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Factors related to the incidence of pulmonary TB with authoritative diseases in the working area of the Tawanga Health Center, Konawe District, Konawe Regency

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Abstract

Pulmonary tuberculosis (TB) is still a public health problem, especially in areas with a high incidence rate and complicated by comorbidities. Comorbidities can aggravate a patient's condition, reduce treatment success, and increase the risk of complications. This study aims to analyze factors related to the incidence of pulmonary tuberculosis with comorbidities in the working area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025. This study uses an analytical design with a cross sectional approach. The population in this study is all patients with Pulmonary TB recorded in the working area of the Tawanga Health Center, with a sample of 40 respondents selected using the total sampling technique. Independent variables include diet, smoking behavior, alcohol consumption, physical conditions of home, occupation, and stress levels, while dependent variables are the incidence of pulmonary TB with comorbidities. Data analysis was carried out using chi-square test and binary logistics regression. The results showed that there was a significant relationship between diet, smoking behavior, alcohol consumption, physical conditions at home, work, and stress levels with the incidence of pulmonary TB with comorbidities ($p < 0.05$). Multivariate analysis showed that alcohol consumption was the most influential factor in the incidence of Pulmonary TB with comorbidities with an OR value of 58,953. The conclusion of this study is that alcohol consumption is the main risk factor for the incidence of pulmonary TB with comorbidities. Therefore, integrated promotive and preventive efforts are needed to control these risk factors in TB control programs.

Keywords: Pulmonary Tuberculosis; Comorbidities; Alcohol Consumption; Risk Factors

1. Introduction

Tuberculosis (TB) is an infectious disease that causes the main cause of death from a chronic infectious agent that Contagious by bacteria *Mycobacterium tuberculosis* which can attack the lungs, which is spread when people with TB expel bacteria into the air for example by coughing. About a quarter of the world's population is infected with curable and preventable TB (WHO, 2024).

Tuberculosis (TB) is the leading cause of death and pain among infectious diseases (Selvaraju et al., 2023). *World Health Organization* (WHO) in 2023 reported around 10.8 million people worldwide infected TB, including 6 million men, 3.6 million women, and 1.3 million children. TB exists in all countries and age groups (WHO, 2025). The picture of TB cases mostly occurs not only in low-income countries but also in developing or middle-income countries such as countries in Asia (Mandal et al., 2023).

TB data in Indonesia according to Global TB *Reporting* 2024, ranks second in the world with 1,090,000 TB cases after India which accounts for around 25% or 2.77 million cases (WHO, 2024). In 2024, around 885 thousand cases of TB were found, with a distribution indicating that 496 thousand Case occurred in men, 359 thousand in women, and 135

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thousand cases in children aged 0-14 years. These statistics confirm the urgency of increasing prevention and treatment efforts throughout Indonesia (Ministry of Health of the Republic of Indonesia, 2025).

Case data from the Southeast Sulawesi Provincial Health Office (Dinkes Sulawesi) shows that the number of pulmonary TB cases every year fluctuates. In 2021, there were 3,964 cases of pulmonary TB, in 2022 4,551 cases. In 2024, the number of *cases of Tuberculosis* or TB will reach 2,024 cases spread throughout the region with 2,024 positive cases.

Data from the Konawe Health Office is known that in 2023 the number of pulmonary TB cases was recorded at 449 cases and increased in 2024 to 574 cases (Konawe Health Office, 2024). Health Center Sword is one of the health centers in the working area of the Konawe Health Office. The Tawanga Health Center is a health center with a red zone because it has the highest incidence of TB in the Konawe area. Data in 2022 recorded 32 suspected TB patients and as many as 16 people have been diagnosed positive, in addition to only 16 people who have started treatment. In 2023, there are 31 suspected cases of pulmonary TB and as many as 16 people have been diagnosed positive and only 15 people have started treatment. In 2024, as many as 26 people suspected of pulmonary TB and only 11 people have been diagnosed positive, while 25 people have started treatment, while in the January-June 2025 period, 13 new cases of pulmonary TB were found (Tawanga Health Center, 2024).

Some of the factors that affect the incidence of pulmonary tuberculosis in Indonesia include sociodemographic factors (gender, age, education status, marital status, family income, type of occupation, BMI), Factors environment (sunlight entering the house, artificial ventilation, contact history of people with pulmonary TB, and number of families), *host-related factor* (smoking habits) and comorbid factors (HIV, hypertension, diabetes mellitus and Asthma) (Pralambang & Setiawan, 2021).

Comorbid conditions can worsen the health condition of a person who already has TB. The risk of death from TB becomes higher due to greater immune system weakness and Treatment TB can also become more complex and require special attention (Maharani, 2024). Other studies report *Outcome* TB treatment was worse in HIV patients (lower success rate, higher mortality), which supports the hypothesis that HIV affects adherence/outpatient outcomes (Mekonen et al., 2024). Data from the CDC 2023 also shows that 23.4% of TB patients in the U.S. have diabetes, making it the most common medical risk factor (CDC, 2025).

Other studies have shown DM increases susceptibility to both latent and active TB and worsens output, prompting recommendations for two-way screening in the WHO 2025 operational guidelines for TB–DM (Essomba et al, 2021). The prevalence of *noncommunicable comorbidities* in TB patients is quite significant, including hypertension of about 16% and DM of about 13%. Hypertension is associated with higher all-cause mortality and infection in the first 9 months of TB therapy; interestingly, the use of dihydropyridine–calcium channel blockers may reduce mortality, although it does not improve microbiological outcomes (Adegbite at al, 2022).

Empirical studies mention that malnutrition problems are also comorbidities that affect the course of TB disease. In research Girinaha, Yekti, and Kusumo (2022) It is known that most TB respondents experience nutritional intake deficits and weight loss. This lack of nutrients will make the TB treatment process in patients not optimal. The results of this study show the same results as the study Musuenge, Poda, and Chen (2020) in Burkina Faso, which has succeeded in finding out the prevalence of malnutrition reaching 35% in adult TB patients. Various factors that also affect HIV infection, diabetes, food consumption <3 times a day, and middle age (45–54 years).

Another empirical study shows that the incidence rate of TB among workers in the Makkah region is 9 per 100,000 workers, compared to 31 per 100,000 population in the general population in 2016. The highest incidence rate of TB was found in the supporting basic engineering group, which was 13 per 100,000 workers in 2016. The high incidence of TB in these occupational groups is likely due to close contact with the general public in closed spaces for long periods of time, as well as low socioeconomic status.

People with pulmonary TB are also often found to experience stress and mental disorders and are associated with poorer treatment outcomes (Feriska et al., 2024; Nurjihan et al., 2025). A meta-analysis study report that mental disorders in TB patients are associated with an increased risk of adverse treatment outcomes (OR ≈ 2.13) and trigger increased follow-up loss as well as an increased risk of death (Lee et al., 2020). While another meta-analysis study found the prevalence of stress as a comorbid in TB patients to be around 52.7%, it was emphasized that stress/anxiety often coincides with depression, stigma, and socio-economic factors that worsen patients' compliance and quality of life (Sutar et al., 2024).

Based on the initial studies carried out, the active TB case discovery program through contact investigation has long been carried out by all health centers in Konawe Regency. Health workers, cadres, and NGOs pro-actively went to the community in carrying out the contact investigation. The implementation obtained information that there are TB patients with comorbidities such as diabetes mellitus and malnutrition. TB patients with comorbidities are of course also influenced by various factors, but what happens in the field is that there is often a refusal from the family to carry out further pulmonary TB examinations such as conducting assessments to find out the factors that may be able to trigger this. Konawe Regency has not succeeded in achieving the target of discovering TB cases because patients and their families are closed from follow-up screening, so further persuasive efforts are needed for the smooth screening of new TB cases. It may be caused by the feeling of shame and ignorance of some people about the benefits of carrying out pulmonary TB examinations.

Although there are case data and an overview of risk factors such as comorbid diabetes mellitus, malnutrition, as well as sociodemographic and environmental factors, there is still a lack of research that specifically examines the direct relationship between these factors in the context of areas with high TB incidence rates. From the results of the researchers' observations and reports from the Tawanga Health Center, most patients with pulmonary tuberculosis with comorbidities in the region have irregular and undernutritious diets, such as rarely consuming fresh vegetables and fruits, and more often consuming instant food. This condition worsens the nutritional status and immune system of the patient, which ultimately increases susceptibility to TB infection. In addition, smoking behavior is still a common habit among men of productive age, both at home and at work, thus increasing the risk of TB transmission in densely populated environments. Alcohol consumption, although not as high as smoking behavior, is still found in some community groups, especially at social events or community gatherings, which can have an impact on decreased immunity and impaired adherence to TB treatment.

Environmental conditions show that many residents' houses in the work area of the Tawanga Health Center still have physical conditions that do not meet health requirements, such as narrow ventilation, lack of natural lighting, and high occupancy density, which facilitates the transmission of *Mycobacterium tuberculosis* bacteria in the air. Most heads of families work as farmers, construction workers, or fishermen with low incomes and long working hours, making it difficult to access health services on time. Economic pressure and heavy workload also trigger high levels of stress for some sufferers and their families, which affects the body's immune system and compliance in undergoing TB treatment therapy. This combination of individual, behavioral, and environmental factors illustrates real-world conditions in the field that are an important basis for research on the factors influencing the incidence of pulmonary TB with comorbidities in the region. This shows the need for research that focuses on the factors that inhibit and support the incidence of pulmonary TB with comorbidities as well as persuasive strategies to improve screening compliance in the work area of the Tawanga Health Center.

Based on the description above, the researcher is interested in conducting a study entitled "Factors Related to the Incidence of Pulmonary TB and Infectious Diseases in the Working Area of the Tawanga Health Center, Konawe District, Konawe Regency".

2. Material and methods

This type of research is quantitative research with observational analytics. The study aims to analyze the relationship between independent variables, namely diet, smoking behavior, alcohol consumption, physical environment, work and stress with dependent variables, namely the incidence of pulmonary tuberculosis and comorbidities. The population of this study is all people diagnosed with TB in the working area of the Tawanga Health Center from 2024 to June 2025 totaling 40 people. The sample size taken in this study is by taking all members of the population as a research sample (*total sampling*), which is as many as 40 people. In this study, the technique used in sampling is purposive sampling.

The Independent variables or variables that affect in this study are Diet, Smoking Behavior, Alcohol Consumption, Physical Condition of Home, Work and Stress. Dependent variables are variables that are influenced by independent variables. The dependent variable in this study is Pulmonary TB with Comorbidity Disease. Primary data were obtained by means of interviews, observations and questionnaires. Secondary data was obtained from available patient medical record data, patient register data, books, literature, articles, journals, and internet sites related to the research conducted.

The instrument used in this study was in the form of a questionnaire. Univariate analysis presents the frequency distribution of the respondent characteristics and each categorical variable. Bivariate analysis uses the Chi Square test to look at the level relationships of a variable. Multivariate analysis uses Binary Logistic Regression analysis .

3. Results

3.1. Characteristics of Respondents

Table 1 Distribution of frequency characteristics of respondents based on age in the Working Area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025

No.	Age	Frequency (f)	Percentage (%)	Mean ± SD
1	26-30	4	10	44.80 ± 9.045
2	31-35	4	10	
3	36-40	4	10	
4	41-45	8	20	
5	46-50	12	30	
6	51-55	4	10	
7	56-60	4	10	
Total		40	100	

The table above shows that the respondents have quite a diverse age range, ranging from 26 to 60 years old. The frequency distribution shows that the age group of 46–50 years is the largest group, which is as many as 12 people (30%). In contrast, other age groups such as 26–30, 31–35, 36–40, 51–55, and 56–60 years each had the same number, namely 4 people (10%). Statistically, the average age of respondents was 44.80 years old with a standard deviation of 9,045. This shows that the majority of respondents are in the late productive age towards pre-elderly, with a fairly evenly distributed data around the average value.

Table 2 Frequency distribution of respondent characteristics based on education in the Tawanga Health Center Working Area, Konawe District, Konawe Regency in 2025

No.	Education	Frequency (f)	Percentage (%)
1	Elementary School	4	10
2	Junior High School	4	10
3	High School	28	70
4	University	4	10
Total		40	100

The table above shows the distribution of education levels above, it can be seen that the majority of respondents are high school graduates with a total of 28 people or 70% of the total sample. Meanwhile, respondents with elementary, junior high, and tertiary education backgrounds had the same large distribution, namely 4 people each with a percentage of 10%. Overall, these data show that most of the research subjects in this group had a high level of education.

Table 3 Frequency distribution of respondent characteristics based on work in the Work Area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025

No.	Jobs	Frequency (f)	Percentage (%)
1	Labor	4	10.0
2	Lecturer	1	2.5
3	Teacher	3	7.5
4	Housewife	5	12.5
5	Health Workers	1	2.5
6	Merchant	2	5.0
7	Private Employees	5	12.5
8	Mine workers	3	7.5
9	Retirees	3	7.5
10	Farmer	3	7.5
11	Civil Servant	1	2.5
12	Driver	1	2.5
13	Not working	1	2.5
14	Self-employed	7	17.5
Total		40	100.0

Based on the table above, it is known that out of a total of 40 respondents, the most common type of work is self-employed, which is 7 people (17.5%). Furthermore, work as a housewife and private employees amounted to 5 people (12.5%) each. Respondents who worked as laborers were recorded as many as 4 people (10.0%). Meanwhile, respondents with jobs as teachers, mine workers, retirees, and farmers amounted to 3 people (7.5%) each. Work as a trader was found in 2 respondents (5.0%). As for jobs as lecturers, health workers, civil servants, drivers, and non-workers, only 1 respondent (2.5%) each.

3.2. Univariate Analysis

Table 4 Distribution of Respondent Frequency Based on Pulmonary TB Variables with Participants in the Working Area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025

No.	Pulmonary TB with Comorbidities	Frequency (f)	Percentage (%)
1	Pulmonary TB	17	42.5
2	Pulmonary tuberculosis with comorbidities	23	57.5
Total		40	100.0

Based on the table above, it is known that out of a total of 40 respondents, as many as 17 respondents (42.5%) experienced pulmonary TB with comorbidities, while 23 respondents (57.5%) experienced pulmonary TB without accompaniment. These results show that most of the respondents are patients with pulmonary TB without comorbidities. However, the proportion of respondents with pulmonary TB accompanied by comorbidities is still quite large, so this condition needs attention in efforts to manage and control pulmonary TB in the region.

Table 5 Frequency Distribution of Research Variables Based on Diet in the Working Area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025

No.	Diet	Frequency (f)	Percentage (%)
1	Adekuat	16	40.0
2	Inadequate	24	60.0
Total		40	100.0

Based on the table above, it is known that out of a total of 97 respondents, as many as 24 respondents (60.0%) have an inadequate diet, while 16 respondents (40.0%) have an adequate diet. These results show that most of the respondents in the study area have an inadequate diet. This condition can potentially affect the health status of respondents, considering that an inadequate diet can have an impact on decreasing immunity and increasing susceptibility to various diseases, including pulmonary TB.

Table 6 Frequency Distribution of Research Variables Based on Smoking Behavior in the Working Area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025

No.	Smoking Behavior	Frequency (f)	Percentage (%)
1	No Smoking	14	35.0
2	Light Smokers	8	20.0
3	Moderate Smoker	14	35.0
4	Heavy Smokers	4	10.0
Total		40	100.0

Based on the above, it is known that out of a total of 40 respondents, as many as 14 respondents (35.0%) are included in the non-smoking category, and 14 respondents (35.0%) are included in the moderate smoking category. Furthermore, respondents with the light smoking category amounted to 8 people (20.0%), while the heavy smoking category was the smallest proportion, which was 4 respondents (10.0%). These results show that most respondents have smoking habits to varying degrees, with an equal proportion between non-smoking respondents and moderate smokers. This condition reflects the exposure to smoking behavior that is still quite high in the study area.

Table 7 Frequency Distribution of Research Variables Based on Alcohol Consumption in the Working Area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025

No.	Alcohol Consumption	Frequency (f)	Percentage (%)
1	No	18	45.0
2	Yes	22	55.0
Total		40	100.0

Based on the table above, it is known that out of a total of 40 respondents, as many as 22 respondents (55.0%) stated that they consumed alcohol, while 18 respondents (45.0%) stated that they did not consume alcohol. These results show that more than half of the respondents have a habit of consuming alcohol.

Table 8 Frequency Distribution of Research Variables Based on the Physical Condition of Houses in the Working Area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025

No.	Physical Condition of the House	Frequency (f)	Percentage (%)
1	Low risk	18	45.0
2	High risk	22	55.0
Total		40	100.0

Based on the table above, it is known that most of them have houses with a high risk category, which is as many as 22 houses or equivalent to 55.0%. Meanwhile, respondents who have houses with low risk categories were recorded as many as 18 houses or 45.0%. This data shows that more than half of respondents' homes in the region are still in high-risk physical conditions.

Table 9 Frequency Distribution of Research Variables Based on Work in the Work Area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025

No.	Jobs	Frequency (f)	Percentage (%)
1	Low risk	29	72.5
2	High risk	11	27.5
Total		40	100.0

Based on the table above, it can be seen that the majority have a low-risk homework category, which is as many as 29 people (72.5%). Meanwhile, respondents with the high-risk homework category amounted to 11 people (27.5%). This shows that most of the respondents at the study site had a burden or type of homework that fell into the low-risk category.

Table 10 Frequency Distribution of Research Variables Based on Stress in the Working Area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025

No.	Jobs	Frequency (f)	Percentage (%)
1	Normal	22	55.0
2	Lightweight	8	20.0
3	Medium	10	25.0
Total		40	100.0

Based on the table above, it can be seen that most of them are in the normal category, which is as many as 22 people (55%). The moderate stress category was 10 people (25.0%), and the light stress category was the group with the least number of 8 people (20%). This indicates that more than half of the respondents did not experience any significant stress disorder within the scope of the study

3.3. Bivariate Analysis

Based on the table below, it shows that of the 16 respondents with an adequate diet, most of them suffered from Pulmonary TB without comorbidities, namely 12 people (30%) and a small number of people suffered from Pulmonary TB with comorbidities as many as 4 people (10%). Meanwhile, of the 24 respondents with an inadequate diet, most of them suffered from Pulmonary TB with comorbidities, namely 19 people (47.5%) and a small number of people suffered from Pulmonary TB without comorbid diseases as many as 5 people (12.5%). The results of the statistical test obtained a p value of Value = 0.001. Because the p value < 0.05 (0.001 < 0.05), it can be concluded that statistically there is a statistically significant relationship between diet and the incidence of pulmonary TB and comorbidities in the Tawanga Health Center, Konawe District, Konawe Regency in 2025.

Table 11 Distribution of the Relationship between Diet and the Incidence of Pulmonary TB with Communicable Diseases in the Working Area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025

No.	Variable	Pulmonary TB with Comorbidity Disease				Quantity		*P Value*
		Pulmonary TB		Pulmonary TB with Comorbidities				
	Diet	**n**	**%**	**n**	**%**	**n**	**%**	
1	Adekuat	12	30	4	10	16	40	0.001
2	Not Adequate	5	12.5	19	47.5	24	60	
	Quantity	17	42.5	23	57.5	40	100	

Table 12 Distribution of the Relationship between Smoking Behavior and the Incidence of Pulmonary TB with Communicative Diseases in the Working Area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025

No	Variable	Pulmonary TB with Comorbidity Disease				Quantity		*P Value*
		Pulmonary TB		Pulmonary TB with Comorbidities				
	Smoking Behavior	**n**	**%**	**n**	**%**	**n**	**%**	
1	No Smoking	10	25	4	10	14	35	0.007
2	Smoking	7	17.5	19	47.5	26	65	
	Quantity	17	42.5	23	57.5	40	100	

Based on the table above, it is known that in the group of respondents who smoke, the majority of people have Pulmonary TB with comorbidities, namely 19 people (47.5%), while those who only experience Pulmonary TB without comorbidities are only 7 people (17.5%). In the non-smoking group of respondents, most only experienced pulmonary TB without comorbidities, namely as many as 10 people (25%), and only 4 people (10%) had comorbidities. The results of the statistical test obtained a p value of 0.007. Because the p value < 0.05, it can be concluded that there is a significant relationship between smoking behavior and the incidence of pulmonary tuberculosis with comorbidities in the work area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025.

Table 13 Distribution of the Relationship between Alcohol Consumption and the Incidence of Pulmonary TB with Communicable Diseases in the Working Area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025

No	Variable	Pulmonary TB with Comorbidity Disease				Quantity		*P Value*
		Pulmonary TB		Pulmonary TB with Comorbidities				
	Alcohol Consumption	**n**	**%**	**n**	**%**	**n**	**%**	
1	No	15	37.5	3	7.5	18	45	0.000
2	Yes	2	5	20	50	22	55	
	Quantity	17	42.5	23	57.5	40	100	

Based on the table above, it is known that in the group of respondents who consume alcohol, the majority experience Pulmonary TB with comorbidities, namely as many as 20 people (50%), while those who only experience Pulmonary TB without comorbidities only 2 people (5%). Meanwhile, respondents who did not consume alcohol, most only experienced pulmonary TB without comorbidities, namely as many as 15 people (37.5%), and only 3 people (7.5%) had comorbidities. The results of the statistical test obtained a p value of Value = 0.000. Because the p value < 0.05, it can be concluded that there is a significant relationship between alcohol consumption and the incidence of pulmonary tuberculosis and comorbidities in the working area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025.

Table 14 Distribution of the Relationship between Physical Condition of the House and the Incidence of Pulmonary TB with Inflammatory Diseases in the Working Area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025

No.	Variable	Pulmonary TB with Comorbidity Disease				Quantity		*P Value*
		Pulmonary TB		Pulmonary TB with Comorbidities				
	Physical Condition of the House	n	%	n	%	n	%	
1	Low Risk	14	35	4	10	18	45	0.000
2	High Risk	3	7.5	19	47.5	22	55	
	Quantity	17	42.5	23	57.5	40	100	

Based on the table above, it is known that in the group of respondents with high-risk home physical conditions, the majority experienced Pulmonary TB with comorbidities, namely 19 people (47.5%), while only 3 people (7.5%) experienced Pulmonary TB without comorbidities. Meanwhile, in the group of respondents with low-risk home physical conditions, most only experienced pulmonary TB without comorbidities, namely 14 people (35%), and only 4 people (10%) had comorbidities. The results of the statistical test obtained a p value of 0.000. Because the p value < 0.05, it can be concluded that there is a significant relationship between the physical condition of the house and the incidence of pulmonary tuberculosis and comorbidities in the working area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025.

Table 15 Distribution of Occupational Relations with the Incidence of Pulmonary TB with Comorbidity in the Working Area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025

No.	Variable	Pulmonary TB with Comorbidity Disease				Quantity		*P Value*
		Pulmonary TB		Pulmonary TB with Comorbidities				
	Jobs	n	%	n	%	n	%	
1	Low Risk	11	27.5	18	45	29	72.5	0,477
2	High Risk	6	15	5	12.5	11	27.5	
	Quantity	17	42.5	23	57.5	40	100	

Based on table 5.18, it is known that in the low-risk occupational group, there were 18 people (45%) who had pulmonary TB with comorbidities and 11 people (27.5%) who only had pulmonary TB. Meanwhile, in the high-risk occupational group, 5 people (12.5%) were recorded to have Pulmonary TB with comorbidities and 6 people (15%) had Pulmonary TB without comorbidities. The results of the statistical test obtained a p value of 0.477. Because the P value > 0.05, it can be concluded that there is no significant relationship between work and the incidence of pulmonary TB and comorbidities in the working area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025.

Table 16 Distribution of the Relationship between Stress and the Incidence of Pulmonary TB with Communicable Diseases in the Working Area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025

No.	Variable	Pulmonary TB with Comorbidity Disease				Quantity		*P Value*
		Pulmonary TB		Pulmonary TB with Comorbidities				
	Stress	n	%	n	%	n	%	
1	Normal	11	27.5	11	27.5	22	55	0,289
2	Stress	6	15	12	30	18	45	
	Quantity	17	42.5	23	57.5	40	100	

Based on table, it is known that in the group of respondents with normal stress levels, there were 11 people (27.5%) who experienced pulmonary TB with comorbidities and 11 people (27.5%) only experienced pulmonary TB. Meanwhile, in the group of respondents who experienced stress, it was recorded that as many as 12 people (30%) had pulmonary TB with comorbidities and 6 people (15%) only experienced pulmonary TB. The results of the statistical test obtained a p Value of 0.289. Because the p value > 0.05, it can be concluded that there is no significant relationship between stress and the incidence of pulmonary TB and comorbidities in the working area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025.

3.4. Multivariate Analysis

Table 17 Distribution of Binary Logistics Regression Results of Factors Related to the Incidence of TB with Comorbidity Disease in the Working Area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025

Variables in the Equation									
		B	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**	**95% C.I.for EXP(B)**	
								Lower	Upper
Step 1a	Diet	2.462	1.479	2.773	1	0.096	11.727	0.647	212.686
	Smoking Behavior	2.975	1.664	3.198	1	0.074	19.592	0.752	510.641
	Alcohol Consumption	4.077	1.525	7.151	1	0.007	58.953	2.970	1170.084
	Physical Condition of the House	1.283	1.417	0.819	1	0.365	3.606	0.224	58.022
	Constant	-16.654	6.204	7.207	1	0.007	0.000		

Based on Table, the results of the binary logistic regression test show the contribution of each independent variable to the incidence of pulmonary TB with comorbidities where the alcohol consumption variable has a value of Sig. 0.007 ($p < 0.05$), which means that alcohol consumption is significantly related to the incidence of pulmonary TB with comorbidities simultaneously. An Exp(B) or Odds Ratio (OR) value of 58.953 indicates that respondents who consume alcohol have a 58.9 times greater risk of developing pulmonary TB with comorbidities than those who do not consume alcohol.

The smoking behavior variable has a Sig. value of 0.074. Although bivariately related, in this multivariate test the p> value is 0.05, so statistically it is not the main risk factor when compared to other variables in this model. However, the OR value of 19,592 shows a risk tendency that is still quite high (19.5 times). The diet variable had a Sig. value of 0.096 ($p > 0.05$), which suggests that after controlling for other variables, diet was not significantly associated with the incidence of pulmonary TB with comorbidities in this final model. The variable of the physical condition of the house had a value of Sig. 0.365 ($p > 0.05$). This shows that in this simultaneous analysis, the physical condition of the home is not the main risk factor for the incidence of pulmonary TB with comorbidities in the region.

From the results of the final modeling, it can be concluded that the most significant variable and is the main risk factor for the incidence of pulmonary tuberculosis with comorbidities in the work area of the Tawanga Health Center is Alcohol Consumption. This is based on the smallest significance value ($p = 0.007$) and the largest Exp(B) value of 58.953. This indicates that among all the factors studied, alcohol consumption habits had the strongest impact on the appearance of comorbidities in Pulmonary TB patients.

4. Discussion

4.1. Relationship of diet to the incidence of pulmonary TB and comorbidities

The results of data analysis in this study showed a significant relationship between diet (adequate vs inadequate) and the incidence of pulmonary tuberculosis with comorbidities, with a p value = 0.001 ($p < 0.05$), which means that statistically diet is related to the incidence of pulmonary tuberculosis with comorbidities. Statistical values show that respondents with an inadequate diet suffer more from Pulmonary TB with comorbidities than those with an adequate diet. The results of this study indicate that dietary variations have the potential to be a risk factor in the occurrence of comorbidities in patients with Pulmonary TB.

Various previous studies support the relationship between diet/nutrition and the incidence of pulmonary TB and comorbid conditions. Research in Korea shows that nutritional status and nutritional risk score are significant factors in pulmonary TB mortality, where malnutrition can worsen the prognosis of TB patients and increase the risk of complications and comorbidities (Kwon et al., 2025). In addition, studies in Mongolia showed a high prevalence of malnutrition in people with TB, indicating that poor diets contribute to low nutritional status and worsen the course of the disease (Hao et al., 2024). In line with previous research, poor nutrition affects the immune response, increasing the risk of complications and comorbidities in pulmonary TB patients (Kwon et al., 2025).

Multivariate analysis showed that diet was not significantly associated with the incidence of pulmonary TB with comorbidities. This indicates that other factors besides diet play a dominant role in influencing the condition. In multivariate models, variables that are initially bivariately significant may become insignificant due to confounder effects or stronger intermediate factors. This is natural in epidemiological research where a single relationship can be distorted by other interrelated variables.

The results of the insignificant diet analysis showed that when other variables were controlled, the role of diet alone was not strong enough to explain the incidence of pulmonary TB with comorbidities in this population context. This can be because complex comorbidities, such as diabetes, HIV, or other chronic diseases, may have a stronger influence on the incidence of comorbid pulmonary TB than dietary factors themselves. Other studies have also found that overall comorbidities and nutritional risk scores influence TB mortality or outcomes more than single nutrition indicators.

These findings are in line with research showing that nutritional status and comorbidities together have a significant impact on TB outcomes, but the contribution of individual factors such as diet per se can vary depending on the population and the method of analysis (Kwon et al., 2025). On the other hand, some studies have shown that diet directly affects the nutritional status and prognosis of TB, so that in some populations diet remains a significant factor, suggesting variations in the study context (Hao et al., 2024). Thus, while bivariate relationships corroborate the role of diet, multivariate effects reflect the complexity of determinants of health involving many concurrent factors.

The researchers concluded that bivariate analysis showed a significant relationship between diet and the incidence of pulmonary TB and comorbidities. However, once other variables were controlled in multivariate analysis, the relationship was no longer significant. These findings suggest that diet may be a relevant risk factor but not a major independent factor in the context of pulmonary TB comorbidities.

4.2. Relationship of smoking behavior to the incidence of pulmonary TB and comorbidities

The results of the analysis showed that there was a significant relationship between smoking behavior and the incidence of pulmonary tuberculosis and comorbidities in the working area of the Tawanga Health Center. This means that the proportion of pulmonary TB incidence with comorbidities is significantly higher in smokers than in non-smokers. The results of this study indicate that smoking contributes to the burden of pulmonary TB disease and its accompanying conditions, which is in line with the literature that states that smoking is a factor that can increase the risk of infectious lung diseases such as TB.

The phenomenon of the relationship between smoking and pulmonary TB is evident in biological and epidemiological contexts, as cigarette smoke can damage lung defenses and decrease the effectiveness of the immune response. Cigarette smoke decreases the movement of cilia and the ability of alveolar macrophages to eradicate TB-causing bacteria, which opens up the opportunity for infection and disease progression more easily. Local research from the Telaga Dewa and Sawah Lebar Health Centers also showed a significant relationship between smoking habits and the incidence of Pulmonary TB, where smoking behavior has implications for an increase in cases of Pulmonary TB (Fernandes et al., 2025).

The chronic infectious disease literature explains that the chemical components in cigarette smoke suppress lung immune mechanisms, such as inhibiting the activity of macrophages and damaging the cilia epithelium that normally filter out pathogens. This impact significantly increases the chances of Mycobacterium tuberculosis germs settling and developing. Recent meta-analyses support that both active and passive smoking are risk factors for Pulmonary TB infection and disease, as well as the possibility of more severe disease progression (Feldman et al., 2024). Meta-analysis studies show that smokers have a higher risk of becoming infected and developing TB disease than non-smokers, as well as worsening the progression of the disease once they are infected (Feldman et al., 2024).

The results of the multivariate analysis showed that smoking behavior was statistically not considered a major risk factor when compared to other variables in the regression model. However, the relative risk (Odds Ratio) of 19,592 indicates a strong tendency that smoking behavior remains potentially a large risk factor in the context of pulmonary TB with

comorbidities. These findings indicate that other variables in the model may be more dominant or moderate the effects of smoking on the incidence of pulmonary TB, thus affecting their statistical significance in multivariate analyses.

Although not significant in multivariaty, the OR of 19,592 still showed a higher risk tendency for smokers to develop pulmonary TB with comorbidities when compared to non-smokers, meaning smokers were 19.5 times more likely to develop the condition. This can be explained by the dangers of smoking causing dysfunction of the local immune system of the lungs as well as impaired mucosal defenses, which biologically magnifies the likelihood of further comorbidities than just pulmonary TB alone. The multivariate approach considers many factors at the same time, so that the effects of smoking may appear to dim if other variables have a stronger contribution to the incidence of pulmonary TB with competants (Feldman et al., 2024).

Several other studies reported results that were in line with the study's findings. For example, research in Bengkulu found a significant relationship between smoking and the incidence of pulmonary TB and the effect of cigarette smoke on the airway defense system (Fernandes et al., 2025). However, there is also a study at the Medan Teladan Health Center that did not find a significant association between smoking and the incidence of pulmonary tuberculosis, suggesting that the results of the relationship can differ depending on the population, data quality, and study design (Elfa et al., 2025). These differences emphasize the complexity of the role of behavior in TB epidemiology, as well as the need to consider other environmental and individual factors.

Based on the results of this study, it can be concluded that bivariate smoking behavior is significantly related to the incidence of pulmonary TB with comorbidities. Biologically, smoking damages the lung defenses thereby increasing the risk of infection and disease progression. These findings are consistent with many other studies but also show variation in outcomes across multiple populations, so smoking remains important to consider in efforts to prevent Pulmonary TB and its comorbidities.

4.3. Relationship of alcohol consumption to the incidence of pulmonary TB and comorbidities

The results of bivariate analysis showed a significant relationship between alcohol consumption and the incidence of pulmonary tuberculosis and comorbidities. The majority of respondents who consumed alcohol experienced pulmonary TB with comorbidities, while in respondents who did not consume alcohol, most only experienced pulmonary tuberculosis without comorbidities (37.5%). The results of this study indicate that alcohol consumption can be a risk factor for the occurrence of pulmonary TB which is aggravated by the presence of comorbidities. The relationship between alcohol consumption and pulmonary tuberculosis and comorbidities is supported by the phenomenon of weakening of the immune system due to alcohol consumption.

Health behavioral theory explains that alcohol consumption is a behavior that can be influenced by a variety of factors, including social norms, beliefs, and information. If individuals have erroneous beliefs about alcohol or are exposed to social norms that favor alcohol consumption, they tend to be more likely to consume alcohol and increase the risk of Pulmonary TB with comorbidities (Juliati et al., 2020). Basically, alcohol can interfere with the function of immune cells, thereby increasing susceptibility to TB infection and worsening comorbidities. (Makalew, 2010). Other studies have also found similar results, where significant alcohol consumption is associated with the incidence of pulmonary TB (Aliviana et al., 2023). Similarly, other studies have found that alcohol consumption is an important risk factor in TB patients, especially in those with comorbidities such as HIV or diabetes (Aliviana et al., 2023).

The results of the binary logistics regression test showed that alcohol consumption was significantly associated with the incidence of pulmonary TB with comorbidities simultaneously. This supports that alcohol consumption has contributed to the incidence of pulmonary TB with comorbidities. Alcohol can damage the lungs and weaken the immune system, increasing the risk of TB infection and worsening comorbidities (Febriyanti et al., 2024). An Odds Ratio (OR) value of 58.953 shows that respondents who consume alcohol have a 58.9 times greater risk of developing pulmonary TB with comorbidities than those who do not consume alcohol. This means that alcohol consumption is a very strong risk factor for the occurrence of Pulmonary TB with comorbidities. Alcohol consumption can increase the risk of pulmonary TB with comorbidities because it can reduce immunity.

Previous research has found that there is a risk of alcoholism in people with pulmonary TB (Makalew, 2010). However, another study by (2016) concluded that there was no significant association between alcohol consumption and the incidence of pulmonary TB (Oktavia et al., 2019). These differences may be due to differences in research methodology, sample characteristics, or other factors that are not controlled.

The researcher concluded that alcohol consumption has a significant relationship with the incidence of pulmonary TB and comorbidities in the working area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025. Respondents who consumed alcohol had a higher risk of developing pulmonary TB with comorbidities than those who did not consume alcohol. Therefore, it is important to provide education about the dangers of alcohol consumption and increase prevention efforts for Pulmonary TB, especially in high-risk groups.

4.4. The relationship between the physical condition of the home and the incidence of pulmonary TB with comorbidities

The results of bivariate analysis showed a significant relationship between the physical condition of the home and the incidence of pulmonary tuberculosis and comorbidities. The majority of respondents with high-risk home physical conditions experienced Pulmonary TB with comorbidities (47.5%), while in respondents with low-risk home physical conditions, most only experienced Pulmonary TB without comorbidities (35%). The results of this study indicate that poor physical condition of the home can be a risk factor for the occurrence of Pulmonary TB which is aggravated by the presence of comorbidities.

The relationship between the physical condition of the home and pulmonary TB with comorbidities is supported by the phenomenon of an unhealthy home environment facilitating TB transmission and worsening health conditions (Adibabulan et al., 2024). Humid home conditions, lack of ventilation, and lack of lighting can increase the risk of TB transmission (Mahawati et al., 2023). Previous research has also shown that poor home physical condition is an important risk factor in TB patients, especially in those with comorbidities (Langkai et al., 2020).

The results of the binary logistics regression test showed that the variable of home physical condition was not significantly related to the incidence of pulmonary TB with comorbidities simultaneously (Sig. 0.365). This shows that in multivariate analysis, the physical condition of the home is not the main risk factor for the incidence of pulmonary TB with comorbidities in the region. Other factors may be more dominant in influencing the incidence of Pulmonary TB with comorbidities in simultaneous analyses (Ayu et al., 2023). Although in bivariate analyses the physical condition of the home showed a significant relationship, in multivariate analyses this relationship was not seen. This can be caused by other factors that have a stronger influence on the incidence of pulmonary TB with comorbidities, such as behavioral, socioeconomic, or comorbidity factors (Pralambang & Setiawan, 2021). Multivariate analysis makes it possible to see the influence of each independent variable simultaneously, so as to identify the most dominant risk factors (Manullang et al., 2025).

Previous research has found that there is a link between the quality of the physical environment of the home and the incidence of pulmonary TB (Oktatri & Prakosa, 2022). However, other studies did not find a significant association between the physical condition of the home and the incidence of pulmonary TB after controlling for other factors (Mushidah et al., 2022). These differences may be due to differences in research methodology, sample characteristics, or other factors that are not controlled.

The physical condition of the house has a significant relationship with the incidence of pulmonary TB with comorbidities in the bivariate analysis, but not significantly in the multivariate analysis in the work area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025. However, the physical condition of the home remains a factor that needs to be considered in efforts to prevent Pulmonary TB. There is a need for comprehensive interventions involving improving home conditions, improving healthy living behaviors, and handling other risk factors to reduce the incidence of pulmonary TB with comorbidities.

4.5. Occupational relationship to pulmonary TB incidence and comorbidities

The results of the statistical test showed that there was no significant relationship between work and the incidence of pulmonary TB and comorbidities (p Value = 0.477). In the low-risk occupational group, 45% of respondents experienced pulmonary TB with comorbidities, while in the high-risk occupational group, only 12.5% experienced a similar condition. The results of this study indicate that work, in this study, is not the main risk factor for the occurrence of pulmonary tuberculosis with comorbidities.

Although statistically insignificant, the type of work can affect the risk of exposure to TB (Renni et al., 2022). Jobs with a high risk of exposure to dust, chemicals, or being in dense, poorly ventilated environments can increase the risk of TB infection (Renni et al., 2022). However, in these cases, other factors may play a greater role in triggering pulmonary TB with comorbidities than the work itself.

The theory of social determinants of health explains that health is influenced by a variety of social, economic, and environmental factors (Nasution, 2019). Employment is one of the social determinants, but its effect on health can be mediated by other factors such as income, access to health services, and lifestyle (Dewi & Susilawati, 2024). Other studies have shown mixed results regarding occupational linkages with pulmonary TB, with some studies finding a significant association, while others do not. (Widiati & Majdi, 2021).

Some studies have shown no significant association between the type of work and the incidence of pulmonary TB (Dewi & Susilawati, 2024). Factors such as home conditions, occupancy density, and clean and healthy living behaviors may have more influence (Siregar, 2023). However, other studies have found that certain occupations, such as medical workers or workers in dusty environments, have a higher risk of developing TB (Ismah et al., 2024).

The researcher concluded that there was no significant relationship between work and the incidence of pulmonary tuberculosis and comorbidities in the working area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025. Nonetheless, it is important to remain mindful of the potential risk of TB associated with specific jobs and focus on comprehensive prevention efforts, including improving working environment conditions, health education, and early detection of TB.

4.6. Relationship of stress to pulmonary TB incidence with comorbidities

The results of the analysis showed that there was no significant relationship between stress and the incidence of pulmonary TB and comorbidities. In the group of respondents with normal stress levels, 27.5% experienced pulmonary TB with comorbidities, while in the group of respondents who experienced stress, 30% experienced a similar condition. This indicates that stress, in this study, is not the main risk factor for the occurrence of pulmonary tuberculosis with comorbidities.

Although statistically insignificant, stress can affect the immune system, which plays an important role in the body's defense against TB infection (Bloom, 2025). Chronic stress can increase levels of the hormone cortisol, which can suppress the function of immune cells (Say, 2025). However, in these cases, other factors may play a greater role in triggering pulmonary TB with comorbidities than the stress itself.

Theory *stress and coping* explains that stress is the body's response to environmental demands, and individuals have different ways of coping with stress. Response Stress can affect the immune system and overall health. Other studies have shown mixed results regarding the relationship between stress and pulmonary TB, with some studies finding a significant association, while others have not. (Sakila et al., 2025).

Some studies have shown no significant correlation between stress levels and quality of life in TB patients (Sakila et al., 2025). Factors such as social support, economic conditions, and comorbidities may have more influence (Ramadhani, 2025). The researcher concluded that there was no significant relationship between stress and the incidence of pulmonary tuberculosis and comorbidities in the working area of the Tawanga Health Center, Konawe District, Konawe Regency in 2025. Nonetheless, it is important to remain mindful of the potential impact of stress on overall health and focus on comprehensive TB prevention efforts, including improving mental health, social support, and early detection of TB.

5. Conclusion

This study shows that the incidence of pulmonary TB with comorbidities is influenced by various behavioral, environmental, occupational, and psychosocial factors. There is a significant relationship between diet, smoking behavior, alcohol consumption, physical conditions at home, work, and stress levels with the incidence of pulmonary TB with comorbidities in the work area of the Tawanga Health Center. Although smoking behavior was significantly associated in bivariate analyses, this factor did not become the dominant risk in multivariate analyses after controlling for other variables. Alcohol consumption was proven to be the strongest and most influential risk factor for the incidence of Pulmonary TB with comorbidities, as shown by the highest odds ratio (OR) value compared to other variables. In addition, the physical condition of the home that does not meet health requirements, work with exposure to risky environments, and high levels of stress also contribute to the increased incidence of pulmonary TB with comorbidities, thus confirming that TB is a multifactorial health problem.

Based on the results of the study, the Tawanga Health Center is advised to conduct routine screening of alcohol consumption and risky behaviors in pulmonary TB patients, increase health education about the dangers of alcohol, smoking, and the importance of a healthy lifestyle, and integrate TB services with promotive, preventive, and

psychosocial support approaches to reduce patients' stress levels. The Health Office is expected to strengthen the TB risk factor control program through cross-sectoral policies, especially related to the improvement of the residential environment and the control of risky behaviors. For subsequent researchers, it is recommended to use longitudinal or cohort designs to strengthen cause-and-effect relationships, add clinical variables such as medication adherence, objective nutritional status, and severity of TB, and expand the location and number of samples so that the results are more representative and generalized.

Compliance with ethical standards

Disclosure of Conflict of Interest

There was no conflict of interest in this study. This research does not have any financial conflicts of interest or any external influence in the implementation and reporting of research results.

Statement of ethical approval

This research was conducted in accordance with ethical principles and received approval from the relevant Research Ethics Committee. The study was carried out in the working area of Tawanga Public Health Center (Puskesmas Tawanga). All participants provided informed consent after receiving a clear and voluntary explanation of the research objectives and procedures. The confidentiality and anonymity of all participants were strictly maintained throughout the research process.

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