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FACTORS ASSOCIATED WITH THE NON-ADHERENCE OF TB SCREENING IN CHILDREN AGED <15 YEARS WITH SMEAR-POSITIVE TB PATIENTS' CLOSE CONTACT

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ABSTRACT

Background: TB screening in children having close contact with smear-positive TB patients is urgent to conduct to improve the case detection rate and to achieve the "End TB" target. In fact, the implementation of screening in Indonesia is still inadequate. **Objective:** To analyze the factors associated with the non-adherence of TB screening in children aged <15 years with smear-positive TB patients' close contact. **Methods:** A cross-sectional study was conducted in Semarang between February and August 2020. Subjects were children <15 years old with smear-positive TB patient's close contact. Data were collected from interviewed parents or guardians of the child using a structured questionnaire. Chi-square or Fisher's exact test analysis was used to identify the factor associated with non-adherence to TB screening in children. **Results:** A total of 84 children were recruited into this study. The proportion of children who did not undergo the screening is still high (86,9%), and there was a significant association with children's age (OR 13,556, 95% CI=3.135-58,613), parents' age (OR 41,143, 95% CI=4,025-420,604), parents' education level (OR 0,114, 95%CI=0.027–0.477), distance to health facilities, knowledge level, perceived barriers, and cues to action. There was no significant association between children's gender, economic level, perceived threats with non-adherence of screening. **Conclusion:** Children and parents' age, education level, distance to health facilities, knowledge level, perception of barriers, and cues to action associated with the non-adherence of TB screening in children aged <15 years with smear-positive TB patients' close contact.

***Keywords**: children, non-adherence, screening, tuberculosis*

INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by the bacteria *Mycobacterium tuberculosis* becomes one of the ten leading causes of death in the world. This disease is a tropical disease that frequently occurred in low-income populations in developing countries (neglected tropical disease). World Health Organization reported that Indonesia ranked the third highest burden of TB cases after India and China.[1] Semarang City Health Office data shows that the number of TB patients in 2018 was 4.252 cases, and 20% of them were TB cases in children.[2] The risk of TB infection increased in children (<15 years), people with low immunity, and people who live in the same house with TB patients.[3–5] The incidence of TB cases in children aged <15 years is high because the immune system is still not functioning optimally in preventing infection.[6, 7] The implementation of screening in children aged <15 years with smear-positive TB patients' close contact has considered urgent to reduce morbidity and mortality in achieving the target of the national TB control program towards elimination in 2035 and Indonesia TB Free in 2050.[8]

The Case Detection Rate (CDR) in Semarang in 2018 was 65% with an initial target of 85%. CDR is the proportion of the number of new smear-positive TB patients calculated within one area. TB case finding or CDR is a method used to assess progress in TB control with a national target of at least 70%.[9] According to Community Lung Health Center (BKPM) Semarang, there has been a decrease in the case detection of TB in children from 2016 to 2018. Problems that may arise in finding TB cases in children in Indonesia include inadequate diagnosis, recording, and reporting systems.

Previous studies reported that some people who were in close contact with TB patients didn't undergo screening because they didn't feel any symptoms and signs of TB.[10] People who don't feel any symptoms can also be infected with TB, this condition is called latent infection.[11] Some studies have revealed other factors that can influence screening behavior in adults with TB patients' close

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contact, such as the role of health workers/health cadres in carrying out active findings, sociodemographic factors (age, gender, education, etc.), knowledge, and health belief model (HBM).[5,10,12,13] Some studies stated that parents' perceptions and knowledge levels about TB significantly influence TB incidence in children.[6, 14] This shows that parents play a crucial role in their children's health. So far, some previous studies indicate that the proportion of non-adherence to adults contact screening is known to be relatively high in the range of 70-80%.[13,15] No data has been found regarding non-adherence of screening in children with TB patients' close contact.

The factors associated with the non-adherence of screening in children need to be investigated as the basis of interventions to minimize the occurrence of non-adherence in screening that can increase active case finding. Many studies have addressed the factors associated with the non-adherence of TB screening on TB patients' close contact, but the majority of these studies have focused on adult contacts only. There has not been found any research regarding the factors associated with the non-adherence of TB screening in children with smear-positive TB patients' close contact. This research aims to analyze the factors associated with the non-adherence of screening in children aged <15 years old with smear-positive TB patients' close contact.

METHOD

This cross-sectional study was conducted in Semarang between February and August 2020. Subjects in this study were children aged <15 years with smear-positive TB patients' close contact. The TB patients as source cases were identified at RSUD K.R.M.T Wongsonegoro, Puskesmas Kedungmundu, and Puskesmas Bandarharjo Semarang. The inclusion criteria of this study are parents willing to follow and cooperate throughout the research procedures as interviews and filling out questionnaires. The exclusion criteria included children who had or are currently diagnosed with TB and/or received anti-tuberculosis drug therapy.

Close contact is defined as contact with a duration of 8 hours per day or living in the same house with an adult smear-positive TB patient.[16] Contact screening is defined as the first step to find active TB cases in children with smear-positive TB patients' close-contact includes observation of symptoms and follow-up examinations according to the flow of TB diagnosis in children with or without symptoms.[7]

The subjects in this study were selected using a consecutive sampling method. The research began with recording patient medical records, communicating by telephone or direct visits to patients with children aged <15 years, followed by informed consent, and filling out questionnaires, guided by the researcher.

For the descriptive analysis, we evaluated the following risk factors: age, gender, education level, economic level, distance from house to health facilities, level of knowledge about TB, perceived threat, perceived barriers, and cues to action. We used Chi-square and Fisher's exact tests to compare differences in the proportions of each categorical variable. Fisher's exact test was used as an alternative test for data that didn't meet the requirements of the Chi-square test. The odds ratio (OR) was used to measure the association of the independent and dependent variables. A 95% confidence interval (95% CI) was used in this study. Data with a p-value <0.05 was considered statistically significant.

RESULTS

There were 84 subjects, consisted of 44 boys, and 40 girls. The results showed that the average age of the children was 5.13 ± 4.52 SD (Standard Deviation), while the parents were 38,46 ± 10,92 SD. Parents aged <20 years were not found. Most of the parents have a high level of education (70,2%) and middle-high economic level (86.9%). The average family income was Rp 808.347 ± 365.531 range from Rp 187.500 to Rp 2.200.000. The majority of subjects' houses were far from the health facilities (57.1%). The average levels of knowledge, perceived threat, perceived barriers, and cues to action on parents were 7.18 ± 1.90 SD respectively; 7.58 ± 2.66 SD; and 3.98 ± 3.23 SD. The proportion of non-adherence to screening in children with smear-positive TB patients' close contact was 86.9%. The characteristics of the subjects are presented in table1.

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Table 1. Characteristics of the subjects

Variable	N	%
Children's age		
≤5 years	64	76,2
>5 years	20	23,8
Parents' age		
20 – 60 years	79	94,0
>60 years	5	6,0
Children's gender		
Male	44	52,4
Female	40	47,6
Parents' education level		
Low	25	29,8
High	59	70,2
Economic level		
Low	11	13,1
Middle-high	73	86,9
Distance to health facilities		
Far	48	57,1
Near	36	42,9
Knowledge of TB		
Poor	23	27,4
Good	61	72,6
Perceived threats		
Negative	13	15,5
Positive	71	84,5
Perceived barriers		
Negative	42	50,0
Positive	42	50,0
Cues to action		
Negative	55	65,5
Positive	29	34,5
Non-adherence		
Disobedient	73	86,9
Obedient	11	13,1

Table 2 shows that children's age factor has a significant association (p <0.001) with non-adherence to TB screening OR value indicating that children aged ≤5 years have a 13,556 times greater risk of non-adherence to TB screening. The parents' age factor has a significant association (p <0.001) on the non-adherence of TB screening, with the OR value indicating that the age of 20-60 years old has a 41,143 times greater risk of non-adherence to TB screening. The parents' education level has a significant association (p = 0.002) on the non-adherence of TB screening, with the OR value indicating a low level of parents' education at 0.114 times the risk of non-adherence to TB screening. Distance to health facilities (p <0.001), parents' knowledge (p = 0.023), perceived barriers (p = 0.001), and cues to action (p <0.001) have a significant association with the non-adherence of TB screening. Factors that didn't have significant association with non-adherence were children's gender (p = 1,000), economic level (p = 0.192), and perceived threats (p = 0.138).

The level of parents' education was considered "low" if they did not attend school/graduated from elementary school/junior high school and "high" if they graduated from high school/higher. The economic level was measured by the position of the family in the community, based on the amount of parental income each month. The income was measured by the regional minimum wage of Semarang divided by the number of the family members. The economic level was considered "low" if the result of the distribution is ≤ Rp 425,000.00 and "middle to high" if the distribution is > Rp 425,000.00. The distance to the health facility is "near" if the distance is <4 kilometers and "far" if the distance is ≥4 kilometers. Parents' knowledge about TB was considered "poor" if the number of correct answers is <70% and was considered "good" if the number of correct answers is ≥70%.

Non-adherence is the behavior of individuals who fail to comply with the health promotion plan or therapeutic plan that has been agreed by the individual, family, or community with health professionals, resulting in clinically ineffective or partially ineffective results.

DISCUSSION

This study showed that more than half (86.9%) of the children aged <15 years with smear-positive TB BTA patient contacts in the of RSUD K.R.M.T Wongsonegoro, Puskesmas Kedungmundu, and Puskesmas Bandarharjo Semarang, who were the subjects of this study, had not done the screening. The implementation of adequate screening is one of the efforts to increase case finding in achieving the national TB control target, towards elimination by 2035 and Indonesia free TB in 2050. The high non-adherence proportion can be a barrier to achieving this target. Several factors examined in this study showed significant association to non-adherence of screening, there are children's age, parents' age, parents' education level, distance to the health facilities, parents' knowledge of TB, perceived barriers, and cues to action.

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The results showed that the children's age was one of the significant factors associated with the non-adherence of screening in children with smear-positive TB patients' close contact (p <0.05). Parents who had children aged ≤5 years have a 13,556 times greater risk of non-adherence to undergo TB screening (OR = 13,556; 95% CI = 3.135-58,613). This result is inconsistent with the results of the study in London, Yogyakarta, and Semarang. These studies stated that TB symptoms are more visible in children aged ≤ five years because they have a greater risk of TB infection development to be TB disease due to the imperfect cellular immunity. Parents are more likely to become aware of it and taking screening actions, which can reduce the risk of non-adherence.[17–19] Age ≤ five years is also an important period for children because it is a critical period for a tremendous impact on children's development, which allows parents to provide more care and attention when their children are still young.[20] This discrepancy can be caused by the limited number of subjects and the possible uneven demographic distribution so that it can't represent the overall condition.

Table 2. Chi-square analysis of non-adherence to TB screening

Variable	Non-adherence				p	OR	95% CI
	Disobedient		Obedient				
	n	%	n	%			
Children's age							
≤5 years	61	83,6	3	27,3	<0,001*	13,556	3,135 – 58,613
>5 years	12	16,4	8	72,7			
Parents' age							
20 – 60 years	72	98,6	7	63,6	<0,001*	41,143	4,025 – 420,604
>60 years	1	1,4	4	36,4			
Children's gender							
Male	38	52,1	6	54,5	1,000	0,905	0,253 – 3,230
Female	35	47,9	5	45,5			
Parents' education level							
Low	17	23,3	8	72,7	0,002*	0,114	0,027 – 0,477
High	56	76,7	3	27,3			
Economic level							
Low	11	15,1	0	0	0,192	–	–
Middle-high	62	84,9	11	100			
Distance to health facilities							
Far	48	65,8	0	0	<0,001*	–	–
Near	25	34,2	11	100			
Knowledge of TB							
Poor	23	31,5	0	0	0,023*	–	–
Good	50	68,5	11	100			
Perceived threats							
Negative	13	17,8	0	0	0,138	–	–
Positive	60	82,2	11	100			
Perceived barriers							
Negative	31	42,5	11	100	0,001*	–	–
Positive	42	57,5	0	0			
Cues to action							
Negative	55	75,8	0	0	<0,001*	–	–
Positive	18	24,7	11	100			

*Significant (p <0.05)

The parents' age factor also has a significant association on non-adherence to TB screening in children with smear-positive TB patients' close contact (p <0.05). The results showed that parents aged 20-60 yers had 41,143 times greater risk of being disobedient to do screening to their children

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who had close contact with smear-positive TB patients (OR = 41,143; 95% CI = 4,025-420,604). The results of the analysis are consistent with study in London, Pandeglang, and Denpasar which stated that busy parents at productive age (20-60 years) associated with the non-adherence of TB screening in children due to the lack of time available to perform the screening procedures.[10,15,17] The implementation of TB screening in children supposed to be done by various age groups so that productivity doesn't become a barrier to do screening. Parents should be more understanding of the importance of children's health, which will have long-term effects on children's lives later.

The parents' education level factor has a significant association with the non-adherence of TB screening in children with smear-positive TB patients' close contact ($p < 0.05$). It was found that the low parents' education level acts as a protective factor, which means that parents with higher education level tend to be less obedient to perform screening in their children than those with low education level (OR = 0.114; 95% CI = 0.027–0.477). These results are consistent with the study in Pandeglang, where low education level acts as a protective factor for non-adherence of TB screening (OR = 0.449), but inconsistent with studies in Ghana, Malawi, Pasirkaliki, China, Magelang. Studies in Ghana and Malawi reported that there was no significant association found, whereas studies in Pasirkaliki, China, and Magelang stated that there was a significant association, but low education level increased the non-adherence of TB screening.[10,13,21–24] The three previous studies (Pasirkaliki, China, Magelang) showed that the higher the level of education, the easier it is for someone to accept the information they get. This is important to change people's behavior, in this case increasing adherence to TB screening. The discrepancy with the previous studies could be caused by linkages with other factors such as knowledge of TB, occupation, age (productivity), and any other perceptions (HBM). In this case, individuals with good TB knowledge do not always come from highly educated circles. Knowledge about TB can also be provided in various ways such as counseling so that anyone can have good knowledge of TB.[25,26] Individuals with higher education levels are more likely to have sedentary jobs and tend to prioritize work so that their children get less attention. It is also associated with the level of non-adherence of TB screening.[13,21,27] The low level of parents' education is a protective factor against non-adherence to TB screening, assuming that the level of education does not guarantee a person's level of knowledge in this study, especially regarding TB.[25] Also, it is necessary to assess the complexity of sociodemographic and HBM component's relationships to the non-adherence of TB screening.[23,28,29]

The results of this study showed that the distance to health facilities is one of the factors which significantly associated with the non-adherence of TB screening in children with smear-positive TB patients' close contact ($p<0.05$). The results are consistent with previous research in Pandeglang and China, where the long distance to health facilities increases the risk of non-adherence to TB screening. The distance of the health facilities is also related to the problem of long travel time, as well as the transportation costs become expensive.[10,23]

The parents knowledge about TB was obtained as one of the factors that significantly associated with the non-adherence of TB screening in children with smear-positive TB BTA patients' close contact ($p<0.05$). The results are consistent with previous studies in Pandeglang and Magelang which stated that poor knowledge increases the risk of non-adherence to TB screening.[10,24] Information is initially received by a person only as a data or if according to Notoatmodjo knowledge level is "know", while "knowledge" can be useful for directing action, in this case if the knowledge of parents are good, it can lead to the TB screening action.[14,24,26] Efforts to improve knowledge are necessary, providing information in the right way can improve knowledge and affects someone's perception so that it can indirectly be a cue to action.[13,23,25]

Perception factor of parents was also found to be one of the factors that significantly associated with the non-adherence of TB screening in children with smear-positive TB patients' close contact ($p<0.05$). The results are consistent with previous theories and studies in Pasirkaliki, Surabaya, and China which stated that the greater a person's view of perceived barriers (perceived barriers positive), the greater level of non-adherence that occurs. A common problem is the lack of time due to work, which can indirectly be related to economic factors.[13,23,25] Improvements are needed related to the perceived

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barriers, such as knowledge factors, perceived threats, and economic level.

Parents' cues of action was found as one of the factors that significantly associated with the non-adherence of TB screening in children with smear-positive TB patients' close contact ($p<0.05$), but the odds ratio is unknown. These results are consistent with the theory which states that cues of action act as signals for a person to perform an action or behavior, in this case to conduct screening in children with smear-positive TB patients' close contact. The cues can be in the form of symptoms or signs in the children, the invitation from relatives, the invitation from health workers through counseling, or messages in the mass media. The less score (cues acting negatively), the more non-adherence to TB screening in children.[23,25]

Some factors that did not have significant association with the non-adherence of TB screening in children are the children's gender, economic level, and perceived threats. The results of this study showed that the children's gender did not have a significant association with the non-adherence of screening in children smear-positive TB patients' close contact ($p=1,000$; OR=0.905; 95%CI=0.253-3.230). The results are consistent with previous studies in Malawi and China but contradict with research in Vietnam.[10,22,23,30] Study in Vietnam stated that men tend to get more attention and are considered more important because they become a financial source later, so they get higher health priorities than women.[22]

The economic level of the family did not have a significant association with the non-adherence to screening in children with smear-positive TB patients' close contact ($p=0.192$). The statement is inconsistent with studies in Pasirkaliki, Iraq, Pakistan, and Somalia that stated that economic status associated with the non-adherence of TB screening. Participants with low economic levels in the study mostly didn't have time to go to health facilities because they had to work for their families.[13,14,31] These discrepancies can be attributed to other factors, such as knowledge about TB and HBM perception. The economic level doesn't always guarantee that someone's knowledge is good either, and it can associated with the non-adherence of TB screening.[30]

The perceived threats factors didn't have a significant association with the non-adherence to screening in children with smear-positive TB patients' close contact ($p=0.138$). These results are inconsistent with the previous study in Denpasar which showed that individuals with low perceived threats (negative perceived threats) are less likely to undergo TB screening.[15] Perceived threats consist of perceptions of seriousness and vulnerability. Study in Semarang reported that the perceived vulnerability had a significant influence with TB transmission protection behavior in children, this was because many of the parents considered themselves vulnerable to transmit TB so that they performed TB transmission protection behavior in children.[4] These discrepancies can be caused by the limited number of subjects, as well as linkages with other factors, such as the lack of time, constraints on access and distance to health facilities (perceived barriers), and knowledge factors.[23,29]

The limitation of this study is that the design used in this study is cross-sectional, so it has weakness in seeing risk factors and their effects, and can't describe the course of the disease. This design has the weakest appearance, compared to the case control or cohort design which analyzes the causal relationship between variables and then follows up the changes.

The data of this research were examined using questionnaires sent by telephone and chatting application, so that there are some biases in the data. Direct observation and assessment of the subject and the environment associated with the variables can reduce the incidence of data bias. It is possible to add or change the variables for the non-adherence of TB screening in children with smear-positive TB patients' close contact.

CONCLUSION

There was significant association between children's age, parents' age, parents' level of education, the distance of health facilities, knowledge level, perceived barriers, and cues to action with the non-adherence of screening in children aged <15 years with smear-positive TB patients' close contact. There was no significant association between children's gender, economic level, and perceived threat on non-adherence to screening in children aged <15 years with non-adherence of screening in children aged <15 years with smear-positive TB patients' close contact.

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Further research needs to be done using multivariate analysis, as well as the addition or replacement of other variables that can still be possible to use. Study with a larger number of subjects may be considered in the future. Education and more understanding to the public regarding TB disease, especially TB in children, needs to be done, so that people can be more active and responsive to do screening in children with smear-positive TB patients' close contact.

Ethical Approval

All procedures have been approved by the issuance of ethical clearance No. 70/EC/KEPK/FK-UNDIP/V/2020 from the Health Research Ethics Commission of the Faculty of Medicine, Diponegoro University, Semarang.

Conflicts of Interest

The authors declare that there was no conflict of interest.

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Author Contributions

Conceptualization, LVS; methodology, LVS; validation, DAA and SCF; formal analysis, LVS; investigation, LVS; resources, LVS; data curation, LVS; writing—original draft preparation, LVS; writing—review and editing, LVS, AS, DAA, and SCF; supervision, AS, DAA, and SCF; project administration, LVS.

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REFERENCES

[1] World Health Organization. Global tuberculosis report 2019, https://www.who.int (2019, accessed 22 February 2020).

[2] Dinas Kesehatan Kota Semarang. Profil kesehatan Kota Semarang 2018. 2018; 15–68.

[3] Diani A, Setyanto DB, Nurhamzah W. Proporsi infeksi tuberkulosis dan gambaran faktor risiko pada balita yang tinggal dalam satu rumah dengan pasien tuberkulosis paru dewasa. *Sari Pediatr* 2011; 13: 62–69.

[4] Bonita, Cahyo K, Riyanti E. Hubungan usia dan persepsi kerentanan dengan perilaku proteksi penularan TB pada anak di lima wilayah kerja puskesmas Kota Semarang. *J Kesehat Masy* 2018; 6: 151–155.

[5] Jaganath D, Zalwango S, Okware B, et al. Contact investigation for active tuberculosis among child contacts in Uganda. *Clin Infect Dis* 2013; 57: 1685–1692.

[6] Brajadenta GS, Laksana ASD, Peramiarti IDSAP. Faktor risiko tuberkulosis paru anak: Studi pada balai kesehatan paru masyarakat (BKPM) Purwokerto. *Str J Ilm Kesehat* 2018; 7: 1–6.

[7] Kementerian Kesehatan RI. Petunjuk teknis manajemen dan tatalaksana TB anak, http://www.ljj-kesehatan.kemkes.go.id (2016, accessed 21 February 2020).

[8] Kementerian Kesehatan RI. Infodatin tuberkulosis, https://pusdatin.kemkes.go.id (2018, accessed 22 February 2020).

[9] Vidyastari YS, Cahyo K. Faktor-faktor yang mempengaruhi pencapaian target CDR (case detection rate) oleh koordinator P2TB dalam penemuan kasus di puskesmas kota semarang. *J Kesehat Masy* 2019; 7: 535–544.

[10] Sukarna N, Lukman M, Sari SP. Faktor-faktor yang berhubungan dengan perilaku skrining TB pada kontak serumah di Kabupaten Pandeglang tahun 2015. *J Media Cendikia* 2015; 2: 1–9.

[11] Kiazyk S, Ball T. Latent tuberculosis infection: An overview. *Canada Commun Dis Rep* 2017; 43: 62–66.

[12] Deswinda D, Rasyid R, Firdawati F. Evaluasi penanggulangan tuberkulosis paru di puskesmas dalam penemuan penderita tuberkulosis paru di Kabupaten Sijunjung. *J Kesehat Andalas* 2019; 8: 211.

[13] Herawati I, Ruslami R, Yamin A. Case study of non-adherence of household contacts toward tuberculosis screening. *J Public Heal* 2013; 1: 63–71.

[14] Oklan L. Faktor-faktor yang mempengaruhi infeksi TB pada anak yang tinggal serumah dengan penderita TB. *J Kesehat Prim* 2016; 1: 56–63.

[15] Agung AAG, Sawitri AAS, Wirawan DN. Rendahnya proporsi kontak yang melakukan

DIPONEGORO MEDICAL JOURNAL
(Jurnal Kedokteran Diponegoro)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
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deteksi dini tuberkulosis paru di puskesmas I Denpasar Selatan tahun 2012. *Public Heal Prev Med Arch* 2013; 1: 40.

[16] Centers for Disease Control and Prevention. Guidelines for the investigation of contacts of persons with infectious tuberculosis. *Morbidity and mortality weekly report* 2005; 54: 1–47.

[17] Roberts DJ, Mannes T, Verlander NQ, et al. Factors associated with delay in treatment initiation for pulmonary tuberculosis. *ERJ Open Res* 2020; 6: 00161–02019.

[18] Nevita, Sutomo R, Triasih R. Faktor risiko kejadian sakit tuberkulosis pada anak yang kontak serumah dengan penderita tuberkulosis dewasa. *Sari Pediatr* 2016; 16: 5.

[19] Yustikarini K, Sidhartani M. Faktor risiko sakit tuberkulosis pada anak yang terinfeksi mycobacterium tuberculosis. *Sari Pediatr* 2016; 17: 136.

[20] Fristi W, Indriati G, Erwin. Perbandingan tumbuh kembang anak toddler yang diasuh orang tua dengan diasuh selain orang tua. *J Online Mhs Progr Stud Ilmu Keperawatan Univ Riau* 2014; 1: 1–8.

[21] Osei E, Akweongo P, Binka F. Factors associated with delay in diagnosis among tuberculosis patients in Hohoe Municipality, Ghana. *BMC Public Health* 2015; 15: 1–11.

[22] Nyasulu P, Phiri F, Sikwese S, et al. Factors influencing delayed health care seeking among pulmonary tuberculosis suspects in rural communities in Ntcheu District, Malawi. *Qual Health Res* 2016; 26: 1275–1288.

[23] Li ZT, Yang SS, Zhang XX, et al. Complex relation among health belief model components in TB prevention and care. *Public Health* 2015; 129: 907–915.

[24] Apriliasari R, Hestiningsih R, Martini, et al. Faktor yang berhubungan dengan kejadian TB paru pada anak (Studi di seluruh puskesmas di Kabupaten Magelang). *J Kesehat Masy* 2018; 6: 298–307.

[25] Zein RA, Suhariadi F, Hendriani W. Estimating the effect of lay knowledge and prior contact with pulmonary TB patients, on health-belief model in a high-risk pulmonary TB transmission population. *Psychol Res Behav Manag* 2017; 10: 187–194.

[26] Notoadmodjo S. Perilaku kesehatan dan ilmu perilaku. Jakarta: Rineka Cipta, 2005.

[27] Tola HH, Karimi M, Yekaninejad MS. Effects of sociodemographic characteristics and patients' health beliefs on tuberculosis treatment adherence in Ethiopia: A structural equation modelling approach. *Infect Dis Poverty* 2017; 6: 1–10.

[28] Setiyaningsih R, Tamtomo D, Suryani N. Health belief model: determinants of hypertension prevention behavior in adults at community health center, Sukoharjo, Central Java. *J Heal Promot Behav* 2016; 01: 160–170.

[29] Abraham C, Sheeran P. The health belief model. 2014. Epub ahead of print 2014. DOI: 10.1017/CBO9780511543579.022.

[30] Nyasulu P, Chirwa T, Makanjee C, et al. Knowledge, beliefs, and perceptions of tuberculosis among community members in Ntcheu district, Malawi. *J Multidiscip Healthc* 2018; 11: 375–389.

[31] World Health Organization. Diagnostic and treatment delay in tuberculosis, http://applications.emro.who.int/dsaf/dsa710.pdf. (2006, accessed 21 September 2020).

[32] Silalahi U. Metode penelitian sosial kuantitatif. *J Vis Lang Comput* 2015; 11: 287–301.