Jurnal Pijar MIPA
https://jurnalfkip.unram.ac.id/index.php/JPM

ISSN 1907-1744 (Print)
ISSN 2460-1500 (Online)

The Effect of Family Support on the Level of Adherence to Medication Among Pulmonary Tuberculosis Patients at the Tenggarong District Health Center

Diana Kurnia Apriani*, Agustiqori Al-Mubarak, M. Yudha Pratama

Department of Pharmacy, Sekolah Tinggi Ilmu Kesehatan Samarinda, Samarinda, Indonesia
*e-mail: dnakurniaapriani@gmail.com

Received: August 15, 2025. Accepted: December 10, 2025. Published: December 25, 2025

Abstract: Tuberculosis (TB) remains one of the leading causes of death worldwide, and the success of its treatment largely depends on patient adherence to medication. Since non-adherence is still common, this study aims to analyze the influence of family support on medication adherence among pulmonary TB patients at the Tenggarong District Health Center, Indonesia. The research employed a quantitative method with a cross-sectional design and a prospective approach, involving 60 patients with pulmonary TB selected through convenience sampling. The research instruments included a demographic questionnaire, a family support questionnaire, and the Morisky Medication Adherence Scale-8 (MMAS-8) to assess patient adherence levels. The results showed that most respondents received good family support (95%) and had a high level of adherence (86.67%). The chi-square test indicated a significant relationship between family support and medication adherence ($p = 0.000$), while multivariate analysis using Principal Component Analysis (PCA) also confirmed a positive correlation between the two variables.

Keywords: Adherence Level; Family Support; MMAS-8; Tuberculosis; Questionnaire.

Introduction

Tuberculosis (TB) is an infectious disease that remains a major cause of global health problems and is among the ten leading causes of death worldwide. The disease is caused by Mycobacterium tuberculosis, a bacterium that is transmitted through airborne droplets when an infected person coughs or sneezes. TB generally attacks the lungs (pulmonary TB), but can also attack other organs (extrapulmonary TB). The World Health Organization (WHO) reports that approximately one-quarter of the world's population has been infected with TB. This bacterium is gram-positive, acid-fast, grows slowly, but can survive in moist environments for several hours. According to the Global Tuberculosis Report, there were approximately 10.1–11.7 million cases of TB globally in 2023, an increase from 10.7 million cases in the previous year, with 8.2 million cases diagnosed. In Indonesia, there were an estimated 969,000 new TB cases in 2021, with 144,000 deaths from TB and 6,500 deaths related to TB-HIV [1].

TB transmission occurs through the air, and patient noncompliance with treatment is often the main cause of treatment failure and the emergence of drug resistance. Compliance with TB medication is very important because irregular treatment can trigger microbial resistance to drugs [2], [3]. Patients who adhere to their medication have been shown to have a 3.76 times lower risk of treatment failure than non-adherent patients. Even after two weeks of regular treatment, the risk of transmission can decrease significantly [4]. However, non-adherence remains a major challenge in achieving optimal cure rates. Contributing factors include the long duration of treatment, the large number of medications, and unwanted side effects [5].

Research indicates that family support plays a crucial role in enhancing TB patient compliance. Low family support (93.8%) at the Sungai Bilu Community Health Center is associated with low patient compliance (87.5%) [6]. Family support can take the form of emotional, informational, instrumental, physical, or spiritual support [7]–[9].

In Kutai Kartanegara Regency, particularly in Tenggarong District, Indonesia, the Health Office reported 371 cases of pulmonary tuberculosis in the 2023–2024 period. This increase in cases highlights the need for an analysis of factors affecting patient compliance, particularly family support. Therefore, a study entitled "The Effect of Family Support on the Level of Adherence to Medication Among Pulmonary Tuberculosis Patients at the Tenggarong Subdistrict Health Center" was conducted to understand the role of families in improving treatment adherence, thereby helping to accelerate the healing process and reduce the risk of TB transmission in the community.

Research Methods

This study used a quantitative method with a descriptive approach and a cross-sectional design supplemented with chi-square statistical tests and a prospective approach. The study was conducted from April to June 2025 at the Tenggarong District Health Center. The study sample consisted of patients who had been diagnosed with pulmonary tuberculosis and were undergoing anti-tuberculosis drug therapy (OAT). The sampling technique used was accidental sampling, which is the selection of respondents by chance based on inclusion and exclusion criteria. The inclusion criteria included patients who were

How to Cite:
D. K. Apriani, A. Al-Mubarak, and M. Y. Pratama, "The Effect of Family Support on the Level of Adherence to Medication Among Pulmonary Tuberculosis Patients at the Tenggarong District Health Center", *J. Pijar.MIPA*, vol. 20, no. 8, pp. 1439–1443, Dec. 2025.
https://doi.org/10.29303/jpm.v20i8.8086

willing to sign an informed consent form, were over 15 years of age, and were willing to fill out the questionnaire honestly. The exclusion criteria were pulmonary TB patients with comorbidities.

Research equipment included medical masks, face shields, gloves, pens, questionnaire sheets, and clipboards. Research materials consisted of responses to the Morisky Medication Adherence Scale-8 (MMAS-8) questionnaire and family support questionnaire sheets.

Data analysis was conducted in three stages, namely univariate, bivariate, and multivariate analysis. Univariate analysis was used to describe the characteristics of the respondents and research variables, including demographic data, family support, and compliance levels based on the MMAS-8. Bivariate analysis was performed to test the relationship between family support and medication adherence in pulmonary TB patients using the chi-square test, with a significance level of $p < 0.05$. Meanwhile, multivariate analysis was conducted using Principal Component Analysis (PCA) through the Minitab application to examine the complex relationships between variables, including gender, age, education, occupation, family support, and medication adherence. The results of the loading plot from PCA were interpreted to identify the variables with the most significant and interrelated relationships.

Results and Discussion

Univariate Analysis

Based on the results of gender research on pulmonary TB patients at three community health centers in Tenggarong District, it was found that more male patients were affected by tuberculosis than female patients.

Table 1. Respondent characteristics by gender

Gender	Frequency	Percentage (%)
Male	40	66.67
Female	20	33.33
Total	60	100.00

The majority of respondents in this study were male, numbering 40 people (66.67%), while females numbered 20 people (33.33%). Men have higher workloads and mobility than women, and tend to have risky habits such as smoking and alcohol consumption, which can increase the likelihood of tuberculosis. Smoking is known to increase the risk of various diseases such as lung cancer, chronic bronchitis, coronary heart disease, and bladder cancer. Previous studies have shown that men are at higher risk of developing tuberculosis than women. The high incidence of pulmonary TB in men is thought to be influenced by lifestyle factors, social roles, and different levels of environmental exposure [10]–[12]. In addition, exposure to cigarette smoke can cause structural changes in the lungs and affect exposure to Mycobacterium tuberculosis, as well as reduce immune system function through disruption of leukocyte and macrophage production, both in healthy individuals and TB patients [13].

Based on the results of the study, pulmonary tuberculosis patients in three Community Health Centers in Tenggarong District were most commonly found in the 46–55 age group, indicating that this age group is more susceptible to tuberculosis.

Table 2. Respondent characteristics based on age

Age	Frequency	Percentage (%)
15-25	11	18.34
26-35	9	15.00
36-45	12	20.00
46-55	14	23.33
56-65	9	15.00
66-75	5	8.33
Total	60	100.00

The respondents included patients ranging from adults to the elderly. As we age, our immune systems decline, making us more susceptible to various diseases. In older adults, there is a decline in organ function, including the immune system, which reduces the ability to fight infection [14]. In addition, this age group is at high risk of forgetting to take medication or stopping treatment when symptoms begin to improve, especially if they do not have family support [15]. Previous studies also emphasize that the risk of pulmonary TB is greater in the productive age group and the elderly due to the aging process, which reduces organ function and immunity [16].

Based on the results of the study, pulmonary TB patients in three health centers in Tenggarong District mostly had a high school education, indicating that secondary education still dominates tuberculosis cases compared to other levels of education.

Table 3. Respondent characteristics based on education

Education	Frequency	Percentage (%)
Did not complete elementary school	1	1.67
Elementary school	8	13.33
Junior high school	5	8.33
Senior high school	29	48.33
Diploma/Bachelor's degree	17	28.33
Total	60	100.00

Patients with a high school education are more likely to suffer from tuberculosis than those with other levels of education. Education level has a significant relationship with the incidence of pulmonary TB, with individuals with lower education levels having a higher risk of contracting the disease. Education plays an important role in shaping health behaviors. The higher a person's education level, the better their ability to understand and manage health information, including knowledge about the causes, prevention, and treatment of tuberculosis. Patients with higher educational backgrounds generally have better health literacy and cognitive abilities, making it easier for them to receive education from medical personnel. They tend to understand the importance of treatment adherence, how TB is transmitted, and the necessary preventive measures. Conversely, patients with secondary or low education may have limitations in understanding complex medical information, which may potentially reduce their adherence to therapy [17].

Based on the results of the study, pulmonary TB patients in three health centers in Tenggarong District were

predominantly private sector employees and unemployed individuals, with relatively equal numbers. This shows that exposure to TB risk is not limited to active workers, but also to individuals who are active in crowded environments or have low immunity due to varying socioeconomic conditions.

Table 4. Respondent characteristics by occupation

Occupation	Frequency	Percentage (%)
Not working	20	33.33
Student	6	10.00
Private employee	20	33.33
Entrepreneur	4	6.67
Civil servant	10	16.67
Total	60	100.00

Patients who are not employed are generally housewives or elderly people without a steady income, so they have limited ability to maintain personal hygiene and environmental cleanliness. On the other hand, private sector workers such as drivers, craftsmen, and laborers tend to have long working hours with insufficient rest time, which impacts their immune system. Both groups are at high risk for pulmonary TB due to economic factors and unhealthy lifestyles. The majority of TB patients come from the unemployed group, which impacts their access to health services [18].

Table 5. Family support analysis

Family support	Frequency	Percentage (%)
Good	57	95.00
Fair	0	0.00
Poor	3	5.00
Total	60	100.00

Research on pulmonary tuberculosis (TB) patients at three community health centers in Tenggarong District showed that most respondents had good family support, namely 57 respondents (95%), while 3 respondents (5%) had poor family support. This finding is in line with a study [19] at the Padurenan Mustikajaya Community Health Center in Bekasi City, which also reported that the majority of respondents had good family support at 56.8%. High family support not only reflects social bonds, but also plays an important role in the success of TB treatment, which requires a long time and high discipline. Family support helps patients remain consistent in taking their medication, motivates them to complete treatment, and accelerates the healing process [20].

Table 6. Analysis of medication adherence levels

Compliance level	Frequency	Percentage (%)
High	52	86.67
Medium	6	10.00
Low	2	3.33
Total	60	100.00

A study of pulmonary tuberculosis (TB) patients at three community health centers in Tenggarong District using the Morisky Medication Adherence Scale-8 (MMAS-8) questionnaire showed that 52 respondents (86.67%) had high adherence, 6 respondents (10%) had moderate adherence, and 2 respondents (3.33%) had low adherence. The implications of these results suggest that most pulmonary TB patients in the region demonstrate good awareness and adherence to treatment, which has the potential to increase the cure rate and reduce the risk of drug resistance. However, the existence of patients with moderate and low levels of adherence highlights the need for improved education and ongoing support from healthcare workers and families to ensure the continuity of treatment until completion. Compliant patients are those who take their medication as recommended by health workers and routinely take their medication at the health center according to schedule. The six respondents (10%) with moderate compliance were mostly of productive age (21–43 years). This age group tends to have busy schedules, which often leads to forgetting or delaying medication. In addition, side effects of the medication, such as nausea, weakness, and loss of appetite, can also reduce motivation to take medication regularly [21].

Meanwhile, two respondents (3.33%) with low compliance were all male. The contributing factors included lack of family support, discontinuation of treatment when symptoms subsided, and fatigue due to the long duration of therapy. Biological, social, and lifestyle differences between men and women can also affect treatment patterns. However, both have equal access to information and pulmonary TB treatment services. The success of therapy remains highly dependent on the individual's willingness to recover and their discipline in undergoing treatment [22]. Adherence to TB treatment is very important, because irregularity in taking medication can cause bacterial resistance to drugs, known as Multi Drug Resistance (MDR) resistance to Isoniazid and Rifampicin simultaneously.

Bivariate Analysis

Bivariate analysis was performed to determine the relationship between family support and medication adherence among pulmonary tuberculosis patients based on the results of univariate analysis at three community health centers in the Tenggarong subdistrict.

Table 7. Analysis of the effect of family support on medication adherence

Family support	Respondents' medication adherence				
	Low	Medium	High	Total	P-Value
Poor	2	0	1	3	
Good	0	6	51	57	0.000
Total	2	6	52	60	

The results of bivariate analysis using the chi-square statistical test showed a P-value of 0.000 (P<0.05), indicating a significant relationship between family support and medication adherence in tuberculosis patients. Families not only serve as reminders for medication schedules but also as sources of emotional and social motivation that can strengthen patients' commitment to long-term treatment. These findings are in line with the study [23], which also reported a similar relationship in the working area of the Kedaton Bandar Lampung Community Health Center with a P-value of 0.042. Research [24] further supports these results, with a P-value of 0.015 (P < 0.05), indicating a significant relationship between family support and the level of treatment adherence among patients with pulmonary TB. Similarly, a study [25] conducted at the Harum Melati

Pringsewu Clinic yielded consistent results with a P-value of 0.000 (P < 0.05).

Multivariate Analysis

Based on the results of univariate and bivariate analyses, the researchers proceeded with multivariate analysis to examine the relationship between respondent characteristics, family support, and medication adherence levels. This analysis was conducted to determine whether there were significant or insignificant relationships among the six variables studied, thereby providing a more comprehensive picture of the factors that influence patient adherence to tuberculosis treatment.

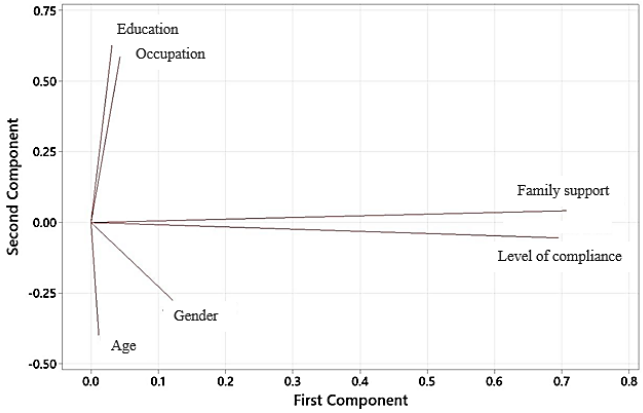

Figure 1. Analysis of the relationship between respondent characteristics, family support, and level of compliance

The variables of family support and compliance level are on the right side with parallel and long vectors, indicating a positive correlation between the two. This means that the higher the family support, the higher the patient's compliance in undergoing tuberculosis treatment. Emotional, informational, and instrumental support from the family plays a crucial role in enhancing patient compliance with the treatment regimen. Family support plays an active role in reminding and motivating patients to complete their treatment [26].

Encouragement and support from family members are crucial factors in maintaining patient adherence to medication. Family involvement in providing emotional support and assistance contributes greatly to improving patient compliance. Family members are the closest people who understand the patient's condition directly and are the main source of motivation during the recovery process [27].

In addition, the variables of education and employment show upward vectors in parallel positions, indicating a positive relationship between the two. Higher levels of education tend to be accompanied by a better understanding of the disease and treatment regimen, thereby improving patients' ability to make appropriate decisions. Patients with secondary and higher education have better treatment compliance than patients with lower education [28].

Meanwhile, the influence of gender on adherence to pulmonary TB medication is relatively small compared to family support. Gender is a passive demographic factor that does not directly influence patient behavior or motivation, whereas family support is an active factor that plays a direct role in improving adherence. Families help patients remain disciplined in taking their medication, provide motivation, and help overcome psychological and social barriers during treatment. The influence of age and gender on adherence is relatively small compared to social factors, especially family support, which plays an important role in the success of tuberculosis treatment [29].

Conclusion

The results showed that most pulmonary tuberculosis patients in three community health centers in Tenggarong Subdistrict had good family support and high medication adherence rates. Bivariate analysis using the chi-square test revealed a significant relationship between family support and patient adherence (p-value = 0.000), indicating that the higher the family support, the greater the patient's adherence to treatment.

Author's Contribution

D. K. Apriani: Conceptualization, study design, data collection, data analysis, manuscript drafting. A. Al-Mubarak: Methodology, data collection, critical manuscript review. M. Y. Pratama: Statistical analysis, data interpretation, manuscript revision. All authors contributed to the writing of this article.

Acknowledgements

We would like to express our gratitude, as this research would not have been possible without the help of several parties. These include the Samarinda College of Health Sciences, the Tenggarong District Health Center, and the respondents who were willing to participate in this research..

References

[1] W. H. O. (WHO), "Global Tuberculosis Report 2023." Geneva: World Health Organization, 2023.

[2] P. I. I. Indraswari, I. N. O. Arsana, and N. N. W. Tegmini, "Monitoring Kepatuhan Minum Obat serta Keberhasilan terapi pada Pasien Tuberkulosis Paru Di UPTD Puskesmas Karangasem I," *J. Pharmactive*, vol. 1, no. 1, pp. 11–15, 2022.

[3] P. Pameswari, A. Halim, and L. Yustika, "Tingkat Kepatuhan Penggunaan Obat Pada Pasien Tuberkulosis Di Rumah Sakit Mayjen H. a Thalib Kabupaten Kerinci," *J. Sains Farm. dan Klin.*, vol. 2, no. 2, pp. 116–121, 2016.

[4] A. Widiyanto, "Hubungan Kepatuhan Minum Obat dengan Kesembuhan Pasien Tuberkulosis Paru BTA Positif Di Puskesmas Delanggu Kabupaten Klaten," *J. Terpadu Ilmu Kesehat.*, vol. 6, no. 1, pp. 7–12, 2016.

[5] I. S. Pradipta, D. Houtsma, J. F. M. van Boven, J.-W. C. Alffenaar, and E. Hak, "Interventions to Improve Medication Adherence in Tuberculosis Patients: A Systematic Review of Randomized Controlled Studies," *npj Prim. Care Respir. Med.*, vol. 30, no. 1, p. 21, 2020, doi: 10.1038/s41533-020-0179-x.

[6] Warjiman, Berniati, and E. E. Unja, "Hubungan Dukungan Keluarga terhadap Kepatuhan Minum Obat Pasien Tuberkulosis Paru Di Puskesmas Sungai Bilu," *J. Keperawatan Suaka Insa.*, vol. 7,

no. 2, pp. 163–169, 2022.
[7] R. Alhaq and E. Indawati, "Hubungan Dukungan Keluarga dengan Kepatuhan Minum Obat pada Pasien Tuberculosis Paru," *Manuju Malahayati Nurs. J.*, vol. 6, no. 11, pp. 4446–4454, 2024.
[8] M. Murwanti, "Studi Fenomenologi : Dukungan terhadap Kepatuhan Minum Obat pada Penderita Tuberculosis dengan Multidrug-Resistant," *J. Delima Harapan*, vol. 8, pp. 12–20, Feb. 2021, doi: 10.31935/delima.v8i1.106.
[9] R. Gurusinga, A. Afrizal, and A. Bachtiar, "The Relationship Between Family Support and Treatment Adherence in Patients with Tuberculosis in Deli Serdang Regency, Indonesia, 2022 : A Cross-sectional Study," *Nurs. Midwifery Stud.*, vol. 13, no. 3, pp. 132–139, 2024.
[10] Karbito, D. Purwaningsih, W. Aliyanto, A. Muslim, A. Fikri, and B. Murwanto, "Evaluasi Program Penanggulangan TB Paru," *Midwifery J.*, vol. 4, no. 2, pp. 60–69, 2024.
[11] R. Marçôaa, A. I. Ribeirob, and R. D. I. Zãoc, "Tuberculosis and Gender - Factors Influencing the Risk of Tuberculosis Among Men and Women by Age Group," *Pulmonulogy J.*, vol. 24, no. 03, 2018.
[12] K. C. Horton, P. MacPherson, R. M. G. J. Houben, R. G. White, and E. L. Corbett, "Sex Differences in Tuberculosis Burden and Notifications in Low- and Middle-Income Countries: A Systematic Review and Meta-analysis," *PLOS Med.*, vol. 13, no. 9, p. e1002119, Sep. 2016, [Online]. Available: https://doi.org/10.1371/journal.pmed.1002119.
[13] H. Yasni, Rasima, N. Usrina, and P. Raisah, "Faktor Resiko Merokok terhadap Tuberkulosis Studi Kasus Di Wilayah Kerja Puskesmas Ladang Tuha Aceh Selatan," *Manuju Malahayati Nurs. J.*, vol. 6, no. 12, pp. 5170–5178, 2024.
[14] P. Goyani, R. Christodoulou, and E. Vassiliou, "Immunosenescence: Aging and Immune System Decline," *Vaccines*, vol. 12, no. 12. p. 1314, 2024, doi: 10.3390/vaccines12121314.
[15] T. Mohamed Dharvees *et al.*, "Facilitators and Barriers of Medication Adherence Amongst the Geriatrics: A Cross-Sectional Study," *J. Pharm. Heal. Serv. Res.*, vol. 13, no. 3, pp. 230–239, Sep. 2022, doi: 10.1093/jphsr/rmac023.
[16] Z. Dong *et al.*, "Age–period–cohort Analysis of Pulmonary Tuberculosis Reported Incidence, China, 2006–2020," *Infect. Dis. Poverty*, vol. 11, no. 1, p. 85, 2022, doi: 10.1186/s40249-022-01009-4.
[17] I. Samsugito and Hambyah, "Hubungan Jenis Kelamin dan Lama Kontak dengan Kejadian Tuberkulosis Paru Di Rumah Sakit A. Wahab Sjahranie Samarinda," *J. Kesehat. Pasak Bumi Kalimantan*, vol. 1, no. 1, pp. 28–40, 2018.
[18] B. Widiati and M. Majdi, "Analisis Faktor Umur, Tingkat Pendidikan, Pekerjaan, dan Tuberkulosis Paru Di Wilayah Kerja Puskesmas Korleko, Kabupaten Lombok Timur," *J. Sanitasi dan Lingkung.*, vol. 2, no. 2, pp. 173–184, 2021.
[19] R. Istiqomah and Naryati, "Hubungan Pengetahuan Pasien dan Dukungan Keluarga terhadap Kepatuhan Minum Obat pada Penderita Tuberkulosis Di Puskesmas Padurenan Mustikajaya Kota Bekasi," *Manuju Malahayati Nurs. J.*, vol. 5, no. 5, pp. 1440–1452, 2023.
[20] S. Sibua *et al.*, "Hubungan Dukungan Keluarga dengan Kepatuhan Berobat Penderita Tuberkulosis di Kabupaten Bolaang Mongondow Timur," *AKSARA J. Ilmu Pendidik. Nonform.*, vol. 07, no. 3, pp. 1443–1450, 2021.
[21] Suwanto, R. Rusdi, and S. K. Pasola, "Hubungan Dukungan Keluarga dengan Kepatuhan Minum Obat Anti Tuberkulosis (OAT) pada Penderita Penyakit Tuberkulosis Paru Di Puskesmas Maridan Kabupaten Penajam Paser Utara," *J. Keperawatan Wiyata*, vol. 5, no. 2023, pp. 62–71, 2024.
[22] A. R. Sari, H. Purwanto, and A. Y. A. B. Rofi'i, "Gambaran Keberhasilan Pengobatan pada Pasien Tuberkulosis Paru Di Puskesmas Semanding," *J. Keperawatan Widya Gantari Indones.*, vol. 6, no. 2, pp. 11–21, 2022.
[23] G. Aulia, R. Rafie, Z. Mandala, and D. Hermawan, "Hubungan Dukungan Keluarga dengan Kepatuhan Minum Obat pada Pasien Tuberkulosis Di Wilayah Kerja Puskesmas Kedaton Bandar Lampung," *J. Ilmu Kedokt. dan Kesehat.*, vol. 10, no. 8, pp. 2634–2643, 2023.
[24] M. D. Padmawati, L. G. Pradnyawati, D. Ayu, and P. Ratna, "Hubungan Dukungan Keluarga terhadap Kepatuhan Minum Obat Penderita Tuberculosis Paru di Wilayah Kerja UPTD Puskesmas Kuta Selatan," *AMJ (Aesculapius Med. Journal)*, vol. 4, no. 2, pp. 217–227, 2024.
[25] R. Dwiningrum, R. Y. Wulandari, and E. Yunitasari, "Hubungan Pengetahuan dan Lama Pengobatan TB Paru dengan Kepatuhan Minum Obat pada Pasien TB Paru Di Klinik Harum Melati," *J. Aisyah J. Ilmu Kesehat.*, vol. 6, no. 1, 2021.
[26] D. Butar-Butar, R. J. Laia, M. A. Silitonga, and L. A. Simaremare, "Hubungan Dukungan Keluarga Dengan Kepatuhan Minum Obat Pada Pasien TB Paru Di Wilayah Kerja Puskesmas Singosari Tahun 2024," *BEST J. (Journal Biol. Educ. Sci. Technol.*, vol. 7, no. 2, pp. 715–721, 2024.
[27] N. Fitriani, T. Sinaga, and A. Syahran, "Hubungan Antara Pengetahuan, Motivasi Pasien dan Dukungan Keluarga Terhadap Kepatuhan Minum Obat Anti Tuberkulosis (OAT) Pada Penderita Penyakit TB Paru BTA (+) di Puskesmas Pasundan Kota Samarinda," *KESMAS UWIGAMA J. Kesehat. Masy.*, vol. 5, p. 124, Mar. 2020, doi: 10.24903/kujkm.v5i2.838.
[28] T. Wiyati, Maifitrianti, and A. R. Nabilla, "Karakteristik yang terkait dengan Pengetahuan dan Kepatuhan Minum Obat Pasien Tuberkulosis Paru di RSUD Raja Ahmad Tabib Tanjung Pinang," *J. Islam. Pharm.*, vol. 9, no. 2, pp. 92–96, 2024, doi: 10.18860/jip.v9i2.29829.
[29] O. Laowo, R. Dachi, F. Tarigan, K. Manurung, and J. Sinaga, "Factors Affecting Compliance with Taking Anti-Tuberculosis Drugs at the UPTD Pulmonology Hospital of North Sumatra Province," *J. Pharm. Sci.*, pp. 1125–1141, Jun. 2025, doi: 10.36490/journal-jps.com.v8i2.821.