



## Treatment Success of Drug-Resistant Tuberculosis Patients in Semarang City

Fina Jazilatun<sup>✉</sup>, Sri Ratna Rahayu, Tika Dwi Cahyani, Aufina Nur Ayu Merzistya  
Universitas Negeri Semarang, Indonesia

### Article Info

Submitted 24 July 2023  
Accepted 24 August 2023  
Published 31 March 2024

Keywords:  
Factors, treatment suc-  
cess, treatment Supporter

DOI:  
<https://doi.org/10.15294/ijphn.v4i1.71814>

### Abstract

**Background:** The treatment success rate was the number of cured and fully treated tuberculosis cases among all treated and reported tuberculosis cases. In Semarang City, the treatment success rate for drug-resistant tuberculosis in 2016 was 71%, and decreased in 2017 to 43%. The purpose of this study was to determine the factors associated with successful treatment of Drug Resistant Tuberculosis in Semarang City.

**Methods:** Type of research is observational analytic research with case control design. Case samples were tuberculosis patients who were declared cured and complete treatment, control samples were tuberculosis patients who were declared not cured or failed. the number of samples in this study were 23 cases and 23 controls. This research instrument used a questionnaire sheet, bivariate analysis using chi-square analysis techniques.

**Results:** The results showed that factors associated with the successful treatment of drug-resistant tuberculosis were treatment supporter ( $p < 0.05$ ; OR=3.93), the role of drug swallowing superintendent ( $p < 0.01$ ; OR=10.20), medication compliance ( $p < 0.01$ ; OR=8.91), and comorbidity ( $p < 0.05$ ; OR=3.93).

**Conclusion:** Factors that were not associated with successful treatment of drug-resistant tuberculosis were age, gender, education level, Occupations, income, smoking status, nutritional status, drug side effects, staff attitude, and distance health facilities.

© 2024 Universitas Negeri Semarang

<sup>✉</sup> Correspondence Address:  
Universitas Negeri Semarang, Indonesia.  
Email : [fina.zila98@gmail.com](mailto:fina.zila98@gmail.com)\*

## Pendahuluan

Tuberculosis remains a public health problem that poses a global challenge. Tuberculosis is an infectious disease caused by the *Mycobacterium tuberculosis* germ. Indonesia is one of the countries with the largest burden of tuberculosis among 8 countries, namely India (27%), China (9%), Indonesia (8%), Philippines (6%), Pakistan (5%), Nigeria (4%), Bangladesh (4%) and South Africa (3%) (Kementerian Kesehatan RI, 2015).

Drug-resistant tuberculosis (DR-TB) is the resistance of the *Mycobacterium tuberculosis* germ, a condition where the germ can no longer be killed with anti-tuberculosis drugs (ATD). Drug-resistant tuberculosis is essentially a man-made phenomenon, resulting from inadequate treatment of tuberculosis patients and transmission from drug-resistant tuberculosis patients (Kementerian Kesehatan RI, 2013).

The number of tuberculosis cases in Indonesia according to the 2015 WHO Report, there are an estimated 1 million new tuberculosis cases per year (399 per 100,000 population) with 100,000 deaths per year (41 per 100,000 population). There are an estimated 63,000 HIV-positive tuberculosis cases (25 per 100,000 population). Case notification rate (CNR) of all cases reported was 129 per 100,000 population. The total number of cases was 324,539, of which 314,965 were new cases. The national HIV prevalence estimate among tuberculosis patients was estimated at 6.2%. The number of drug-resistant tuberculosis cases was estimated at 6700 cases, comprising 1.9% of drug-resistant tuberculosis cases from new tuberculosis cases and 12% of drug-resistant tuberculosis cases from tuberculosis with re-treatment (Kementerian Kesehatan RI, 2016).

According to WHO (2019), Indonesia has the third highest burden of tuberculosis in the world, after India and China. In 2018, an estimated 845,000 people fell ill and 93,000 people died from tuberculosis. Of these tuberculosis cases, 24,000 were drug-resistant tuberculosis, 21,000 were accompanied by HIV disease (WHO Global TB Report, 2019).

In 2018, the treatment success rate for all tuberculosis cases in Central Java was 77.1%. This shows that the success rate of tuberculosis

treatment has not yet reached the target of the Central Java Provincial Health Office plan, which is 90%. The death rate during treatment in Central Java in 2018 was 1.8 per 100,000 population (Profil Kesehatan Provinsi Jawa Tengah Tahun 2018, 2019). In Semarang City, the success rate of drug-resistant tuberculosis treatment in 2016 was 71%, and decreased in 2017 to 43% (Data Persebaran Pasien TB-RO Berdasarkan Wilayah Kerja Puskesmas Di Kota Semarang, 2020).

There are several factors that cause cases of DR-TB or MDR-TB to continue to increase, including the uneven distribution of Tuberculosis treatment services in Indonesia, and inadequate facilities. From the patient's perspective, Drug-Resistant Tuberculosis cases occur due to poor adherence to medication, which is often caused by the presence of drug side effects (Kementerian Kesehatan RI, 2015). The purpose of this study was to determine the factors associated with successful treatment of drug-resistant tuberculosis in Semarang City.

## Method

This type of research is an observational analytic study with a case control research design. This research was conducted from August to November 2020 and was approved by Universitas Negeri Semarang Health Research Ethics Commission Number: 062/KEPK/EC/2020. Data collection was carried out at the Semarang City Health Office and public health center (PHC) in Semarang City. The data used was the data of drug-resistant tuberculosis patients from January 2015 to December 2019 who were recorded as drug-resistant tuberculosis patients in Semarang City.

The sampling technique in this study was purposive sampling. Case samples in this study were patients who were treated with drug-resistant tuberculosis from January 2015 to December 2019 at the public health center (PHC) in Semarang City who according to medical records were declared cured and complete treatment. Control samples in this study were patients who were treated with drug-resistant tuberculosis from January 2015 to December 2019 at the public health center (PHC) in Semarang City who according to medical records were declared not cured or

failed. The variables in this study were age, gender, education level, employment status, income, tuberculosis treatment supporter, smoking status, nutritional status, drug side effects, role of drug swallowing supervisor (DSS), attitude of the officer, Health Facility Distance, medication adherence, comorbidity.

The instruments in this study used questionnaires and medical records that had been tested for validity and reliability. Data collection techniques were carried out by interview using questionnaires and observation. Data analysis used chi-square analysis techniques. The analysis was carried out with the help of SPSS software.

## Results and Discussion

### The results of bivariate analysis are presented in Table 1.

Table 1 was known that there was no relationship between age and the success of tuberculosis treatment in Semarang city area. This was based on analysis with the chi-square test, which obtained a p-value of 0.35. This research was in line with research conducted by Anisah et al., (2021), which explained that there was no relationship between age and treatment success as evidenced by the confidence interval value of 0.39-3.58. Different results were shown by previous studies which showed that most patients with Drug Resistant Tuberculosis who succeeded in treatment were productive age, namely aged <44 years where at a productive age had a greater effort to recover compared to patients of unproductive age because it required more effort and support to get treatment services until the patient succeeds in treatment. (Khan et al., 2015).

Table 1 was known that there was no association between gender and the success of drug-resistant tuberculosis treatment in Semarang City. This was based on the analysis with the chi-square test, which obtained a p-value of 0.37. This study was in line with research conducted by Aminah & Djuwita (2021) which explained the absence of an association between gender and treatment outcomes of patients with drug-resistant tuberculosis with short-term alloys. A different result was shown by a previous study which showed that male gender was a factor associated

with treatment failure as men are more likely to be smokers and had more comorbidities (Feng et al., 2012).

Table 1 was known that there was no association between education level and the success of drug-resistant tuberculosis treatment in Semarang City. This was based on the analysis with the chi-square test, which obtained a p-value of 0.38. This study was in line with research conducted by Prananda & Andatani, (2018) with a value of  $P > 0.005$  ( $p = 0.405$ ), which reinforces that the level of education variable was not meaningful because not all patients with drug-resistant tuberculosis who had basic education had low knowledge and not all patients with high education had high knowledge about tuberculosis. Different results were shown by previous studies which showed that the success of tuberculosis treatment was correlated with the level of education or knowledge. Higher education would make it easier for people to absorb information and knowledge to lead a healthy life and overcome their health problems (Hakim & Putri, 2015).

Table 1 was known that there was no association between employment status and the success of drug-resistant tuberculosis treatment in Semarang City. This was based on the analysis with the chi-square test, which obtained a p-value of 0.55. This research was in line with Setyaningrum, (2018) There was no association between employment status and the success of tuberculosis treatment, and patients who worked and did not work had the same adherence to taking medication, so it did not affect the success of treatment. Research by Widyasrini & Probandari, (2017) also stated that there was no association between employment status and the success of tuberculosis treatment in Surakarta with a p-value of 0.31.

Table 1 was known that there was no association between income and successful treatment of drug-resistant tuberculosis in Semarang City. This was based on the analysis with the chi-square test, which obtained a p-value of 0.74. The absence of a relationship between income level and treatment success in this study of Tuberculosis patients was in line with research conducted by Rahmah et al., (2018) which showed that there was no relationship between income and treatment

success in tuberculosis patients at the Johar Baru sub-district health center in Central Jakarta in 2016. The results of a study conducted by Andrade et al., (2019) showed that higher cure rates could be found in individuals with Tuberculosis who received social benefits during treatment. However, there was no statistically significant relationship between income and tuberculosis treatment success.

Table 1 was known that there was an association between treatment supporters and the success of drug-resistant tuberculosis treatment in Semarang City area. This was based on the analysis with chi-square test, which obtained a p-value of 0.03 and OR 3.93. These results indicate that people who had a treatment supporter were 3.93 times more likely to be successful in treatment compared to people who did not have a treatment supporter. This research was in line with Giri et al., (2022) There was a significant impact of treatment supporter on treatment outcomes, and treatment supporter played a crucial role in reducing treatment failure. Different results were shown by Dogah et al., (2021) which stated that there was no relationship between treatment supporters and adherence to taking medication so that it did not affect the success of tuberculosis treatment with a p-value of 0.75.

Table 1 was known that there was no association between smoking status and successful treatment of drug-resistant tuberculosis in Semarang City. This was based on the analysis with chi-square test, which obtained a p-value of 0.24. This study was in line with Aslamiyati et al., (2019) which stated that there was no relationship between smoking status and the success of pulmonary tuberculosis treatment in public health center Kedungmundu Semarang City with a p-value of 0.46. Different results were shown by Mariawati et al., (2021) which stated that there was an association between active smoking and the incidence of conversion failure in tuberculosis patients.

Table 1 was known that there was no association between nutritional status and successful treatment of drug-resistant tuberculosis in Semarang City. This was based on the analysis with chi-square test, which obtained a p-value of 1.00. This study was in line with

Research by Widyasrini & Probandari, (2017) also stated that the nutritional status of MDR-TB patients was not associated with treatment success with a p-value of 0.718. Different results were shown by Intiyati et al., (2012) which stated that there was a relationship between nutritional status and recovery in patients with pulmonary tuberculosis in the Pulmonary Clinic of Sidoarjo Regional Hospital.

Table 1 was known that there was no association between drug side effects and the success of drug-resistant tuberculosis treatment in Semarang City area. This was based on the analysis with chi-square test, which obtained a p-value of 1.00. This study was in line with Aminah & Djuwita, (2021) which illustrated that patients with mild side effects were 1.42 times more likely to have successful treatment than patients with severe side effects, although this was not statistically significant (p-value=0.103). However, different results were shown by Wahyuningsih, (2020) which showed that there was a tendency that the lighter the side effects felt by respondents, the more compliant they would be in taking medicine, and the more severe the side effects would have an impact on the more non-compliant respondents in taking Tuberculosis drugs which could affect the success of treatment.

Table 1 was known that there was an association between the role of Drug Swallowing Supervisor (DSS) and the success of drug-resistant tuberculosis treatment in Semarang City area. This was based on analysis with chi-square test, which obtained a p-value of 0.01 and OR 10.20. These results indicated that a high role of the drug swallowing supervisor (DSS) had a risk of 10.20 times more successful treatment than a low role of the drug swallowing supervisor (DSS). Research by Sari et al., (2022) stated that the role of Drug Swallowing Supervisor (DSS) was needed by tuberculosis patients so that patients were on time in taking medication. Different results were shown by Dailami et al., (2019) which stated that there was no significant relationship between the presence of drug swallowing supervisors and the recovery status of pulmonary tuberculosis patients with a p-value of 0.67

Table 1 was known that there was no association between the attitude of officers

and the success of drug-resistant tuberculosis treatment in Semarang City area. This was based on the analysis with the chi-square test, which obtained a p-value of 0.69. Research by Sari et al., (2022) stated that the attitude or role of health workers during the provision of health services to tuberculosis patients was very important in providing information about the importance of taking drugs regularly and completely, explaining the correct rules for taking drugs and symptoms of side effects that might be experienced by patients, the willingness of officers to listen to patient complaints and provide solutions, and the role of officers in providing health counseling to patients so as to increase success in treatment.

Table 1 was known that there was no association between the distance of health facilities and the success of drug-resistant tuberculosis treatment in Semarang City. This was based on the analysis using the chi-square test, which obtained a p-value of 1.00. This study was in line with Widyasrini & Probandari, (2017) which stated that the distance where MDR-TB patients lived was not associated with the success of patient treatment with a p-value of 0.973. In difference to research Yulisetyaningrum et al., (2019) which showed that there was a relationship between distance from home and adherence to taking medication for tuberculosis patients at Sunan Kudus Islamic Hospital with a p-value of 0.000.

Table 1 was known that there was an association between medication adherence and successful treatment of drug-resistant tuberculosis in Semarang City area. This was based on the analysis with chi-square test, which obtained p-value <0.01 and OR 8.91. These results indicated that people who adhered to taking medication were 8.91 times

more likely to succeed in treatment compared to people who did not adhere to taking medication. This research was in line with research conducted by Panggayuh et al., (2019) which showed that there was a relationship between medication compliance and the success of pulmonary tuberculosis treatment at Karsa Husada Batu General Hospital with a p-value of <0.001. Different results were shown by Priska P. H Kondoy, Dina V Rombot, Henry M.F Palandeng, (2012) which showed that there was no relationship between the side effects of anti-tuberculosis drugs (ATD) and compliance with pulmonary tuberculosis treatment with a p-value of 0.460, which also showed that drug compliance did not affect the success of treatment.

Table 1 it was known that there was an association between comorbidities and the success of drug-resistant tuberculosis treatment in Semarang City area. This was based on the analysis with chi-square test, which obtained a p-value of 0.03 and OR 3.93. These results indicated that people who did not have comorbidities were 3.93 times more likely to be successful in treatment compared to people who had comorbidities. Research by Ncube et al., (2017) stated that the elderly who had comorbidities showed worse treatment outcomes than other age groups. Research by Cáceres et al., (2022) stated that when Tuberculosis disease was accompanied by Diabetes it was 'like a vicious circle', meaning that the effects of each disease could compound negatively, synergistically, complicating the patient's health condition.. Research by (Samuels et al., 2018) also found no clear association between unsuccessful treatment outcomes and comorbidities.

Table 1. Bivariate Analysis Results

Independent Variable	p-value	OR	CI 95%
Age	0.35	4.63	0.48-45.08
Gender	0.37	0.59	0.18-1.90
Educational Level	0.38	1.69	0.53-5.47
Employment Status	0.55	1.42	0.44-4.53
Income	0.74	0.81	0.22-2.92
TB Treatment Supporter	0.03	3.93	1.09-14.19
Smoking Status	0.24	3.71	0.66-20.76
Nutritional Status	1.00	0.78	0.17-3.28
Drug Side Effects	1.00	1.00	0.31-3.27
The Role of Drug Swallowong Supervisor (DSS)	<0.01	10.20	2.62-39.72
Attitude of Officer	0.69	1.85	0.39-8.87
Health Facility Distance	1.00	2.09	0.18-24.86
Medication Adherence	<0.01	8.91	2.24-35.33
Comorbidity	0.03	3.93	1.09-14.19

### Conclusion

Factors associated with the successful treatment of drug-resistant tuberculosis were treatment supporter ( $p < 0.05$ ;  $OR = 3.93$ ), role of drug swallowing supervisor (DSS) ( $p < 0.01$ ;  $OR = 10.20$ ), medication adherence ( $p < 0.01$ ;  $OR = 8.91$ ), and comorbidity ( $p < 0.05$ ;  $OR = 3.93$ ). After controlling for other variables, factors that were not associated with successful treatment of drug-resistant tuberculosis were age, gender, education level, employment status, income, smoking status, nutritional status, drug side effects, attitude of the officer, and health facility distance.

### References

- Afdilla, J. W., Insan Sosiawan A Tunru, & Yusnita. (2016). *Hubungan Perilaku Merokok Terhadap Keberhasilan Pengobatan Pada Pasien Tuberkulosis di Puskesmas Kecamatan Johar Baru*, Jakarta Pusat Tahun 2016. 0–5.
- Aminah, N. S., & Djuwita, R. (2021). Trend dan Faktor yang Berhubungan dengan Keberhasilan Pengobatan Pasien TB MDR Paduan Jangka Pendek di Indonesia 2017-2019. *Pro Health Jurnal Ilmiah Kesehatan*, 109(1), 109–117.
- Andrade, K. V. F. de, Nery, J. S., Araújo, G. S. de, Barreto, M. L., & Pereira, S. M. (2019). Association between treatment outcome, sociodemographic characteristics and social benefits received by individuals with tuberculosis in Salvador, Bahia, Brazil, 2014-2016. *Epidemiologia e Serviços de Saude: Revista Do Sistema Unico de Saude Do Brasil*, 28(2), e2018220. <https://doi.org/10.5123/S1679-49742019000200004>

- Anisah, A., Sumekar, D. W., & Budiarti, E. (2021). Hubungan Demografi dan Komorbid dengan Kejadian Tuberkulosis Resisten Obat (TB RO). *Jurnal Ilmiah Kesehatan Sandi Husada*, 10(2), 568–574. <https://doi.org/10.35816/jiskh.v10i2.655>
- Aslamiyati, D. N., Wardani, R. S., & Kristini, T. D. (2019). Faktor yang Berhubungan dengan Keberhasilan Pengobatan Tuberkulosis Paru (Studi di Puskesmas Kedungmundu Kota Semarang). *Prosiding Mahasiswa Seminar Nasional Unimus*, 102–108. <https://prosiding.unimus.ac.id/index.php/mahasiswa/article/view/447>
- Cáceres, G., Calderon, R., & Ugarte-Gil, C. (2022). Tuberculosis and comorbidities: treatment challenges in patients with comorbid diabetes mellitus and depression. *Therapeutic Advances in Infectious Disease*, 9, 1–17. <https://doi.org/10.1177/204993612211095831>
- Dailami, F. A. M., Wiraharja, R. S., & Christyia, F. (2019). Relationship Between Successful Treatment of Pulmonary Tuberculosis Patients With the Availability of Treatment Supporter in Atma Jaya Hospital. *Damianus Journal of Medicine*, 18(2), 67–73. <https://doi.org/10.25170/djm.v18i2.2221>
- Data Persebaran Pasien TB-RO Berdasarkan Wilayah Kerja Puskesmas di Kota Semarang, (2020).
- Profil Kesehatan Provinsi Jawa Tengah Tahun 2018, (2019).
- Dogah, E., Aviisah, M., Kuatowo, D.-A. M., Kpene, G. E., Lokpo, S. Y., & Edziah, F. S. (2021). Factors Influencing Adherence to Tuberculosis Treatment in the Ketu North District of the

- Volta Region, Ghana. *Tuberculosis Research and Treatment*, 2021, 1–6. <https://doi.org/10.1155/2021/6685039>
- Feng, J., Huang, S., Ting, W., Chen, Y., Lin, Y., Huang, R., Lin, C., Hwang, J., & Lee, J. (2012). *Gender differences in treatment outcomes of tuberculosis patients in Taiwan : a prospective observational study*. 1–7.
- Giri, O. P., Kumar, A., Giri, V. P., & Nikhil, N. (2022). Impact of Treatment Supporters on the Treatment Outcomes of Drug Resistant-Tuberculosis (DR-TB) Patients: A Retrospective Cohort Study. *Cureus*, 14(c). <https://doi.org/10.7759/cureus.22886>
- Hakim, A., & Putri, P. M. (2015). Pengaruh latar belakang pendidikan pasien terhadap keteraturan pengobatan TB paru di Puskesmas Wangon I Banyumas. *Psycho Idea*, 13(2).
- Intiyati, A., Mukhis, A., Arna, Y. D., & Fatimah, S. (2012). Hubungan Status Gizi dengan Kesembuhan Penderita Tb Paru Di Poli Paru di Rumah Sakit Daerah Sidoarjo. *The Indonesian Journal of Health Science*, 3(1), 60–74.
- Kementerian Kesehatan RI. (2013). *Peraturan Menteri Kesehatan Republik Indonesia Pedoman Manajemen Terpadu Pengendalian Resistan Obat Tuberculosis*. 285, 6–132.
- Kementerian Kesehatan RI. (2015). *Temukan Obati Sampai Sembuh*. Pusat Data dan Informasi Kementerian Kesehatan RI.
- Kementerian Kesehatan RI. (2016). Tuberculosis Control Program. *New England Journal of Medicine*, 244(26), 993–994. <https://doi.org/10.1056/nejm195106282442609>
- Khan, M. A., Mehreen, S., Basit, A., Khan, R. A., Jan, F., Ullah, I., Ihtesham, M., Khan, A., Ullah, U., & Javaid, A. (2015). Characteristics and treatment outcomes of patients with multi-drug resistant tuberculosis at a tertiary care hospital in Peshawar, Pakistan. *Saudi Medical Journal*, 36(12), 1463–1471. <https://doi.org/10.15537/smj.2015.12.12155>
- Mariawati, M., Amirus, K., & Marliyana, M. (2021). Kepatuhan menelan obat, merokok dan resiko kegagalan konversi (BTA positif) pada pasien tuberculosis. *Holistik Jurnal Kesehatan*, 14(4), 581–589. <https://doi.org/10.33024/hjk.v14i4.1600>
- Ncube, R. T., Takarinda, K. C., Zishiri, C., van den Boogaard, W., Mlilo, N., Chiteve, C., Siziba, N., Trinchán, F., & Sandy, C. (2017). Age-stratified tuberculosis treatment outcomes in Zimbabwe: are we paying attention to the most vulnerable? *Public Health Action*, 7(3), 212–217. <https://doi.org/10.5588/pha.17.0024>
- Panggayuh, P. L., Winarno, M. E., & Tama, T. D. (2019). Faktor Yang Berhubungan dengan Keberhasilan Pengobatan Tuberculosis Paru di Rumah Sakit Umum Karsa Husada Batu. *Sport Science and Health*, 1(1), 28–38. <http://journal2.um.ac.id/index.php/jfik/article/view/9986>
- Prananda, V., & Andatani, N. (2018). Hubungan Tingkat Pendidikan Terhadap Angka Kejadian Multidrug Resistant Tuberculosis (MDR-TB) di RSUDZA Banda Aceh. *Jurnal Penelitian Nanggroe Medika*, 1(4), 7–13. <https://jknamed.com/jknamed/article/download/27/32/>
- Priska P. H Kondoy, Dina V Rombot, Henry M.F Palandeng, T. A. P. (2012). Faktor-Faktor Yang Berhubungan Dengan Kepatuhan Tuberculosis Paru di Lima Puskesmas di Kota Manado Berobat Pasien. *Jurnal Kedokteran Komunitas Dan Tropik*, 1–8.
- Rahmah, P. M., Tunru, I. S. A., & Yusnita. (2018). Hubungan Tingkat Pendapatan Terhadap Keberhasilan Pengobatan Tuberculosis di Puskesmas Kecamatan Johar Baru Jakarta Pusat Tahun 2016. *Jurnal Profesi Medika : Jurnal Kedokteran Dan Kesehatan*, 12(2), 7–12. <https://doi.org/10.33533/jpm.v12i2.262>
- Samuels, J. P., Sood, A., Campbell, J. R., Ahmad Khan, F., & Johnston, J. C. (2018). Comorbidities and treatment outcomes in multidrug resistant tuberculosis: A systematic review and meta-analysis. *Scientific Reports*, 8(1), 1–13. <https://doi.org/10.1038/s41598-018-23344-z>
- Sari, A. R., Purwanto, H., & Rofi'i, A. Y. A. B. (2022). Gambaran Keberhasilan Pengobatan Pada Pasien Tuberculosis Paru Di Puskesmas Semanding. *Jurnal Keperawatan Widya Gantari Indonesia*, 6(2), 106. <https://doi.org/10.52020/jkwgi.v6i2.3374>
- Setyaningrum, R. (2018). Correlation between gender, age, education level, and working status with anti-tuberculosis drug uses (OATS) in patients with lung tb in Indonesia 2013. *International Journal of Chemical & Material Sciences*, 1, 7–13. <https://doi.org/10.31295/ijcms.v1n1.3>
- Wahyuningsih, S. (2020). *Gambaran Keberhasilan Pengobatan Multidrug Resistance Tuberculosis (MDR-TB) di Kota Makassar*. Universitas Islam Negeri Alauddin Makassar.
- Widyasri, E. R., & Probandari, A. N. (2017). Factors Affecting the Success of Multi

- Drug Resistance ( MDR-TB ) Tuberculosis Treatment in Residential Surakarta. *Journal of Epidemiology and Public Health*, 2, 45–57.
- WHO Global TB Report, (2019).
- Yulisetyaningrum, Hidayah, N., & Yuliarti, R. (2019). Hubungan Jarak Rumah Dengan Kepatuhan Minum Obat Pada Pasien TBC Di RSI Sunan Kudus. *Jurnal Ilmu Keperawatan Dan Kebidanan*, 10(1), 248–255. <https://doi.org/10.26751/jikk.v10i1.676>