

*THE 8TH INTERNATIONAL SYMPOSIUM OF PUBLIC HEALTH 2024***MONITORING ANTI-TUBERCULOSIS DRUGS USAGE AMONG PEDIATRIC PATIENTS TO CONTROL TB TRANSMISSION IN FAMILY****Nursia Aja^{1,2*}, Ravik Karsidi¹, Sapja Anantanyu¹, Anik Lestari³**¹*Doctoral Program of Extension Education/Community Development, Postgraduate School Faculty, Universitas Sebelas Maret, Surakarta, Indonesia,*²*Public Health Faculty, Universitas Muhammadiyah Maluku Utara, Indonesia*³*Public Health Science, Faculty of Medicine, Universitas Sebelas Maret, Surakarta, Indonesia*

**Presenting author: Nursia Aja; Contact number: +6281340343845; Email: nursiaaja89@student.uns.ac.id*

ABSTRACT

Background: Tuberculosis (Tb) is one of main causes of death by infection. One of keys to successful treatment is patient compliance. Medical requires compliance with treatment, compliance Tb treatment is very important, because of transmission risk. This study to analyze determine of monitoring anti-Tb drugs usage among pediatric patients to controlling Tb transmission (TT) in family. **Methods:** Used quantitative design with an approach cross-sectional. Total sample used sampling where researchers took data from 2019 to 2022 total 155 respondents to control of TT in families of sufferers aged over 5 to 13 years. Survey relying on questionnaire to collecting data. Analyze used Chi-square test with significance level of $p < 0.05$. **Results and Discussions:** There were significant relationship between knowledge ($p = 0.000$; OR = 4.832; 95% CI = 2.415-9.669). Age has significant relationship in controlling TT in family ($p = 0.204$; OR = 1.621; 95% CI = 0.799-3.287), while family support, prevention level, drugs usage and risk level of transmitting Tb in family have no significant relationship. Anti-Tb drugs usage in pediatric patients to controlling TT in family. Implementing pulmonary Tb transmission program, it needs to be carried out comprehensively and screening of child patients suffering from Tb is also carried out regularly so that rate of reduction in pulmonary Tb is quickly achieved. **Conclusions:** Handling Tb in children requires cooperation with the patient's family and health workers through an epidemiological approach to infectious diseases to stop the spread of Tb disease.

Keywords: *anti-tuberculosis drugs usage, pediatric patients, tuberculosis transmission, family*

Introduction

Tuberculosis (Tb) is one of the main causes of death caused by infection. Tb is chronic disease where one of the keys to successful treatment is patient compliance (adherence) (Chida et al., 2015). Possibility of patient non-compliance during Tb treatment is very large. This non-compliance can occur due to several things, including long-term medication usage, large amount of medication taken and sufferer's awareness lack of disease (Direktorat Bina Farmasi Komunitas dan Klinik, 2005). Tb treatment is very important in controlling Tb. Anti-Tb treatment requires standard use of number of drugs regularly for period of at least six months for new patients and eight months for inpatients, which has been implemented in control and cure program (Tang et al., 2015). In treating Tb disease, for compliance with taking medication, mother and child must have very important role in process of compliance with taking medication in curing pulmonary Tb disease. Treatment adherence is an important determinant of successful outcomes (Davtyan et al., 2019) patients were cured in retreatment cases compared to new treatment cases and in the first two months after starting treatment (Park et al., 2021). Variety of public health program strategies have been used to increase adherence to Tb medications, including financial incentives and improving coordination and logistics around Tb treatment delivery, as well as training for health care providers. Directly observed therapy (Bayer & Wilkinson, 1995) adherence to medication, storing medication, issuing audible and visual alerts to remind patients to take their medication, and enabling healthcare providers to monitor compliance (Manyazewal et al., 2022). When taking medicine, child is often negligent in taking the medicine. This phenomenon often occurs in children with TB because child who has tuberculosis is often ostracized and even alienated from surrounding environment so that child's psychological pressure is definitely disturbed.

Medical requires compliance with treatment, compliance with tuberculosis (Tb) treatment is very important, because of transmission risk. Furthermore, patients who fail to follow recommended treatment are more likely to develop drug-resistant forms of Tb, which in turn will lead to more Tb disease complicating treatment process (Ravenscroft et al., 2020). Improving compliance by increasing patient satisfaction could be viable option, especially for Tb patients who have to follow long-term and complex therapy schemes managing disorder that come with multiple solutions in healing Tb patients.

Based on data from the Ternate City Health Service, the number of TB sufferers spread across health service facilities throughout Community Health Center (CHC) and several hospitals, namely in 2019 the number of Tb cases was 448 Tb cases, while in 2019 in Kalumpang CHC working area there were 54 TB cases, in 2020 amounting to 26 TB cases, in 2021 there will be 29 TB cases and in 2022 the number of TB sufferers will be 46 Tb cases, while the research limit examines last 4 years, namely from 2019-2022 there are 155 Tb cases in Kalumpang CHC Working Area in Central Ternate City . This data shows that the number of Tb cases has increased from the previous year. Even though CHC has good community health program infrastructure, it cannot guarantee compliance with treatment and taking medication as well as control of Tb cases in community and family environment.

Increase in number of TB sufferers is caused by various factors, namely lack of patient compliance in seeking treatment and taking medication, high drug prices, emergence of multiple resistance, patients take medication from clinic every week and undergo it with family support. Tb Clinic maintains database of contact information for patients treated at clinic (Chida et al, 2015). When patients started treatment, there was lack of host resistance to mycobacteria, decrease in bactericidal power of existing drugs, an increase in HIV/AIDS cases and an economic crisis. Even though various efforts have been made by government, without community participation, optimal results will not be achieved because Tb is not only a health problem but also social problem. Success of Tb control is very dependent on the level of community awareness and participation. Therefore, it is necessary to involve various parties and sectors in society, private sector, health professional organizations and social organizations as well as NGOs, especially pharmacist profession in pharmacies, hospital pharmacy installations, health centers and other places that serve the community in meeting their need for Tb drugs. The reported treatment outcomes of pediatric patients provide evidence about various aspects of the experience of living with an illness or condition and how important these aspects are to patient. In this, they go beyond clinical parameters and respect integrated nature of health, ideally encompassing physical, mental and social well-being (Kastien et al., 2016) as well as surrounding environment.

This is first time study has been conducted in Ternate City; Indonesia which is related to monitoring anti-Tb drugs usage in pediatric patients in controlling Tb transmission in family environment. This study focuses on non-standard treatment of patients suspected of having Tb carried out by health service facilities, which further worsens situation of Tb germ resistance. In addition, patients who do not comply with taking medication cause treatment therapy to take longer and patient's recovery. Health program carried out by CHC cannot guarantee rate of compliance with treatment and taking medication as well as Tb transmission (TT) in community or in family.

Research Method

This study used non-experimental methods, quantitative approach with research design using cross-sectional study, aims to determine the influence of causal effects simultaneously on individuals from population at one time and only assessed once at a time. Data collection used survey relying on an instrument in questionnaire form. Location was carried out in Ternate City within Kalumpang CHC working area.

Sampling technique using total sampling approach, took data from 2019 to 2022. Where family members were treated for pulmonary Tb in Kalumpang CHC working area. Respondents were child patients in control of Tb transmission in families of Tb sufferers aged over 5 to 13 years.

We used two analyzes each independently. This stage is carried out to obtain statistical analysis of univariate analysis to see description of each variable in form of average data and frequency distribution to measure variables. Based on gender, highest percentage of pulmonary Tb sufferers were boys (56.1%) while percentage of sufferers was girls (43.9%). Based on education level, highest number of pulmonary Tb sufferers were those with an education level of elementary school class V1, namely 46.5%, while those with no education were 4.5%. Good family support variable was 63.9%, while highest percentage of knowledge was in poor knowledge category (55.5%), while risk prevention action variable was (69.7%), risk treatment variable was (65.8%), risk transmission action variable was percentage of (85.2%) for Tb variable in pediatric patients in suffering families, namely 60.6%. Next, bivariate analysis was carried out to test relationship between variables using Chi-Square test. Conclusions are drawn based on significance value at $p < 0.05$. Determine magnitude of risk factors for variables, test was carried out using lowest Odds Ratio (OR) value for age, namely at the age of

5-60 years, amounting to 71.6%. Bivariate analysis to identify relationship between dependent variables, namely monitoring anti-tuberculosis usage medication in pediatric patients in controlling TT in families of Tb sufferers aged over 5 to 13 years. Independent variables, namely variables related to other variables. In this study, it consisted of: variables of age, knowledge, family support, level of prevention, use of drugs and level of risk of transmission.

This study was approved by the Health Research Ethics Committee Dr. Moewardi General Hospital RSUD Dr. Moewardi. (Num. 2.103/XI/HREC/2023).

Results and Discussion

Data analysis is in form of univariate analysis to see description of each variable in form of average data and frequency distribution. Next, bivariate analysis was carried out to test relationship between variables using Chi-Square test. Conclusions are drawn based on significance value at $p<0.05$. Determine magnitude of risk factors for variables, test was carried out using lowest OR value for age, namely at the age of 5-9 years, amounting to 71.6%.

Table 1. Characteristics and Frequency Distribution of Respondents		
Variable	Frequency	%
Age		
Risk 5 – 9 Years	111	71.6
No Risk > 10 - 13 Years	44	28.4
Gender		
Man	87	56.1
Woman	68	43.9
Education		
No school	7	4.5
Class I Elementary School	23	14.8
Elementary School Class IV	27	17.4
Elementary School Class VI	72	46.5
Finished elementary school	26	16.8
Knowledge		
Not enough	86	55.5
Good	69	44.5
Family support		
Good	99	63.9
Not enough	56	36.1
Preventive measure		
Risky	108	69.7
No Risk	47	30.3
Drug Use		
Risky	102	65.8
No Risk	53	34.2
Infection Risk Measures		
Risky	132	85.2
No Risk	23	14.8
Tuberculosis Sufferers		
Suffering from TB	94	60.6
Not suffering from TB	61	39.4

Source: Primary Data Processing (2024)

Based on table 1, gender highest percentage of pulmonary TB sufferers were boys (56.1%) while percentage of sufferers was girls (43.9%). Based on education level, highest number of pulmonary TB sufferers were those with an education level of elementary school class V1, namely 46.5%, while those with no education were 4.5%. Good family support variable was 63.9%, while highest percentage of knowledge was in poor knowledge category (55.5%), while risk prevention action variable was (69.7%), risk treatment variable was (65.8%), risk transmission action variable was percentage of (85.2%) for Tb variable in pediatric patients in suffering families, namely 60.6%.

Pulmonary Tb sufferers in Kalumpang CHC working area from 2019 to 2022 are dominated by at-risk group of children aged over 5-9 years, namely 71.6%. This is also in line with study results (Dubois et al., 2022) which found that highest number of pulmonary Tb sufferers in Pakistan were dominated by children with screening used from 8-10 children who received clinical examinations. In the age group that is not at risk, those aged over 10-13 years are 28.4% with family members who suffer from pulmonary Tb disease in children, which can reduce the quality of life and will be a burden for their family members.

In this study, results showed that proportion of pulmonary Tb sufferers based on gender was almost same, namely 56.1% of male sufferers and 43.9% of female sufferers. These results are also in line with 2013 Basic Research Health data. In several regions in Indonesia, it was reported that proportion of pulmonary Tbsufferers among men is higher than among women. Study Hadifah et al (2017) shows that pulmonary Tb sufferers in Pidie Regency are dominated by males, likewise research at Harapan Raya CHC, Pekanbaru City also shows that the incidence of pulmonary Tb is more in group of boys (Tri Siwi et al., 2015). Lar+ge number of pulmonary Tb sufferers occurring in men can be caused by vigilance lack towards family members. Research shows that frequency distribution of respondents at elementary school grade VI education level is 46.5% greater than those with lower non-school education, namely 4.5%.

Table 2. Analysis of Relationship between Age, Knowledge, Family Support, Prevention Level, Drug Usage and Risk Level of Transmission in Controlling Tb Transmission in Family

Variable	TB Transmission in the Family				P-Value	OR
	Suffering from TB		Not suffering from TB			
	N	%	n	%		
Age						
Risk 5 – 9 Years	71	75.5	40	65.6	0.204	1,621
No Risk > 10-13 Years	23	24.5	21	34.4		0.799-3.287
Knowledge						
Not enough	66	70.2	20	32.8	0,000	4,832
Good	28	29.8	41	67.2		2,415-9,669
Family support						
Good	61	64.9	38	62.3	0.864	1,119
Not enough	33	35.1	23	37.7		0.573-2.184
Levels of Prevention						
Risky	67	71.3	41	67.2	0.597	1,210
No Risk	27	28.7	20	32.8		0.603-2.430
Drug Use						
Risky	61	64.9	41	67.2	0.863	0.902
No Risk	33	35.1	20	32.8		0.456-1.783
Level of Risk of Infection						
Risky	81	86.2	51	83.6	0.652	1,222
No Risk	13	13.8	10	16.4		0.499-2.992

Sources: Primary Data Processing (2024)

Table 2 depicts bivariate analysis to see relationship between variables age, knowledge, family support, prevention level, anti-Tb drugs usage and risk level of transmission in controlling TT in family. Age has relationship in controlling TT in pulmonary Tb families ($p = 0.204$; OR = 1.621; 95% CI = 0.799 – 3.287). Knowledge has relationship in controlling TT in pulmonary Tb families ($p = 0.000$; OR = 4.832; 95% CI = 2.415–9.669). Family members who have poor knowledge have risk of pulmonary TT to family members 4.832 times greater than family members who have good knowledge. Family support is not significantly related to monitoring anti-Tb drugs usage in pediatric patients in controlling TT in family ($p = 0.864$; OR = 1.119; 95% CI = 0.573–2.184). Prevention level of transmission was not significantly related to controlling TT in family ($p = 0.597$; OR = 1.210; 95% CI = 0.603–2.430). Families who do not take measures to prevent TT have risk of pulmonary TT to family members 1,210 times greater than family members who have preventive measures. Meanwhile, drug use variable is not significantly related to monitoring anti-tuberculosis drugs usage in pediatric patients in controlling TT in family ($p = 0.863$; OR = 0.902; 95% CI = 0.456–1.783), while transmission level variable is not significantly related to controlling TT in family ($p = 0.652$; OR = 1.222; 95% CI = 0.499–2.992). Based on OR value, it shows that risk level pulmonary TT in families is 1.222 times greater than transmission level without risk when using pulmonary TB drugs.

Knowledge level can have significant relationship to controlling Tb transmission within family as obtained from results of this study. This is also in line with study conducted by Adane et al (2013) that there was significant relationship in study, namely ($p = 0.000$) between knowledge level and controlling pulmonary TT in family ($p = 0.000$; OR = 4.832). Poor level of knowledge would have a 4,832 times higher risk of contracting pulmonary TB in family compared to respondents with good knowledge. Higher person's level of knowledge is expected to be, higher of prevention level in controlling of pulmonary TT to their children. Results from previous studies are similar in that low knowledge may reflect higher risk of transmission, compared with good knowledge (Noé et al., 2017) Previous looking at this study is first to look at knowledge used for Tb diagnosis and testing resistance in high Tb burden setting with low knowledge resources. Although WHO issued recommendations supporting the Xpert MTB/RI Technology in December 2010 and its widespread use throughout the world since knowledge of its existence and purpose is still low in the world.

Comprehensive interventions in controlling the transmission of pulmonary Tb have great potential to reduce the number of sufferers. Various programs to eradicate pulmonary Tb in Indonesia have been carried out as an effort to reduce the rate of transmission, including Directly Observe Treatment Shortcourse (DOTS) Program and Find and Treat Until Heal (TOSS) Program to increase cure rate for pulmonary Tb sufferers (Aja & Ramli, 2022) Family support has an important role in treatment and prevention of disease. Family support can take form of moral support, emotional connection, providing information and feedback (Biswas et al., 2020) Having family support can influence sufferers to motivate themselves to seek treatment and have good health behavior in children. In this study, family support was not related to controlling transmission of pulmonary Tb in family ($p = 0.864$; OR = 1.119), however if family support was lacking it could cause transmission of pulmonary Tb in family 1.119 times compared to conditions of good family support, as shown obtained from the results of this study. This is also in line with research conducted by Machado et al (2015) was told that they entered as entrepreneurs in this village always because they were just members who completed their family, along with head of pesquisadora school. Inclusion criteria in this study were as follows: based on Tb diagnostic criteria, regardless of physical localization. If you receive notification via live broadcast, or if there is contact with professional assistant when confirming information obtained during the interview and direct consultation are not realized by the company other than company there is no confirmation of diagnosis of Tb, if it occurs directly, whether it is professional memory or consultation with family. Form for researchers, for every person diagnosed with Tb, for users, professional and other people, beyond situation in country, those who can be contacted only for professionals, due to difficulty of access to other places. Once the researchers realized that this was transcript, digitization, and rescue in format carried out by beggars and looked for other literature for their children.

From the results of this study, there is no significant relationship between prevention level of transmission and monitoring anti-tuberculosis drug usage in pediatric patients in controlling TT in families at risk, namely ($p = 0.597$; OR = 1.210). Not taking preventive measures in pulmonary TT in family will have risk of 1.210 times compared to respondents who take measures to prevent pulmonary Tb in children.

From the results of this study, there was no significant relationship with anti-tuberculosis drugs usage in pediatric patients in controlling of pulmonary TT in families with risky drug use ($p = 0.863$; $OR = 0.9020$). Risk of resistance to drug use in pediatric patients is 0.902 times compared to pediatric patients who use medication regularly which is adjusted by doctor to prescription and dosage given by doctor. This is also in line with research conducted by Pecora et al (2021) pediatric case reports or case series reported in literature. In study that enrolled 16 children treated with delamanid on compassionate basis, no side effects were reported in fifteen of them, while one child was treated with combination of delamanid, capreomycin, ethionamide, cycloserine, clofazimine, imipenem, amoxicillin/clavulanate, and pyrazinamide experienced vomiting, kidney problems, electrolyte disorders. In another case series, 36 children (0–17 years) treated with delamanid at two sites in Philippines and one site in South Africa well tolerated treatment.

From the results of this study, there was no significant relationship with risk level of TT in families at risk ($p = 0.652$; $OR = 1.222$). There is 1,222 times greater risk of transmission to family members compared to respondents who take preventive measures for their families. Importance of finding cases of Tb in children. While preventive therapy and contact tracing are effective and have benefits in preventing disease in children, most children are contacted too late and prevent their disease. Although cost-effectiveness analyzes and implementation barriers must be assessed, and early diagnosis of adult cases or widespread community screening approaches of children may be necessary to improve prevention of Tb in children. Third, we provide robust estimates of the risk of tuberculosis in children living with Tb infection or previous diagnosis of Tb. These children should be prioritized for preventive interventions and monitoring of disease progression. Fourth, there is concern that IGRAs may perform poorly in young children. However, this is also in line with the latest research conducted by Leonardo et al (2020) demonstrated good performance in infants < 2 years of age. 27.28 Our study confirmed these results in all children, finding that children aged <19 years with a positive IGRA test had 6 – 7 times higher risk of incident Tb than children with negative IGRA test. Results of our analysis should be understood in context of limited observational data from the various groups included in this study regarding incidence of Tb when assessing effectiveness of preventive therapy undertaken and administered to children at higher or lower risk of Tb. Results identified specific groups of children based on age and risk factors that could be prioritized for Tb control programs and found that although preventive therapy is highly effective for individual children, this strategy can only be targeted at small children proportion and should be used as an additional intervention with search efforts intensive cases to address these problems and global burden of Tb in children.

Even though majority of pulmonary incidents occur outside home or in community, comprehensive intervention can start from family environment. Occurrence of pulmonary TT in household or family is very high risk in controlling pulmonary TT in family which has been proven through molecular epidemiological investigations (Augustynowicz-Kopec et al., 2012). Therefore, WHO recommends routinely carrying out contact tracing on all children of pulmonary Tb sufferers to control Tb transmission in families to prevent and reduce the number of pulmonary TB sufferers in children (Otero et al., 2016).

Conclusion and Implications

Tb is chronic disease, and one of the keys to successful treatment is adherence. Increase in the number of TB patients is caused by various factors, one of which is compliance lack of patients to seek treatment and take medicine because of high price of drugs, resulting in multiple resistance. This is because patients take medicine from clinic every week and undergo need for family support. Therefore, it is necessary to cooperate with families of pediatric patients with Tb and health workers through an epidemiological approach to infectious diseases. There is need for further research by looking at other variables that may be related to anti-Tb drugs usage and control of TT in family, such as condition of home environment and nutritional status or nutritional fulfillment of family members.

References

- Adane, A.A., Alene, K.A., Koye, D.N., & Zeleke, B.M. (2013). Non-Adherence to Anti-Tuberculosis Treatment and Determinant Factors among Patients with Tuberculosis in Northwest Ethiopia. *PLoS ONE*, 8(11), e78791. doi: 10.1371/journal.pone.0078791.
- Augustynowicz-Kopec, E., Jagielski, T., Kozinska, M., Kremer, K., van Soolingen, D. & Bielecki J, Zwolska. Z. (2012). Transmission of Tuberculosis within Family-Households. *Journal of Infection*, 64, 596-60. Doi: <https://doi.org/10.1016/j.jinf.2011.12.022>.
- Bayer, R., & Wilkinson, D. (1995). Directly observed therapy for tuberculosis: history of an idea. *Lancet (London, England)*, 345(8964), 1545–1548. [https://doi.org/10.1016/s0140-6736\(95\)91090-5](https://doi.org/10.1016/s0140-6736(95)91090-5).
- Biswas B.R. (2010). The relationship between family support and health behaviors among patients with pulmonary Tb. *Available from* <https://api.semanticscholar.org/CorpusID:78743561>.
- Chida N, Ansari Z, Hussain H, Jaswal M, Symes S, Khan AJ, Mohammed S. Determinants of Default from Tuberculosis Treatment among Patients with Drug-Susceptible Tuberculosis in Karachi, Pakistan: A Mixed Methods Study. *PLoS One*. 2015 Nov 12;10(11):e0142384. doi: 10.1371/journal.pone.0142384.
- Davtyan, K., Aghabekyan, S., Davtyan, H., Hayrapetyan, A., Aslanyan, G. (2019). Quality of care provided to tuberculosis patients in Armenia: How satisfied are the patients? *JIDC The Joernal Infektion In Developing Countries*, 13(5.1), 28s-34s. Doi:10.3855/JIDC.10873.
- Direktorat Bina Farmasi Komunitas dan Klinik. (2005). Pharmaceutical Care Untuk Penyakit Tuberkulosis. *Jakarta: Departemen Kesehatan RI*.
- Dubois, M. M., Brooks, M. B., Malik, A. A., Siddiqui, S., Ahmed, J. F., Jaswal, M., Amanullah, F., Becerra, M. C., & Hussain, H. (2022). Age-specific Clinical Presentation and Risk Factors for Extrapulmonary Tuberculosis Disease in Children. *The Pediatric infectious disease journal*, 41(8), 620–625. <https://doi.org/10.1097/INF.0000000000003584>.
- Hadifah, Z., Manik, U. A., Zulhaida, A., & Wilya, V. (2017). Profil Penderita Tuberkulosis Paru Di Tiga Puskesmas Wilayah Kerja Kabupaten Pidie Propinsi Aceh. *Sel Jurnal Penelitian Kesehatan*, 4(1), 31–44. <https://doi.org/10.22435/sel.v4i1.1446>.
- Kastien-Hilka T, Abulfathi A, Rosenkranz B, Bennett B, Schwenkglenks M, Sinanovic E. (2016). Health-related quality of life and its association with medication adherence in active pulmonary tuberculosis- a systematic review of global literature with focus on South Africa. *Health Qual Life Outcomes*. 11, 14:42. Doi: 10.1186/s12955-016-0442-6.
- Machado, D.deC., Moreira, M. C., & Sant'Anna, C. C. (2015). Children with tuberculosis: situations and interactions in family health care. *Cad Saude Publica*; 31(9), 1964-74. Doi: 10.1590/0102-311X00084414..
- Manyazewal, T., Woldeamanuel, Y., Holland, D. P., Fekadu, A., & Marconi, V. C. (2022). Effectiveness of a digital medication event reminder and monitor device for patients with tuberculosis (SELFTB): a multicenter randomized controlled trial. *BMC medicine*, 20(1), 310. Doi: <https://doi.org/10.1186/s12916-022-02521-y>.
- Martinez, L., Cords, O., Horsburgh, C. R., Andrews, J. R., & Pediatric TB Contact Studies Consortium (2020). The risk of tuberculosis in children after close exposure: a systematic review and individual-participant meta-analysis. *Lancet (London, England)*, 395(10228), 973–984. Doi: [https://doi.org/10.1016/S0140-6736\(20\)30166-5](https://doi.org/10.1016/S0140-6736(20)30166-5).
- Noé, A., Ribeiro, R.M., Anselmo, R., Maixenchs, M., Sitole, L., Munguambe, K., Blanco, S., le Souef, P., García-Basteiro, A.L. (2017). Knowledge, attitudes and practices regarding tuberculosis care among health workers in Southern Mozambique. *BMC Pulmonary Medicine*, 17(1), 2. Doi: <https://doi.org/10.1186/s12890-016-0344-8>.

- Nursia Aja & Ramli, H.R. (2022). Penularan Tuberkulosis Paru dalam Anggota Keluarga di Wilayah Kerja Puskesmas Siko Kota Ternate. *Jurnal Kedokteran dan Kesehatan*, Vo.18(N0.1). <https://api.semanticscholar.org/CorpusID:261635329>.
- Otero, L., Shah, L., Verdonck, K., Battaglioli, T., Brewer, T., Gotuzzo, E., Seas, C., & Van der Stuyft, P. (2016). A prospective longitudinal study of tuberculosis among household contacts of smear-positive tuberculosis cases in Lima, Peru. *BMC infectious diseases*, 16, 259. Doi: <https://doi.org/10.1186/s12879-016-1616-x>.
- Park, S., Moon, N., Oh, B., Park, M., Kang, K., Sentissi, I., & Bae, S. H. (2021). Improving Treatment Adherence with Integrated Patient Management for TB Patients in Morocco. *International journal of environmental research and public health*, 18(19), 9991. <https://doi.org/10.3390/ijerph18199991>.
- Pecora, F., Dal Canto, G., Veronese, P., & Esposito, S. (2021). Treatment of Multidrug-Resistant and Extensively Drug-Resistant Tuberculosis in Children: The Role of Bedaquiline and Delamanid. *Microorganisms*, 9(5), 1074. Doi: <https://doi.org/10.3390/microorganisms9051074>.
- Ravenscroft, L., Kettle, S., Persian, R., Ruda, S., Severin, L., Doltu, S., Schenck, B., & Loewenstein, G. (2020). Video-observed therapy and medication adherence for tuberculosis patients: randomised controlled trial in Moldova. *The European respiratory journal*, 56(2), 2000493. <https://doi.org/10.1183/13993003.00493-2020>.
- Tang, Y., Zhao, M., Wang, Y., Gong, Y., Yin, X., Zhao, A., Zheng, J., Liu, Z., Jian, X., Wang, W., Wu, C., & Lu, Z. (2015). Non-adherence to anti-tuberculosis treatment among internal migrants with pulmonary tuberculosis in Shenzhen, China: a cross-sectional study. *BMC public health*, 15, 474. <https://doi.org/10.1186/s12889-015-1789-z>.
- Tri Siwi, K.N., Norlita, W., & Novita, R. (2015). Karakteristik penderita tuberkulosis tahun 2011-2012 di Puskesmas Harapan Raya Pekanbaru. *Jurnal Photon*, 5(2), 111-118. <https://api.semanticscholar.org/CorpusID:86646165>
- Vang, S. (2023). Health-related Quality of Life in Elderly Asian American and Non-Hispanic White Cancer Survivors. *Journal of preventive medicine and public health = Yebang Uihakhoe chi*, 56(5), 440–448. Doi: <https://doi.org/10.3961/jpmph.22.464>.