

Jurnal Kesehatan Gigi

p-ISSN: [2407-0866](#)e-ISSN: [2621-3664](#)<http://ejournal.poltekkes-smg.ac.id/ojs/index.php/jkg/index>

Tuberculosis Transmission Risk and IPC Practice Implementation by Students During Preventive Dentistry Procedures in the Dental Health Care Laboratory at Polkesmar

Sukini¹ Jeineke Ratuela² Angga Sugiarta³ Siti Fitria U⁴ Miranda Gita Wahyuningtyas⁵¹Diploma III Program, Health Polytechnic of Semarang²Health Polytechnic of Manado³Diploma IV Program, Health Polytechnic of Semarang, Campus of Magelang⁴Diploma IV Program, Health Polytechnic of Surabaya⁵Faculty of Public Health, Diponegoro University, Semarang, Indonesia

Corresponding author: Sukini

Email: sukini@poltekkes-smg.ac.id

Received: written by editor; Revised: written by editor; Accepted: written by editor

ABSTRACT

Tuberculosis (TB) remains a major concern in clinical health education settings due to its airborne transmission risk. This study aimed to analyze the risk of TB transmission and evaluate the implementation of Infection Prevention and Control (IPC) by students during preventive dentistry procedures in the JKG Care Service Laboratory at Poltekkes Semarang. Using a descriptive-analytic method with a cross-sectional survey design, data were collected from 60 students through structured questionnaires and direct observation. The results showed that 73% of students demonstrated moderate IPC behavior, and 67% of the laboratory conditions were rated as moderately compliant with standards. Bivariate analysis revealed no significant relationship between student IPC behavior and laboratory conditions ($p = 0.885$), but there was a significant relationship between IPC behavior and the implementation of preventive dentistry procedures ($p = 0.012$). These findings indicate that student compliance with IPC is more influenced by procedural application than environmental factors. Strengthening IPC training and supervision during clinical practice is crucial to minimize TB transmission risk in dental health education settings.

Keyword: Infection, Tuberculosis, JKG Care Service Lab.

Introduction

The Diploma III Study Program for health workers must have a laboratory that meets established standards. To ensure that students' practical experiences lead to the development of skills aligned with predetermined competencies, the educational process places greater emphasis on hands-on training. The curriculum consists of a maximum of 80% core curriculum and a minimum of 20% institutional curriculum, with a structure comprising 40% theoretical content and 60% practical content. This composition is expected to equip graduates with the necessary capabilities to meet both national and global challenges (PP RI No. 19 of 2005).

The Department of Dental Health at the Semarang Health Polytechnic provides learning facilities that allow students to apply theoretical knowledge and develop practical skills. These facilities include the Nursing Service Laboratory and the Conservation Laboratory, which are utilized by students from the second to sixth semesters. Students engage in practical sessions aligned with their respective courses, such as Preventive Dentistry, Individual Care Services, Basic Tooth Extraction, Dental Health Promotion, and Conservation.

The use of the laboratory is organized into groups, each consisting of 8–10 students, under the supervision and guidance of a practical instructor. The Nursing Service Laboratory has an area of 10.2

$\times 16.5 \text{ m}^2$ and is divided into four cubicles. Each cubicle is enclosed with 3-meter-high glass partitions and contains four dental units. Each cubicle measures $5.5 \times 4.7 \text{ m}$, with a total area of 25.8 m^2 . The layout of the laboratory follows the Diploma III Dental Health Laboratory Standards issued by BPSD Kesehatan in 2017, which recommend a square or near-square configuration with a minimum space of 2.5 m^2 per student for practical activities. Each cubicle is equipped with one handwashing sink and one air conditioning unit with a power of 2 horsepower.

Infection is a dynamic disease caused by pathogenic microbes [1]. Infection is an invasion of the body of pathogens or microorganisms that can cause illness[2]. Tuberculosis is one of the most frequently occurring infections in healthcare settings. It is caused by an infection of the lungs with *Mycobacterium tuberculosis* bacteria[3]. This bacterium spreads when a person inhales droplets released by individuals with tuberculosis when they cough, talk, or sneeze[4].

The condition of the Nursing Service Laboratory crowded with users for extended periods, with air humidity and temperatures ranging from $16\text{--}18^\circ\text{C}$ and lacking proper ventilation can serve as a medium for infection transmission.[5]. Dental procedures can produce aerosols that have the potential to pose a risk of cross-infection for dentists, dental care staff, and patients[6]. Aerosols have the potential to be an infection transmission route when exposed in high concentrations and enclosed environments[7]. Cross-infection, or Healthcare-Associated Infections (HAIs), refers to the transmission of infections caused by the presence of infectious agents. HAIs are a major concern for the safety of both patients and Dental Healthcare Workers (DHCWs), making their prevention a top priority for healthcare systems and organizations. In Indonesia, a middle-income country, the prevalence of HAIs has reached 7.1%.[8].

Tuberculosis bacterial infection in the primary stage occurs when bacteria enter through the nose and mouth by breathing air that contains the bacteria causing tuberculosis. [9]. These bacteria can reach the lungs and begin to multiply. The Nursing Home Laboratory can act as a reservoir and transmit the bacteria through airborne particles and droplets to vulnerable hosts. Students of the Department of Dental Health at the Polytechnic of the Ministry of Health, Semarang, receive instruction on infection prevention and control (PPI) during the second and fifth semesters.

Therefore, students already have basic knowledge about how to prevent and control infections (PPI).

Based on observations during practical guidance at the Nursing Service Lab, it was found that the students did not fully comply with infection prevention and control (PPI) measures, such as wearing masks, gowns, rubber shoes, gloves, and head coverings. Given their prolonged presence in the Care Service Lab, frequent direct contact with patients who secrete saliva, and the environment of closed rooms with low temperatures and poor ventilation, it is necessary to conduct an in-depth analysis regarding the potential transmission of tuberculosis infection as a link in the chain of healthcare-associated infections (HAIs) in dental health services at the Polkesmar Dental Health Care Service Lab.

Methods

This study is an analytical descriptive research using a cross-sectional survey approach. It aims to analyze the risk of tuberculosis (TB) transmission in the JKG Care Service Laboratory of the Ministry of Health Semarang and to assess the implementation of Infection Prevention and Control (PPI) by students during Preventive Dentistry practice. The research was conducted at the Nursing Services Laboratory of the Department of Dental Health, Polytechnic of the Ministry of Health, Semarang, from July to August 2024.

The population in this study consisted of all students practicing in the JKG Care Service Laboratory. A sample of 60 respondents was selected using a simple random sampling technique with a lottery method, based on the inclusion criteria of active students who have learned about PPI and are currently conducting Preventive Dentistry practices.

Data collection was carried out through direct observation and structured interviews using pre-validated questionnaires. The questionnaire covered aspects of student knowledge, attitudes, and behaviors regarding the implementation of PPI, as well as laboratory environmental conditions and practical actions.

Data measurement used a categorical assessment scale (good, medium, poor) based on observation sheets and questionnaire scores. Each data point was encoded and processed for analysis.

Data analysis involved univariate analysis to describe the distribution of variables, and bivariate tests to determine relationships between variables, such as the association between student behavior

toward PPI, laboratory conditions, and Preventive Dentistry practices.

This research received ethical approval from the Health Research Ethics Commission of the Ministry of Health Semarang, with ethical clearance number 078/KEPK/Poltekkes-Smg/VI/2024. All respondents provided informed consent prior to participating in the study.

Results and Discussion

Tabel 1. Student Behavior Towards Infection Prevention and Control (IPC)

Category	N	%
Good	10	17
Medium	44	73
Bad	6	10
N	60	100

The majority of students (73%) demonstrated moderate compliance with IPC procedures. This suggests that although theoretical knowledge of IPC is provided in earlier semesters, its application in practice remains suboptimal. This finding aligns with previous research, Although there is theoretical knowledge about IPC, compliance in actual practice remains moderate for example, the use of eye protection and hand hygiene immediately after removing gloves is sometimes neglected [10].

Table 2. Condition of the JKG Care Service Laboratory

Category	N	%
Good	20	33
Medium	40	67
Bad	0	0
n	60	100

The results indicate that 67% of the laboratory conditions were rated as moderate. Although the lab design meets some spatial and ventilation criteria, essential features such as exhaust systems or air filtration are lacking, which could increase the risk of airborne infection. Additionally, inconsistent use of full PPE among students—particularly nurse caps and rubber footwear—may be attributed to insufficient enforcement and discomfort in a cool environment (16–18°C).

Previous research suggests that found that aerosol accumulation occurs in dental treatment rooms with poor ventilation, and adding a portable air cleaner with a HEPA filter significantly reduced aerosol levels and sped up aerosol removal[11]. The absence of such facilities in the JKG lab may increase vulnerability to tuberculosis exposure.

Table 3. Student Performance in Preventive Dentistry Practice

Category	N	%
Good	20	33
Medium	34	57
Bad	6	10
n	60	100

Most students (57%) performed at a moderate level during preventive dentistry procedures, including scaling, polishing, and fluoride application. These procedures often generate aerosols, increasing the risk of infection if appropriate PPE is not used. Many students were observed using only gowns and gloves, which is insufficient for high-aerosol procedures. This highlights a potential breach in IPC and supports previous findings that aerosol-generating procedures require stricter control measures. The moderate performance may also reflect limited awareness of the infectious status of patients, as students were not routinely trained to identify symptoms such as chronic cough, fever, or malaisekey indicators of TB.

Table 5. Chi-square Test Results

No.	Variable	p-value	Result
1.	Student behavior towards PPI with the suitability of the Laboratory of the Department of Dental Health	0.885	Not significant
2.	Student behavior towards PPI with preventive measures of dentistry	0.012	Significant

There is no statistically significant relationship between student IPC behavior and lab condition ($p = 0.885$), possibly due to students' unawareness of the lab's technical specifications. However, a significant relationship ($p = 0.012$) was found between IPC behavior and student actions during preventive dentistry, suggesting that those with better IPC understanding were more consistent in applying safe practices. This supports the idea that behavioral compliance is a critical determinant of clinical safety, particularly in high-exposure procedures.

The results of the univariate analysis show that student behavior towards infection prevention and control falls mostly into the moderate category, with 44 respondents (73%) in this group. This

indicates that health students are not yet fully aware of cross-infection control. Although students have received PPI-related materials in previous semesters, their practical implementation remains suboptimal. This phenomenon aligns with the Knowledge–Attitude–Practice (KAP) model, which suggests that knowledge alone does not necessarily lead to proper practices unless supported by a positive attitude and a conducive environment.[12]

Basically, most students in the Department of Dental Health have received courses on cross-infection control procedures in the semester prior to entering clinical practice in the laboratory. The theory of cross-infection control is delivered by competent lecturers; however, students have not fully applied this knowledge during their clinical practice in the laboratory. This is not due to a lack of understanding but rather because students tend to focus more on the limited laboratory borrowing hours. As a result, they often pay less attention to the infection prevention and control procedures and more to the time constraints for using the lab.

Additionally, this was confirmed by observations showing that 6 respondents (10%) fell into the poor category because their clinical practice in the laboratory did not meet the required criteria. In contrast, another observation using a questionnaire revealed that 10 respondents (17%) were in the good category, as they understood the key principles of infection prevention and control in the laboratory during clinical practice after receiving theoretical instruction on cross-infection control.

Furthermore, observations of laboratory conditions showed that 67% of respondents rated the laboratory environment as moderate, indicating that it does not fully support the optimal implementation of PPI. Ideally, a dental health clinic practice laboratory should provide adequate ventilation, temperature control, and exhaust grill facilities to reduce the spread of aerosol particles, which can serve as a medium for the transmission of infectious diseases such as tuberculosis[13]. This discrepancy increases the risk of healthcare-associated infections (HAIs), as working environment conditions greatly affect the incidence of cross-infection in dental health facilities [14]. Some factors causing inconsistencies in practice include the limited laboratory usage time, which leads students to overlook PPI procedures for the sake of time efficiency. Additionally, unclear internal regulations and weak supervision regarding the use of complete personal protective equipment (PPE) contribute to low student compliance. This

aligns with previous research stating that the success of PPI implementation is greatly influenced by institutional leadership and supervision[15].

Complete personal protective equipment that must be worn during clinical practice, including head, body, and foot protection[16]. However, there is still a discrepancy between the availability of laboratory equipment and students' use of personal protective equipment. Regarding PPE usage, most students were found to wear only gowns and gloves, while other PPE items, such as nurse caps and laboratory slippers, were often neglected. This indicates that although students have basic knowledge, there is resistance to fully applying the practice. Previous research has found that comfort, risk perception, and institutional support are key determinants in PPE use among health students.[17].

There are two factors that cause most students not to use complete personal protective equipment. Such as the time factor and the discipline factor[18]. The time factor refers to the contract for borrowing laboratory hours from the laboratory officers. Meanwhile, the discipline factor involves the lack of firmness from laboratory officers in enforcing the requirement for students to wear complete personal protective equipment. Several reasons contribute to the rules not being fully implemented: students feel uncomfortable wearing complete PPE due to temperature issues in the laboratory, and they experience some inconvenience, such as restricted movement between positions or difficulty when calling patients outside the laboratory. However, according to the researchers, the protective equipment used by students meets the minimum PPE requirements. This indicates a match between the personal protective equipment worn by students and the completeness of practice in the laboratory.

The results of the univariate analysis and the researcher's observations on students' performance in preventive dentistry activities show that most respondents (34 students, or 57%) fall into the moderate category. This indicates that the clinical practice of preventive dentistry by students is fairly good but not fully optimal, as there are still factors that pose a risk for tuberculosis transmission in the laboratory during these procedures.

Most students in the Department of Dental Health have received instructions on procedures to prevent the transmission of tuberculosis and other infectious diseases. However, observations show that not all students consistently follow these guidelines. The use of complete personal protective equipment during clinical practice is still very

limited, with many students wearing only gowns. Nevertheless, in preventive dentistry procedures, the minimum personal protective equipment is generally sufficient to reduce the risk of infectious disease transmission, such as tuberculosis. For example, most students rely on these basic protective measures, but personal safety is not fully guaranteed.

Based on the researcher's observations, preventive dentistry activities in the nursing laboratory do not have a major impact on the transmission of infections. However, caution is still necessary because some students are unaware of the patient's health background, and cross-infection through aerosols in patients' saliva remains a concern.

The control and transmission of tuberculosis can be influenced by dental aerosols, as aerosols consist of water particles that travel quickly through the air with high velocity. This shows that aerosols play a significant role in infection control and prevention during students' preventive dentistry practice.

Preventive dental procedures that require special infection control measures include scaling, filling using burs, and pumice polishing before the application of topical fluoride and after scaling. The presence of aerosols during these procedures highlights the importance of proper infection control, especially in preventing diseases such as tuberculosis.

Based on the results of the bivariate analysis using the Chi-Square test, two outcomes were obtained regarding the relationships between independent and dependent variables. The first result showed that the relationship between student behavior towards Infection Prevention and Control (PPI) and the suitability of the Dental Health Department Laboratory had a p-value greater than 0.05 ($p = 0.885 > 0.05$). This indicates that the null hypothesis (H_0) was accepted and the alternative hypothesis (H_a) was rejected, meaning there was no significant relationship between these two variables. This lack of association may be due to some inaccuracies in respondents' questionnaire answers. For example, one question asked whether there was a specific officer responsible for sterilizing dental equipment after use. Some respondents answered incorrectly because they knew that students themselves were responsible for sterilizing the equipment and cleaning the surrounding area after use.

The second test examined the relationship between student behavior towards PPI and

preventive dentistry actions, yielding a p-value less than 0.05 ($p = 0.012 < 0.05$). This indicates that H_0 was rejected and H_a was accepted, meaning there is a significant relationship between the two variables. This finding aligns with previous research showing that student behavior during preventive dentistry practice greatly affects the effectiveness of infection control and prevention[19]. This includes behavior from preparation to completion of actions. The related factor is found in the checklist sheet regarding the seven standard precautions that students must follow in the laboratory. One example is in the Personal Protective Equipment section, which asks whether practical students wear clean gowns when entering the dental and oral health service laboratory to protect their clothes from contact with patients, patient fluids, or open wounds[20]. Personal protective equipment is essentially designed to prevent direct contact with patients. [21].

A factor in the spread of infectious diseases, especially tuberculosis, is direct contact with patients who have a history of the disease[22]. Generally, the clinical characteristics of tuberculosis include coughing up phlegm for 3 weeks or more, fever, and malaise[23]. Other symptoms are coughing with blood discharge from the patient's mouth, tightness, weakness, and influenza[24]. Therefore, students practicing preventive dentistry in the laboratory must pay attention to the patient's medical history by inquiring about symptoms that have occurred in the past week.

Moreover, tuberculosis continues to evolve over time, the number of cases is increasing, and it is difficult to predict when this disease will be eradicated in Indonesia.[25]. Another study revealed that a negative pressure room is used for patients who need to be isolated, ensuring that the air inside does not mix with air from other rooms, preventing the spread of contaminants. Therefore, exhaust grills are necessary for negative pressure chambers. Based on this research, the Care Service Laboratory of the Department of Dental Health at Semarang Polytechnic needs to be equipped with exhaust grills for room sterilization, especially if a student brings a patient with tuberculosis symptoms into the laboratory.

Conclusion

Based on the study findings, it can be concluded that the risk of tuberculosis transmission in the JKG Polkesmar Care Service Laboratory

during preventive practice activities is influenced by several factors. These factors include the incomplete personal protective equipment (PPE) worn by students, as well as the absence of dedicated personnel assisting with equipment sterilization after use, leading to sterilization techniques that do not fully meet infection prevention standards. While the JKG Polkesmar Care Service Laboratory generally adheres to Diploma III Dental Health laboratory standards, some aspects remain non-compliant, particularly regarding the completeness of infection prevention tools within the room. Furthermore, scaling activities pose a high risk of tuberculosis transmission if patients brought by students have high-risk indications and proper infection prevention procedures are not diligently followed

Acknowledgements

The authors would like to express their sincere gratitude to the Health Polytechnic of the Ministry of Health Semarang for providing support and access to the facilities used in this research. Appreciation is also extended to all students who participated in the study and contributed valuable data.

References

- [1] A. N. A. Ahmad Deni Handoko, Tri Setyawati, "Uji Efektivitas Antibakteri Ekstrak Daun Kersen (Muntigia Calabura L.) Terhadap Bakteri Escherichia Coli," *Med. Tadulako J. Ilm. Kedokt.*, Vol. 6, No. 1, 2019.
- [2] C. R. N. Gita and V. Mardina, "Pemeriksaan Jumlah Leukosit, Laju Endap Darah Dan Bakteri Tahan Asam (BTA) Pada Pasien Penyakit Tuberculosis Paru Di Rsud Langsa," *J. Biol. Samudra*, vol. 1, no. 2, pp. 6–15, 2019.
- [3] A. Alhawaris And N. A. Tabri, "Risiko Infeksi Mycobacterium Tuberculosis Pada Orang Yang Tinggal Serumah Dengan Penderita Tuberculosis Di Makassar," *J. Kedokt. Mulawarman*, Vol. 7, No. 1, P. 11, 2020, Doi: 10.30872/J.Ked.Mulawarman.V7i1.3892.
- [4] Ratna, V. Fitriana, E. N. Khamdannah, and A. A. Fitriana, "Pencegahan Penularan TBC Melalui Implementasi Cekoran Bu Titik (Cegah Resiko Penularan Melalui Batuk Efektif dan Etika Batuk) pada Remaja di SMAN2 Kudus," *J. Pengabd. Kesehat.*, vol. 6, no. 1, pp. 77–87, 2023.
- [5] A. Zolanda, M. Raharjo, and O. Setiani, "Faktor Risiko Kejadian Infeksi Saluran Pernafasan Akut Pada Balita Di Indonesia," *Link*, vol. 17, no. 1, pp. 73–80, 2021, doi: 10.31983/link.v17i1.6828.
- [6] S. W. R. U. Jatiputri, A. Sriatmi, and H. S. Susanto, "Kepatuhan terhadap Pedoman Pengendalian Infeksi dalam Praktik Kedokteran Gigi: Literature Review," *Indones. J. Heal. Promot.*, vol. 2, no. 1, pp. 56–61, 2023.
- [7] D. Hasanah, "Tinjauan Literatur: SUMBER Potensial Penyebaran Sars-Cov-2 Dari Lingkungan Rumah Sakit Dan Pentingnya Pemantauan Sanitasi Rumah Sakit Untuk Menekan Pandemi Covid-19 Di Indonesia," *Maj. Kesehat.*, vol. 9, no. 3, pp. 181–198, 2022, doi: 10.21776/majalahkesehatan.2022.009.03.7.
- [8] D. Mawu, H. Bidjuni, and R. Hamel, "Hubungan Karakteristik Perawat Dengan Penanganan Pertama Pada Pasien Kegawatan Muskuloskeletal Di RSUP Prof. Dr. R. D. Kandou Manado," *J. Keperawatan UNSRAT*, vol. 4, no. 2, p. 113423, 2016.
- [9] S. Tuhuteru *et al.*, "Rekonstruksi Ventilasi Rumah Dengan Kasus Tuberculosis (TBC) Paru Di Wilayah Kerja Puskesmas Wani," *Abdimas Indones.*, vol. 1, no. 2, pp. 26–32, 2021, [Online]. Available: <https://dmi-journals.org/jai/article/view/226>
- [10] D. E. Meisha, "Comparison of compliance with infection control practices among dental students in saudi arabia before and during the covid-19 pandemic," *Risk Manag. Healthc. Policy*, vol. 14, pp. 3625–3633, 2021, doi: 10.2147/RMHP.S318031.
- [11] Y. Ren, Q. Huang, T. Marzouk, R. Richard, and K. Pembroke, "Effects of mechanical ventilation and portable air cleaner on aerosol removal from dental treatment rooms," *J. Dent.*, no. January, 2020.
- [12] H. M. Alzoubi, N. Alnawaiseh, A. M. Al-Mnayyis, and A. Aqel, "Expression of glypican-3 in primary and metastatic tumor of neuroblastoma View project Analyzing the spread of anthrax in farms in Pakistan and Jordan View project," *Artic. J. Pure Appl. Microbiol.*, vol. 14, no. March, pp. 17–24, 2020, [Online]. Available: <https://www.researchgate.net/publication/340419519>
- [13] World Health Organization, *Infection Prevention and Control Programme*, vol. 62, no. 1. 2019. doi: 10.21101/hygiena.a1487.
- [14] A. Tada, M. Watanabe, and H. Senpuku,

- “Factors influencing compliance with infection control practice in Japanese dentists,” *Int. J. Occup. Environ. Med.*, vol. 5, no. 1, pp. 24–31, 2014.
- [15] R. M. Shrestha *et al.*, “Infection prevention practices and its associated factors among hospital workers in a national medical center designated for COVID-19 in Tokyo, Japan,” *PLoS One*, vol. 17, no. 8 August, pp. 1–10, 2022, doi: 10.1371/journal.pone.0272856.
- [16] S. A. Nurhayati, R. Setyaningrum, And N. A. Fadillah, “Pertolongan Persalinan Normal Studi Observasional Analitik Pada Bidan Praktik Swasta Di Kabupaten Hulu Sungai Selatan,” *J. Publ. Kesehat. Masy. Indones.*, Vol. 3, No. 1, Pp. 13–19, 2016.
- [17] L. C. Vogt *et al.*, “Personal protective equipment use among dental healthcare personnel during the coronavirus disease 2019 (COVID-19) pandemic and the impact of an educational video in clinical practice,” *Infect. Control Hosp. Epidemiol.*, vol. 32, pp. 1472–1480, 2023, doi: 10.1017/ice.2023.6.
- [18] I. P. Dewi, W. R. Adawiyah, and L. Rujito, “Analysis of Adherence Level of Using Personal Protective Equipment for Dentist Profession Students at Unsoed Dental and Oral Hospital,” *JEconomic J. Bus. Accountants*, vol. 21, no. 4, pp. 1–10, 2019, [Online]. Available: <http://jp.feb.unsoed.ac.id/index.php/jeba/article/viewFile/1541/1550>
- [19] S. Y. Ertem, “Evaluation of Infection Control Practices and Washing Hand Behaviours in Dental Hygiene Students,” *Oral Health Prev. Dent.*, vol. 23, pp. 101–106, 2025, doi: 10.3290/j.ohpd.c_1809.
- [20] B. Afroozi, M. Mardani, A. Motaghi, and A. Tahmorespour, “The Protective Role of Front-Closed and Front-Open Gowns Against Staphylococcus Aureus Contamination of Dental Students before and after Restorative Treatments,” *J. Dent. (Shiraz, Iran)*, vol. 19, no. 4, pp. 305–310, 2018, [Online]. Available: <http://www.ncbi.nlm.nih.gov/pubmed/30680304>
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC6338681>
- [21] M. A. Pratama, “Scooping Review : Efektivitas Penggunaan Alat Pelindung Diri dengan Kejadian Dermatitis Kontak pada Pekerja Pabrik,” *J. Ris. Kedokt.*, vol. 1, no. 1, pp. 26–31, 2021, doi: 10.29313/jrk.v1i1.107.
- [22] Sitti Marya Ulva and Andi Junarwan Hamsi, “Faktor Risiko Kejadian Tuberculosis Paru Di Wilayah Kerja Puskesmas Lombakasih Kabupaten Bombana,” *MIRACLE J. Public Heal.*, vol. 3, no. 2, pp. 188–196, 2020, doi: 10.36566/mjph/vol3.iss2/177.
- [23] I. M. K. Wijaya, “Infeksi HIV (Human Immunodeficiency Virus) Pada Penderita Tuberculosis,” *Semin. Nas. FMIPA UNDIKSHA III*, vol. 3, pp. 295–303, 2019, [Online]. Available: <http://ejournal.undiksha.ac.id/index.php/semnasmipa/article/view/2721/2301>
- [24] R. W. Safitri and R. L. Suryani, “Batuk Efektif Untuk Mengurangi Sesak Nafas Dan Sekret Pada Anak Dengan Diagnosa Bronkopneumonia,” *J. Inov. Penelit.*, vol. 3, no. 4, pp. 5751–5756, 2022, [Online]. Available: <https://stp-mataram.e-journal.id/JIP/article/download/1951/1514/>
- [25] T. Srisantyorini, P. Nabilla, D. Herdiansyah, Dihartawan, F. Fajrini, and Suherman, “Analisis Spasial Kejadian Tuberculosis di Wilayah DKI Jakarta Tahun 2017-2019,” *J. Kedokt. dan Kesehat.*, vol. 18, no. 2, pp. 131–138, 2022, [Online]. Available: <https://doi.org/10.24853/jkk.18.2.131-138>