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Analysis of the risk of diabetes mellitus among pulmonary tuberculosis patients in the working area of lepo-lepo public health center, Kendari City, 2025

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Abstract

Communicable diseases such as tuberculosis (TB/TBC) and non-communicable diseases such as diabetes mellitus (DM) represent a double burden in public health that requires an integrated approach. At Lepo-Lepo Public Health Center, TB cases fluctuate annually, while DM cases have increased significantly each year. This study aims to analyze the factors influencing the risk of diabetes mellitus among pulmonary tuberculosis patients in the working area of Lepo-Lepo Public Health Center, Kendari City, in 2025. This research employed a quantitative observational analytic method with a case-control design. The study population consisted of all patients recorded at BLUD UPTD Lepo-Lepo Public Health Center from January to September 2025. A total sample of 90 respondents was selected, comprising 30 cases and 60 controls, using total sampling for the case group and simple random sampling for the control group. Data collection was conducted using a structured questionnaire. The findings indicate that age significantly influences the incidence of DM among pulmonary TB patients ($p = 0.000 < 0.05$; OR = 19.421). Sex also shows a significant effect ($p = 0.040 < 0.05$; OR = 2.822), as do smoking behavior ($p = 0.000 < 0.05$; OR = 7.667), nutritional status ($p = 0.020 < 0.05$; OR = 3.208), history of diabetes ($p = 0.044 < 0.05$; OR = 2.852), and health literacy ($p = 0.008 < 0.05$; OR = 3.727). Among all variables, age is the most influential factor associated with DM incidence in pulmonary TB patients ($p = 0.000 < 0.05$; Wald = 14.611). In conclusion, age, sex, smoking behavior, nutritional status, history of diabetes, and health literacy all have significant effects on the incidence of diabetes mellitus among pulmonary tuberculosis patients. It is recommended that pulmonary TB and DM patients adhere to medication, maintain a healthy diet, routinely monitor blood glucose levels, avoid smoking, and consult healthcare professionals to obtain accurate health information related to pulmonary TB and diabetes mellitus.

Keywords: Pulmonary TB with DM comorbidity; Age; Sex; Smoking Behavior; Nutritional Status; History of Diabetes; Health Literacy

1. Introduction

Communicable diseases such as tuberculosis (TB/TBC) and non-communicable diseases such as diabetes mellitus (DM) constitute a double burden in public health, requiring an integrated approach. The interaction between these two chronic conditions presents challenges in clinical management and public health, and also creates social and economic impacts (Boadu et al., 2024). Therefore, the rising burden of TB comorbid with DM in Indonesia contributes to a dual challenge in addressing both infectious and non-communicable diseases (Rau & Huldjannah, 2021). In addition, individuals who suffer from both TB and DM have a 1.88-fold higher risk of mortality and a 1.64-fold higher risk of relapse, which directly affects healthcare costs and the overall quality of life (Huangfu et al., 2019).

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis*, which spreads through the air when an infected person coughs, sneezes, or spits, allowing the bacteria to be inhaled by those nearby (Ministry of Health of the Republic of Indonesia, 2025a). Diabetes mellitus (DM) is a chronic metabolic disorder characterized by elevated

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blood glucose levels, which over time can lead to serious damage to the heart, blood vessels, eyes, kidneys, and nerves (WHO, 2025).

The WHO reported that global TB cases increased from 10.4 million in 2021 to 10.7 million in 2022, and rose again in 2023 to 10.8 million cases. Five countries accounted for the highest global TB burden, namely India (26%), Indonesia (10%), China (6.8%), the Philippines (6.8%), and Pakistan (6.3%) (WHO, 2024). Indonesia ranks second, indicating the urgent need for concrete efforts in TB control and prevention to reduce morbidity. Meanwhile, the International Diabetes Federation (IDF) recorded that the global prevalence of DM among individuals aged 20–79 years increased from 536.6 million (10.5%) in 2021 to 589 million in 2024, with 3.4 million deaths. Indonesia is the fifth-highest country in the world in terms of adult DM prevalence (International Diabetes Federation, 2025). The majority of individuals with DM live in low- and middle-income countries, with more than half not receiving treatment. The number of untreated and newly diagnosed DM cases has continued to increase over the past several decades (WHO, 2025).

The Ministry of Health of the Republic of Indonesia reported that TB case detection reached 443,235 cases in 2021, rising to 724,309 cases in 2022, and increasing further to 821,200 cases in 2023 (Directorate General of P2P, 2024), with approximately 885,000 cases reported in 2024. Indonesia records around 1,090,000 TB cases and 125,000 deaths annually, equivalent to about 14 deaths per hour. To accelerate TB elimination efforts, comprehensive national strategies and policies have been implemented (Ministry of Health RI, 2025b). Meanwhile, DM cases continue to rise, with 19.47 million cases recorded in 2022, increasing to 19.5 million (10.7% of the adult population) in 2023 (Ekafarm, 2024), and rising again in 2024 to 20,426,400 cases (11.3% of the adult population) (International Diabetes Federation, 2025).

Diabetes mellitus complicates the diagnosis and management of TB due to alterations in TB clinical manifestations and delayed sputum culture conversion. DM may also negatively influence TB treatment outcomes by slowing microbiological response to medication, accelerating disease progression, and increasing the risk of death and TB relapse. Currently, the prevalence of pulmonary TB has increased in parallel with the rise in DM prevalence. The proportion of TB patients with DM is reported to be around 10–15%, and the prevalence of TB is 2–5 times higher among individuals with DM compared to those without DM (PERKENI, 2021).

Data from Lepo-Lepo Public Health Center show that pulmonary TB cases have increased annually. In 2021, there were 35 cases (SR = 100%), rising to 68 cases (SR = 66.20%) in 2022. In 2023, a sharp increase occurred, reaching 409 cases (SR = 78.30%), but the number declined to 100 cases (SR = 76.0%) in 2024. From January to September 2025, 103 cases were recorded. These findings indicate that the TB treatment success rate in Lepo-Lepo Public Health Center has not met the national target of 90% over the past three years, and the area ranks third in TB cases after Puuwatu and Poasia Public Health Centers.

In contrast, DM cases have shown a consistent upward trend each year. In 2021, 311 cases were recorded (Standard Service 90%), decreasing to 253 cases in 2022 (Standard Service 100%). The number increased again to 375 cases in 2023 (Standard Service 100%), rose to 472 cases in 2024 (Standard Service 100%), and reached 328 cases from January to June 2025. These data indicate that DM-standardized services at Lepo-Lepo Public Health Center have consistently improved, reaching the national target of 100%, yet the number of detected DM cases continues to rise (Lepo-Lepo Public Health Center, 2025).

An initial survey conducted in September 2025 at Lepo-Lepo Public Health Center involving TB patients aged ≥15 years showed that out of 10 TB patients, 3 also had DM. The current program to detect DM among TB patients requires all diagnosed TB patients to undergo blood glucose testing, particularly at the beginning of TB treatment, using fasting blood glucose and random blood glucose assessments. If initial screening results suggest abnormal glucose levels, further examinations such as an oral glucose tolerance test (OGTT) and HbA1c are performed to confirm a clinical diagnosis of DM and provide appropriate patient education.

Based on this background, the present study aims to analyze the risk factors associated with the occurrence of diabetes mellitus among pulmonary tuberculosis patients in the working area of Lepo-Lepo Public Health Center, Kendari City, in 2025.

2. Material and methods

This study employed a quantitative observational analytic research design using a case–control approach. The study population included all patients recorded in the registration book of BLUD UPTD Lepo-Lepo Public Health Center from January to September 2025 who were diagnosed with pulmonary tuberculosis, totaling 103 individuals. A sample of 90 respondents was selected, with the case group chosen through total sampling and the control group through simple random sampling. The research instrument used was a structured questionnaire, and primary data were collected by distributing the questionnaire to respondents.

The independent variables in this study were age, sex, smoking behavior, nutritional status, history of diabetes, and health literacy, while the dependent variable was the occurrence of diabetes mellitus among tuberculosis patients. Data were analyzed using univariate analysis, bivariate analysis with the chi-square test, and multivariate analysis using binary logistic regression.

3. Results and discussion

3.1. Univariate Analysis

3.1.1. Respondent Characteristics

Table 1 The characteristics of respondents in this study, categorized by age, sex, education, and occupation.

Characteristic	Category	Frequency	Percentage (%)
Umur	Older adults (≥ 45 years)	46	51.1
	Adults (< 45 years)	44	48.9
Sex	Male	54	60.0
	Famale	36	40.0
Education	Junior High School level	13	14.4
	Senior High School level	58	64.4
	Diploma/Bachelor's degree	19	21.2
Occupation	Housewife	20	22.2
	Private employee	12	13.3
	Civil servant	2	2.2
	Entrepreneur	22	24.4
	Student	13	14.4
	Retired	4	4.4
	Unemployed	17	18.9

The results show that among the 90 respondents (100%), the highest proportion was found in the older adult age group (≥ 45 years), totaling 46 respondents (51.1%), while the lowest proportion was in the adult age group (< 45 years), totaling 44 respondents (48.9%). For sex distribution, male respondents represented the highest proportion with 54 respondents (60%), whereas females accounted for 36 respondents (40%). In terms of education level, the highest percentage was among respondents with a senior high school education, totaling 58 respondents (64.4%), while the lowest was among those with a junior high school education, totaling 13 respondents (14.4%). Regarding occupation, the highest proportion was housewives, totaling 20 respondents (22.2%), whereas the lowest was civil servants, totaling 2 respondents (2.2%).

3.1.2. Research Variables

Case and Control Groups

Table 2 Distribution of Respondents Based on Case Group (Pulmonary TB with DM Comorbidity) and Control Group (Pulmonary TB) for the Incidence of Diabetes Mellitus Among Pulmonary Tuberculosis Patients in the Working Area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, 2025

No.	Case and Control Groups	Frequency	Percentage (%)
1	Cases (Pulmonary TB – DM)	30	33.3
2	Controls (Pulmonary TB)	60	66.7
	Total	90	100.0

Source: Processed Primary Data, 2025

Table 2 shows that based on the case group (Pulmonary TB–DM) and the control group (Pulmonary TB) in the working area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, in 2025, out of 90 respondents (100%), there were 30 respondents (33.3%) in the case group (Pulmonary TB–DM) and 60 respondents (66.7%) in the control group (Pulmonary TB).

Age

Table 3 Distribution of Respondents Based on Age and the Incidence of Diabetes Mellitus Among Pulmonary Tuberculosis Patients in the Working Area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, 2025

No.	Age Category	Frequency	Percentage (%)
1	Older adults (≥ 45 years)	46	51.1
2	Adults (< 45 years)	44	48.9
	Total	90	100.0

Source: Processed Primary Data, 2025

Table 3 shows that based on age categories related to the incidence of diabetes mellitus among pulmonary tuberculosis patients in the working area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, in 2025, out of 90 respondents (100%), there were 46 respondents (51.1%) in the older adult age group (≥ 45 years) and 44 respondents (48.9%) in the adult age group (< 45 years).

Sex

Table 4 Distribution of Respondents Based on Sex and the Incidence of Diabetes Mellitus Among Pulmonary Tuberculosis Patients in the Working Area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, 2025

No.	Sex	Frequency	Percentage (%)
1	Male	54	60.0
2	Famale	36	40.0
	Total	90	100.0

Source: Processed Primary Data, 2025

Table 4 shows that based on sex in relation to the incidence of diabetes mellitus among pulmonary tuberculosis patients in the working area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, in 2025, out of 90 respondents (100%), there were 54 male respondents (60.0%) and 36 female respondents (40.0%).

Smoking Behavior

Table 5 Distribution of Respondents Based on Smoking Behavior and the Incidence of Diabetes Mellitus Among Pulmonary Tuberculosis Patients in the Working Area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, 2025

No.	Smoking Behavior	Frequency	Percentage (%)
1	Non-smoker	41	45.6
2	Smoker	49	54.4
	Total	90	100.0

Source: Processed Primary Data, 2025

Table 5 shows that based on smoking behavior in relation to the incidence of diabetes mellitus among pulmonary tuberculosis patients in the working area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, in 2025, out of 90 respondents (100%), 41 respondents (45.6%) reported being non-smokers, while 49 respondents (54.4%) reported being smokers.

Nutritional Status

Table 6 Distribution of Respondents Based on Nutritional Status and the Incidence of Diabetes Mellitus Among Pulmonary Tuberculosis Patients in the Working Area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, 2025

No.	Nutritional Status	Frequency	Percentage (%)
1	Normal	40	44.4
2	Undernourished	50	55.6
	Total	90	100.0

Source: Processed Primary Data, 2025

Table 6 shows that based on nutritional status in relation to the incidence of diabetes mellitus among pulmonary tuberculosis patients in the working area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, in 2025, out of 90 respondents (100%), there were 50 respondents (55.6%) classified as undernourished and 40 respondents (44.4%) classified as having normal nutritional status.

History of Diabetes

Table 7 Distribution of Respondents Based on History of Diabetes and the Incidence of Diabetes Mellitus Among Pulmonary Tuberculosis Patients in the Working Area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, 2025

No.	History of Diabetes	Frequency	Percentage (%)
1	Yes	48	53.3
2	No	42	46.7
	Total	90	100,0

Source: Processed Primary Data, 2025

Table 7 shows that based on the history of diabetes in relation to the incidence of diabetes mellitus among pulmonary tuberculosis patients in the working area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, in 2025, out of 90 respondents (100%), 48 respondents (53.3%) reported having a history of diabetes, while 42 respondents (46.7%) reported having no history of diabetes.

Health Literacy

Table 8 Distribution of Respondents Based on Health Literacy and the Incidence of Diabetes Mellitus Among Pulmonary Tuberculosis Patients in the Working Area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, 2025

No.	Health Literacy	Frequency	Percentage (%)
1	Adequate	38	42.2
2	Poor	52	57.8
	Total	90	100.0

Source: Processed Primary Data, 2025

Table 8 shows that based on health literacy in relation to the incidence of diabetes mellitus among pulmonary tuberculosis patients in the working area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, out of 90 respondents (100%), 52 respondents (57.8%) had poor health literacy, while 38 respondents (42.2%) had adequate health literacy.

3.2. Bivariate Analysis

Bivariate analysis is used to determine the relationship, association, or differences between two variables. The statistical test employed in this bivariate analysis is the Chi-square test with a confidence level of 95% ($\alpha = 0.05$). A statistical relationship is considered significant if the p-value obtained is < 0.05.

3.2.1. Age

Table 9 The Influence of Age on the Incidence of Diabetes Mellitus Among Pulmonary Tuberculosis Patients in the Working Area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, 2025

Age	**Incidence of Pulmonary TB – DM**				**Total**		***Statistical Test***
	Cases		Controls				
	n	%	n	%	n	%	
Older adults (≥ 45 years)	27	90.0	19	31.7	46	51.1	*p Value* =0.000 OR = 19.421
Adults (< 45 years)	3	10.0	41	48.3	44	48.9	
Total	30	100.0	60	100.0	90	100.0	

Source: Data Analysis Results using SPSS, 2025

Table 9 shows that among older adults (≥ 45 years), totaling 46 respondents (51.1%), the case group—patients with pulmonary TB comorbid with diabetes mellitus—comprised 27 respondents (90%), while the control group—patients with pulmonary TB only—comprised 19 respondents (31.7%). Meanwhile, among adults (< 45 years), totaling 44 respondents (48.9%), the case group consisted of 3 respondents (10.0%) and the control group consisted of 41 respondents (93.2%). Based on the Chi-square statistical test, a p-value of 0.000 < 0.05 was obtained; therefore, Ha is accepted, indicating that age has a significant influence on the incidence of diabetes mellitus among pulmonary tuberculosis patients in the working area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, in 2025. The odds ratio (OR) was 19.421.

3.2.2. Sex

Table 10 shows that among female respondents, totaling 36 individuals (40.0%), the case group—patients with pulmonary TB comorbid with diabetes mellitus—consisted of 17 respondents (56.7%), while the control group—patients with pulmonary TB only—consisted of 19 respondents (31.7%). Meanwhile, among male respondents, totaling 54 individuals (60.0%), the case group included 13 respondents (43.3%) and the control group included 41 respondents (68.3%).

Based on the Chi-square statistical test, a p-value of 0.040 < 0.05 was obtained; therefore, Ha is accepted, indicating that sex has a significant influence on the incidence of diabetes mellitus among pulmonary tuberculosis patients in the working area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, in 2025. The odds ratio (OR) was 2.822.

Table 10 The Influence of Sex on the Incidence of Diabetes Mellitus Among Pulmonary Tuberculosis Patients in the Working Area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, 2025

Sex	**Incidence of Pulmonary TB – DM**				**Total**		***Statistical Test***
	Cases		Controls				
	n	%	n	%	n	%	
Female	17	56.7	19	31.7	36	40.0	*p Value*= 0.040 OR = 2.822
Male	13	43.3	41	68.3	54	60.0	
Total	30	100.0	60	100.0	90	100.0	

Source: Data Analysis Results using SPSS, 2025

3.2.3. Smoking Behavior

Table 11 The Influence of Smoking Behavior on the Incidence of Diabetes Mellitus Among Pulmonary Tuberculosis Patients in the Working Area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, 2025

Smoking Behavior	**Incidence of Pulmonary TB – DM**				**Total**		***Statistical Test***
	Cases		Controls				
	n	%	n	%	n	%	
Non-smoker	23	76.7	18	30.0	41	45.6	*p Value*= 0.000 OR = 7.667
Smoker	7	23.3	42	70.0	49	54.4	
Total	30	100.0	60	100.0	90	100.0	

Source: Data Analysis Results using SPSS, 2025

Table 11 shows that among respondents who did not smoke, totaling 41 individuals (45.6%), the case group—patients with pulmonary TB comorbid with diabetes mellitus—comprised 23 respondents (76.7%), while the control group—patients with pulmonary TB only—comprised 18 respondents (30.0%). Meanwhile, among respondents who smoked, totaling 49 individuals (54.4%), the case group consisted of 7 respondents (23.3%), and the control group consisted of 42 respondents (70.0%). Based on the Chi-square statistical test, a p-value of 0.00 < 0.05 was obtained; therefore, Ha is accepted, indicating that smoking behavior has a significant influence on the incidence of diabetes mellitus among pulmonary tuberculosis patients in the working area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, in 2025. The odds ratio (OR) was 7.667.

3.2.4. Nutritional Status

Table 12 The Influence of Nutritional Status on the Incidence of Diabetes Mellitus Among Pulmonary Tuberculosis Patients in the Working Area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, 2025

Nutritional Status	**Incidence of Pulmonary TB – DM**				**Total**		***Statistical Test***
	Cases		Controls				
	n	%	n	%	n	%	
Normal	19	63.3	21	35.0	40	44.4	*p Value*= 0.020 OR = 3.208
Undernourished	11	36.7	39	65.0	50	55.6	
Total	30	100.0	60	100,0	90	100,0	

Source: Data Analysis Results using SPSS, 2025

Table 12 shows that among respondents with normal nutritional status, totaling 40 individuals (44.4%), the case group—patients with pulmonary TB comorbid with diabetes mellitus—consisted of 19 respondents (63.3%), while the control group—patients with pulmonary TB only—consisted of 21 respondents (35.0%). Meanwhile, among respondents with undernutrition, totaling 50 individuals (55.6%), the case group comprised 11 respondents (36.7%), and the control group comprised 39 respondents (65.0%). Based on the Chi-square statistical test, a p-value of 0.020 < 0.05 was obtained; therefore, Ha is accepted. This indicates that nutritional status has a significant influence on the

incidence of diabetes mellitus among pulmonary tuberculosis patients in the working area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, in 2025. The odds ratio (OR) was 3.208.

3.2.5. History of Diabetes

Table 13 The Influence of Diabetes History on the Incidence of Diabetes Mellitus Among Pulmonary Tuberculosis Patients in the Working Area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, 2025

History of Diabetes	**Incidence of Pulmonary TB – DM**				**Total**		***Statistical Test***
	Cases		Controls				
	n	%	n	%	n	%	
Yes	21	70.0	27	45.0	48	53.3	*p Value*= 0.044 OR = 2.852
No	9	30.0	33	55.0	42	46.7	
Total	30	100.0	60	100.0	90	100.0	

Source: Data Analysis Results using SPSS, 2025

Table 13 shows that among respondents with a history of diabetes, totaling 48 individuals (53.3%), the case group—patients with pulmonary TB comorbid with diabetes mellitus—consisted of 21 respondents (70.0%), while the control group—patients with pulmonary TB only—consisted of 27 respondents (45.0%). Meanwhile, among respondents without a history of diabetes, totaling 42 individuals (46.7%), the case group comprised 9 respondents (30.0%), and the control group comprised 33 respondents (55.0%). Based on the Chi-square statistical test, a p-value of 0.044 < 0.05 was obtained; therefore, Ha is accepted. This indicates that a history of diabetes has a significant influence on the incidence of diabetes mellitus among pulmonary tuberculosis patients in the working area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, in 2025. The odds ratio (OR) was 2.852.

3.2.6. Health Literacy

Table 14 The Influence of Health Literacy on the Incidence of Diabetes Mellitus Among Pulmonary Tuberculosis Patients in the Working Area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, 2025

Health Literacy	**Incidence of Pulmonary TB – DM**				**Total**		***Statistical Test***
	Cases		Controls				
	n	%	n	%	n	%	
Adequate	19	63.3	19	31.7	38	42.2	*p Value*= 0.008 OR = 3.727
Poor	11	36.7	41	68.3	52	57.8	
Total	30	100.0	60	100.0	90	100.0	

Source: Data Analysis Results using SPSS, 2025

Table 14 shows that among respondents with adequate health literacy, totaling 38 individuals (42.2%), the case group—patients with pulmonary TB comorbid with diabetes mellitus—consisted of 19 respondents (63.3%), while the control group—patients with pulmonary TB only—consisted of 19 respondents (31.7%). Meanwhile, among respondents with poor health literacy, totaling 52 individuals (57.8%), the case group comprised 11 respondents (36.7%), and the control group comprised 41 respondents (68.3%).

Based on the Chi-square statistical test, a p-value of 0.008 < 0.05 was obtained; therefore, Ha is accepted. This indicates that health literacy has a significant influence on the incidence of diabetes mellitus among pulmonary tuberculosis patients in the working area of Lepo-Lepo Public Health Center, Kendari City, in 2025. The odds ratio (OR) was 3.727.

3.3. Multivariate Analysis

Multivariate analysis is a statistical method used to process and interpret data involving more than two variables simultaneously. In this study, multivariate analysis was conducted using logistic regression. The model applied was binary logistic regression because the dependent variable consisted of nominal categories, while the independent variables were nominal and ordinal.

Based on the results of the bivariate analysis, the independent variables with a p-value < 0.05 were age, sex, smoking behavior, nutritional status, history of diabetes, and health literacy. Therefore, these variables were included in the multivariate binary logistic regression analysis.

Table 15 Multivariate Analysis of Factors Influencing the Incidence of Diabetes Mellitus Among Pulmonary Tuberculosis Patients in the Working Area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, 2025

Variable	B	S.E.	Wald	df	Sig.	Exp(B)
Respondents' Age	4.158	1.088	14.611	1	.000	63.964
Sex	-3.149	1.557	4.090	1	.043	.043
Smoking Behavior	3.478	1.418	6.016	1	.014	32.404
Nutritional Status	1.938	.842	5.292	1	.021	6.944
History of Diabetes	1.603	.761	4.433	1	.035	4.970
Health Literacy	2.688	.900	8.915	1	.003	14.705

The results show that the most influential factor associated with the incidence of diabetes mellitus among pulmonary tuberculosis patients in the working area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, in 2025 is age. The age variable yielded a significance value of 0.000 < 0.05 and an Exp(B) value of 63.964, indicating that age has a statistically significant effect on the incidence of diabetes mellitus among pulmonary tuberculosis patients. This means that the higher the age, the greater the likelihood of experiencing diabetes mellitus among patients with pulmonary tuberculosis.

As a person's age increases, cellular aging occurs. Cellular aging involves two aspects: (1) cellular proliferation and differentiation eventually cease, and (2) basic cellular functions are maintained, with growth stopping but metabolic activity continuing. One of the stimuli that can induce cellular aging is oxidative stress. Oxidative stress is a condition characterized by an imbalance between protective antioxidants (antioxidant defenses) and an increase in free radicals. The impact of oxidative stress includes increased lipid, DNA, and protein modification in tissues, eventually leading to a state of hyperglycemia (Suastika, 2018).

These findings are consistent with a study conducted by Alturki et al. (2023) in Yemen, which reported that age was the most dominant factor associated with the occurrence of diabetes mellitus among tuberculosis patients, with an OR of 10.8 (95% CI = 4.3–27.3). This indicates that advancing age increases the risk of developing diabetes mellitus in tuberculosis patients due to reduced organ function associated with aging.

4. Conclusion

The results of the study indicate that there is a significant influence of age, sex, smoking behavior, nutritional status, history of diabetes, and health literacy on the incidence of diabetes mellitus among pulmonary tuberculosis patients in the working area of BLUD UPTD Lepo-Lepo Public Health Center, Kendari City, in 2025. This is evidenced by p-values below 0.05 for each variable: age (p = 0.000, OR = 19.421), sex (p = 0.040, OR = 2.822), smoking behavior (p = 0.000, OR = 7.667), nutritional status (p = 0.020, OR = 3.208), history of diabetes (p = 0.044, OR = 2.852), and health literacy (p = 0.008, OR = 3.727).

Among all these variables, age was identified as the most influential factor associated with the incidence of diabetes mellitus among pulmonary tuberculosis patients, based on the binary logistic regression analysis. The odds ratio Exp(B) = 63.964 indicates that older adults have approximately 63.964 times higher likelihood of experiencing pulmonary tuberculosis comorbid with diabetes mellitus.

Compliance with ethical standards

Acknowlegement

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Disclosure of Conflict of Interest

There are no conflicts of interest in this study.

Statement of informed consent

As a researcher, I affirm that prospective participants have received complete, clear, and comprehensible information regarding the study's objectives, procedures, potential benefits and risks, data confidentiality provisions, and their right to refuse or withdraw from participation at any time without consequences. I ensure that the informed consent process is conducted ethically, voluntarily, free from coercion, and in accordance with established research ethics standards. Thus, participants are provided with sufficient information to make an informed and responsible decision about their involvement in this study.

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