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Tuberculosis Prevention Measure from an Environmental Factors Perspective and the Role of Health Workers

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ABSTRACT

Tuberculosis (TB) is an environmentally transmitted disease caused by Mycobacterium tuberculosis. The second Tuberculosis position in the world is occupied by Indonesia after India. In 2024, the incidence of TB in men was recorded at 496 thousand cases, women with TB at 359 thousand, and children aged 0-14 years as many as 135 thousand cases. This condition requires attention in prevention efforts throughout Indonesia. The study aimed to analyze environmental factors and the role of health workers associated with TB prevention measures. Analytical observational research with a cross-sectional approach was conducted among 1,947 people, and a proportional random sample of 92 residents was drawn. Data analysis using the Chi-Square test obtained lighting (P-value=0.021), humidity (P-value=1.000), temperature (P-value=0.939), occupancy density (P-value=0.040), and the role of health workers (P-value=0.002). The study concludes that there is an association between lighting, occupancy density, and the role of health workers in TB prevention efforts. The variables that did not have an association with TB prevention measures were humidity and temperature. The results of this study can provide input for improving TB prevention and control programs that collaborate across programs and sectors. This includes enhancing outreach and strengthening the role of health cadres and community organizations to encourage communities to improve their physical home environments to create healthy, TB-free homes.

INTRODUCTION

Tuberculosis (TB) is a global disease that can affect the entire human body, but is most commonly found in the lungs. As a respiratory disease, TB is easily transmitted through the air when an infected person sneezes, spits, or coughs[1]. Environmental changes such as pollution and climate change significantly impact TB, an environmentally based disease. It's important to understand that the environment plays a key role in determining a community's health. Climate change and exposure to air pollution can be risk factors for developing TB[2]. For example, climate change affects food availability, thereby threatening food security. Furthermore, malnutrition will occur, thereby weakening the immune system. Another example

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is air pollution, which degrades environmental quality and causes respiratory problems by weakening the immune system. Poor air quality (especially PM2.5 status) worsens TB symptoms. Ecological factors such as average rainfall, wind speed, average relative humidity, air pollutants, and population density were associated with TB occurrence. Climatic variables, sunshine, absolute humidity, and average temperature were related to TB incidence[3]. Health services, population-level factors, and socioeconomic status are associated with TB incidence and mortality [4].

Tuberculosis in developing countries is entering a phase of serious challenges in health problems. Risk factors for tuberculosis in the home include separate floors, roofs, and wall materials; the number of people sleeping in one room; sharing toilets and drinking water with other households; indoor smoke; and the type of cooking fuel in the kitchen [5]. Presidential Regulation of the Republic of Indonesia No. 67 of 2021 concerning the Control of Tuberculosis in Indonesia is still a health problem that is difficult to prevent, both medically, socially, economically, and culturally. Currently, Indonesia ranks second in TB cases in the world, so Indonesia is facing a major problem in eliminating TB. The government is targeting the elimination of TB by 2030. Tuberculosis is a serious threat to public health, with the spread of TB being very massive, where 14 people die per hour, making it difficult to achieve the target in the next five years. Data for 2024 recorded 889 thousand notifications of TB cases[6].

TB control policies continue to develop and are pursued with various evaluation findings in the field. The success rates of drug-sensitive TB (SO) treatment remains below the target of 90%, with is 81% and 58%, and drug-resistant TB (RO) treatment, even though the target is 80%. With treatment that has not yet reached the target, this is a serious threat to controlling TB transmission. The mechanism of TB transmission is through the air. Air is a medium for the transmission of TB, which is caused by the bacterium Mycobacterium tuberculosis. Coughing, talking, spitting, and sneezing are risky activities that can expose the sufferer's droplets to people around them. TB patients will transmit the disease to people around them, and olk-lTB sufferers will be at risk of being infected by around 10-15 people. For example, health workers at Namwala District Hospital are at risk of contracting TB. They are more likely to contract TB if they do not wear masks, do not practice infection prevention, such as washing hands after caring for patients, have a poorly ventilated work environment, overcrowded rooms, an unclean environment, and lack awareness of health promotion for health workers in hospitals[7].

Mycobacterium tuberculosis in droplets can survive for several hours in a room that is not exposed to sunlight and is humid. The environment serves as a medium that supports TB transmission. Mycobacterium tuberculosis will die within 10 minutes if exposed to temperatures of 80°C or more. Ultraviolet light and direct sunlight can inactivate Mycobacterium tuberculosis. At low temperatures between 4°C and- 70°C, TB bacteria can survive for a long time. Given that Mycobacterium tuberculosis is found and can survive in various natural and artificial environments. Especially in crowded environments that have the potential to transmit TB[8]. The length of contact with TB patients is one of the determinants of the TB disease

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process. Long contact or intense interaction is a natural phenomenon in families, including families with TB sufferers. New TB sufferers will increase due to transmission that occurs in the home itself, from family members themselves. This means that it is not only about the body's resistance and the number of TB bacteria, but also about the duration of contact within a family, especially in families with a TB patient.

Although not resistant to sunlight, Mycobacterium tuberculosis can survive in extreme conditions such as low oxygen, is resistant to disinfectants and alcohol, and is capable of dormancy. This means that this bacterium still transmits disease even in conditions that were not ideal, so this survival ability is a challenge in tuberculosis control efforts. Mycobacterium tuberculosis has survived for years by manipulating its metabolism under adverse conditions in the human body as the sole reservoir and spread of TB[9]. Its hidden nature poses a challenge in efforts to prevent TB transmission. Based on preliminary studies, TB patients in Cicalengka Wetan live near an industrial factory in a densely populated residential area. Observations revealed that residents do not practice cough etiquette or wear masks, maintain a healthy lifestyle, and avoid opening windows, citing the high dust associated with living in the industrial area. Interviews revealed that TB transmission within families is common, given the close contact, the physical home environment, and the unhealthy, densely populated environment.

The residential environment requires serious attention as part of TB prevention efforts. Public awareness of TB prevention and control can inform clean and healthy living practices. Environmental modifications can be an effective means of reducing the potential for transmission in unhealthy environments. Based on the above description, this study aims to analyze environmental factors and the role of health workers in TB prevention measures in Cicalengka Wetan Village.

METHOD

This research employs a quantitative design. An observational analytical method with a cross-sectional approach. The purpose of this research is to analyze environmental factors and the role of health workers associated with TB prevention efforts. The location chosen for this research is in Cicalengka Wetan Village, Bandung Regency, West Java Province, from March to July 2024. The population 1,947of this study comprised 1,947 residents of Cicalengka Wetan Village, within the Cicalengka DTP Community Health Center's service. The determination of the sample in this study uses a proportion formula with a known population [10]. The research sample is drawn from the target population, namely the residents of Cicalengka Wetan Village. The sample was determined using a proportion formula with a 95% confidence level, yielding 92 respondents. The 95% Confidence Level aims to guarantee the reliability of the sample so that it can generalize the actual population conditions. Sampling was conducted using proportional random sampling to ensure an equal probability of selection for the population. The 92 residents were drawn from 16 neighbourhood associations (RW), as calculated in the following table:

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Table 1. Sample Distribution Table

No	RW	Sample	Amount	No	RW	Sample	Amount
1	RW 1	$\frac{76}{1,947} x\ 92$	4	**9**	RW 9	$\frac{216}{1,947} x\ 92$	10
2	RW 2	$\frac{103}{1,947} x\ 92$	5	**10**	RW 10	$\frac{65}{1,947} x\ 92$	3
3	RW 3	$\frac{46}{1,947} x\ 92$	2	**11**	RW 11	$\frac{113}{1,947} x\ 92$	5
4	RW 4	$\frac{88}{1,947} x\ 92$	4	**12**	RW 12	$\frac{166}{1,947} x\ 92$	8
5	RW 5	$\frac{259}{1,947} x\ 92$	12	**13**	RW 13	$\frac{159}{1,947} x\ 92$	8
6	RW 6	$\frac{76}{1,947} x\ 92$	4	**14**	RW 14	$\frac{58}{1,947} x\ 92$	3
7	RW 7	$\frac{72}{1,947} x\ 92$	3	**15**	RW 15	$\frac{84}{1,947} x\ 92$	4
8	RW 8	$\frac{233}{1,947} x\ 92$	11	**16**	RW 16	$\frac{131}{1,947} x\ 92$	6
			Total				**92**

Based on the table above, the number of samples for each neighbourhood unit (RW) can be determined. Determination of 92 residents as 92 was assisted by computer-assisted randomization until each RW sample was fulfilled. The research sample must meet the inclusion criteria, which include willingness to participate in the study, residence in Cicalengka Wetan Village, Cicalengka District, for at least 2 years, and age 26-35 years. Then the exclusion criteria in this study were residents who were sick, not at home when the research was conducted, and unable to read and write.

After obtaining 92 residents, the questionnaire was completed for approximately 30 minutes for each residents. The questionnaire sheet contained statements about the role of health workers and TB prevention measures. Then the observation sheet was used in measuring the physical environment of the house. The lighting was measured with a digital lux meter, humidity and temperature were measured with a thermohygrometer. Occupancy density was determined by comparing the size of the room (floor area of the room) with a roll meter measurement with the number of occupants in the bedrooms of the resident's house. Validity and reliability tests were conducted in Cicalengka Kulon Village with a sample of 30 people. The validity test used Pearson product-moment correlation, while the reliability test used Cronbach's alpha. The questionnaire and observation sheet were considered valid if the calculated $R \geq 0.361$ and reliable if ≥ 0.6. The TB prevention measures questionnaire obtained a Cronbach alpha value of 0.795, and the health worker role questionnaire obtained a Cronbach alpha value of 0.836.

Univariate analysis was conducted to determine the frequency distributions of the research variables of the role of health workers, the physical environment, namely lighting, humidity, temperature, and occupancy density as independent variables. And also TB prevention measures as dependent variables.

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Bivariate analysis was conducted to examine the association between the role of health workers and environmental factors including lighting, humidity, temperature, and occupancy density with TB prevention measures. This study used nonparametric statistics, specifically the chi-square test.

This research has received ethical approval from the Health Research Ethics Commission of Bhakti Kencana University with Number 189/09.KEPK/UBK/VIII/2024.

RESULTS AND DISCUSSION

RESULTS

This study aimed to analyze environmental factors and the role of health workers associated with TB prevention measures in Cicalengka Wetan Village. The characteristic data of 92 resident were presented in Table 2 below:

Table 2: Data On Resident Characteristics

Characteristics	Frequency	Percentage
Sex		
Male	35	38
Female	57	62
Education		
Basic Education	23	25
Secondary Education	61	66
Higher Education	8	9
Occupation		
Doesn't Work	50	54
Work	42	46
Income		
< the minimum wage	53	58
≥ above the minimum wage	39	42
Total	**92**	**100**

Based on the research results, the majority of community residents were female, had a high school education, were unemployed or employed in informal jobs, and earned income below the Bandung Regency Minimum Wage. Data on the distribution of tuberculosis prevention measures, the role of health workers, environmental factors such as lighting, humidity, temperature, and occupancy density were listed in Table 3 below, presenting the frequency distribution of research variables.

Table 3: Frequency Distribution of Risk Factors in TB prevention measures

Research Variable	Frequency	Percentage
TB prevention measures		
Taking prevention measures	45	49
Not Taking prevention measures	47	51
Role of Health Workers		
Were perceived as playing an active role	37	40
Were perceived as not playing an active role	55	60
Total	**92**	**100**

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Based on the table above, the majority of the residents did not take TB prevention measures (51%) and felt that health workers did not play a role in preventing TB (60%). Meanwhile, environmental factors include lighting, humidity, temperature, and occupancy density, as shown in Table 4 below:

Table 4. Frequency Distribution of Environmental Factors in TB Prevention Measures

Environmental Factors	Frequency	Percentage (%)
Lighting		
Adequate	45	48.9
Inadequate	47	51.1
Humidity		
Adequate	61	66.3
Inadequate	31	33.7
Temperature		
Adequate	81	88
Inadequate	11	12
Occupancy Density		
Adequate	17	18.5
Inadequate	75	81.5
Total	**92**	**100**

Based on the table above, most of the residents' home environments have humidity and room temperature that meet the requirements, but have lighting and occupancy density that do not meet the requirements. Based on the analysis using non-parametric statistics with the Chi-Square test to determine the association between variables, the results of the analysis were used to determine the association between physical environment (lighting, humidity, temperature, occupancy density), and the role of health workers. And TB transmission prevention. The results of the Chi-Square test are shown in Table 5 below:

Table 5. Association between Risk Factors and Prevention of TB prevention measures

Research Variable	Taking prevention		Not taking prevention		P-value	POR 95% CI
	n	%	n	%		
Role of Health Workers						
Were perceived as playing an active role	26	70.3	11	29.7	0.002	4.478
Were perceived as not playing an active role	19	34.5	36	65.5		(1.825 - 10.990)
Lighting						
Adequate	16	35.6	29	64.4	0.021	1.415
Inadequate	23	61.7	24	38.3		(0.623 - 3.215)
Humidity						
Adequate	30	49.2	31	50.8	1.000	1.222
Inadequate	15	48.4	16	51.6		(0.452 - 3.305)
Temperature						
Adequate	39	48.1	42	51.9	0.939	0.774
Inadequate	6	54.5	5	45.5		(0.219 - 2.740)
Occupancy Density						
Adequate	4	23.5	13	76.5	0.040	0.255
Inadequate	41	54.7	34	45.3		(0.076 - 0.855)

Based on the analysis in the table above, there is no association between humidity (P-value 1.000) and temperature (P-value 0.939) with TB prevention measures in Cicalengka Wetan Village. There is an association between occupancy density (P-value 0.040), lighting (P-value 0.021), and the role of health workers (P-value 0.002) with TB prevention measures in Cicalengka Wetan Village. Inadequate lighting

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and high occupancy density, as well as perceptions that health workers are not actively involved, increase the risk of TB transmission. Lighting (POR 1.415) and occupancy density (POR 0.255) were significantly associated with TB prevention measures and had a strong protective effect on TB prevention measures. The role of health workers is significantly related to TB prevention measures and has a very strong impact on TB prevention measures (POR 4.478).

Humidity and temperature were not associated with TB prevention measures, although they were scientifically proven to affect the survival of Mycobacterium tuberculosis (Mtb) bacteria in the air. This means these two factors were not directly related to TB prevention efforts in the home. Changes in humidity and temperature have a smaller impact than the risk of infection. Modifying the environment with adequate lighting and ventilation can eliminate bacteria. TB prevention behaviors, such as cough etiquette, were also more appropriate than modifying humidity and temperature.

DISCUSSION

The research that has been completed has found that there is an association between the role of health workers, lighting, and occupancy density and TB transmission prevention.

Association Between Lighting and TB Prevention In Cicalengka Wetan Village.

Based On The Research Results, It Was Found That Most Living In Houses Have Lighting That Does Not Meet The Requirements, Namely <60 Lux. Natural Or Artificial Lighting Or Lighting With A Minimum Brightness Of 60 Lux That Can Illuminate The Entire Room Is One Of The Requirements For A Healthy Home, Based On The Minister Of Health Regulation Number 2 Of 2023 Concerning The Implementation Regulations Of Government Regulation Number 66 Of 2014 Concerning Environmental Health[11]. Based On The Results Of The Chi-Square Analysis With A P Value Of 0.021, Lighting Is Associate To TB Prevention Measures. Nearly Half Of Residents (38.3%) Living In Homes With Poor Lighting Do Not Take TB Prevention Measures. The Results Of The Observation Indicate That Natural Light Cannot Enter The Houses Because The Spacing Between Houses Is Dense, People Rarely Open Doors Or Windows, And Some Houses Lack Ventilation. Therefore During The Day, People Have To Use Artificial Light Sources From Appropriate Lamps, But Although They Have Used Light, The Light Intensity Is Still Less Than The Standard. Inadequate Lighting Increase The Risk Of TB Transmission. Lighting (POR 1.415) Was Significantly Associated With TB Prevention Measures And Had A Strong Protective Effect On TB Prevention Measures.

Lighting, Both Natural And Artificial, In The Home Is A Necessary Environmental Component. The Government Also Plays A Role In Regulating Environmental Health Indicators In Realizing Public Health. Environmental Factors Influence The Spatial Distribution Of TB In Nepal, Necessitating The Integration Of Disease Management Strategies With Environmental Health Policies[12]. The Ventilation Ratio Of Building Area To House Lighting Is Associated With The Incidence Of Pulmonary Tuberculosis [13].

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Inadequate Lighting Allows Tuberculosis Bacteria To Survive In The Air For 1-2 Hours, Or Even Months. Bacteria Thrive Primarily In Damp, Dark Spaces. Sunlight Can Kill Bacteria, So Natural Light Must Be Ensured To Enter The Home Through Windows Or The Roof. Adequate Indoor Lighting Is Associated With A Lower Incidence Of Tuberculosis [14]. There Is A Link Between Lighting And Preventing TB Transmission. Houses In Alleys Lack Lighting That Meets The Requirements For A Good Physical Environment. This Is Due To Light Does Not Enter The Home Due To Habits Such As Rarely Opening Windows And Doors, Making The Home Stuffy And Dark[15]. Improving Indoor Air Quality Through Ventilation Reduces The Likelihood Of Pathogen Transmission, Including That Of Bacteria That Cause TB [16]. A Good Physical Home Environment Can Improve Residents' Health. Poor TB Treatment Outcomes Can Be Linked To Low Socioeconomic Status[17].

Low-Income Communities Tend To Cluster According To Purchasing Power, Ultimately Congregating In Densely Populated Residential Areas That Tend To Lack The Requirements For Healthy Occupancy, Including Adequate Indoor Lighting And Sparsely Populated Spaces. Elements Of The Physical Environment Of The Home Contribute To The Transmission Of Tuberculosis, So Improving The Physical Environment Of The Home Is Necessary To Control The Transmission Of Tuberculosis[18]. Utilizing Natural Light Sources Such As Sunlight, Which Has The Ability To Kill TB Bacteria, Is Crucial. Therefore, Opening Windows During The Day Will Allow Sunlight To Enter The Room. Environments, Including Residences, Should Have Natural Openings, Such As Windows, And Access To Natural Light. Natural Lighting Can Kill Germs, Reduce Humidity, And Promote Good Air Circulation, Thus Reducing The Concentration Of Mtb Bacteria In The Air And Expelling Polluted Air.

Association Between Occupancy Density and TB Prevention in Cicalengka Wetan Village.

Accordingly on the research results, it was found that most of the community has a occupancy density that does not meet the requirements. Based on the results of the Chi-Square analysis with a P value of 0.040, occupancy density was associated with TB prevention measures. Nearly all residents (45.3%) living in homes with inadequate housing density do not take TB prevention measures. According to the Minister of Health's regulations, the space requirement per person is 9 m^2, calculated based on basic human activities within the home. These activities include sleeping, working, bathing, washing, cooking, eating, sitting, showering, toileting, and other movement areas[11]. Based on conditions at the research location, occupancy density was found in dense settlements, where the area of the house, such as bedrooms, did not meet the requirements. Bedrooms was shared with children and even teenagers because there are no separate rooms. This condition causes poor air circulation and facilitates the spread of disease. Inadequate occupancy density increase the risk of TB transmission. Occupancy density (POR 0.255) was significantly associated with TB prevention measures and had a strong protective effect on TB prevention measures.

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High residential density, especially in densely populated settlements, is a major risk factor for the transmission of tuberculosis (TB). Tuberculosis, caused by the bacterium Mycobacterium tuberculosis, is transmitted through the air, particularly when an infected person sneezes, coughs, or spits. In crowded environments, individuals were nearby, making the risk of transmission much higher. Poor indoor ventilation and insufficient sunlight also exacerbate the situation. Humid air and low light can allow TB bacteria to survive for hours. When an individual with active TB coughs, the bacteria was spread through the air and easily inhaled by others in the same room. Environmental control is the second step in the TB infection control strategy. It aims to minimize exposure in healthcare settings by reducing the concentration of infectious droplet nuclei in the air through ventilation[19].

Analysis using the Chi-Square test indicates a association between occupancy density and TB transmission prevention. High occupancy density increases the risk of tuberculosis transmission through more frequent contact with infected individuals. The results indicate that most homes have inadequate occupancy density. High occupancy density can contribute to unhealthy Occupancy conditions, resulting in limited indoor oxygen and facilitating the transmission of disease from sick individuals. This is especially true for homes located in narrow alleys blocked by tall buildings. Income and atmospheric pressure were related and were the main controls that determined TB cases in Gombak[20].

A novel association has been identified between Mycobacterium tuberculosis (Mtb) transmission and prolonged residence in high-burden communities. Transmission is associated with fewer bedrooms per family. Increased social interaction and prolonged residence in high-burden environments increase Mtb transmission. This increase is due to high rates of effective contact. Further study is needed on poverty levels in low-socioeconomic status settings[21]. Overcrowding in densely populated areas is unavoidable when economic conditions render such conditions unavoidable. Improve ventilation by ensuring adequate air circulation within the home, either through windows or through mechanical ventilation for air exchange. This aims to reduce the concentration of TB bacteria in the air. High population density, both in the community and within homes, significantly increases the risk of TB transmission. Mycobacterium tuberculosis (Mtb) infection is more easily transmitted between individuals due to close proximity and prolonged contact. Modifying ventilation and providing adequate natural lighting are strategies to break the cycle of TB transmission in densely populated environments and homes.

Association Between the Role Of Health Workers With TB Prevention In Cicalengka Wetan Village.

Research shows that the public perceives most health workers as having little role in preventing TB transmission. Based on the results of the Chi-Square test (P = 0.002), the role of health workers is associated with TB prevention measures. Most residents (65.5%) who do not take TB prevention measures believe that health workers play a less important role in TB prevention. Inadequate health workers who were perceived as not playing an active role increase the risk of TB transmission. The role of health workers is

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significantly associated with TB prevention measures and has a strong impact on them (POR = 4.478). Perceived inactivity among health workers can increase the likelihood that residents do not take TB prevention measures by up to 4.5 times.

This lack of role stems from their infrequent TB education and motivational support for TB prevention. The role of health workers is critical to achieving community participation in government health programs [22]. Information about TB is only provided to patients, not to the general public. Health workers rarely provide guidance on environmental health, especially in the home, for TB prevention. Health workers are underutilizing resources and resources to prevent TB transmission. Health workers are the spearhead of health programs, therefore the success and achievement of health development goals require the role and commitment of health workers. Health promoters, as health workers, are responsible for improving and maintaining public health [23]. Health workers must be able to analyze problems, formulate effective actions, and plan TB control strategies to motivate the community to actively participate in government programs. Maintaining health workers' health through the orientation of junior health workers, further studies, and training for health workers, especially private health workers, is highly recommended [24].

Collaboration between the community and health workers in TB prevention will build public trust. The community will be actively engaged in every TB prevention health program socialized by health workers. The involvement of health service providers is an important element in the implementation of community-based TB programs[25]. A small percentage of the community believes that health workers play a role in encouraging community members to take preventive measures against TB transmission. Almost all of the community takes action to prevent TB transmission because they play the role of health workers in providing counseling, such as providing information on the benefits of prevention, TB symptoms, transmission methods, and TB prevention. This means that health workers who do not play a role in preventing TB transmission will increase the incidence of TB. One of the obstacles to TB prevention is distrust of health center staff Feelings of shame and fear of being ostracized if they admit they have TB. Concerns about creating a negative stigma in the workplace, which could threaten their income. Lack of knowledge about the urgency of treatment, long duration of treatment, and side effects of drugs pose a threat to the success of TB treatment attempted by health workers. Based on research results [26], distrust arises from clients' perceptions that they spend a lot of time at the clinic without receiving treatment or medication. According to research conducted in February and November 2014, the role of health workers is essential in preventing TB transmission and reducing the incidence of pulmonary TB. Support for health workers is needed to maximize their important role in the work environment and to implement TB infection prevention and control (IPC) as an intervention [27].

Given the high transmission rate in densely populated areas, one role of health workers is to conduct regular TB screening to detect cases as early as possible and interrupt transmission. Community health workers can play an effective role in active screening and referral for TB identification in states with low

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TB detection rates[28]. The next important role is to educate the public about the risks of overcrowding and to implement preventive measures to effectively reduce TB transmission rates and protect public health. The capabilities of healthcare workers also need to be considered to ensure they can play their full role, including screening, early detection, and health education. Approximately 90% of healthcare workers had never received training in TB infection prevention and control. More than half (54%) of study participants worked in poorly ventilated rooms. Triage of patients with cough was not performed in 32% of facilities studied (community health centers and hospitals) [29]. The role of healthcare workers is crucial in implementing TB prevention, management, and control strategies. Healthcare workers act as facilitators in preventing, detecting, and curing TB by connecting science and healthy community behaviors in TB prevention. These findings may form the basis for the need for comprehensive TB training for healthcare workers.

CONCLUSION

A Significant Association Was Observed Between Occupancy Density (P-Value 0.040), Lighting (P-Value 0.021), And The Role Of Health Workers (P-Value 0.002) With TB Prevention Measures But The Study Not Find A Significant Relationship Between Humidity (P-Value 1.000) And Temperature (P-Value 0.939) With TB Prevention In Cicalengka Wetan Village.

TB Prevention Measures Combine Environmental Modifications And Healthy Community Behaviors. Environmental Modification Is An Application Of Environment-Based TB Prevention Measures. Cross-Sector Collaboration Is Needed To Modify Healthy Living Environments. Cross-Program Collaboration Is Also Needed To Increase Understanding Of The Importance Of TB Prevention Measures.

AUTHOR CONTRIBUTIONS

The authors' contributions aim to increase the transparency of the journal articles they compile. Ratna serves as the research team leader, responsible for the overall research process, particularly data analysis and journal article preparation. Rita Setiawati is responsible for coordinating with field staff, collecting data in the field, and summarizing and processing it. Martini is responsible for ensuring that data curation in the recapitulation and processing follows the methodology. Onny Setiani is responsible for finalizing the concept and conducting final editing of the journal articles.

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