Banua: Jurnal Kesehatan Lingkungan
e-ISSN 2797-8184 | p-ISSN 2797-8176
Volume 6 Issue 1, 2026, page 27-33
DOI: 10.33860/bjkl.v6i1.4377
Website:http://jurnal.poltekkespalu.ac.id/index.php/bjkl/
Publisher: Poltekkes Kemenkes Palu

Original Article

Knowledge, Attitudes, And Home Conditions Among Tuberculosis Patients at Kamonji Public Health Center, Palu, Indonesia

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ARTICLE INFO
Article History:
Received: 2026-03-28
Accepted: 2026-05-14
Published: 2026-06-25

Keywords:
Tuberculosis;
Knowledge;
Attitude;
Home environmental conditions;
Ventilation

ABSTRACT
Background: Tuberculosis remains a major public health problem in Indonesia. Beyond clinical management, community knowledge, attitudes, and household physical conditions are important entry points for prevention because transmission often occurs in close indoor settings. This study described the knowledge, attitudes, and physical home environment of tuberculosis patients in the working area of Kamonji Public Health Center.
Methods: This quantitative descriptive study was conducted in June 2024 in the working area of Kamonji Public Health Center, Palu Barat District. The study population consisted of 110 tuberculosis patients, and 52 respondents were included based on Slovin's sample size calculation with a 10% margin of error. Data were collected using a questionnaire for knowledge and attitudes, and an observation checklist for home lighting, ventilation, and humidity. Data were analyzed descriptively using frequencies and percentages.
Results: Most respondents were aged 19-40 years (40.4%), male (67.3%), and worked as private employees (38.5%). Good knowledge was found in 39 respondents (75.0%), while 37 respondents (71.2%) had a positive attitude. Regarding home physical conditions, 35 houses (67.3%) met lighting standards, 30 houses (57.7%) met ventilation standards, and 33 houses (63.5%) met humidity standards. The largest environmental gap was ventilation, with 22 houses (42.3%) failing to meet the standard.
Conclusion: Most tuberculosis patients in the Kamonji Public Health Center area had good knowledge and positive attitudes, and most houses met the observed physical environmental standards. However, inadequate ventilation remained common and should be prioritized in home-based environmental health counseling, routine home visits, and community tuberculosis prevention activities.

INTRODUCTION

Tuberculosis (TB) remains a major public health challenge because it is transmitted through the air and is closely linked with social and environmental conditions. The World Health Organization reported that the 2025 Global Tuberculosis Report used data from 184 countries and areas, covering more than 99% of the world's population and TB cases, making TB surveillance a global priority (World Health Organization, 2025). In Indonesia, TB continues to require strong programmatic attention. The Ministry of Health reported that Indonesia has the second-highest TB burden after India, with an estimated 1,090,000 cases and 125,000 deaths annually; in 2024, approximately 885,000 TB cases were detected (Kementerian Kesehatan

Republik Indonesia, 2025). These data indicate that prevention at the household and community level remains an essential component of TB control.

The household is an important setting for TB prevention because prolonged indoor contact can increase exposure to infectious aerosols. The household environment does not act as a single cause of TB, but poor air exchange, limited sunlight, unsuitable humidity, and crowding may contribute to conditions that support transmission risk. The WHO operational guidance on TB infection prevention and control emphasizes environmental control as part of an integrated approach to reduce transmission risk, while inadequate housing reviews also identify ventilation, dampness, and crowding as relevant housing-related exposures for TB (Lee, Kwon, Goo, & Cho, 2022; World Health Organization, 2023). Recent studies in Indonesia have consistently discussed the relevance of the physical home environment, including ventilation, lighting, density, and humidity, in relation to pulmonary TB occurrence (Akhmalnihar, Fahdhienie, & Azwar, 2024; Amelia, Agustina, Azmiyannoor, & Rifaldi, 2023; Derny, Murwanto, & Helmy, 2023; Hasan, Nurmaladewi, & Saktiansyah, 2023). A broader review of housing and respiratory health also shows that indoor environmental quality remains a public health concern, particularly where households have poor ventilation and indoor air quality (Holden, Abrams, Agache, & Davis, 2023; Wimalasena, Chang-Richards, Wang, & Dirks, 2021).

Knowledge and attitudes are also important in TB prevention. Patients who understand transmission, symptoms, treatment, and environmental prevention are more likely to support healthy practices, complete treatment, and reduce exposure among family members. Studies among Indonesian populations and other settings have shown that TB knowledge and attitudes vary and remain relevant for prevention programs, patient education, and contact-based intervention (Pitaloka, Jati, Nisa, Ningrum, & Seweng, 2023; Puspitasari et al., 2022; Zhang et al., 2024). Evidence from Afghanistan, China, Jordan, Saudi Arabia, and Tanzania similarly demonstrates that knowledge and attitudes shape prevention behavior and readiness to seek (Abu-Humaidan et al., 2022; Du et al., 2022; Essar et al., 2022; Kandasamy, Jerah, Alosaimi, Alsowayigh, & Alghamdi, 2024; Kazaura & Kamazima, 2021).

Kamonji Public Health Center is located in Palu Barat District and serves communities with documented cases of TB. The source report identified 110 TB patients in the working area. However, local descriptive evidence on patients' knowledge, attitudes, and household physical conditions remains limited. Such information is needed to support targeted health education, routine home visits, and feasible environmental health actions by the public health center. Therefore, this study aimed to describe the knowledge, attitudes, and physical home environment of TB patients in the working area of Kamonji Public Health Center.

METHODS

This study used a quantitative descriptive design with cross-sectional data collection. The design was selected because the purpose was to describe the distribution of knowledge, attitudes, and physical home environmental conditions among TB patients, not to test causal relationships or intervention effects.

The study was conducted in the working area of Kamonji Public Health Center, Palu Barat District, Central Sulawesi, Indonesia. Data collection was carried out in June 2024.

The study population comprised all TB patients recorded in the Kamonji Public Health Center's working area, totaling 110 individuals. The sample size was determined using Slovin's formula with a 10% margin of error, resulting in 52 respondents. The sample size calculation followed the formula $n = N/(1 + Ne^2)$, where N = 110 and e = 0.1. Respondents were selected from the list of registered TB patients who were reachable during data collection and agreed to participate until the required sample size was fulfilled. The inclusion criteria were patients recorded as TB patients in the Kamonji Public Health Center register, residing in the working area, able to communicate during data collection, and willing to participate. Patients who could not be contacted, were unavailable during data collection, or declined to participate were not included.

The study variables included respondent characteristics, knowledge, attitude, and physical home environmental conditions. Respondent characteristics consisted of age, sex, and occupation. Knowledge was assessed using a structured questionnaire and categorized as good,

fair, or poor according to the scoring guide used in the study instrument. Attitude was assessed using attitude statements and categorized as positive or negative based on the total attitude score. The observed physical home environment included lighting, ventilation, and humidity, each categorized as meeting or not meeting the standard based on the observation checklist and Indonesian environmental health requirements for healthy housing and indoor environmental quality (Kementerian Kesehatan Republik Indonesia, 2023).

Data were collected using a structured questionnaire and a home observation checklist. The questionnaire was used to assess respondent characteristics, knowledge, and attitudes. The observation checklist was used to record the home's physical condition, including lighting, ventilation, and humidity. Data were tabulated and analyzed using descriptive statistics. Results are presented as frequencies and percentages. Because the study was descriptive, no inferential statistical tests were performed. Administrative permission was obtained from the relevant local institutions, and informed consent was obtained from all respondents before data collection.

RESULTS

A total of 52 TB patients were included in the study. The characteristics of respondents are presented in Table 1.

Table 1. Characteristics of tuberculosis patients in the working area of Kamonji Public Health Center

Characteristics	Category	n	%
Age	19-40 years	21	40.4
	41-60 years	19	36.5
	>60 years	12	23.1
Sex	Male	35	67.3
	Female	17	32.7
Occupation	Private employee	20	38.5
	Civil servant	2	3.8
	Entrepreneur	19	36.5
	Housewife	6	11.5
	Unemployed	5	9.6

Source: Primary Data, 2024

Table 1 shows that the largest age group was 19-40 years, consisting of 21 respondents (40.4%). Most respondents were male, totaling 35 people (67.3%). Based on occupation, the largest group was private employees, with 20 respondents (38.5%), followed by entrepreneurs with 19 respondents (36.5%).

Table 2. Knowledge and attitudes of tuberculosis patients in the working area of Kamonji Public Health Center

Variable	Category	n	%
Knowledge	Good	39	75.0
	Fair	10	19.2
	Poor	3	5.8
Attitude	Positive	37	71.2
	Negative	15	28.8

Source: Primary Data, 2024

Table 2 shows that 39 respondents (75.0%) had good knowledge, 10 respondents (19.2%) had fair knowledge, and 3 respondents (5.8%) had poor knowledge. Positive attitudes were found in 37 respondents (71.2%), while 15 respondents (28.8%) had negative attitudes.

Table 3. Physical home environment of tuberculosis patients in the working area of Kamonji Public Health Center

Physical environment	Category	n	%
Lighting	Met the standard	35	67.3
	Did not meet the standard	17	32.7
Ventilation	Met the standard	30	57.7
	Did not meet the standard	22	42.3
Humidity	Met the standard	33	63.5
	Did not meet the standard	19	36.5

Source: Primary Data, 2024

Table 3 shows that most houses met the observed environmental standards. Lighting met the standard in 35 houses (67.3%), ventilation met the standard in 30 houses (57.7%), and humidity met the standard in 33 houses (63.5%). Among the three observed physical environmental factors, ventilation showed the highest non-compliance rate, with 22 houses (42.3%) failing to meet the standard.

DISCUSSION

This study found that most TB patients had good knowledge and positive attitudes. These findings are important because patient knowledge and attitude can support early recognition of symptoms, treatment adherence, cough etiquette, separation of sleeping space when possible, and household-level prevention. The relatively high proportion of good knowledge and positive attitudes may reflect previous contact with health workers, TB counseling during diagnosis and treatment, and repeated exposure to health information from the public health center. Similar findings have been reported in several KAP studies, showing that knowledge is associated with prevention orientation and treatment-related behavior, although knowledge alone is insufficient without sustained counseling and enabling household conditions (Pitaloka et al., 2023; Puspitasari et al., 2022; Rianto, Sari, Pitaloka, & Jati, 2024). Studies in other countries also highlight that educational exposure, access to health information, and interaction with health workers influence TB knowledge and attitudes (Abu-Humaidan et al., 2022; Du et al., 2022; Essar et al., 2022; Kazaura & Kamazima, 2021).

The respondent profile showed that men constituted the majority of patients. This pattern is consistent with national information from the Ministry of Health, which reported more TB cases among men than women in 2024 (Kementerian Kesehatan Republik Indonesia, 2025). The dominance of respondents in productive age groups and among workers also has practical implications. Health education should be delivered in a way that accommodates work schedules and emphasizes prevention in both home and work settings. TB education should not only explain disease transmission but also translate this knowledge into practical actions that patients and families can perform.

The study also found that most homes met lighting, ventilation, and humidity standards, but a considerable proportion still did not. Ventilation was the most prominent gap, with 42.3% of houses failing to meet the standard. This finding deserves attention because ventilation is directly related to air exchange and dilution of infectious aerosols in indoor spaces. The WHO infection prevention and control handbook places environmental controls within the hierarchy of TB prevention, while engineering and indoor air studies emphasize that dilution through ventilation can reduce the concentration of infectious airborne particles (Nardell, 2016; World Health Organization, 2023). Household-based evidence also shows that opening windows and doors can substantially improve air changes and reduce estimated TB transmission risk in indoor settings (Lygizos et al., 2013). Studies in Indonesia have reported that inadequate ventilation and poor physical housing conditions are associated with the occurrence of pulmonary TB (Akhmalnihar et al., 2024; Derny et al., 2023; Hasan et al., 2023; Sari, Fikri, Murwanto, & Yushananta, 2022). A case-control study conducted in a high-prevalence region of Indonesia also highlighted the role of housing and environmental risk factors in TB control (Fahdhienie, Husna, Kurniawan, & Zulfikar, 2024).

Lighting and humidity also remain relevant. Although most homes in this study met the lighting standard, 32.7% still did not. Limited natural lighting often occurs together with closed rooms, poor air movement, and lower indoor environmental quality. A systematic review on lighting in the home reported that home lighting is linked to several health outcomes, suggesting that lighting should be considered part of a broader housing health agenda rather than a decorative issue (Osibona, Solomon, & Fecht, 2021). Humidity that does not meet standards was found in 36.5% of homes. In practice, unsuitable humidity can reflect poor air circulation, limited sunlight, and building conditions that are difficult to modify without household and community support. Reviews on housing and respiratory health also emphasize that poor housing and indoor air quality should be addressed as part of respiratory disease prevention (Holden et al., 2023; Lee et al., 2022; Wimalasena et al., 2021).

The high proportion of inadequate ventilation in this study may be related to structural limitations in housing, insufficient window area, limited cross-ventilation, or household practices such as keeping windows closed for security, privacy, or thermal comfort. Therefore, counseling should not only recommend opening windows but also consider feasible household-level modifications, such as arranging furniture so that air pathways are not blocked, opening opposite windows when available, using vents that can remain open safely, and prioritizing sleeping arrangements that reduce prolonged close exposure. These recommendations are consistent with Indonesian environmental health policy, which emphasizes environmental quality as part of public health protection (Kementerian Kesehatan Republik Indonesia, 2023).

The findings suggest that TB prevention in the Kamonji Public Health Center area should maintain patient education while strengthening environmental health actions. Counseling should include simple messages such as opening windows regularly, improving cross-ventilation where feasible, reducing crowding in sleeping rooms, allowing sunlight into the house, and maintaining dry indoor conditions. Home visits by sanitarians and TB program officers can help identify households that need priority support. These actions are aligned with national TB control efforts, which emphasize case detection, treatment, prevention, and community engagement (Kementerian Kesehatan Republik Indonesia, 2022; Kementerian Kesehatan Republik Indonesia and World Health Organization Indonesia, 2025).

Study Limitations

This study has several limitations. First, the design was descriptive, so the findings cannot establish causal relationships among knowledge, attitudes, the home environment, and TB occurrence. Second, the study was conducted in a single public health center, with 52 respondents, limiting generalizability to other settings. Third, this study did not assess clinical TB status, treatment phase, household density, socioeconomic status, or detailed housing structure, which may influence knowledge, attitudes, and home environmental conditions. Fourth, the study did not include detailed psychometric testing of the questionnaire. Despite these limitations, the findings provide practical local information that can guide environmental health counseling and home-based TB prevention in the Kamonji Public Health Center area.

CONCLUSION

Most TB patients in the Kamonji Public Health Center service area had good knowledge and positive attitudes. Most observed houses also met standards for lighting, ventilation, and humidity. Nevertheless, a meaningful proportion of homes still did not meet environmental standards, particularly in ventilation. The public health center should continue TB education and strengthen home-based environmental health interventions through routine counseling, home visits, and practical guidance for improving air circulation, sunlight exposure, and indoor humidity control. Future studies should use analytic designs to examine the relationship between household environmental factors and TB transmission risk in this setting.

Author's Contribution Statement: Maryam contributed to the study conception, data collection, data tabulation, and initial manuscript drafting. Rini Yulianti contributed to supervision,

methodological guidance, interpretation of findings, manuscript review, editing, and final manuscript approval. Both authors approved the final manuscript for submission.

Conflicts of Interest: The authors declare no conflict of interest.

Source of Funding Statements: This study did not receive external funding.

Acknowledgments: The authors thank Poltekkes Kemenkes Palu, the Department of Environmental Health, Kamonji Public Health Center, and all respondents who participated in this study.

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