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# RISK FACTORS ASSOCIATED WITH THE OCCURRENCE OF TB IN HOUSEHOLD CONTACTS BASED ON SCREENING TESTS IN THE WORKING AREA OF THE KENARILANG PUBLIC HEALTH CENTER, TELUK MUTIARA DISTRICT, ALOR REGENCY

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**Abstract**

Tuberculosis (TB) is one of the diseases with a high mortality rate in the world. Based on *the Global Tuberculosis Report 2022*, TB ranked 13th as the highest cause of death worldwide in 2019. TB transmission occurs through the air (*airborne disease*) increasing the possibility of infection to people who are physically close to TB patients, including those living in the same house. The infection rate can increase with the length of contact/exposure to TB patients. The possibility of TB bacteria to infect will increase when the immune system decreases, making humans susceptible to TB bacterial infection. This study aims to analyze the risk factors associated with the occurrence of TB in household contacts based on screening tests in the working area of the Kenarilang Community Health Center, Teluk Mutiara District, Alor Regency in 2023. The type of research is observational analytic using a cross-sectional design. Technique simple random sampling and sample as much as 157 respondents. Instrument study use questionnaire and use test Chi Square And regression multiple logistic (p=0.05).. The results of the study showed that factors related to the incidence of TB in household contacts were knowledge (p=0.001), attitude (p=0.001), availability of information (p=0.001), and residential density (p=0.001). Meanwhile, those that were not related were phlegm removal behavior (p=0.575) and cough etiquette (p=0.330). The factor most related to the incidence of TB was the level of knowledge (PR 98.4). The community, in this case, household contacts of TB, need to improve their knowledge and understanding of the dangers, prevention, and control of TB by accessing health information through health workers, print, and electronic media. The government needs to increase public knowledge by intensively promoting health about TB prevention through direct counseling and health promotion media.

**Keywords:** Household Contacts, Screening Test, TB Incidence

## Introduction

The *2022 Global Tuberculosis Report* shows that TB was the 13th leading cause of death worldwide in 2019. Furthermore, the WHO estimates that in 2021, there were 10.6 million people worldwide with TB, with a death toll of 1.4 million. The number of TB cases occurring in 30 countries with a high TB burden contributed to 87% of the total estimated TB incidents in 2021 worldwide, and two-thirds of them occurred in these eight countries, one of which was Indonesia, which contributed 9.2% of the total cases, placing Indonesia in second place in the world.

Several risk factors for TB incidence identified by previous research include housing density, knowledge, and behavior, which are significantly associated with TB transmission; knowledge is the most dominant variable (Zulaikhah et al., 2019). Meanwhile, research by Budi et al. (2018) states that


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family history of TB, access to information, and housing density are significantly associated with TB incidence; housing density is the most influential variable in the incidence of the disease. Furthermore, research by Sari (2018) shows that the level of knowledge, attitudes, and actions regarding TB are associated with TB incidence. Other research has found a significant relationship between the variables of knowledge, attitudes, and actions with TB incidence; actions are the most dominant variable in influencing TB incidence (Anggraini & Hutabarat, 2021).

The Central Statistics Agency of East Nusa Tenggara Province (2022) recorded 4,798 confirmed cases of TB in East Nusa Tenggara (NTT). Alor Regency, one of the regencies in NTT, ranked eighth out of 22 regencies/cities in the province with the highest TB incidence rate in 2021, with 250 active TB cases. Alor Regency also showed a significant upward trend in the number of active TB cases over the past three years, with 236 cases in 2019; 263 cases in 2020; and 264 cases in 2021. Furthermore, data from January to October 2022 recorded 262 cases, and there is still a possibility of an increase in the number of cases until the end of 2022.

Based on secondary data on TB cases in Alor Regency, it was found that Kenarilang Community Health Center had the highest number of TB cases from 2018 to 2022. In 2018, there were 98 TB cases at Kenarilang Community Health Center; in 2019 there were 87 cases; in 2020 there were 75 cases; in 2021 there were 94 cases; and in 2022 (January-October) there were 80 cases. Furthermore, it was found that TB patients at Kenarilang Community Health Center tended to increase every year and always ranked first for the highest number of TB cases when compared to other community health centers in Alor Regency.

**Research Methods**

This research was conducted in the working area of Kenarilang Community Health Center, Teluk Mutiara District, Alor Regency. This research was conducted in April 2023 using a quantitative analytical study approach with a cross-sectional study design. The design approach used is cross-sectional, namely the study was conducted at one time and once to find the relationship between the independent variable and the dependent variable (Murti, 2013). The independent variables in this study include knowledge, attitudes, phlegm removal behavior, availability of information, residential density, cough etiquette, while the dependent variable in this study is the incidence of tuberculosis. The population is all people in the working area of Kenarilang Community Health Center who have a history of household contact with tuberculosis patients. The number of populations in this study was taken from data on people living in the same house as tuberculosis patients, namely 370 people. Samples were taken as many as 157 samples using a *simple random sampling technique*. Data were collected using a questionnaire, then processed and analyzed using the chi-square test with a 5% error rate ($p = 0.05$).

## Results

### Respondent Characteristics

**Table 1. Frequency Distribution of Respondents Based on Gender, Education Level and Type of Employment**

| Characteristics | Amount | % |
|---|---|---|
| **Gender** | | |
| Man | 61 | 38.9 |
| Woman | 96 | 61.1 |
| **Level of education** | | |
| No school | 1 | 0.6 |
| Elementary School | 28 | 17.8 |
| JUNIOR HIGH SCHOOL | 62 | 39.5 |
| SENIOR HIGH SCHOOL | 52 | 33.1 |
| S1 | 14 | 8.9 |
| **Type of work** | | |
| Students | 37 | 23.6 |
| Student | 1 | 0.6 |
| PTT/Contract | 11 | 7.0 |
| civil servant | 5 | 3.2 |
| Self-employed | 18 | 11.5 |
| Civil Servant Retirement | 5 | 3.2 |
| Teacher Retirement | 2 | 1.3 |
| Laborer | 6 | 3.8 |
| Farmer | 13 | 8.3 |
| Trader | 8 | 5.1 |
| Fisherman | 10 | 6.4 |
| Housewife | 41 | 26.1 |

Source: Primary Data, 2023

Table 1 shows the characteristics of respondents based on gender. It is known that the majority of respondents were women, namely 96 respondents (61.1%), Respondent characteristics based on education level, the most educated were junior high school graduates, namely 62 respondents (39.5%), and respondent characteristics based on occupation, the most were housewives, namely 41 respondents (26.1%).

### Univariate Analysis

**Table 2. Frequency Distribution of Respondents Based on Level of Knowledge, Attitude, Phlegm Removal Behavior, Information Availability, Housing Density, Cough Etiquette**

| Variables | Amount | % |
|---|---|---|
| **Level of Knowledge** | | |
| Low | 70 | 44.6 |
| Good | 87 | 55.4 |
| Attitude | | |
| Negative | 64 | 40.8 |
| Positive | 93 | 59.2 |
| **Phlegm Removal Behavior** | | |
| Negative | 34 | 21.7 |
| Positive | 123 | 78.3 |
| **Information Availability** | | |
| Not available | 81 | 51.6 |
| Available | 76 | 48.4 |

| | | |
|---|---|---|
| **Residential Density** | | |
| Not feasible | 79 | 50.3 |
| Worthy | 78 | 49.7 |
| **Cough Etiquette** | | |
| Wrong | 50 | 31.8 |
| Correct | 107 | 68.2 |
| **TB Incidence in Household** Contacts | | |
| Yes | | |
| No | 65 | 41.4 |
| | 92 | 58.6 |

Table 2 shows that most respondents have a good level of knowledge of 87 respondents (55.4%), most respondents have a positive attitude of 93 respondents (59.2%), most respondents have positive phlegm-removing behavior of 123 respondents (78.3%), most respondents did not receive information of 81 respondents (51.6%), most respondents have inadequate housing density of 79 respondents (50.3%), most respondents have proper cough etiquette of 107 respondents (68.2%). The table above shows the distribution of respondents based on the incidence of TB in household contacts, the majority of respondents are respondents who do not have TB, namely 92 respondents (58.6%).

**Bivariate Analysis**

| **Variables** | **TB incident** | | | | **N** | **p** | **PR (95% CI)** |
|---|---|---|---|---|---|---|---|
| | **Yes** | **%** | **No** | **%** | | | |
| **Knowledge** | | | | | | | |
| **Low** | 60 | 85.7 | 10 | 14.3 | 100 | 0 , 000 | 98,400 |
| **Good** | 5 | 5.7 | 82 | 94.3 | 100 | | 31,979-302,781 |
| **Attitude** | | | | | | | |
| **Negative** | 53 | 82.8 | 11 | 17.2 | 100 | 0 , 0 00 | 32,532 |
| **Positive** | 12 | 12.9 | 81 | 87.1 | 100 | | 13,377-79,070 |
| **Phlegm removal behavior** | | | | | | | |
| **Negative** | 16 | 47.1 | 18 | 52.9 | 100 | 0.575 | 1,342 |
| **Positive** | 49 | 39.8 | 74 | 60.2 | 100 | | 0.625-2.882 |
| **Availability of information** | | | | | | | |
| **Not available** | 57 | 70.4 | 24 | 29.6 | 100 | 0,000 | 20,188 |
| **Available** | 8 | 10.5 | 68 | 89.5 | 100 | | 8,423-48,386 |
| **Residential Density** | | | | | | | |
| **Not feasible** | 44 | 55.7 | 35 | 44.3 | 100 | 0 , 0 00 | 3,412 |
| **Worthy** | 21 | 26.9 | 57 | 73.1 | 100 | | 1,748-6,661 |
| **Cough Etiquette** | | | | | | | |
| **Wrong** | 24 | 48.0 | 26 | 52.0 | 100 | 0 ,330 | 1,486 |
| **Correct** | 41 | 38.3 | 66 | 61.7 | 100 | | 0.754-2.927 |
| **Total** | **65** | **41.4** | **92** | **58.6** | **100** | | |

The results of the bivariate analysis showed that factors that influence the incidence of TB include the level of knowledge (p=0.000 ) with a PR value= 98,400 (95% CI= 31.979-302.781 ), attitude (p = 0.000) with a PR value= 3.2532 (95% CI= 13.377-79.070 ) , availability of information (p = 0.000) with a PR value= 20.188 ( 95% CI= 8.423-48.386 ), and residential density (p = 0.000) with a PR value= 3.412 (95% CI= 1.748-6.661 ).

**Discussion**

1. **The Relationship Between Knowledge and the Incidence of Tuberculosis in Household Contacts at Kenarilang Community Health Center**

Knowledge is one of the factors that influence behavior. Good behavior is based on knowledge. Lawrence Green's theory suggests that knowledge is related to behavior. Knowledge, or cognition, is a crucial domain for individuals to take action. A person with good knowledge of healthy behaviors is likely to engage in good behavior as well. This means that improving healthy and safe behaviors requires increasing health knowledge. Knowledge can be measured through interviews or questionnaires that ask about the content of the material being measured from research subjects or respondents.

The results of TB screening conducted in the working area of the Kenarilang Health Center with a total of 157 respondents who were screened through sputum collection found that 65 respondents (41.4%) had TB and 92 respondents (58.6%) did not have TB. When further investigation into the level of knowledge of respondents using a questionnaire, the results showed that respondents with a low level of knowledge were 70 respondents (44.6%) and respondents with low knowledge and experienced TB incidents were 60 respondents (85.7%). The results of the test of the relationship between knowledge and TB incidents using *the Chi-square test* were obtained. *p-* value = *0.000* where *p-value* < *0.05* so there is a significant relationship between knowledge and the incidence of TB.

The results of this study are in line with research conducted by Wahyuni (2012) Good knowledge regarding tuberculosis prevention efforts will be closely related to community behavior in carrying out tuberculosis prevention efforts. Widoyono (2011) stated that there is a relationship between knowledge and TB incidents, namely that a person's knowledge will affect a person's health so that with sufficient knowledge, a person will try to behave in a clean and healthy way.

Respondents with good knowledge of TB symptoms will immediately check themselves at a health facility to determine their TB status. In contrast, respondents with poor knowledge tend to be reluctant to get themselves checked because they assume it is a common illness that will heal on its own. Screening tests are not intended to directly diagnose a disease, but rather the purpose of screening is to capture a number of people (population) in a community who appear healthy and are not yet showing symptoms and then conduct a more thorough diagnosis to determine treatment or other actions (Rahma, 2018). Respondents with good knowledge are more likely to undergo screening to determine their TB status.

According to the researcher's analysis, household contacts with good knowledge will have good behavior regarding health. Good knowledge of household contacts about various ways to achieve health maintenance and how to avoid disease will increase the community's knowledge to behave positively. Knowledge plays a crucial role in determining complete behavior because it will shape beliefs that then in perceiving reality, providing a basis for decision-making and determining behavior towards certain objects, thus will connect the elderly in their behavior. Knowledge is the most important factor in shaping individual behavior, so the good or bad of a person's behavior is closely related to the level of knowledge.

2. **The Relationship Between Attitudes and the Incidence of Tuberculosis in Household Contacts at Kenarilang Community Health Center**

Attitude is one of the foundations for behavior, and it has three important interrelated components: *cognitive, affective, and conative*. A positive attitude can increase respondents' confidence and belief in avoiding the risk of TB transmission.

The results of the study showed that there were 64 respondents (40.8%) with negative attitudes and 53 respondents (82.8%) with negative attitudes who experienced TB. The results of the test of the relationship between attitudes and TB incidents using *the chi-square test* were obtained. *p-* value = *0.000* where *p-value* < *0.05* so there is a significant relationship between attitude and the incidence of

TB. This research aligns with research conducted by Margaretha Kaka Pati et al. (2021) that found a relationship between attitudes and TB prevention behavior, with a *chi-square test* yielding a *p-value of 0.000.* Attitudes can be measured directly or indirectly. Direct measurement involves asking respondents about an object or asking them about it. Indirect measurement involves stating a hypothesis and then asking respondents about their opinions via a questionnaire.

According to the researcher's analysis, household contacts who did not experience TB had a positive attitude due to good knowledge. Attitude is a pattern of behavior, a tendency or anticipatory readiness, a predisposition to adapt to social situations. The better the knowledge possessed, the more likely it is to form a positive attitude. Efforts to prevent TB transmission among household contacts include staying away from TB sufferers. Respondents' high attitude towards TB transmission prevention efforts is the willingness to behave in a clean and healthy manner both for themselves and those around them. The more a person perceives many supporting factors to be able to carry out a behavior, the more likely they are to perceive themselves to carry out that behavior. Increasing the understanding of household contacts, family, and the community about TB will create a positive attitude, which will then form appropriate behavior in TB prevention. Attitudes formed by good knowledge will make people aware of conducting self-screening if they experience TB symptoms.

**3. The Relationship between Sputum Exhalation Behavior and the Incidence of Tuberculosis in Household Contacts at Kenarilang Community Health Center**

Indiscriminate phlegm spitting is an act that spreads tuberculosis germs. Meanwhile, the behavior of not spitting phlegm carelessly is an action taken to prevent the spread of tuberculosis germs (Ministry of Health of the Republic of Indonesia, 2008). The results of this study indicate that 123 respondents (78.3%) already knew the recommendations for proper phlegm spitting and therefore they did it as recommended. Respondents with negative phlegm spitting behavior and had TB amounted to 16 respondents (47.1%). The results of the test of the relationship between phlegm spitting behavior and the incidence of TB using *the chi-square test* obtained *p-* value = *0.575* where *p-value > 0.05* so there is no significant relationship between phlegm removal behavior and the incidence of TB.

During TB screening, one of the most common symptoms observed is coughing (regardless of duration). This coughing behavior is assessed to determine the risk of TB. Observations and interviews conducted during the study revealed that respondents had good coughing habits. This is linked to their good knowledge of TB management. A good understanding of the impact of coughing carelessly led them to consistently follow recommendations.

**4. The Relationship between Information Availability and TB Incidence in Household Contacts at Kenarilang Community Health Center**

The availability of information is one factor that can influence a person's decision-making regarding the use of health services. Information about TB is essential for the public to prevent the disease. Available sources of information are usually obtained directly from health workers or the mass media, but the information obtained must be accurate, reliable, and easily accessible. Misinformation can lead to misperceptions, which can lead to decreased adherence to TB prevention and control (Nusawakan, 2017).

The results of the study showed that 81 respondents (51.6%) reported that information was not available. Fifty-seven respondents (70.4%) experienced TB without information and experienced TB. The results of the *chi-square test* showed that the relationship between information availability and TB incidence was *p-* value = *0.000* where *p-value <0.05* so there is a significant relationship between the availability of information and the incidence of TB. The results of this study are in line with the study conducted by Kundari (2020) which stated that there is a relationship between the availability of information and the incidence of TB, this study is also in line with the study conducted by Sari (2021)

which stated that there is a significant relationship between the source of information and the incidence of TB in household contacts.

Field research findings indicate that a lack of information can be related to a person's knowledge. The results also indicate that, compared to respondents who chose print or direct media, respondents who used electronic media as their primary source of information regarding TB tended to have good phlegm expectoration practices. Information through electronic media, sourced officially directly from the government, health institutions, licensed health professionals, and trusted journalists, will also provide facts and up-to-date information, which will have a positive impact. Respondents who live with TB sufferers must have adequate information on how to manage their lives. To ensure information availability, extensive outreach by health workers is required. During screening, information about TB can also be provided so that the public can obtain good and correct information. Ease of accessing information about TB will increase public understanding and thus prevent TB.

**5. The Relationship Between Residential Density and the Incidence of Tuberculosis in Household Contacts at the Kenarilang Community Health Center**

Housing density is closely related to a person's socioeconomic factors, as low incomes prevent people from living a decent life that meets health requirements. Standards for public housing essentially provide adequate housing in terms of design, location, and building area, as well as other facilities to meet the requirements for a healthy and pleasant home. Poorly maintained or run-down homes can facilitate the transmission of diseases and disorders such as pulmonary tuberculosis (Chandra, 2006).

TB symptom screening was conducted on respondents who had a history of household contact with TB patients. The more frequent a respondent's history of contact with TB patients, the greater the likelihood of infection, especially if they live in areas with inadequate housing density. Housing density is grouped into two groups: adequate and inadequate housing density. Based on the results of the study, 79 respondents (50.3%) had inadequate housing and 78 respondents (49.7%) had adequate housing density. Respondents with inadequate housing and experienced TB cases were 44 respondents (55.7%). The results of the test of the relationship between housing density and TB cases using *the chi-square test* obtained *p-* value = *0.000* where *p-value* < *0.05* so there is a significant relationship between residential density and the incidence of TB.

According to the researcher's analysis, dense housing in a house will facilitate the transmission of tuberculosis from household contacts. The greater the number of occupants, the greater the oxygen levels in the room. Residential density significantly affects health, this is because residential density determines the incidence of infectious diseases such as respiratory diseases, including tuberculosis. The number of rooms occupied by many people will have a negative impact on health and will be a potential source of infectious diseases. Residential density in the Kenarilang Community Health Center work area is more inadequate (79 respondents (50.3%), so the greater the number of occupants will affect the oxygen levels in the room. Increased CO2 levels $_{in}$ the air, then the bacteria *Mycobacterium tuberculosis*.

**6. The Relationship between Cough Etiquette and the Incidence of Tuberculosis in Household Contacts at Kenarilang Community Health Center**

Coughing etiquette is the proper and correct way to cough, by covering the nose and mouth with a tissue or sleeve so that bacteria do not spread into the air and are not transmitted to others. The main goal of maintaining coughing etiquette is to prevent the widespread spread of a disease through free air (Droplets) and to make people around them comfortable. These droplets can contain infectious germs from *Mycobacterium Tuberculosis* which have the potential to be transmitted to others around them through the respiratory air. Respiratory hygiene/coughing and sneezing etiquette applies to everyone, especially in cases of infections with airborne transmission in the form of phlegm droplets (droplet nuclei) which can spread germs. (WHO, 2007 in Ministry of Health, 2017). Results of the test of the

relationship between cough etiquette with the incidence of TB using *the chi-square test* obtained *p*-value = *0.000* where *p-value > 0.330* so there is no significant relationship between cough etiquette and TB incidence.

During the screening, researchers asked questions while observing the coughing etiquette of the respondents. A total of 107 respondents (68.2%) were able to apply the correct coughing etiquette, while 24 respondents (48.0%) had incorrect coughing etiquette and experienced TB. This study shows that the respondents' coughing etiquette is good enough so that they can apply good coughing etiquette to prevent TB transmission. The results of the study showed that when coughing, respondents had disposable tissues, handkerchiefs, or the folds of their sleeves available.

According to the researcher's analysis, with a good knowledge of proper coughing etiquette, respondents can prevent being infected with TB by TB sufferers in their household contacts. Proper coughing etiquette requires supporting equipment such as masks, tissues, trash cans, and soap and clean water or hand sanitizer for washing hands. TB sufferers can spread germs into the air in the form of phlegm droplets. A single cough can produce around 3,000 phlegm droplets. Implementing proper coughing etiquette can prevent the transmission of TB within the family. This is related to the mechanism of TB transmission through respiration. A person is susceptible to infection through phlegm droplets expelled when a nearby TB sufferer coughs, talks, or sneezes.

## Conclusion

Factors influencing TB incidence in the Kenarilang Community Health Center work area include knowledge level, attitudes, information availability, and residential density. Therefore, it is important to increase public understanding and awareness, especially among family members living with TB patients, to break the chain of TB transmission.

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