



IMPROVING THE KNOWLEDGE AND ATTITUDES OF PULMONARY TUBERCULOSIS PREVENTION IN THE PROBOLINGGO COMMUNITY WITH COUNSELING AND THE USE OF SOBAT-TB

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ABSTRACT

Tuberculosis (TB) is a significant global health issue, particularly in Indonesia. The increasing number of TB cases and deaths highlights the need for health education to reduce the incidence of TB and support eradication efforts. Objective: This study aimed to analyze the knowledge and attitudes of the Probolinggo community toward preventing pulmonary TB through counseling and the use of the Sobat-TB. Method: An analytical observational study with a cross-sectional approach was conducted. The knowledge and attitudes of 50 voluntary respondents were measured using a validated and reliable questionnaire before and after health education interventions, which included counseling, educational videos, and an introduction to the Sobat TB app. The data were analyzed descriptively and statistically at the 95% confidence level. Results: In the Puskesmas Kanigaran area, the initial findings showed poor knowledge and attitudes toward TB prevention among respondents. Postintervention, there was a significant improvement: 46 out of 50 respondents had good knowledge, and 48 out of 50 had positive attitudes toward TB prevention. Statistical analysis confirmed a significant relationship between pre- and postintervention knowledge and attitudes ($p=0.0001$). Conclusions: Enhanced access to information and continuous health education using modern technology are crucial for achieving TB elimination goals.

Keywords: attitude; health education; knowledge; pulmonary tuberculosis; sobat TB application

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INTRODUCTION

Tuberculosis (TB) is an infectious disease with a high severity and mortality rate that threatens communities in Indonesia and around the world (Aisah et al., 2024). The disease is caused by the bacterial complex *Mycobacterium tuberculosis*, and transmission occurs through the air via droplet particles during coughing, sneezing, talking, and other respiratory-related activities. TB not only affects lung tissue (pulmonary TB) but can also invade other organs (extrapulmonary TB). According to data from the World Health Organization (WHO), in 2021, the number of TB cases increased to approximately 10 million people, with 1.5 million people dying from TB globally (Puspitasari et al., 2022; Setiyowati et al., 2023).

After India, Indonesia will have the second highest TB incidence worldwide by 2022 (WHO, 2024). Indonesia is also one of the countries facing a triple burden of TB, namely, a high number of cases of TB, TB-HIV, and MDR-TB (WHO, 2024). In 2019, the Ministry of Health of the Republic of Indonesia recorded approximately 301 new cases of pulmonary TB per 100,000 people, with a mortality rate of approximately 34 cases per 100,000 people. West Java, East Java, and Central Java provinces have the highest number of TB cases in Indonesia (Kementrian Kesehatan Republik Indonesia, 2023). Furthermore, the Probolinggo District Health Office report in 2021 estimated that there were approximately 2,572 incident cases of TB, but only 1,193 TB cases were identified that year, with a new BTA-positive case finding rate of 46.4%; only 3,027 (25.09%) of the total target of 12,060 suspected TB cases were found, and 451 cases were bacteriologically confirmed. Furthermore, the cure rate reached 51.4%, with 78 deaths during TB treatment. Based on these data, the Probolinggo District is still far from achieving the TB elimination target by 2030 (Craciun et al., 2023; M. Iqbal Alfarizi et al., 2021).

Delays in TB detection have led to a significant spread of TB. This finding is in line with research by Paramasivam et al. (2017), which revealed that early TB detection and prompt treatment are key to implementing an effective TB control program. Patients who are not diagnosed with pulmonary TB are often a source of infection, and delays in diagnosis can aggravate the condition, increase the risk of death, and increase the spread of TB in the community, as each case of infection can result in 10-15 additional cases of infection. Treatment delays also affect the cost of treatment for patients. Delays in TB treatment initiation also affect the rate of spread, disease severity, treatment success, drug resistance, and mortality (Setyawan et al., 2023; Utomo et al., 2022). This occurs due to a lack of community knowledge about the symptoms of pulmonary TB, steps to seek treatment, and the persistence of a negative stigma toward TB in the community. Therefore, it is important to conduct health promotion aimed at increasing community knowledge of TB (Utomo et al., 2022). The active role of the community is important in supporting the implementation of TB control programs. This community role certainly needs to be supported by easy access to appropriate and interesting TB-related information. The use of digital technology and telemedicine can also help provide health services, especially those related to TB, which are easily accessible and can reach all elements of the community (Jiang et al., 2022; Moosazadeh et al., 2021; Paramasivam et al., 2017)

The SOBAT-TB is a mobile application designed to provide easier access to accurate information about TB. The app allows the community to self-detect TB and provides information on healthcare facilities that support TB prevention efforts. This online solution provides information about TB through features such as early detection of TB symptoms, screening algorithms, articles, and podcasts about TB, as well as community access that allows sharing experiences and consultations about TB. In addition, this application provides easy access to healthcare facilities that support TB prevention programs in Indonesia. However, to date, one of the problems that has occurred is the lack of available information about the use of the SOBAT-TB in the community. Therefore, efforts are needed to disseminate information about TB in the community by utilizing technology in the form of the SOBAT-TB application in Probolinggo.

The purpose of this study was to analyze the level of knowledge and attitudes of the Probolinggo community toward preventing pulmonary tuberculosis by counseling and using the Sobat-TB. By increasing public awareness of TB symptoms, implementing preventive measures, and introducing technology, such as the SOBAT-TB, it is hoped that this approach

can assist in early detection, timely treatment, and reduce the spread of the disease locally and globally. Thus, this study has a positive impact on TB prevention efforts at the community level by prioritizing a community-based approach.

METHOD

This study used an analytical observational research design with a cross-sectional approach (Darwin et al., 2021). The level of knowledge and attitudes toward preventing pulmonary tuberculosis in the Probolinggo community were measured after 1×50 minutes of health coaching on the concept of pulmonary tuberculosis, risk factors and prognosis, transmission, preventive behaviors, and the use of the Sobat TB application for tuberculosis screening. The questionnaires were distributed to 50 community respondents in Probolinggo who voluntarily attended and were willing to participate in this study (Adnyana, 2021). This research was conducted in 2023 in the working area of the Kanigaran Health Center, Probolinggo City, East Java. The study met the ethical feasibility of the Health Research Ethics Commission (KEPK) Universitas Airlangga Number 2/EC/KEPK/FKUA/2023.

The instruments used in this study included tuberculosis materials in the form of PowerPoint materials, educational videos related to tuberculosis prevention, and the use of TB buddies, booklets, and posters. All respondents were given questionnaires twice: before and after being exposed to materials related to pulmonary tuberculosis and the use of the Sobat TB application. Demographic data, including age, sex, body mass index (BMI), BCG vaccination status, education status, employment status, income, marital status, presence of comorbidities, and smoking habits, were collected via a questionnaire, which included knowledge and attitudes data consisting of 24 questions, each containing 12 questions related to knowledge and 12 questions related to attitudes. All question items contained in the questionnaire met the validity and reliability tests with a Cronbach's alpha value ≥ 0.7 . Correct answers were assigned a score of 1, whereas incorrect answers were assigned a score of 0. Scores were categorized accordingly as good (≥ 9) or less (< 9) for knowledge or prevention of TB transmission, respectively. All the data were analyzed descriptively and analytically using IBM SPSS® Inc., USA Statistics 25.0 software with univariate and bivariate tests at the 95% confidence level. All the data are presented in tables, figures, and short narratives.

RESULTS

The questionnaires were distributed to all respondents ($n=50$) who voluntarily contributed to the study. All respondents were asked to fill out a pretest sheet related to pulmonary tuberculosis material, including definitions, modes of transmission, risk factors, signs and symptoms, and comprehensive treatment. After completing the questionnaire, participants were given material by educators (lecturers) who were experts in their fields and who introduced the Sobat TB application for self-screening of tuberculosis at the household level. All respondents were then given the same questions and evaluated in the form of a posttest. Based on the results of the univariate analysis of the demographic characteristics of respondents in the Kanigaran Health Center working area of Probolinggo City, the respondents were mostly 45–54 years old, female, and had a normal nutritional status ($18.5\text{--}25 \text{ kg/m}^2$). Sixty-four percent of the respondents stated that they had received the BCG vaccine (*Bacille Calmette-Guérin*), while the rest did not. Education was dominated by senior high school (SMA) level, marital status, and job status (housewives/not-working/students). The respondents predominantly had no history of comorbidities, and 98% did not smoke and had no income. Table 1 presents the demographic data.

Table 1.
Demographic data of the respondents (n =50)

Variable	Frequency	
	f	%
Age (Years)		
15-24 years	1	2
25-34 years	1	2
35-44 years	12	24
45-54 years	16	32
55-64 years	15	30
>65 years	5	10
Gender		
Male	4	8
Female	46	92
Body Mass Index (BMI)		
<17	1	2
17-18,4	1	2
18,5-25	23	46
25,1-27	11	22
>27	14	28
BCG vaccine		
No	18	36
Yes	32	64
Education		
SD/SMP	13	26
SMA	29	58
D1-3/S-3	8	16
Jobs		
Not working/housewife/student	43	86
TNI/PORLI/PNS/BUMN/retirees	4	8
Private employee	-	-
Self-employed/trade/services	3	6
Farmer/fisherman	-	-
Revenue		
No income	43	86
< UMR (< Rp 3.280.320/month)	3	6
≥ UMR (≥ Rp 3.280.320/month)	4	8
Marital Status		
Married	43	86
Living divorce	2	4
Divorce by death	5	10
Comorbid		
No comorbidities	42	84
Diabetes mellitus	4	8
Hypertension	3	6
Hepatitis	1	2
Smoking Habit		
Yes	1	2
No	49	98

Based on the results of the pretest assessment, 50 respondents showed that they had insufficient knowledge related to pulmonary TB disease, while the results of the posttest showed a change in the increase in respondents' knowledge related to pulmonary TB after the delivery of material and discussion; 46 respondents had good knowledge. Furthermore, the results of the statistical analysis showed that there was a significant relationship between the pretest and posttest knowledge of respondents in the Kanigaran Health Center Working Area,

Probolinggo City, East Java, with a p value of 0.0001 (95% CI 0.842 - 0.998). Furthermore, the pretest results revealed that 37 of the 48 respondents reported poor behavior in pulmonary TB disease, and after the delivery of material and discussions related to pulmonary TB, there was a change in the posttest value of respondent behavior to good. The results of the statistical analysis showed that there was a significant relationship between the pretest and posttest behaviors of respondents in the working area of Puskesmas Kanigaran, Probolinggo City, East Java, with a p value of 0.0001 (95% CI 0.568-0.832). Thus, the provision of pulmonary tuberculosis material and the introduction of TB buddies are highly beneficial for increasing community knowledge and attitudes toward the prevention and control of pulmonary tuberculosis. The results of the pre- and posttests are presented in Table 2.

Table 2.
Pretest and posttest results of respondents' knowledge and attitudes

Categories	Pretest		Posttest		p value	Confidence interval (CI) 95%	
	f	%	f	%		Lower	Upper
Knowledge Category							
Poor Knowledge	50	100	4	8	<0,0001	0,842	0,998
Good Knowledge	0	0	46	92			
Attitude Category							
Attitude Lack	37	74	2	4	<0,0001	0,568	0,832
Good Attitude	13	26	48	96			

DISCUSSION

In Indonesia, TB remains a serious public health problem, mainly because of low levels of knowledge and attitudes toward the disease (WHO, 2024). A lack of knowledge and appropriate attitudes about TB can increase the risk of transmission and the incidence of new cases. Community knowledge and attitudes toward TB greatly influence efforts to prevent and control the disease. Low knowledge about TB often leads to ignorance about the modes of transmission, symptoms, and importance of proper treatment (Kaaffah et al., 2023). Field findings showed that before the materials were provided, many respondents did not know that TB was transmitted through the air when an infected person coughed or sneezed. Without this knowledge, respondents did not take preventive measures, such as wearing masks or maintaining a distance from infected individuals (Andriani & Sukardin, 2020; Madebo et al., 2023). In addition, poor knowledge of TB symptoms, such as cough lasting more than two weeks, fever, weight loss, and night sweats, is often not recognized by people with low knowledge. This leads to delays in diagnosis and treatment and increases the risk of transmission to others.

Other predictors of low knowledge and negative attitudes toward people with TB, such as stigma and discrimination, can deter infected individuals from seeking medical help. They may fear ostracization by their family or community, thus choosing to conceal their disease and not adhere to treatment. Low knowledge of the importance of completing the entire TB treatment course results in many patients discontinuing medication after feeling slightly better. This not only increases the risk of disease recurrence but also triggers the development of drug-resistant TB, which is more difficult and expensive to treat. Numerous studies have also revealed that poor knowledge and attitudes contribute to an increase in TB cases and transmission in the community (Dameria et al., 2023; Kaka, 2021; Siregar et al., 2021; Yermi et al., 2018). This condition can be addressed through interventions that focus on improving knowledge and attitudes through counseling and the introduction of technology such as the Sobat-TB application, which can play a major role in TB prevention and control, especially in

Probolinggo, East Java. Health counseling is one of the most effective ways to increase knowledge and change attitudes toward TB. The Sobat-TB app, as a modern technology tool, can extend the reach of counseling and make information more accessible (Andriani & Sukardin, 2020). This study showed that counseling and the use of Sobat-TB were effective in improving community knowledge and attitudes toward pulmonary TB. Structured delivery of materials and the use of technology in the form of an application helped respondents better understand the information and adopt more positive attitudes toward preventing pulmonary TB (Teo et al., 2021). Significant changes in the pretest and posttest results for both knowledge and attitude indicate that the intervention had a major impact. This can serve as a basis for other health programs to integrate technology into public health education and outreach activities (Adnyana et al., 2023).

Providing technology-assisted counseling has advantages and positive impacts on respondents, including a) counseling and applications that can provide accurate and consistent information about TB to the community. Through application and continuous outreach, this information can be accessed anytime and anywhere, making it a highly effective tool for health education (Astuti et al., 2019); b) by building awareness of symptoms and the importance of early diagnosis, with a better understanding of TB symptoms, people can more quickly seek medical diagnosis and treatment, ultimately reducing the risk of transmission; and c) appropriate outreach can help reduce stigma and discrimination against people with TB. The Sobat-TB app can also provide a support platform for TB patients, provide information on support groups, and encourage more open communication about the disease (Gysi et al., 2022; Noviyani et al., 2021). d) The Sobat-TB app can remind patients of their medication schedule, provide information on the importance of completing treatment, and provide motivational support. This is critical for preventing the development of drug-resistant TB (Iskandar et al., 2023), and e) the app can be used to track patient progress, monitor treatment side effects, and enable easier interactions between patients and healthcare providers. This helps ensure that patients receive timely and high-quality care (M. Iqbal Alfarizi et al., 2021; Paramasivam et al., 2017).

CONCLUSION

Improving community knowledge and attitudes toward TB is key to preventing and controlling the disease. Increased knowledge enables people to recognize symptoms early, understand the modes of transmission, and understand the importance of proper treatment. Positive attitudes reduce stigma and encourage individuals to seek medical care and to adhere to treatment. Research in Probolinggo has shown that routine counseling and the use of the Sobat-TB app are effective interventions for improving community knowledge and attitudes. Before the intervention, the majority of respondents had poor knowledge of pulmonary TB, with 37 out of 50 respondents having poor attitudes toward TB prevention. After the intervention, 46 out of 50 respondents had good knowledge of pulmonary TB, with a highly significant relationship between pretest and posttest knowledge, and respondents' attitudes also improved significantly, with 48 out of 50 respondents showing good attitudes after the intervention, with a significant relationship between pretest and posttest attitudes. With these significant results, similar programs can be implemented in other areas to help reduce the TB burden in Indonesia. Improving access to information and continuous health education through modern technology is an important step toward achieving the goal of TB elimination in the future. Further research is needed regarding the role of TB buddies in reducing TB cases and transmission in several regions of East Java.

REFERENCES

- Adnyana, I. M. D. M. (2021). *Populasi dan Sampel*. In M. Darwin (Ed.), *Metode Penelitian Pendekatan Kuantitatif* (1st ed., pp. 103–116). CV. Media Sains Indonesia.
- Adnyana, I. M. D. M., Utomo, B., Eljatin, D. S., & Sudaryati, N. L. G. (2023). One Health approach and zoonotic diseases in Indonesia: Urgency of implementation and challenges. *Narra J*, 3(3), e257. <https://doi.org/10.52225/narra.v3i3.257>
- Aisah, S., Nurkharistna Al Jihad, M., Pebriani, A., Pranata, S., & Soesanto, E. (2024). Bibliometric Analysis of Nursing Interventions to Improve Adherence to Treatment among Patients with Tuberculosis. *Africa Journal of Nursing and Midwifery*, 26(1), 14557. <https://doi.org/10.25159/2520-5293/14557>
- Andriani, D., & Sukardin, S. (2020). Knowledge and Attitudes of Families with Prevention of Transmission of Tuberculosis (TBC) in the Work Area of Puskesmas Penana'e, Bima City. *Jurnal Ilmiah Ilmu Keperawatan Indonesia*, 10(3), 72–80. <https://doi.org/10.33221/jiiki.v10i03.589>
- Astuti, V. W., Nursasi, A. Y., & Sukihananto, S. (2019). Pulmonary tuberculosis prevention behavior improvement and structured-health education in Bogor regency. *Enfermería Global*, 18(2), 285–302. <https://doi.org/10.6018/eglobal.18.2.325821>
- Craciun, O. M., Torres, M. del R., Llanes, A. B., & Romay-Barja, M. (2023). Tuberculosis Knowledge, Attitudes, and Practice in Middle- and Low-Income Countries: A Systematic Review. *Journal of Tropical Medicine*, 2023, 1–15. <https://doi.org/10.1155/2023/1014666>
- Dameria, D., Hulu, V. T., Siregar, S. D., Manalu, P., Samosir, F. J., Rambe, F. U. C., & Hasibuan, N. (2023). Improvement of Patients' Knowledge, Attitude, and Practice on Tuberculosis Treatment Using Video and Leaflet. *Jurnal Promosi Kesehatan Indonesia*, 18(2), 79–88. <https://doi.org/10.14710/jpki.18.2.79-88>
- Darwin, M., Mamondol, M. R., Sormin, S. A., Nurhayati, Y., Tambunan, H., Sylvia, D., Adnyana, I. M. D. M., Prasetyo, B., Vianitati, P., & Gebang, A. A. (2021). *Quantitative approach research method* (T. S. Tambunan, Ed.; 1st ed.). CV Media Sains Indonesia.
- Gysi, S., Douberis, M., Légeret, C., & Köhler, H. (2022). The Role of the Pediatric Yorkhill Malnutrition Score (PYMS), Neutrophil-to-Lymphocyte and Platelet-to-Lymphocyte Ratios in Malnutrition Prediction of Hospitalized Children. *Children*, 9(9), 1378. <https://doi.org/10.3390/children9091378>
- Iskandar, D., Suwantika, A. A., Pradipta, I. S., Postma, M. J., & van Boven, J. F. M. (2023). Clinical and economic burden of drug-susceptible tuberculosis in Indonesia: national trends 2017–19. *The Lancet Global Health*, 11(1), e117–e125. [https://doi.org/10.1016/S2214-109X\(22\)00455-7](https://doi.org/10.1016/S2214-109X(22)00455-7)
- Jiang, Y., Luo, L., Gui, M., Liu, L., Lin, Y., Deng, G., Chen, J., & Zhang, P. (2022). Duration and Determinants of Delayed Diagnosis with Tuberculosis in Shenzhen, China: A Cross-Sectional Study. *Risk Management and Healthcare Policy*, 15, 1473–1481. <https://doi.org/10.2147/RMHP.S367998>
- Kaaffah, S., Kusuma, I. Y., Renaldi, F. S., Lestari, Y. E., Pratiwi, A. D. E., & Bahar, M. A.

- (2023). Knowledge, Attitudes, and Perceptions of Tuberculosis in Indonesia: A Multi-Center Cross-Sectional Study. *Infection and Drug Resistance*, 16, 1787–1800. <https://doi.org/10.2147/IDR.S404171>
- Kaka, M. P. (2021). The relationship between the level of knowledge and attitude of the family with the behavior of preventing the transmission of tuberculosis (TB) disease. *Media Husada Journal of Nursing Science*, 2(2), 6–12. <https://doi.org/10.33475/mhjns.v2i2.40>
- Kemntrian Kesehatan Republik Indonesia. (2023). *Profil Kesehatan Indonesia 2022* (1st ed.). Kementerian Kesehatan Republik Indonesia.
- M. Iqbal Alfarizi, Ricky Riyanto Iksan, & Sri Atun Wahyuningsih. (2021). Increase Family Knowledge of Lung Tuberculosis Prevention Attitudes. *Comprehensive Health Care*, 5(3), 89–98. <https://doi.org/10.37362/jch.v5i3.724>
- Madebo, M., Balta, B., & Daka, D. (2023). Knowledge, attitude and practice on prevention and control of pulmonary tuberculosis index cases family in Shebedino District, Sidama Region, Ethiopia. *Heliyon*, 9(10), e20565. <https://doi.org/10.1016/j.heliyon.2023.e20565>
- Moosazadeh, M., Kheradmand, M., Aarabi, M., Afshari, M., Parsaee, M., Nezammahalleh, A., & Hessami, A. (2021). Factors associated with delay in diagnosis among tuberculosis patients in the north of Iran. *Medical Journal of Indonesia*, 30(1), 60–65. <https://doi.org/10.13181/mji.oa.204476>
- Noviyani, A., Nopsopon, T., & Pongpirul, K. (2021). Variation of tuberculosis prevalence across diagnostic approaches and geographical areas of Indonesia. *PLOS ONE*, 16(10), e0258809. <https://doi.org/10.1371/journal.pone.0258809>
- Paramasivam, S., Thomas, B., Chandran, P., Thayyil, J., George, B., & Sivakumar, C. (2017). Diagnostic delay and associated factors among patients with pulmonary tuberculosis in Kerala. *Journal of Family Medicine and Primary Care*, 6(3), 643. <https://doi.org/10.4103/2249-4863.222052>
- Puspitasari, I. M., Sinuraya, R. K., Aminudin, A. N., & Kamilah, R. R. (2022). Knowledge, Attitudes, and Preventative Behavior Toward Tuberculosis in University Students in Indonesia. *Infection and Drug Resistance*, 15, 4721–4733. <https://doi.org/10.2147/IDR.S365852>
- Setiyowati, E., Khamidah, Nurul Khamariyah, Budhi Setianto, Nety Mawarda Hatmanti, Difran Nobel Bistara, & Erika Martining Wardani. (2023). Preventive behaviors toward transmission of pulmonary tuberculosis. *Bali Medical Journal*, 12(3), 3376–3381. <https://doi.org/10.15562/bmj.v12i3.4429>
- Setyawan, M. F., Mertaniasih, N. M., Utomo, B., Soedarsono, S., Adnyana, I. M. D. M., Eljatin, D. S., Sumah, L. H. M., Karina, C. Al, & Nuha, Z. (2023). An analysis of the trend of incidences and fatality of pulmonary tuberculosis in East Java from 2015-2020: A lesson from COVID-19. *National Journal of Community Medicine*, 14(5), 308–315. <https://doi.org/10.55489/njcm.140520232903>
- Siregar, P. A., Ashar, Y. K., Hasibuan, R. R. A., Nasution, F., Hayati, F., & Susanti, N. (2021). Improvement of Knowledge and Attitudes on Tuberculosis Patients with Poster

- Calendar and Leaflet. *Journal of Health Education*, 6(1), 39–46. <https://doi.org/10.15294/jhe.v6i1.42898>
- Teo, A. K. J., Singh, S. R., Prem, K., Hsu, L. Y., & Yi, S. (2021). Duration and determinants of delayed tuberculosis diagnosis and treatment in high-burden countries: a mixed-methods systematic review and meta-analysis. *Respiratory Research*, 22(1), 251. <https://doi.org/10.1186/s12931-021-01841-6>
- Utomo, B., Chan, C. K., Mertaniasih, N. M., Soedarsono, S., Fauziyah, S., Sucipto, T. H., Aquaresta, F., Eljatin, D. S., & Adnyana, I. M. D. M. (2022). Comparison epidemiology between Tuberculosis and COVID-19 in East Java Province, Indonesia: An analysis of regional surveillance data in 2020. *Tropical Medicine and Infectious Disease*, 7(6), 83. <https://doi.org/10.3390/tropicalmed7060083>
- WHO. (2024). Tuberculosis. World Health Organization and International Labor Organization Join Forces to Release New Guidance on Social Protection for People Affected by TB. <https://www.who.int/news-room/fact-sheets/detail/tuberculosis>
- Yermi, Ardi, M., Lahming, Tahmir, S., & Pertiwi, N. (2018). Knowledge and Attitudes with Family Role in Prevention of Pulmonary Tuberculosis in Maros, Indonesia. *Journal of Physics: Conference Series*, 1028, 012001. <https://doi.org/10.1088/1742-6596/1028/1/012001>

