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Active and Secondhand Smokers as Influential Factors in Pulmonary Tuberculosis: A Descriptive Case Analysis

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Abstract

Pulmonary tuberculosis (TB) remains a major global health problem, and Indonesia ranks second worldwide in TB incidence. Smoking has been widely reported as a behavioral factor associated with increased susceptibility to TB. This study aimed to describe the smoking behavior of pulmonary TB patients at RSI Surabaya Jemursari. A descriptive study was conducted on 117 pulmonary TB patients registered in 2023. Data were obtained from medical records and included demographic characteristics and smoking history. Smoking behavior was categorized by smoker type (active or passive), frequency (light or heavy), and duration (short-term or long-term).

The results showed that most patients were active smokers (69.2%), the majority were light smokers (59.0%), and most had smoked for more than one year (76.9%). These findings indicate that smoking behavior was highly prevalent among pulmonary TB patients in this hospital-based population. Integrating smoking cessation programs into TB management may help support better treatment outcomes and strengthen TB control efforts.

Keywords: pulmonary tuberculosis, smoking behavior, descriptive analysis, risk factors, Surabaya

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Introduction

Pulmonary tuberculosis (TB) remains one of the leading causes of morbidity and mortality worldwide, and it is listed among the top 10 causes of death globally. In 2022, an estimated 10.6 million people developed TB and 1.3 million people died, mostly in low- and middle-income countries (World Health Organization, 2023). The Southeast Asia region accounts for nearly half of global TB cases, with Indonesia contributing significantly to the burden. Indonesia currently ranks second globally in TB incidence after India, highlighting the urgency of intensified control strategies (Kementerian Kesehatan Republik Indonesia, 2023).

In addition to infectious transmission dynamics, the development of TB disease is strongly influenced by host-related factors such as human immunodeficiency virus (HIV) co-infection, diabetes mellitus, undernutrition, and behavioral risk factors including

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smoking. Among these, smoking has been recognized as a key determinant because it directly impairs pulmonary defense mechanisms. Studies have shown that smokers have a two-fold higher risk of TB infection and progression to active disease compared to non-smokers (Lin et al., 2020; Patra et al., 2015).

National studies reinforce this evidence. Research conducted in Aceh and Medan found a strong association between cigarette smoking and pulmonary TB (Akbar et al., 2023; Purwati et al., 2023). Another study in Sukawali highlighted that poor knowledge of smoking risks was linked to higher TB incidence (Aditia et al., 2024). Collectively, these findings suggest that smoking is not only a personal health issue but also a public health concern in TB endemic areas.

At RSI Surabaya Jemursari, a referral hospital in East Java, TB remains a significant clinical problem. Preliminary observations suggested that a large proportion of TB patients had a history of long-term smoking (Kementerian Kesehatan Republik Indonesia, 2023). Understanding the patterns of smoking behavior among these patients is therefore critical to support hospital- and community-based TB control programs. This study was designed to describe smoking behavior—including smoker type, frequency, and duration—among pulmonary TB patients at RSI Surabaya Jemursari, with the aim of providing evidence for integrating smoking cessation into TB management strategies.

Methods

This study employed a descriptive study and was conducted at RSI Surabaya Jemursari from January to December 2023. The study population included all patients diagnosed with pulmonary TB during this period. Inclusion criteria were patients aged ≥15 years who were registered in the TB clinic and had complete medical records, including smoking history. Patients with extrapulmonary TB or incomplete medical records were excluded.

Pulmonary TB diagnosis was established primarily based on bacteriological examination, including sputum smear microscopy and/or GeneXpert, in accordance with the Indonesian National TB Guidelines. Clinical evaluation and chest radiography were used as supporting assessments, particularly in cases where bacteriological confirmation was not available or sputum specimens were difficult to obtain. Bacteriological confirmation was available for a proportion of patients, while some cases lacked complete microbiological data due to unavailable records or difficulty in obtaining sputum specimens.

Data collection was carried out using secondary data from medical records, which included demographic information, smoking behavior, and diagnostic results. Smoking behavior was assessed through documentation of smoking status (active or passive), frequency (light or heavy), and duration (short-term or long-term).

Data were processed and analyzed using descriptive statistics. Frequencies and percentages were used to present categorical variables, while cross-tabulation was applied to explore the relationship between smoking behavior and bacteriological status.

TB diagnosis was determined based on medical records, with bacteriological examination as the primary reference, supported by clinical and radiological assessment.

Results

Characteristics of Respondents

A total of 117 pulmonary TB patients were included in this study. The largest proportion of respondents were adults aged 19–60 years (69%), followed by elderly patients over 60 years (29%). Only a small fraction were adolescents (2%). This finding shows that TB cases were most common in the productive age group in this study.

In terms of gender distribution, the majority of respondents were male (70%), while females accounted for 30%. This finding indicates that male patients accounted for a higher proportion of pulmonary TB cases in this study.

Most respondents resided in Surabaya city (64.1%), while 35.9% came from surrounding districts. This urban predominance highlights the persistence of TB as a major health problem even in areas with relatively better access to healthcare facilities.

Smoking Behavior of Respondents

Analysis of smoking behavior revealed that most TB patients were active smokers (69.2%), while the remaining 30.8% were passive smokers. Among active smokers, light smokers (1–10 cigarettes per day) made up the majority (67.9%), while heavy smokers (> 10 cigarettes per day) comprised 32.1%. Nearly all active smokers (97.5%) had smoked for more than five years, indicating long-term exposure.

Table 1. Distribution of Smoking Behavior among Pulmonary TB Patients at RSI Surabaya Jemursari (n = 117)

Variable	Category	n	%
Smoker Type	Active smoker	81	69.2%
	Passive smoker	36	30.8%
Smoking Frequency	Light (1–10/day)	55	67.9%*
	Heavy (>10/day)	26	32.1%*
Smoking Duration	Short-term (<1 year)	2	2.5%*
	Long-term (>1 year)	79	97.5%*

*Notes: Frequency and duration were only analyzed among active smokers (n = 81).

These results suggest that although not all smokers develop TB, the majority of TB patients in this study were individuals with active, long-term smoking habits. This highlights the possibility of a cumulative effect of tobacco exposure that may increase susceptibility to pulmonary infections.

Pulmonary TB Diagnosis

Most TB cases (75.2%) were documented using a single diagnostic approach, most commonly chest radiography recorded in the medical records. The remaining 24.8% involved bacteriological confirmation. A proportion of patients did not have documented bacteriological results, and in these cases, diagnosis was based on clinical evaluation supported by radiological findings.

Pattern Between Smoking Behavior and TB

The descriptive findings indicate that a large proportion of pulmonary TB patients had a history of smoking. Most patients were active smokers with long-term exposure. Light smokers represented the largest subgroup, suggesting that even relatively low cigarette consumption over a prolonged period was common among TB patients in this study. In addition, nearly one-third of the patients were exposed to passive smoking, highlighting the potential role of second-hand smoke exposure among individuals diagnosed with pulmonary TB.

Discussion

The findings of this study indicate that pulmonary TB in this hospital-based population predominantly affects individuals in their productive age group and is more common among males. In addition, smoking behavior—particularly long-term smoking—was highly prevalent among TB patients, highlighting the potential contribution of tobacco exposure to the persistence of TB cases.

The present study confirmed that smoking behavior was highly prevalent among pulmonary TB patients at RSI Surabaya Jemursari, with most identified as active and long-term smokers. This finding aligns with previous national studies. Aditia et al. (2024) reported that knowledge and awareness of smoking risks significantly influenced TB incidence, while Purwati et al. (2023) demonstrated that smoking behavior was a dominant risk factor among TB patients in Medan. Similarly, Akbar et al. (2023) showed that TB patients in Banda Aceh were more likely to be smokers compared to the general population, suggesting a consistent pattern across different regions of Indonesia.

Other regional studies also provide similar evidence. Research in Makassar identified smoking as one of the strongest behavioral risk factors for TB, particularly among men in productive age groups (Nurjana, 2015). A study in East Java further demonstrated that smoking intensity was associated not only with TB incidence but also with delayed treatment-seeking behavior, which worsens clinical outcomes (Rahmawati & Karno, 2023). These findings suggest that smoking not only predisposes individuals to TB but also negatively influences health-seeking behavior, thereby compounding the disease burden.

The association between smoking and TB has also been extensively documented in international studies. Lin et al. (2020) and Patra et al. (2015) provided strong evidence through systematic reviews that both active and passive smoking increase the risk of TB infection and disease progression. Dodd et al. (2021) highlighted that behavioral and environmental exposures, including tobacco smoke, significantly contribute to TB-related mortality worldwide. Moreover, Pai et al. (2016) emphasized that addressing modifiable risk factors, such as smoking, is essential for achieving global TB elimination.

In addition to smoking behavior, this study also observed variations in the diagnostic methods recorded in the medical records. A substantial proportion of TB diagnoses were documented based on a single diagnostic approach, which may reflect variability in clinical documentation practices as well as limitations inherent in the use of secondary data. In particular, not all cases had documented bacteriological confirmation, which may have influenced the classification of TB diagnosis in this study.

Several biological mechanisms explain the vulnerability of smokers to TB. Cigarette smoke contains toxic chemicals that impair mucociliary clearance, alter alveolar macrophage function, and disrupt adaptive immune responses, thereby facilitating infection with *Mycobacterium tuberculosis* (Nhamoyebonde & Leslie,

2014). Chronic inflammation induced by smoke exposure may also accelerate lung damage, creating a favorable environment for bacterial growth. These mechanisms are consistent with our findings that most patients in this study had a history of long-term smoking exposure.

The implications of these findings are highly relevant for TB control efforts. In Indonesia, the National TB Program has adopted the 2030 End TB Strategy, which emphasizes early detection, treatment adherence, and integration of comorbidity management (Kementerian Kesehatan Republik Indonesia, 2023). However, behavioral risk modification—particularly smoking cessation—has not been fully incorporated into routine TB care. Integrating smoking cessation counseling and support into TB management could improve treatment outcomes, reduce recurrence, and contribute to national TB elimination targets.

This study also underscores the importance of hospital-based data in enriching our understanding of TB epidemiology. While community-based surveys provide broad insights, hospital studies can identify high-risk patient groups and inform targeted interventions. Future research should explore the effectiveness of integrating tobacco cessation programs into TB clinics and assess the long-term impact on treatment outcomes and relapse rates. In addition, further studies may investigate the interaction between smoking and other risk factors such as diabetes, malnutrition, and HIV co-infection, which may synergistically increase TB risk. Such integrated approaches will provide a more comprehensive basis for strengthening TB control programs in Indonesia.

Programmatic Implications

The high prevalence of smoking among TB patients at RSI Surabaya Jemursari highlights the need for programmatic integration of tobacco control and TB services. Hospitals could incorporate structured smoking cessation counseling into TB clinics, using trained health workers and evidence-based interventions such as nicotine replacement therapy or behavioral support. Community-based health workers (kaders) can also play an important role in providing education and follow-up for patients undergoing TB treatment. This integrated approach may enhance adherence to both TB and smoking cessation interventions, ultimately reducing relapse and improving long-term outcomes.

Limitations of the Study

This study was limited by its reliance on secondary data from medical records, which may be subject to incomplete documentation and may not capture all aspects of smoking behavior, such as duration in years, type of tobacco product, or exposure to second-hand smoke in the household. In addition, the absence of complete bacteriological data in some cases may have affected the accuracy of diagnostic classification, as not all diagnoses were supported by microbiological confirmation. Furthermore, the study employed a descriptive design, which limits the ability to establish causal relationships between smoking behavior and TB outcomes. Future research using longitudinal or case–control designs is recommended to provide stronger evidence of the association. Despite these limitations, this study provides valuable hospital-based data that can inform local TB control strategies.

Conclusion

This study found that most pulmonary TB patients at RSI Surabaya Jemursari were active smokers, with a predominance of long-term smoking behavior. These findings highlight the high prevalence of smoking among pulmonary TB patients in this hospital-based population. Strengthening TB control strategies should therefore include smoking cessation interventions, both at the hospital level and in community-based programs, to improve treatment outcomes and support the achievement of TB elimination targets.

Although no causal relationship was examined in this study, the descriptive patterns suggest that prolonged exposure to tobacco smoke—both active and passive—may be common among individuals diagnosed with pulmonary TB. Future research using analytical or longitudinal designs is recommended to further clarify the relationship between smoking behavior and TB incidence.

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