area and the health center also had a significant relationship with HBM perception ($p = 0.017$, OR 95%, CI = 3.500). The respondent's gender and age had no significant relationship with their perception of HBM ($p = 0.623$ and $p = 0.050$, respectively). Similarly, the respondent's level of education and their occupational status had no significant relationship with their perception of HBM ($p = 0.538$ and $p = 0.388$, respectively).

Table 2. Relationship between socio-demographic characteristics and perceptions of the Health Belief Model in Karo Regency.

Model in Karo Regency.								
Variable	HBM				Total		p-value	OR 95% CI
	High		Low					
	n	%	n	%	n	%		
Gender								
Male	26	50.0	26	50.0	52	100	0.623†	1.400
Female	10	41.6	14	58.3	24	100		0.527-3.718
Age								
18-39 years	14	63.4	8	36.3	22	100	0.050	-
40-59 years	16	50.0	16	50.0	32	100		
≥ 60	6	27.3	16	72.7	22	100		
Education								
Higher education	5	62.5	3	37.5	8	100	0.538	-
Secondary education	15	50.0	15	50.0	30	100		
Primary education	16	42.1	22	57.9	38	100		
Knowledge								
Good	28	63.6	16	36.4	44	100	0.001*†	5.250
Poor	8	25.0	24	75.0	32	100		1.915-14.396
Occupation								
Employed	27	44.2	34	55.8	61	100	0.388†	0.529
Unemployed	9	60.0	6	40.0	15	100		0.168-1.672
Distance								
Near	28	58.3	20	41.7	48	100	0.017*†	3.500
Far	8	28.5	20	71.5	28	100		1.287-9.521

Notes: Chi-square test, Odds ratio (OR), Confidence Interval (CI), Fisher's exact test (†), $p < 0.05$ (*)

4. Discussion

This study shows that knowledge has a significant relationship with the perception of HBM among TB patients in Karo Regency, where TB patients with a good level of knowledge have a 5.250 times greater chance of having a high perception of HBM. These results are in line with previous studies in Ethiopia and Banjarmasin, where the level of knowledge about TB directly affects perception in HBM [12,13]. The higher a person's understanding, the better his or her behavior in terms of drug adherence [13]. According to the HBM theory, a person's beliefs about their likelihood of contracting an illness, or perceived susceptibility, have a big influence on their health-related behavior [14]. People will be more inclined to take preventative action if they believe they are at risk for illness [15]. This knowledge strengthens perceived susceptibility, thereby promoting positive health behaviors, such as medication adherence, health check-ups, and infection prevention measures. These results are in line with a previous study in Ethiopia, where TB patients with less knowledge about TB and its treatment had a three times greater risk of non-adherence to anti-TB drugs compared to TB patients with good knowledge [12]. This phenomenon is supported by the active role of TB officers in Karo Regency who provide routine education to TB patients. Additionally, there was a strong correlation between

the patient's assessment of HBM and the distance between their home and the health center. Living close to the health center increases the likelihood that TB patients will have a favorable opinion of HBM by 3,500 times. According to a previous study conducted in Kudus, the distance between a patient's home and a health center was found to have a significant impact on TB patients with adherent drug-taking behavior [16]. The perceived benefits and susceptibility to TB are generally higher for patients who live closer than for those who live farther away. This effect can be explained by the ease of access to health centers, education, and treatment monitoring from health workers, which is more optimal for patients with a short travel distance. Respondents who live distant from the health center, however, encounter more difficulties getting access to medical care. These barriers are not only physical but also involve economic (transportation cost) and psychological aspects (reluctance to visit) [17, 7]. This condition is in line with the construct of perceived barriers in HBM theory, which states that high barriers can reduce the tendency of individuals to take health actions [11]. Thus, distance to the health center acts as a modifying variable in the HBM that influences patients' perceived susceptibility, perceived benefit, and perceived barriers to TB control. The implication of these results is the need for efforts to improve access to health services, for example, through the provision of mobile clinic services, home visits, or transportation support for those living in remote areas.

In this study, no significant relationship was found between males and females and their perception of HBM. This phenomenon may be because exposure to information about TB and access to health services are relatively similar in Karo Regency. This result is in line with other research in Banjarmasin, which found no gender variations in views of HBM. [18]. The age range of respondents in this study also did not show a significant relationship with HBM perception. This finding is inconsistent with a previous study in Jombang, which found a significant relationship between age range and coping strategies based on HBM in TB patients, where age indicates a person's level of mental maturity, which can be used as a basis for how they think and act, and factors related to age can shape their character [19]. We found that a high level of education did not significantly influence the HBM perception, with a p-value of 0.538. This result contributes to disparities and is not in line with previous research in Surabaya, showing that education has a significant relationship with TB compliance and prevention [20]. Perceptions of HBM, especially perceived benefits and susceptibility in the setting of TB, are greatly influenced by education. Education also leads to inequality in knowledge and decision-making [21]. According to earlier research, TB patients' lack of knowledge about the illness and its effects on themselves, their families, and their communities is correlated with poor educational attainment, which can impact the effectiveness of therapy [22, 23]. Employment status also had no significant relationship with HBM perception. This finding aligns with previous research in China, although the respondents were migrant workers, and job type was not a predictor of HBM components [24]. This is because the majority of study participants were farmers; hence, there were no appreciable variations in the information or experiences that occupational groups had regarding tuberculosis. Additionally, TB officers actively conduct TB education without regard to employment status.

5. Conclusion

Respondents' knowledge and the distance from their residence to the health center showed an association with their Health Belief Model (HBM) perceptions. Strengthening HBM-based education and improving access to health care may help improve TB patients' HBM perceptions.

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7. Conflict of Interest

The authors declare no conflict of interest.

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