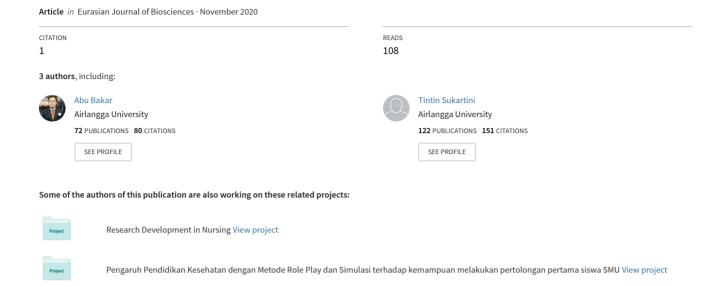# The relationship of nurse characteristics with prevention behavior and control of pulmonary tuberculosis infection

3 authors, including:

Abu Bakar
Airlangga University
72 PUBLICATIONS   **80** CITATIONS

SEE PROFILE

Tintin Sukartini
Airlangga University
122 PUBLICATIONS   **151** CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:

Research Development in Nursing View project

Pengaruh Pendidikan Kesehatan dengan Metode Role Play dan Simulasi terhadap kemampuan melakukan pertolongan pertama siswa SMU View project

The relationship of nurse characteristics with prevention behavior and control of pulmonary tuberculosis infection

Tintin Sukartini [1*], **Ahmad Eko Wibowo** [1], **Abu Bakar** [1]

[1] Faculty of Nursing, Universitas Airlangga, Surabaya, INDONESIA
*Corresponding author: tintin-s@fkp.unair.ac.id

Abstract
Nurses who work in the Tuberculosis (TB) room are at great risk of contracting the disease. This study aimed to analyze the relationship of nurse characteristics with the prevention behavior and control of Tuberculosis infection. This research used a cross-sectional design. The population was all the nurses who work in the TB room. The number of the population taken was 40 respondents who have met the inclusion criteria. The dependent variable was the prevention behavior and control of Tuberculosis infection, while the independent variable was the nurse characteristics. The data were taken using questionnaires and observations towards nurses. Then, the data were analyzed using Chi-Square. The result showed no relation between education level with prevention behavior and tuberculosis infection ($p=0.525$). Training has no relation with the prevention behavior and control of tuberculosis infection ($p=0.316$). Working time has no relation to the prevention behavior and control of tuberculosis infection ($p=0.190$). Knowledge has no relation with the prevention behavior and control of tuberculosis infection ($p=0.798$). Attitude and motivation have no relation with the prevention behavior and control of tuberculosis infection ($p=1.000$). It can be concluded that there is no relation between nurse characteristics and prevention behavior and control of tuberculosis infection. The nurse behavior has implemented four pillars of prevention behavior and control of tuberculosis infection. Further research is suggested to research things related to the prevention behavior and control of tuberculosis infection such as compliance, workload, and self-efficacy of nurses.

Keywords: control of tuberculosis infection, nurses' characteristics, prevention behavior

INTRODUCTION

The case of Tuberculosis (TB) has still become a very serious problem in the world. It is often known as infectious disease. Tuberculosis is caused by Mycobacterium Tuberculosis bacteria (Daulay, Majeda, & Nataprawira, 2018; Syarifah, Mutiara, & Novita, 2019; Zetov et al., 2019). TB can attack anyone, regardless of age or gender, whether it be women, men, adults, or children (Ariga & Amelia, 2018; Irmawati, Ridwan, & Ansar, 2019). TB continues to become a health problem globally, especially in some developing countries, including Indonesia. The tuberculosis problem is increasing, making the disease the re-emerging, so the WHO declared TB as a health emergency. Nurses are one of the health officers who handle TB patients with great risk of infected by the disease (Claassens et al., 2013). Nurses who work in TB room have a great risk of getting infected with the disease (Claassens et al., 2013). Nowadays, TB is often known as a disease caused by works or known as an occupational disease (Claassens et al., 2013). Nowadays, TB is often known as a disease caused by works or occupational disease

(Claassens et al., 2013). This situation needs more serious attention in conducting prevention behavior and control of Tuberculosis infection. Nurse behavior is influenced by several characteristics, such as attitude and motivation (Madjid et al., 2019; Nursalam, 2015). Nurse characteristics also consist of knowledge, education, training, and working time (Nursalam, 2015). Positive attitude and good Knowledge in the prevention of tuberculosis infection are the main factors related to a good prevention behavior and control of tuberculosis infection (Engelbrecht, van Rensburg, Kigozi, & van Rensburg, 2016).

Tuberculosis is identified as the top 10 deadly diseases in the world (World Health Organization, 2016). According to the World Health Organization in 2018, patients with TB in Indonesia achieved second place in the biggest country with the disease after India (World Health Organization, 2018). The number of TB in Indonesia is around 330,729 cases (WHO, 2016).

According to the report of East Java's Health Service, patients with TB who treated in East Java were around 40,185 people, and the number of patients with TB lungs positive BTA was around 21,475 people. This puts East Java in second place of the highest number of TB patients in Indonesia after West Java (Dinkes Jatim, 2016).

The nurse behavior in the prevention and control of TB infection is very crucial, namely by implementing the TB Infection Prevention and Control (PPI) policy covering four pillars: managerial control, administrative control, environmental control, and self-protection control (Chen et al., 2016). One of the efforts to prevent the transmission of TB through the behavior of the individual itself. Knowledge and attitude are the main factors in prevention and control behavior (Engelbrecht et al., 2016). In general, motivation refers to the existence of a driving force that moves to behave in certain ways, including PPI TB behavior (Muhith & Nursalam, 2012). TB training such as TB Directly observed treatment, short-course (DOTS), Multidrug-Resistant Tuberculosis (MDR TB), and PPI TB could be given to nurses as a form of implementing the four pillars of PPI TB. It is expected that by attending the training, it can influence the behavior of nurses in PPI TB (Engelbrecht et al., 2016). The nurses were working time influences PPI TB. The longer the nurse is in the TB room, the better the TB prevention and control behavior (Zhou et al., 2014).

MATERIALS AND METHODS

The design of this study used a cross-sectional, namely, analytic research design. The independent variable in this study is the characteristics of nurses consisting of knowledge, attitudes, motivation, education, years of service, and training that has been attended. The dependent variable in this study is TB prevention and control behavior. The instruments used in this study were questionnaire and observation sheet. The research questionnaire was tested for validity and reliability on October 3-5th 2017, in Surabaya, the observation sheet was used to measure TB infection prevention and control behavior. The study population was nurses who work in the four TB rooms in the hospital. Sampling was done by using purposive sampling with inclusion and exclusion criteria. The sample consisted of 40 implementing nurses during the monthly meeting and according to the nurse's guard schedule. The data were analyzed by inferential analysis using computer assistance. The data analysis technique used was Chi-Square to analyze the relationship of nurse characteristics with TB infection prevention and control behavior. This study has passed an ethical review (Ethical approval) at the Health Research Ethics Commission (KEPK) Faculty of Nursing Universitas

Table 1. Characteristics of respondents in TB inpatient

Characteristics	Frequency	Percentage
Age		
20-25 years old	7	17.50%
26-30 years old	21	52.50%
31-35 years old	7	17.50%
36-40 years old	5	12.50%
Total	40	100%
Gender		
Men	17	42.50%
Women	13	57.50%
Total	40	100%
Room		
Mawar	10	25%
Dahlia	11	27.50%
Anggrek	10	25%
HCU Infection	9	22.5%
Total	40	100%

Airlangga with number: 517-KEPK on September 25th, 2017.

RESULT

Based on the data in **Table 1**, the majority of respondents were from productive age, namely 26-30 years old, with 21 people (52.5%), while the gender of the majority of female respondents was 23 people (57.5%). And the distribution of respondents is almost evenly distributed in each TB inpatient room.

Based on **Table 2**, the best PPI TB behavior is in diploma respondents who have a 52.5% percentage. It is also still found that the respondents who behave sufficiently in doing the prevention and control of TB infection (PPI TB) of 1 person. There were several points of behavior when the researchers made observations that were not carried out, including the nurse did not di a fit test before wearing the N95 mask, the nurse did not apply universal precaution to all patients and did it all times (not washing hands five moments), and the nurse did not wear a gown when they were doing treatments. From the table, it can be concluded that the respondents have good PPI TB behavior. Based on the data analysis, the significant value on Chi-Square is p=0.525. It can be concluded that there is no relationship between the level of education with the behavior of preventing and controlling TB infection.

The best PPI TB behavior among respondents who did not have a training certificate (TB MDR/TB DOTS/PPI TB) was 62.5%. In contrast, respondents who only have one of the training certificates (TB MDR/TB DOTS/PPI TB) were 32.5%, consisting of respondents who behave reasonably 2.5% and well-behaved 30%. Respondents who have more than one training certificate (TB MDR/TB DOTS/PPI TB) and well-behaved are 5%. Respondents who behaved sufficiently have one of the TB training, namely PPI TB. Based on the analysis, the significant value of Chi-Square is p=0,316. It can be concluded that there is no relationship between training and prevention and control of TB infection (PPI TB) behavior.

Table 2. Statistical test of the relationship between education level and behavior of PPI TB

Variables	PPI TB Behavior				p
	Enough		Good		
	∑	%	∑	%	
Education Level					
Diploma	1	2.5	20	50	0.525
Undergraduate	0	0	19	47.5	
Total	1	2.5	39	97.5	
Training					
Less	0	0	25	62.5	
Enough	1	2.5	12	30	0.316
Good	0	0	2	5	
Total	1	2.5	39	97.5	
Work Period					
Less	0	0	18	45	
Enough	1	2.5	7	17.5	0.190
Good	0	0	14	35	
Total	1	2.5	39	97.5	
Knowledge					
Less	0	0	1	2.5	
Enough	0	0	12	30	0.798
Good	1	2.5	26	65	
Total	1	2.5	39	97.5	
Attitude					
Positive	0	0	20	50	
Negative	1	2.5	19	47.5	1.000
Total	1	2.5	39	97.5	
Motivation					
Less	0	0	0	0	
Enough	1	2.5	22	55	1.000
Good	0	0	17	42.5	
Total	1	2.5	39	97.5	

The best PPI TB behavior in respondents with a working period of ≤2 years is 45%. It is still found that respondents who behaved adequately in the prevention and control of TB infection (PPI TB) are ten people. Respondents who behaved adequately have three years work period from the beginning of the placement letter in the TB inpatient care. The conclusion from **Table 2** is that respondents have good PPI TB behavior. Based on the data analysis, the significant value on Chi-Square was $p=0,190$. It can be concluded that there is no relationship between the work period with the behavior of TB infection prevention and control (PPI TB).

The best PPI TB behavior was in respondents whose Knowledge was good at 65%. Some respondents were lack of Knowledge but well-behaved in PPI TB number of 100 people. Respondents behaved well because of good Knowledge about the four pillars of PPI TB: Managerial control, administrative control, environmental control, and self-protection control (PPE). The conclusion from **Table 2** is that respondents have good PPI TB knowledge. Based on the data analysis, the significant value on Chi-Square is $p=0,798$. It can be concluded that there is no relationship between Knowledge and prevention behavior and control of TB infection (PPI TB).

The PPI TB behavior of the majority of respondents was good at 97.5%. Respondents who have a negative attitude were only one person, and a positive attitude was 19 people. Respondents who have a negative attitude with moderate behavior value of all respondents. The total value of respondents' attitudes is 32, while the

average value of total attitudes of all respondents is 33. The conclusion from **Table 2** is that respondents have good PPI TB behavior. Based on the data analysis, the significant value of Chi-Square is $p=1,000$. because $p > 0,05$. It can be concluded that there is no relationship between attitudes and prevention and control of TB infection (PPI TB) behavior.

The best PPI TB behavior on respondents with sufficient motivation was 55%. Respondents who have good motivation and behave well in the prevention and control of TB infection (PPI TB) are 17 people. Respondents who behave sufficiently in the prevention and control of TB infection (PPI TB) have a total value of 28 included in the interval of sufficient motivation categories (> 22 - < 30). The conclusion from **Table 2** is that respondents have good PPI TB behavior. Based on the data analysis, the significant value of Chi-Square is $p=1,000$. because $p > 0,05$. It can be concluded that there is no relationship between motivation and prevention behavior and control of TB infection (PPI TB).

DISCUSSION

The results showed that there was no relationship between education and TB infection prevention and control behavior. Nurses who are highly educated will have better behavior because they have already had broader Knowledge and insight than those with less education (Mariyanti, Nursalam, & Kurniawati, 2015). The results of this study are in line with other studies that state that nurse education does not significantly affect compliance with standard vigilance (Aung, Nursalam, & Dewi, 2017). The same point stated by Nurhayati, Kurniawan, & Mariah in 2015 that there is no significant relationship found between TB prevention behavior and education (Nurhayati, Kurniawan, & Mardiah, 2015). Education is an effort of persuasion or learning for someone to take action as a form of behavior to maintain, overcome problems, and improve their health (Yuliastuti, Novita, & Narsih, 2014). Education is an important thing because it makes it easy for someone to understand something. The higher the level of education, the more they always look for evidence and critical thinking (Makhfudli, Rachmawati, & Andini, 2017).

The results showed there was no relationship between the characteristics of nurses (training) with the behavior of TB infection prevention and control (PPI TB) in pulmonary hospital. Training is related to TB infection control behavior (Engelbrecht et al., 2016). The results of this study are in line with other studies that state that the characteristics of nurses (training) do not significantly influence the standard vigilance compliance behavior (Aung et al., 2017). Another nurse characteristics that influences TB infection prevention and control behavior is training. Nurse training can be attended in the TB room, which can be in the form of TB

MDR training, TB DOTS training, and PPI TB training. Through this special training, nurses can improve their work quality so that they can work efficiently and effectively. Thus, it is clear that the importance of training for nurses in providing the best nursing services or care for their patients, including efforts to improve PPI TB behavior (Engelbrecht et al., 2016). Respondents who have lack of training (not having TB training certificates or such) but have good behavior in preventing and controlling TB infection (PPI TB). Based on this study, the researcher believes that the respondents' behavior is not influenced by the training that has been followed but obtained from the work experience of each respondent and other factors (peers or head of the room).

The results showed that there was no relationship between a work period and PPI TB behavior. Good prevention behavior and control of TB infection were closely related to the work period (Nurhayati et al., 2015). Other studies that are in line with this study stated that nurses who work less than four years have a low risk of transmission of TB infection (Tiemersma et al., 2016). This means that the nurses' behavior in the TB room is good. The longer a person works, the skills and experience increase. Someone must have experience related to psychological objects to have a response and appreciation (Azwar, 2008). The work period is one of the characteristics of nurses that influence PPI TB behavior (Aung et al., 2017). Nurses who have worked in certain special rooms for a long time have had various experiences related to their respective fields to implement TB infection prevention and control behavior. Nurses who have a longer work period have more experience. This experience can be useful when nurses face problems related to the prevention behavior and control of TB infection (Zhou et al., 2014).

The results which that there was no relationship between Knowledge and prevention behavior and control of Tb infection (PPI TB). The Knowledge that nurses possess greatly influences the reflection of pulmonary TB prevention behavior (Kurniasih & Widianingsih, 2017). Knowledge of nurses influences the implementation of TB infection prevention (Engelbrecht et al., 2016). The result of this study was in line with other studies that have been conducted, stating that Knowledge does not significantly influence the standard precautionary behavior (Aung et al., 2017). Knowledge is an important domain in forming a behavior (Makhfudli et al., 2017). Knowledge can be taken from someone's work experience (Ibrahim, Mardiah, & Priambodo, 2014). Knowledge is needed as support in generating attitudes and behavior every day, so it can be said that Knowledge is a very important domain for the formation of a person's behavior (Notoatmodjo, 2014). Nurse's Knowledge and understanding of TB disease and prevention of transmission play an important role in the success of PPI TB.

The results show that there is no relationship between attitude and the behavior of preventing and controlling TB infection (PPI TB) in pulmonary hospital. Attitude is an important factor related to behavior (Laili, Sulistiawati, & Widyawati, 2017). The results of this study are in line with other studies stating that attitude is not the only determinant of behavior. However, there are still many other factors that influence the emergence of a person's behavior (Ibrahim et al., 2014). Attitude is a predisposition used to positively or negatively respond to an object, situation, concept, and person. A positive attitude and good Knowledge in the prevention of TB infection are the main factors associated with the implementation of a good TB infection as well (Engelbrecht et al., 2016).

Based on observations, there is a nurse's attitude that does not apply to universal precaution, one of which is not washing hands five moments. Based on observations of nurses' attitudes toward TB infection prevention and control behavior (PPI, TB) is influenced by several factors. First, each nurse's personal experience in treating TB patients is different, so this will shape and influence the nurses' behavior. Second, the influence of peers or head of the room in implementing PPI TB so that someone who is considered important will greatly influence nurses' attitude. Third, the Work discipline culture will form the attitude of nurses whose adherence to the principles following standard operating procedures (SOP) is to prevent and control TB infection (PPI TB). Fourth, the influence of emotional factors because not all forms of attitude are determined by one's environmental situation and personal experience, but sometimes a form of attitude is based on emotions as a form of the defense mechanism of an individual ego.

The results showed no relationship between motivation and behavior to prevent and control TB infection (PPI TB) in pulmonary hospitals. Other studies that are in line say that high motivation will have the desire to carry out duties as a nurse well (Mariyanti et al., 2015). This means that high motivation can lead to good behavior in the prevention and control of TB infection (PPI TB), and vice versa. Low motivation will cause less behavior in PPI TB. There is no clear reward and punishment in the implementation of PPI TB influences the nurses' attitude and motivation to carry out PPI TB (Bogar, Nursalam, & Dewi, 2017). Motivation is one of the characteristics of nurses that influence behavior (Nursalam, 2016). Motivation is needed in determining the intensity of work effort for nurses that has an impact on behavior. The majority of respondents have sufficient motivation and good behavior in the prevention and control of TB infection (PPI TB) in pulmonary hospital. Based on the research results, nurses' motivation in PPI TB behavior is quite good because of the reward from staffing if they are able to provide good service, one of which is PPI TB behavior.

CONCLUSION

There is no relationship between the characteristics: Education, training, work period, Knowledge, attitudes, and motivation of nurses with prevention and control behavior of TB infection (PPUI TB) in pulmonary hospital. TB infection prevention and control behavior are good because nurses apply the four pillars of PPI TB: Administrative control, managerial control, environmental control, and self-protection control (PPE). The behavior of Tb infection prevention and control (PPI TB) as one of the evaluation and monitoring material in the successful implementation of PPI TB in pulmonary hospital. The results of this study can provide information about the characteristics of nurses with TB infection prevention and control behavior.

REFERENCES

Ariga, R. A., & Amelia, R. (2018). *Parents' Behavior in Giving Drug in Children With Tuberculosis in Polyclinic Children Rsud. Dr. Pirngadi Medan.*

Aung, S. S., Nursalam, N., & Dewi, Y. S. (2017). Factors Affecting The Compliance of Myanmar Nurses in Performing Standard Precaution. *Jurnal Ners*, *12*(1), 1. https://doi.org/10.20473/jn.v12i1.2294

Azwar, S. (2008). Sikap Manusia Teori dan Pengukurannya, Edisi ke-4. In *Yogyakarta: Pustaka Pelajar Offset*.

Bogar, M. M., Nursalam, N., & Dewi, Y. S. (2017). Model Of Emergency Department Nurse Performance Improvement Based on Association of Individual Characteristic, Organization Characteristic and Job Characteristic. *Jurnal Ners*, *8*(2), 271–282.

Chen, B., Liu, M., Gu, H., Wang, X., Qiu, W., Shen, J., & Jiang, J. (2016). Implementation of tuberculosis infection control measures in designated hospitals in Zhejiang Province, China: are we doing enough to prevent nosocomial tuberculosis infections? *BMJ Open*, *6*(3).

Claassens, M. M., Van Schalkwyk, C., Du Toit, E., Roest, E., Lombard, C. J., Enarson, D. A., … Borgdorff, M. W. (2013). Tuberculosis in healthcare workers and infection control measures at primary healthcare facilities in South Africa. *PloS One*, *8*(10).

Daulay, R. S., Majeda, A., & Nataprawira, H. M. (2018). Unrecognized and delayed to diagnose of adolescence tuberculosis case in a boarding school in West Java, Indonesia. *International Journal of Mycobacteriology*, *7*(4), 387–389. https://doi.org/10.4103/ijmy.ijmy_149_18

Dinkes Jatim. (2016). *Sebanyak 207.667 Pasien TB di Jatim Berhasil Disembuhkan*. Retrieved from http://kominfo.jatimprov.go.id/read/umum/sebanyak-207-667-pasien-tb-di-jatim-berhasil-disembuhkan

Engelbrecht, M., van Rensburg, A. J., Kigozi, G., & van Rensburg, H. C. J. D. (2016). Factors associated with good TB infection control practices among primary healthcare workers in the Free State Province, South Africa. *BMC Infectious Diseases*, *16*(1), 633.

Ibrahim, K., Mardiah, W., & Priambodo, A. P. (2014). Pengetahuan, sikap, dan praktik kewaspadaan universal perawat terhadap penularan HIV/AIDS. *Jurnal Ners*, *9*, 11–18.

Irmawati, Ridwan, A., & Ansar, J. (2019). Risk factors of pulmonary tuberculosis relapse in working population of Makassar City. *Indian Journal of Public Health Research and Development*, *10*(7), 1140–1144. https://doi.org/10.5958/0976-5506.2019.01737.6

Kurniasih, D. N., & Widianingsih, C. (2017). Hubungan antara Pengetahuan dengan Perilaku Pencegahan Penularan Tb pada Penderita Tb Paru di Poli Paru Rumah Sakit Prof. Dr. sulianti Saroso. *The Indonesian Journal of Infectious Diseases*, *1*(2), 28–31.

Laili, N. R., Sulistiawati, S., & Widyawati, I. Y. (2017). Nurse Behavior in Implementation of Diabetes Mellitus Education Based on Theory of Planned Behavior. *Jurnal Ners*, *12*(1), 19–26.

Madjid, A., Muhammad, S., Andi, A. A., Maria, I. L., Abdullah, T., Burbahar, & Russeng, R. (2019). Effect of knowledge and attitude factors on tuberculosis incidents in mandar ethnic in the District of Majene West Sulawesi. *Indian Journal of Public Health Research and Development*, *10*(8), 1935–1939. https://doi.org/10.5958/0976-5506.2019.02135.1

Makhfudli, M., Rachmawati, P., & Andini, S. (2017). Factors related to open defecation behavior among school-age children in West Lombok. *J Ners*, *12*, 119–125.

Mariyanti, H., Nursalam, N., & Kurniawati, N. D. (2015). Model of Caring Behavior Improvement to Achieve the Competence in Critical Care Nursing. *Jurnal Ners*, *10*(1), 158–164.

Muhith, A., & Nursalam. (2012). Mutu asuhan keperawatan berdasarkan analisis kinerja perawat dan kepuasan perawat dan pasien. *Journal Ners*, *7*(1), 47–55.

Notoatmodjo, S. (2014). *Promosi kesehatan dan ilmu perilaku*.

Nurhayati, I., Kurniawan, T., & Mardiah, W. (2015). Perilaku Pencegahan Penularan dan Faktor-Faktor yang Melatarbelakanginya pada Pasien Tuberculosis Multidrugs Resistance (TB MDR). *Jurnal Keperawatan Padjadjaran*, *3*(3).

Nursalam. (2015). *Metodologi Penelitian Ilmu Keperawatan Pendekatan Praktis Ed. 4*. Jakarta: Salemba Medika.

Nursalam, N. (2016). Manajemen keperawatan: Aplikasi dalam praktek keperawatan profesional. *Jakarta: Salemba Medika*.

Syarifah, Mutiara, E., & Novita, S. (2019). Cadre behavior as social capital for the development of tb care community in the management of tuberculosis in Medan city. *Indian Journal of Public Health Research and Development*, *10*(8), 1309–1314. https://doi.org/10.5958/0976-5506.2019.02077.1

Tiemersma, E. W., Huong, N. T., Yen, P. H., Tinh, B. T., Thuy, T. T. B., Van Hung, N., … Nhung, N. V. (2016). Infection control and tuberculosis among health care workers in Viet Nam, 2009-2013: a cross-sectional survey. *BMC Infectious Diseases*, *16*(1), 664.

WHO. (2016). *Global tuberculosis report 2016*. WHO Geneva.

World Health Organization. (2016). *The top 10 causes of death*. Retrieved from https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death

World Health Organization. (2018). *Tuberculosis profile*. Retrieved from https://extranet.who.int/sree/Reports?op=Replet&name=/WHO_HQ_Reports/G2/PROD/EXT/TBCountryProfile&ISO2=ID&outtype=html

Yuliastuti, C., Novita, N. W., & Narsih, S. (2014). Tingkat pengetahuan tb paru mempengaruhi penggunaan masker pada penderita tb paru. *Journal of Health Sciences*, *7*(2).

Zetov, A., Erimbetov, K., Parpieva, N., Zhetibayev, B., & Malbaskanov, A. (2019). Surgical approach in multi- and extensively drug-resistant tuberculosis: resection and thoracomioplasty. *Electronic Journal of General Medicine,* *16*(6), em185. https://doi.org/10.29333/ejgm/115862

Zhou, F., Zhang, L., Gao, L., Hao, Y., Zhao, X., Liu, J., … Chen, J. (2014). Latent tuberculosis infection and occupational protection among health care workers in two types of public hospitals in China. *PLoS One*, *9*(8).