

Demographic Characteristics and History of Pulmonary TB Treatment in Malang City in 2022-2023

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ARTICLE INFO	ABSTRACT
ORCID ID Author 1: https://orcid.org/0000-0003-4217-5661 Author 2: - Author 3: - Author 4: - Author 5: - Author 6: - Author 7: - Author 8: - Author 9: -	Tuberculosis (TB) is currently in thirteenth place as the main cause of death globally. In 2022, at East Java there were 78,799 cases of pulmonary TB. The success rate for TB treatment in East Java is 89.01 percent or has not yet reached the target for the Treatment Success Rate indicator in 2022, which is 90 percent. Meanwhile in Malang City, in 2022 there were 2,417 TB cases and this will increase in 2023 to 2,716 cases. The increase in cases occurs because people still think it's trivial, especially when they cough and are reluctant to get checked, but when the disease is serious, they just get checked. The goal of this research is to analyze the demographic characteristics and treatment history of pulmonary TB patients based on secondary data sourced from Malang City Health Office. The sample numbered 4,735 with a study design using descriptive methods using total population sampling techniques. The results showed that Sukun sub district have the highest number of pulmonary TB patients and most of pulmonary TB patients was 19 until 45 years old. In the gender variable, it was more common in men and in the employment status variable, there were more patients with working status. Treatment history was most frequently found in the new treatment category.
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1. Introduction

Pulmonary tuberculosis (TB) is an infectious disease where *Mycobacterium tuberculosis* as the main cause and is including the top ten causes of disease globally (Dahmar et al., 2023; Firmansyah et al., 2021). In 2021, it was the second most common cause of morbidity and mortality after SARS-CoV-2 (WHO, 2022). Pulmonary TB is a lower respiratory tract infection that affects lung tissue or lung parenchyma and has the potential to infect the other organs, such as the meninges, kidneys, bones, and lymph nodes (Hutagalung et al., 2022; Irawati et al., 2020). The symptoms of pulmonary TB include coughing for a period exceeding three weeks, coughing with blood, breathlessness, chest discomfort, loss of appetite and weight, night sweats, and high fever (Hutagalung et al., 2022; Langingi et al., 2023). Pulmonary TB is transmitted via the air and droplets (through coughing, sneezing, and direct contact with

sputum from individuals with pulmonary tuberculosis) (Hutagalung et al., 2022; Kristini & Hamidah, 2020).

In 2022, there were 7.5 million new cases of TB globally. This represents the highest number of new cases since the World Health Organization (WHO) began monitoring worldwide TB incidence in 1995. It is higher than the number of TB cases in previous years, that are 7.1 million cases in 2019, then decreased to 5.8 million cases in 2020, and back up in 2021 to 6.4 million cases. It is in line with pandemic covid-19 happened in 2019-2021 that cause diagnosis and treatment were delayed due to the impact of the pandemic so that many individuals who had contracted pulmonary TB experienced an increase in 2022 (WHO, 2023).

WHO approximated that 10.6 million people worldwide were diagnosed with TB in 2022. This highest approximation represents an increase from the previous two years. In 2020, the approximated number of TB cases was 10.0 million and increase to 10.3 million cases in 2021. Downward trends such as before pandemic Covid-19 is anticipated in 2023 or 2024. TB patient's characteristic includes 12% children aged 0-14 years old, 33% female, and 55% male. In 2022, an approximated 410,000 people worldwide developed multidrug-resistant or rifampicin-resistant tuberculosis (MDR/RR-TB) (WHO, 2023). This is since patients with pulmonary TB do not receive equal treatment, which results in the development of drug resistance, complications (including extensive lung damage), and even death (Rupang et al., 2024). The number of individuals diagnosed and initiating treatment is considerably lower, in 2019 there are 181.533 cases and has decreased to 175,650 cases reported in 2022 that represents approximately two in five of those requiring treatment (WHO, 2023).

In 2021, Indonesia was the second most affected country in the world by pulmonary TB, with a total of 397,377 cases, surpassed only by India (Sari et al., 2023). The most of pulmonary TB cases are concentrated in the 15-54 years old, with a treatment and reporting coverage of 41.7%. This is significantly far away from Indonesia's 2020 target of 80% and is also below the global target of 71% (Langingi et al., 2023; Nailius & Anshari, 2022). This classification places Indonesia among the ten countries with the highest TB burden (Nopita et al., 2023; WHO, 2018). The 2018 Global TB Report indicated that Indonesia ranked third for TB, seventh for TB/HIV, and seventh for MDR-TB (Fatriyani & Nunung, 2020).

Total of pulmonary TB cases identified in East Java was 78.799, representing 73.3% of the total cases in 2022. The number of cases identified has increased in comparison to the figures recorded in 2021, which stood at 43,427. The highest number of pulmonary TB case findings was reported in Surabaya City, with 10,382 cases identified. Consequently, the number of pulmonary TB cases identified and treated in 2022 reached 68,545 cases (63.74%). Based on the number of all pulmonary TB cases cured and those undergoing complete treatment among all pulmonary TB cases treated and reported, the pulmonary TB treatment success rate in East Java is 89.01%, which has not yet reached the target for the 2022 Treatment Success Rate indicator of 90%. In Malang City, the number of pulmonary TB cases has increased from 2,417 in 2022 to 2,716 in 2023. This rise in cases can be attributed to the continued perception of pulmonary TB as a minor ailment, particularly among those who cough but only seek medical attention when the disease has reached an advanced stage.

Demographic factors, including age, gender, employment status, and place of residence, have been identified as significant contributors to the prevalence of pulmonary TB in Malang City. The age group is a significant factor influencing the occurrence of pulmonary TB.

Pulmonary TB transmission and contraction in productive age group individuals is more susceptible than individuals with non-productive age group than individuals in non-productive age group (Yosephine et al., 2021). This is because individuals of productive age are more active in working and interacting socially, which consequently influences them more susceptible to the contraction of the Mycobacterium tuberculosis bacteria. Nevertheless, pulmonary TB can be transmitted to any age group, from infants to the elderly (WHO, 2018).

On the other hand, gender is one of the transmission factors of pulmonary TB. It is significantly of health issues due to males and females have notable differences in pulmonary TB epidemiology. These such as differences in anatomy, physiology, disparate lifestyle, levels of healthcare awareness, differing diagnostic criteria for certain diseases, and disparate occupational profiles (R. R. K. Dewi & Fazri, 2022). This argument is support by Savitri et al. (2018) study that identified male (66.7%) as the largest proportion of pulmonary TB patients.

In addition, employment status is also a significant predictor of pulmonary TB disease infection. The risk of becoming infected with pulmonary TB is influenced by occupational factors, particularly in contexts where exposure to infected individuals or an unhealthy environment is prevalent (Widiati & Majdi, 2021). The work environment is characterized by low levels of natural light and inadequate ventilation. In the research by Jurcev-Savicevic et al. (2013) revealed that individuals who were unemployed or not working were at a 2.69 times greater risk of developing pulmonary TB.

The incomplete, relapsed, failed, or non-compliant treatment of pulmonary TB patients can increase the risk of pulmonary TB incidence. As stated by Nurmala et al. (2020), suboptimal treatment, including premature cessation of therapy before the designated period and non-standard regimens, can impair the body's immune response and potentially lead to drug resistance to anti-tuberculosis medications (OAT). Furthermore, the study demonstrated that patients who completed their treatment in less than or more than six months exhibited a 5% difference in the risk of pulmonary TB recurrence compared to patients who completed treatment within the recommended six-month timeframe (Nurmala et al., 2020). This finding suggests that delayed treatment may contribute to an increased incidence of pulmonary TB, particularly in patients with a medical record of ineffective or uncontrolled treatment.

There are many factors that influence the occurrence of pulmonary TB is the subject of ongoing research into the demographic characteristics of pulmonary TB. This includes an investigation of the impact of age, gender, employment status, place of residence, and treatment history on the disease. The objective of this analysis is to ascertain the demographic characteristics and treatment history of pulmonary TB patients based on secondary data sourced from the Malang City Health Office. It is anticipated that this study will provide a foundation for further investigation into the demographic characteristics of pulmonary TB patients and furnish the government with data to inform its approach to pulmonary TB management and public education initiatives in Malang City.

2. Method

This research study explores a descriptive method with a quantitative research design. The sampling technique employed in this study was total population sampling, whereby the entire population was utilized as the sample. The study sample consisted of all positive TB patients documented in the Publication of Health Profile Malang City by Malang City Health Office during the 2022-2023 period.

The secondary data collected covers information on district of residence, age, gender, employment status, and treatment history include the incomplete, relapsed, failed, or non-compliant treatment of pulmonary TB patients. Additionally, the data were tabulated and analyzed descriptively based on the number of and percentage of each sub district in Malang City. This study has received ethical approval from Institute for Research and Community Service, Universitas Negeri Malang with certificate number No.26.07.10/UN32.14.2.8/LT/2024.

3. Result and Discussion

Table 1 indicates that in 2022, Sukun sub district had the highest prevalence of pulmonary TB patients, representing 32.2% (188 individuals) of the total cases. In 2023, Sukun sub district maintained its leading position in Malang City, with a prevalence of 26.2% (440 individuals). The Kedungkandang sub district ranked second, with a pulmonary TB prevalence of 23.2% (135 individuals) in 2022 and 24.9% (412 individuals) in 2023. Blimbing sub district was the third highest in terms of pulmonary TB prevalence, with 18.9% (110 individuals) affected in 2022 and 19.8% (332 individuals) affected in 2023. In 2022, the sub districts with the lowest prevalence of pulmonary TB were Klojen and Lowokwaru sub district, with a percentage of 12.9% (75 individuals). In 2023, the sub-district with the lowest prevalence of pulmonary TB B was Klojen, with a pulmonary TB incidence rate of 13.8% (232 cases), and Lowokwaru, with a pulmonary TB incidence rate of 15.2% (255 cases). Table 1 show about number and percentage of pulmonary TB patients per Sub-district in Malang City

Table 1. Number and Percentage of Pulmonary TB Patients per Sub-district in Malang City

District in Malang City	2022		2023	
	n	%	n	%
Blimbing	110	18,9%	332	19,8%
Kedungkandang	135	23,2%	412	24,9%
Klojen	75	12,9%	232	13,8
Lowokwaru	75	12,9%	255	15,2%
Sukun	188	32,2%	440	26,2%

Source: Health Profile of Malang City Health Office 2022-2023

As evidenced in Table 1, the highest increase in the number of pulmonary TB patients was observed in Kedungkandang sub district, with 277 new cases. Conversely, the lowest increase in the number of pulmonary TB patients was observed in Klojen sub district, with 157 new pulmonary TB cases. As illustrated in Table 1, despite the highest percentage and number of pulmonary TB cases in Sukun sub-district, the surge in new cases in Kedungkandang sub-district serves as an early warning of potential new pulmonary TB cases in Malang City. Table 2 show about total population per Sub-district in Malang City.

Table 2. Total Population per Sub-district in Malang City

District in Malang City	2022	2023	Population Differences
Blimbing	182.693	182.851	158
Kedungkandang	208.741	209.375	634
Klojen	94.039	93.990	-49
Lowokwaru	163.964	164.106	142
Sukun	196.689	196.860	171

Source: Statistics Indonesia (malangkota.bps.go.id)

The rise in the number of new pulmonary TB cases in the Kedungkandang sub district is directly correlated with the notable growth in the subdistrict's population. As illustrated in Table 2, the largest increase of 643 individuals was observed in the Kedungkandang sub district. Conversely, the decline in population in the Klojen sub district by 49 people is also proportional to the relatively low increase in the incidence of new pulmonary TB in Klojen sub district.

3.1 Age characteristics of Pulmonary TB patients in Malang City

As evidenced in Table 3, pulmonary TB affects individuals of all age groups, from infants to the elderly. However, research conducted by Widiati & Majdi (2021) indicates that age is not a factor associated with the occurrence of pulmonary TB in the working area of the Korkelo Health Center in East Lombok Regency. This research is in line with the results study of Mathofani et al. (2024), which indicate that age is not a definitive factor in the development of pulmonary TB. Table 3 show about characteristics of pulmonary TB patients per Sub-district in Malang City.

Table 3. Characteristics of Pulmonary TB Patients per Sub-district in Malang City

District in Malang City	2022		2023	
	n	%	n	%
Age				
0-5 years old	203	9,6%	289	11,0%
6-12 years old	85	4,0%	115	4,4%
13-18 years old	128	6,0%	187	7,1%
19-45 years old	953	45,0%	1081	41,3%
>45 years old	748	35,3%	946	36,1%
Sex				
Male	1124	53,1%	1402	53,6%
Female	993	46,9%	1216	46,4%
Working Status				
Working	1129	53,3%	2378	90,8%
Not Working	763	36,0%	240	9,2%
Medical History				
New	1704	80,5%	2023	77,3%
Failed	27	1,3%	29	1,1%
<i>Lost To Follow Up</i>	286	4,7%	438	16,7%
Relapsed	100	13,5%	128	4,9%

Source: Health Profile of Malang City Health Office 2022-2023

Table 3 indicates that the case of pulmonary TB patients in the 0-5 age group increased from 203 (9.6%) in 2022 to 289 (11.0%) in 2023, representing an 86-case increase. The risk for the 0-5 age group is 4.44 times that of the age group above 5 years. The early years of life, from birth to age 12, are a period of heightened vulnerability due to the immature and malnourished state of the body's defense system, which increases the risk of infection and illness (Ernirita et al., 2020). The immune system of children is less developed than that of adults, and it continues to mature with age, eventually reaching a level of resistance to pulmonary TB disease that is comparable to that of adults (Tammi et al., 2024; Wijaya et al., 2021). Although young age is associated with increased susceptibility to infection with *Mycobacterium tuberculosis* bacteria, research indicates that infants who receive exclusive

breastfeeding exhibit enhanced immune system development and superior natural immunity compared to those who do not receive exclusive breastfeeding (Putih & Sumiati, 2023).

Table 3 indicates that in the age group of 6-12 years, there were 85 pulmonary TB patients (4.0%) in 2022, representing an increase of 30 cases to 115 pulmonary TB patients (4.4%) in 2023. The risk factor for pulmonary TB in children is a lack of BCG (*Bacillus Calmette-Guérin*) immunization (Putih & Sumiati, 2023; Siregar et al., 2018). Individuals with a history of not receiving the BCG vaccination are 2 times higher risk of suffering pulmonary TB more than individuals with a history of vaccination (Muhajirin et al., 2022). Furthermore, environmental factors also affected the incidence of pulmonary TB in children. Children are at an elevated risk of exposure to pulmonary TB in regions with a high prevalence of the disease (Farsida & Kencana, 2020). The recurrence of coughing in children with pulmonary TB is caused by irritation of the bronchi, which subsequently results in a decline in the body's immunity (Dewi et al., 2020; Haerunnisya et al., 2024).

Table 3 indicates that the number of pulmonary TB patients in the 13-18 age group increased from 128 (6.0%) in 2022 to 187 (7.1%) in 2023, representing a 59-case increase. The results demonstrated that the 19-45 age group exhibited the highest prevalence of pulmonary TB disease, with a percentage of 953 patients (45%) in 2022 and a 3.7% decrease in 2023, amounting to 1,081 patients (41.3%). Notwithstanding the decline in the percentage of cases in 2023, the 19-45 age group exhibited an increase pulmonary TB incident of 129 cases over the course of a year.

In accordance with the findings presented in Table 3, research by Nopita et al. (2023) revealed that 25 out of 30 respondents (83.3%) within the productive age range had pulmonary TB (p-value 0.044). This suggests a correlation between age and the prevalence of pulmonary TB. Research by Arisandi et al. (2023) indicates that the most prevalent age group for pulmonary TB is 15-24 years, with 63 patients (24.14%); 35-44 years, with 51 patients (19.54%); and 45-54 years, with 50 patients (19.16%). The research Konde et al. (2020) explain a correlation between age and pulmonary TB [OR = 4.439 and CI = 1.708-11.537] and the highest number of pulmonary TB cases was identified within the age range of 15-55 years.

The incidence of pulmonary TB is higher in the productive age group (15-55 years) due to the increased time and energy expenditure on work, which results in reduced rest and a weakened immune system (Konde et al., 2020). In line with Konde's study, the most individuals diagnosed with pulmonary TB are in the age group between 15 and 50, because their mobility is not limited and there is an elevated risk of transmission of the *Mycobacterium tuberculosis* bacteria (Nurkumalasari et al., 2016; Sikumbang et al., 2022). Moreover, pulmonary TB cases in adults are predominantly caused by childhood infection with pulmonary TB that was not adequately treated (Ibrahim, 2017).

Table 3 indicates that in the age group over 45 years, there were 748 TB patients (35.3%) in 2022, representing the highest incidence of new pulmonary TB cases. This figure increased to 946 TB patients (36.1%) in 2023, representing a significant rise of 198 cases. The research conducted by Pangaribuan et al. (2020) indicates that individuals aged 55 and above are at a 1.73 times greater risk of developing pulmonary TB compared to those in the 15-34 age group. Individuals aged 45 and above, including those in non-productive age groups, will experience a decline in physiological function across multiple organ systems, including the lungs, liver, kidneys, and blood vessels. This will result in a reduction in immune system efficacy, increasing

the risk of infection. The studies by Andayani & Astuti, (2017); Langingi et al. (2023); Pangaribuan et al. (2020); Widiati & Majdi, (2021) have explained the ins and outs of treatment processes. Furthermore, as individuals age, their quality of life tends to decline due to illness, and their expectations for recovery are often less optimistic than those of younger individuals (Abrori & Riris, 2018). Pulmonary TB can lead to a notable deterioration in the physical condition of the elderly, who often experience fatigue when engaging in activities. This can result in a tendency for the elderly to withdraw from their social and physical environments (Nurwidia et al., 2022).

3.2 Sex characteristics of Pulmonary TB patients in Malang City

Table 3 show that most pulmonary TB patients in 2022 were male (53.1%), with 1124 patients and there are 993 patients (46.9%) were female. In 2023, this trend continued, with male patients comprising 53.6% of the total, and female pulmonary TB patients representing 46.4%. Many previous studies in line with this result that indicated higher prevalence of pulmonary TB disease among male (Andayani & Astuti, 2017; Arisandi et al., 2023; Nafsi & Rahayu, 2020).

Male with pulmonary TB is more prevalent than female, with a 0.305 time riskier of developing the disease than the female (OR = 0.305) (Nopita et al., 2023). In another study, it was determined that male exhibited a 2.07 time riskier of developing pulmonary TB compared to female (Pangaribuan et al., 2020). The studies of Sikumbang et al. (2022) indicate a correlation between gender and the prevalence of pulmonary TB. The incidence of pulmonary TB in males is consistently high across all age groups, whereas in females, the prevalence of pulmonary TB tends to decline after childbearing (Nopita et al., 2023).

Pulmonary TB affects male more frequently than female due to the prevalence of risk factors among the male population such as smoking, alcohol consumption, and substance abuse, which collectively destructive the immune system and increase susceptibility to pulmonary TB. Furthermore, male is more likely involved in many activities outside the domestic area, often with longer working hours and greater mobility than female. This increases their susceptibility to exposure to viruses and bacteria that cause disease (Mariana & Hairuddin, 2017; Rupang et al., 2024; Sikumbang et al., 2022).

However, research by Agustian et al. (2022) indicates that gender is not associated with the incidence of pulmonary TB s, as evidenced by a P-value of 0.483 ($p > 0.05$). Based on the Riskesdas 2018, the prevalence of pulmonary TB in male and female is almost identical, thereby substantiating the conclusion that there is no relationship between gender and pulmonary TB.

3.3 Works status characteristics of Pulmonary TB patients in Malang City

The transmission of pulmonary TB is closely associated with the type of work performed, where the level of disease exposure depends on the characteristics of the work environment. An indoor work environment with inadequate lighting and a substandard ventilation system is one of the factors that facilitate the transmission of pulmonary TB) infection (Arisandi et al., 2023). The study revealed that in 2022 there are 1,129 (53.3%) pulmonary TB patients were employed and this number of cases increased to 2,378 (90.8%) in 2023. This result is in line with the Pratiwi's 2023 result study, which indicated that a greater

proportion of individuals with pulmonary TB are employed. Furthermore, obedience to treatment among pulmonary TB patients is more prevalent among those who are employed (Samsuri et al., 2024).

3.4 Medical history characteristics of Pulmonary TB patients in Malang City

In 2019, the national pulmonary TB treatment rate was 86.6%, and the national case detection rate (CDR) was 64.5%. These rate still far from the WHO target of $\geq 90\%$ (Masnarivan et al., 2022). The study results of treatment history characteristics indicate that in 2022, there are 1,704 (80.5%) pulmonary TB patients were in the new category. In 2023, the number of new category pulmonary TB patients was 2,023 (77.3%). The data indicates a reduction in the number of new treatments, accompanied by an increase in the number of patients who have been lost to follow-up. In 2022, there were 286 patients (4.7%) in this category, while in 2023, there were 438 patients (16.7%).

Patients with a history of pulmonary TB relapse, treatment failure, or loss to follow-up are at an elevated risk of developing multidrug-resistant tuberculosis (MDR TB) compared to those with a new diagnosis (Kusumandari et al., 2023). As result stated by Sarifuddin & Sabir, (2023), this explain the increased prevalence of pulmonary TB cases caused by drug-resistant patients due to non-compliance with treatment regimens. Irregular administration of pulmonary TB drugs for a period of six months has been identified as a potential cause of mortality (Dahmar et al., 2023). Consequently, pulmonary TB patients are advised to adhere to a six-month course of OAT to prevent the emergence of relapsed and failed pulmonary TB cases.

4. Conclusion

The highest incidence of pulmonary TB in the 2022-2023 period is observed in the Sukun sub district. However, the greatest increase in new TB cases is observed in the Kedungkandang sub district. This is since the population of Kedungkandang sub district increased considerably in 2023. The results of this study demonstrate that there are several characteristics of pulmonary TB patients that are more prevalent. Regarding age, most patients are between the ages of 19 and 45. With respect to gender, most patients are male, and regarding employment status, most patients are employed. Regarding treatment history, most patients are in the new treatment category.

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