

Diagnostic Importance of Bronchoscopy with Pathological Examination in Lung Cancer and Tuberculosis: A Public Awareness Approach

Suriany^{1,2,3}, Rahmadani Sitepu¹, Benny Sihombing^{1,4}

¹Faculty of Medicine, Institut Kesehatan Medistra, Lubuk Pakam, Indonesia

²Department of Anatomical Pathology, Sembiring General Hospital, Deli Serdang, North Sumatera, Indonesia

³Department of Anatomical Pathology, Martha Friska General Hospital, Medan, North Sumatera, Indonesia

⁴Department of Pulmonology and Respiratory Medicine, Grandmed General Hospital, Deli Serdang, North Sumatera, Indonesia

DOI: 10.29322/IJSRP.16.01.2026.p16928

<https://dx.doi.org/10.29322/IJSRP.16.01.2026.p16928>

Paper Received Date: 23rd December 2025

Paper Acceptance Date: 24th January 2026

Paper Publication Date: 29th January 2026

Abstract- A community education program on bronchoscopy was conducted at the Pulmonary Outpatient Clinic of Sembiring General Hospital to increase public awareness of its diagnostic role in pulmonary disease. The session introduced indications for bronchoscopy in evaluating lung lesions suspected to represent malignancy, tuberculosis, or other infectious and inflammatory conditions. Participants were informed about the procedural steps and the importance of obtaining biopsy tissue, cytology, histopathology, and bronchoalveolar lavage specimens, particularly in suspected tuberculosis when sputum is unavailable for microbiological testing. The program also presented findings from a three-year review of bronchoscopy examinations at Sembiring General Hospital, which demonstrated the value of tissue confirmation malignant cases and also specific inflammatory cases.

The activity involved patients, family members, nurses, and medical students, and encouraged active discussion regarding respiratory symptoms and the need for early evaluation. By increasing public understanding of bronchoscopy, the program aimed to reduce hesitation toward invasive procedures and promote timely health-seeking behavior, thereby supporting earlier detection and improved outcomes in pulmonary disease.

Index Terms:- bronchoscopy, pulmonary lesions, public health education, early diagnosis

confirmation are associated with more advanced lung cancer stages and reduced survival, especially when symptoms are initially attributed to common respiratory infections or non-specific clinical presentations.⁶⁻⁹ In infectious diseases such as tuberculosis, similar delays can prolong disease progression and increase transmission risk within the community.¹⁰⁻¹² For these reasons, bronchoscopy remains integral to timely and accurate diagnostic pathways in pulmonary medicine.

Despite its relevance, patient awareness regarding when bronchoscopy is indicated remains limited, particularly in hospital settings where referrals depend on recognition of symptoms, risk factors, and imaging abnormalities. Persistent cough, hemoptysis, unexplained weight loss, or non-resolving radiologic opacities warrant further evaluation, especially when malignancy or infection is suspected.¹³⁻¹⁶ Educational barriers and communication gaps between clinicians and patients can delay diagnostic decision-making and contribute to misconceptions about the procedure, its purpose, and its safety profile.^{17,18} Therefore, structured public education regarding bronchoscopy is essential not only to improve diagnostic timeliness but also to inform patients about the signs and symptoms that necessitate further evaluation. Within a hospital-based community, this initiative serves to enhance health-seeking behavior, support early detection of tumors and infectious diseases, and promote patient participation in diagnostic care pathways.

I. INTRODUCTION

Bronchoscopy is an essential diagnostic procedure for visualizing the bronchial tree and obtaining tissue or cytological samples for lung diseases, including malignancies and infections. Its diagnostic utility has increased as clinicians encounter radiological abnormalities such as pulmonary masses, consolidations, atelectasis, and endobronchial lesions that require tissue confirmation for definitive management. These findings may reflect a spectrum of conditions, ranging from lung cancer to tuberculosis, where earlier diagnosis improves clinical outcomes and guides therapeutic strategies.¹⁻⁵ Delays in diagnostic

II. METHODOLOGY

The hospital-based public education session on bronchoscopy was carried out at the Pulmonology Outpatient Clinic of Sembiring General Hospital in collaboration with the Faculty of Medicine, Institut Kesehatan Medistra Lubuk Pakam. The activity was held on November 17th, 2025, coinciding with peak outpatient hours to ensure optimal attendance and engagement from clinic visitors.

Participants included 45 outpatients and accompanying family members, six nurses assigned to the pulmonology clinic, eight internship students from the Institut Kesehatan Deli Husada

Deli Tua, and six medical students from the Faculty of Medicine, Institut Kesehatan Medistra Lubuk Pakam who attended as part of the public education initiative. Participation was voluntary and no personal health data were collected.

The session began with a brief preliminary questioning phase to assess baseline awareness regarding bronchoscopy. The educational material covered indications for bronchoscopy in suspected pulmonary malignancies and infectious diseases based on radiological findings, as well as the diagnostic role of cytological and histopathological sampling techniques—such as brushing, bronchoalveolar lavage, and forceps biopsy—which were explained by a consultant in Anatomical Pathology. As part of the lecture, findings from a three-year retrospective study conducted at Sembiring General Hospital were also presented, illustrating the contribution of bronchoscopy toward diagnosing lung lesions by differentiating malignant, infectious, and normal respiratory cases. The session concluded with an open discussion allowing participants to clarify concerns related to procedural steps, safety, and post-diagnostic follow-up. Institutional approval for conducting the outreach was obtained, and ethical considerations were observed throughout the activity.

III. RESULT

The public education session on bronchoscopy was attended by a total of 65 participants, consisting of 45 outpatients and accompanying family members, six nurses assigned to the pulmonology clinic, eight internship students from the Institut Kesehatan Deli Husada Deli Tua, and six medical students from the Faculty of Medicine, Institut Kesehatan Medistra Lubuk Pakam. The program began with a brief interactive questioning to explore baseline assumptions about bronchoscopy. Most participants associated bronchoscopy with cancer and perceived the procedure as highly invasive. Some individuals believed bronchoscopy to be a surgical intervention, while others expressed uncertainty about whether radiological abnormalities always required tissue confirmation for diagnosis. Only a minority recognized its role in detecting infectious diseases such as tuberculosis.

During the educational lecture, participants demonstrated notable engagement and attentiveness. The presentation covered indications for bronchoscopy, common radiologic triggers for biopsy such as pulmonary masses and persistent consolidations, and the rationale for obtaining cytological and histopathological samples. Particular emphasis was placed on helping patients distinguish when persistent respiratory symptoms such as chronic cough, hemoptysis, or unexplained weight loss require further diagnostic evaluation, including bronchoscopy.

At the conclusion of the lecture, an open question-and-answer session allowed participants to seek clarification. Several questions reflected heightened curiosity and improved comprehension, including:

1. “Is bronchoscopy always necessary if a mass is found on CT, or can it be monitored first?”
2. “Can bronchoscopy detect tuberculosis even if sputum tests are negative?”
3. “Is the procedure painful, and how long does recovery usually take?”

4. “What is done with the tissue after biopsy, and how long until the results are available?”
5. “Are there risks of bleeding or infection from the procedure?”
6. “Do patients have to stay in the hospital after bronchoscopy, or can they go home the same day?”

These questions suggested a growing understanding of bronchoscopy as a structured diagnostic pathway rather than a purely invasive or surgical procedure. Feedback from participants also indicated that the session reduced anxiety about the diagnostic process, particularly among family members accompanying patients scheduled for evaluation. Participants expressed appreciation for the opportunity to directly engage with clinical specialists and gain a clearer picture of procedural expectations.

IV. DISCUSSION

Patient-centered education plays a critical role in addressing misconceptions surrounding bronchoscopy, particularly among patients who often associate the procedure with surgical intervention, pain, or cancer diagnosis. Such misconceptions may generate fear and hesitation, discouraging individuals from undergoing necessary diagnostic evaluations despite clear clinical indications. Public education has been shown to enhance health literacy and improve patient engagement, promoting more informed participation in medical decision-making.^{19,20} In the context of pulmonary diagnostics, this is especially relevant as bronchoscopy is frequently misunderstood despite its long-standing role in visualizing airway lesions and obtaining tissue or fluid samples for cytological and microbiological analysis.^{19,21} By clarifying procedural steps, expected outcomes, and safety considerations, educational efforts help mitigate anxiety and reduce the reluctance often encountered when recommending invasive diagnostic pathways.

With improved understanding, patients become better equipped to recognize the significance of respiratory symptoms and radiologic abnormalities that warrant further investigation. This becomes instrumental in conditions such as lung cancer and tuberculosis, where delays in diagnosis are strongly associated with advanced disease at first presentation and reduced treatment efficacy.²²⁻²⁴ Patient-centered education also reinforces the clinical rationale for bronchoscopy as an extension of radiological and laboratory assessments rather than an isolated intervention. In this regard, it opens a pathway toward discussing how timely diagnostics may shorten waiting periods, facilitate faster referral processes, and integrate more seamlessly into broader pulmonary care frameworks, thereby linking educational outcomes with diagnostic efficiency and system-level performance.

Delays in diagnosis represent a major concern in pulmonary medicine, as both lung cancer and tuberculosis often present with non-specific respiratory symptoms that overlap with more common conditions, leading to postponement in definitive evaluation and tissue confirmation. Several studies indicate that prolonged diagnostic intervals in lung cancer correlate with reduced curative options, advanced disease stage at diagnosis, and poorer survival outcomes.²²⁻²⁴ Similarly, tuberculosis may be misinterpreted as malignancy or vice versa due to radiologic similarities, further complicating clinical pathways and

contributing to treatment delays that can increase transmission risk within the community.^{25,26} Educational interventions that improve awareness of when bronchoscopy is indicated may shorten these diagnostic trajectories by reducing hesitation and increasing compliance with recommended investigations.

Furthermore, improving public and patient understanding of the role of bronchoscopy supports earlier recognition of the need for tissue or microbial sampling beyond imaging workup. Many patients assume that computed tomography or radiography alone is sufficient for determining the etiology of a pulmonary lesion, without realizing that radiological findings often require histopathological or cytological confirmation to differentiate between infectious, inflammatory, and neoplastic processes.^{21,27} By contextualizing bronchoscopy as a continuation of diagnostic imaging rather than a separate or optional procedure, education may help accelerate clinical decision-making and reduce diagnostic uncertainty. This forms a logical transition toward discussing how radiologic findings integrate with bronchoscopic assessments in routine pulmonary care, creating a cohesive diagnostic framework that benefits both patients and clinicians.

Radiological examinations frequently form the initial step in evaluating pulmonary abnormalities; however, imaging alone cannot reliably distinguish between malignant, infectious, and inflammatory etiologies. Pulmonary masses, consolidations, and atelectasis may indicate malignancy, tuberculosis, or benign inflammatory processes, thereby necessitating tissue confirmation through bronchoscopy to establish an accurate diagnosis.^{21,27} Integrating bronchoscopy into the radiologic-clinical workup allows for direct airway visualization and retrieval of biopsy or cytology specimens, aligning with diagnostic strategies that seek to minimize delays and avoid misclassification of pulmonary lesions.²²⁻²⁴ By framing bronchoscopy as an extension of radiological assessment rather than an isolated invasive procedure, patient-centered education helps reinforce its role in the stepwise evaluation of lung disease.

Beyond biopsy, bronchoscopy offers additional diagnostic versatility through bronchoalveolar lavage (BAL), particularly in suspected pulmonary tuberculosis cases where microbiological confirmation is required but sputum specimens cannot be obtained due to poor expectoration. BAL samples may undergo smear microscopy, culture, or rapid molecular assays, thereby improving diagnostic accuracy and shortening time to treatment initiation.^{25,26} Such integration between radiologic imaging and bronchoscopic sampling supports diagnostic pathways that prioritize early confirmation of tuberculosis and malignancy, which are both associated with adverse outcomes when diagnosis is delayed.²²⁻²⁴ As patients gain a clearer understanding of the complementary roles of imaging and bronchoscopy, diagnostic processes become more acceptable and less intimidating, facilitating smoother transitions to subsequent clinical evaluation and decision-making.

Educational interventions that enhance patient understanding of bronchoscopy may have important implications for the wider healthcare system. Improved procedural literacy increases willingness to undergo diagnostic investigations, potentially reducing delays in confirming lung cancer or tuberculosis. Earlier diagnosis is associated with higher access to curative treatment in malignancy and reduced disease transmission for tuberculosis, whereas delayed diagnosis contributes to advanced-stage

presentation, diminished treatment efficacy, and increased morbidity.²²⁻²⁶ Increasing patient acceptance of bronchoscopy within diagnostic pathways therefore supports more efficient clinical decision-making and better continuity of care in pulmonary services.

Furthermore, bronchoscopy operates within a multidisciplinary diagnostic framework that requires coordinated collaboration among pulmonology, radiology, and pathology. Public education may serve as a low-cost and scalable strategy to streamline these pathways by reducing procedural refusal, missed appointments, or cancellations—factors that frequently disrupt invasive diagnostic workflows.^{19,20} In settings with a high burden of lung cancer and tuberculosis, enhanced diagnostic literacy may offer broader public health benefits through earlier health-seeking behavior and faster linkage to treatment.²²⁻²⁶ These system-level implications underscore the value of sustaining patient education efforts while acknowledging that several challenges remain in their practical implementation.

Implementing structured patient education programs within outpatient pulmonary clinics presents several practical challenges. Variability in patient literacy levels, cultural beliefs, and prior experiences with healthcare may influence the degree to which individuals engage with and benefit from educational interventions.^{19,20} Limited consultation time during outpatient visits further restricts clinicians' ability to provide detailed explanations regarding procedural indications, diagnostic goals, and potential clinical implications of bronchoscopy. Such constraints are particularly relevant in busy settings, where clinical priorities tend to focus on immediate diagnostic or therapeutic management rather than educational reinforcement. These issues may hinder the intended impact of educational initiatives and limit their scalability within routine clinical practice.

Another challenge lies in establishing sustained follow-up after educational encounters. Patients may receive accurate information during clinic visits yet experience uncertainty or anxiety later when facing decisions about invasive diagnostic procedures. Without adequate follow-up, these concerns may remain unaddressed, contributing to deferred scheduling, appointment cancellations, or reluctance to proceed with bronchoscopy. The absence of standardized educational protocols for invasive diagnostics further contributes to heterogeneity in implementation, with practices varying among institutions and providers.^{21,27} Such limitations highlight the need for more structured and adaptive models of patient-centered education that can accommodate clinical workload, patient diversity, and the complexity of pulmonary diagnostics, paving the way toward considerations of program sustainability.

Ensuring the sustainability of patient-centered education programs in bronchoscopy requires institutional commitment, standardized protocols, and integration into routine clinical workflows. Educational materials must be accessible, adaptable to varying literacy levels, and aligned with the diagnostic priorities of pulmonary clinics. Such programs are most effective when supported by multidisciplinary teams, allowing pulmonologists, radiologists, and pathologists to contribute complementary perspectives regarding indications, diagnostic value, and procedural expectations. Because bronchoscopy frequently involves evaluation for malignancy and tuberculosis—two conditions with significant public health and clinical burdens—

sustained educational initiatives may yield long-term benefits beyond individual patient encounters.²²⁻²⁶ Incorporating these activities into scheduled outpatient bronchoscopy sessions or pre-procedural briefings may provide a practical framework for continuity.

Digital modalities also offer new opportunities for sustainability. Educational videos, visual infographics, and electronic decision aids can reinforce information provided during in-person encounters, alleviating the time constraints faced by clinicians and reducing dependence on one-to-one verbal counseling.^{19,20} These tools may enhance patient recall, promote adherence to diagnostic recommendations, and address challenges associated with limited follow-up. However, sustained implementation ultimately depends on institutional prioritization, resource allocation, and recognition of public education as a valuable component of pulmonary diagnostic services. If effectively integrated, such models have the potential to contribute to earlier diagnosis of lung cancer and tuberculosis, improve patient confidence in invasive procedures, and strengthen the overall performance of healthcare systems, thereby providing a compelling rationale for continuation.

Taken together, these findings emphasize the importance of integrating patient-centered education into bronchoscopy services, particularly within healthcare systems confronting dual burdens of lung cancer and tuberculosis. Improved patient understanding may enhance diagnostic adherence, reduce hesitation toward invasive procedures, and strengthen multidisciplinary collaboration in the diagnostic workup of pulmonary lesions. The educational component presented in this community service activity also provides insights into how public health strategies can interact with clinical workflows to promote earlier detection and improve outcome trajectories for diseases with significant morbidity.

Despite these potential benefits, sustaining such initiatives requires thoughtful implementation and continuous refinement to ensure relevance, feasibility, and equitable access for diverse patient populations. As health systems evolve toward more patient-engaged models of care, educational interventions embedded within routine diagnostic services may serve as an important complement to technological and procedural advancements. These considerations establish a logical transition toward concluding remarks that highlight the broader value of patient education in pulmonary diagnostics and its potential contribution to future community health initiatives.

V. CONCLUSION

Effective utilization of bronchoscopy for the evaluation of pulmonary lesions relies not only on procedural expertise but also on the important role of public education in improving patient understanding and acceptance of diagnostic pathways. Increasing public awareness of respiratory symptoms that warrant medical evaluation, such as chronic cough, hemoptysis, persistent dyspnea, and abnormal radiologic findings, may facilitate earlier recognition of lung cancer and tuberculosis. Both diseases are known to have poorer outcomes when diagnosis is delayed. Educational activities conducted at the community level and in outpatient clinical settings can help explain the purpose of bronchoscopy and highlight its relevance for tissue sampling, bronchoalveolar lavage, cytology, and histopathology in determining the etiology of pulmonary disease.

- Public education increases awareness of respiratory symptoms and radiologic abnormalities that may require bronchoscopy.
- Improved understanding of the procedure may reduce fear and hesitation, and support earlier diagnostic assessment for malignancy and tuberculosis.
- Educational efforts reinforce the importance of tissue confirmation through biopsy and bronchoalveolar lavage in distinguishing infectious, inflammatory, and neoplastic lung conditions.
- Integrating patient education into outpatient bronchoscopy services may enhance compliance, reduce delayed diagnosis, and support more effective treatment planning.
- Sustained community outreach and institutional commitment are important for encouraging early health seeking behavior and improving outcomes in pulmonary disease.
- Public health education should be viewed as an essential complement to clinical expertise and diagnostic services in strengthening pulmonary healthcare systems.

REFERENCES

- [1] Hare S., Souza C., Bain G., Seely J., Gomes M., & Quigley M.. The radiological spectrum of pulmonary lymphoproliferative disease. *British Journal of Radiology* 2012;85(1015):848-864. <https://doi.org/10.1259/bjr/16420165>
- [2] Kassam N., Aziz O., Somji S., Shayo G., & Surani S.. Endobronchial Tuberculosis: A Rare Presentation. *Cureus* 2020. <https://doi.org/10.7759/cureus.8033>
- [3] Esa N., Othman S., Zim M., Ismail T., & Ismail A.. Bronchoscopic Features and Morphology of Endobronchial Tuberculosis: A Malaysian Tertiary Hospital Experience. *Journal of Clinical Medicine* 2022;11(3):676. <https://doi.org/10.3390/jcm11030676>
- [4] Chaudhuri A., Mukherjee S., Nandi S., Bhuniya S., Tapadar S., & Saha M.. A study on non-resolving pneumonia with special reference to role of fiberoptic bronchoscopy. *Lung India* 2013;30(1):27. <https://doi.org/10.4103/0970-2113.106130>
- [5] Omesh T., Gupta R., Saqi A., Burack J., & Khaja M.. A rare case of endobronchial mucoepidermoid carcinoma of the lung presenting as non-resolving pneumonia. *Respiratory Medicine Case Reports* 2018;25:154-157. <https://doi.org/10.1016/j.rmcr.2018.08.014>
- [6] Hage M., Plesa O., Lemaire I., Sanson M. Estrogen and progesterone therapy and meningiomas. *Endocrinology*. 2021;163(2):bqab259.
- [6] Ezer N., Navasakulpong A., Schwartzman K., Ofiara L., & Gonzalez A.. Impact of rapid investigation clinic on timeliness of lung cancer diagnosis and treatment. *BMC Pulmonary Medicine* 2017;17(1). <https://doi.org/10.1186/s12890-017-0504-5>
- [7] Salomaa E., Sällinen S., Hiekkanen H., & Liippo K.. Delays in the Diagnosis and Treatment of Lung Cancer. *Chest Journal* 2005;128(4):2282-2288. <https://doi.org/10.1378/chest.128.4.2282>
- [8] Kessler R., Steinberger J., Chen S., Baron R., & Caridi J.. Lung adenocarcinoma presumed to be Pott's disease in a 28-year-old patient: A case report and review of literature. *Surgical Neurology International* 2019;10:208. https://doi.org/10.25259/sni_403_2019
- [9] Crvenkova S., Jakimovski D., & Ristovski V.. Review of Lung Cancer Patient Characteristics and Treatment Strategies in the Pandemic Covid-19 Year. *Prilozi* 2023;44(1):105-115. <https://doi.org/10.2478/prilozi-2023-0012>
- [10] Khan D., Saddique M., Paul T., Murshed K., & Zahid M.. Metastatic Adenocarcinoma of the Lung Mimicking Miliary Tuberculosis and Pott's Disease. *Cureus* 2021. <https://doi.org/10.7759/cureus.12869>
- [11] Hammen I. Tuberculosis mimicking lung cancer. *Respiratory Medicine Case Reports* 2015;16:45-47. <https://doi.org/10.1016/j.rmcr.2015.06.007>
- [12] Öztürk A., Şener M., & Yılmaz A.. Bronchoscopic procedures during COVID-19 pandemic: Experiences in Turkey. *Journal of Surgical Oncology* 2020;122(6):1020-1026. <https://doi.org/10.1002/jso.26164>

- [13] Memoli J., Nietert P., & Silvestri G.. Meta-analysis of Guided Bronchoscopy for the Evaluation of the Pulmonary Nodule. *Chest Journal* 2012;142(2):385-393. <https://doi.org/10.1378/chest.11-1764>
- [14] Schreiber G. and McCrory D.. Performance Characteristics of Different Modalities for Diagnosis of Suspected Lung Cancer*. *Chest Journal* 2003;123(1):115S-128S. https://doi.org/10.1378/chest.123.1_suppl.115
- [15] Wan T., Hu Q., Hu W., Deng H., & Li D.. Utility of Rapid On-Site Evaluation during Bronchoscopy in the Diagnosis of Pulmonary Tuberculosis. *Acta Cytologica* 2024;68(2):153-159. <https://doi.org/10.1159/000538094>
- [16] Puri N., Adhikari S., Gurung S., Patel S., Wagley P., Thakur B.et al.. DIAGNOSTIC YIELD OF FIBEROPTIC BRONCHOSCOPY IN A TERTIARY CENTER. *Journal of Chitwan Medical College* 2022;12(3):25-29. <https://doi.org/10.54530/jcmc.667>
- [17] Chiu C. and Miller S.. Clinical metagenomics. *Nature Reviews Genetics* 2019;20(6):341-355. <https://doi.org/10.1038/s41576-019-0113-7>
- [18] Rand I., Blaikley J., Booton R., Chaudhuri N., Gupta V., Khalid S.et al.. Summary of the British Thoracic Society guideline for diagnostic flexible bronchoscopy in adults. *Thorax* 2013;68(8):786-787. <https://doi.org/10.1136/thoraxjnl-2013-203629>
- [19] Zhou D., Cheng L., & Wu H.. The Impact of Public Health Education on Migrant Workers' Medical Service Utilization. *International Journal of Environmental Research and Public Health* 2022;19(23):15879. <https://doi.org/10.3390/ijerph192315879>
- [20] Thakur H. and Meadors A.. Editorial: Insights in public health education and promotion: 2022. *Frontiers in Public Health* 2023;11. <https://doi.org/10.3389/fpubh.2023.1280357>
- [21] Wang X., He X., Wei J., Liu J., Li Y., & Liu X.. Application of artificial intelligence to the public health education. *Frontiers in Public Health* 2023;10. <https://doi.org/10.3389/fpubh.2022.1087174>
- [22] Salehi A., Rezvani A., Fallahi M., Gholamabbas G., & Moayedfar M.. Evaluating the Time Interval Between Symptoms Onset, Diagnosis, and Therapeutic Intervention in Lung Cancer: A Cross-Sectional Study in Southern Iran. *Cancer Reports* 2024;7(10). <https://doi.org/10.1002/cnr2.70026>
- [23] Tsiglianni I., Christodoulakis A., Monastirioti A., Mavroudis D., & Agelaki S.. The journey of lung cancer patients from symptoms to diagnosis in Greece. A mixed methods approach. *NPJ Primary Care Respiratory Medicine* 2024;34(1). <https://doi.org/10.1038/s41533-024-00359-w>
- [24] Sreeramareddy C., Qin Z., Satyanarayana S., Subbaraman R., & Pai M.. Delays in diagnosis and treatment of pulmonary tuberculosis in India: a systematic review. *The International Journal of Tuberculosis and Lung Disease* 2014;18(3):255-266. <https://doi.org/10.5588/ijtld.13.0585>
- [25] Nwagbara U., Ginindza T., & Hlongwana K.. Health systems influence on the pathways of care for lung cancer in low- and middle-income countries: a scoping review. *Globalization and Health* 2020;16(1). <https://doi.org/10.1186/s12992-020-00553-8>
- [26] Htun Y., Khaing T., Yin Y., Myint Z., Aung S., Hlaing T.et al.. Delay in diagnosis and treatment among adult multidrug resistant tuberculosis patients in Yangon Regional Tuberculosis Center, Myanmar: a cross-sectional study. *BMC Health Services Research* 2018;18(1). <https://doi.org/10.1186/s12913-018-3715-4>
- [27] Tagorda-Kama M. and Nelson-Hurwitz D.. Community Health Scholars: a summer program developing a public health workforce pipeline for diverse high school students. *Frontiers in Public Health* 2023;11. <https://doi.org/10.3389/fpubh.2023.1256603>

AUTHORS

First Author – dr. Suriany, M.Ked (PA), Sp.PA Faculty of Medicine, Institute Kesehatan Medistra, Lubuk Pakam, Indonesia, **email ID:** suriany.ppds.pa@gmail.com
Second Author – Dr. dr. Rahmadani Sitepu, M.Kes., S.Pd., Sp.KKLP., FISPH, FISCN, Institute Kesehatan Medistra Lubuk Pakam, Indonesia.
Third Author – dr. Benny Sihombing, M.Ked (Paru), Sp.P., Institute Kesehatan Medistra Lubuk Pakam, Indonesia.

Correspondence Author – dr. Suriany, Faculty of Medicine, Institut Kesehatan Medistra, Lubuk Pakam, Indonesia, **email ID:** suriany.ppds.pa@gmail.com