

## Conference Paper

# Pulmonary Tuberculosis Suspects and Their Determinants among Boarding Students in Islamic Boarding Schools in the Garut District

Asep Surahman, Ella Nurlaela Hadi, and Kartika Anggun Dimar Setio

Department of Health Education and Behavioral Science, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia

## Abstract

Living in a crowded Islamic boarding school (*pondok pesantren*) may cause tuberculosis (TB) transmission, poor sanitation and personal hygiene presenting risks for residents' health. Sleeping together in a small room may increase the risk of TB transmission in the *pondok pesantren*. The objective of this study is to assess TB suspects and their determinants among boarding students at Islamic boarding schools in Garut. A cross-sectional design was employed in this study. Applying two stages of cluster sampling, 429 samples were selected from six Islamic boarding schools in the Garut District. Data was collected through interviews, using a questionnaire that was pre-tested for validity and reliability, and analyzed using a multiple logistic regression technique. This study determined that almost 22% of the boarding students, commonly known as *santri*, had been suffering from a cough for at least 2 weeks (TB suspects). Half of them (50.8%) are women, living in environments prone to TB transmission (62.5%), having low levels of knowledge of TB (70.6%), exhibiting poor TB prevention behavior (52.7%), and around 37% are smokers. The analysis proves that sex and smoking habits are associated with TB suspects. Smoking habits are the most dominant risk factor for TB suspects after controlling for knowledge of TB. The risk of smoking *santris* becoming a TB suspect is 2.7 times higher than for those who do not smoke, after controlling for knowledge of TB.

**Keywords:** tuberculosis, boarding school, boarded students.

## 1. INTRODUCTION

The 2013-2014 Indonesian Tuberculosis Prevalence Survey showed a rise in the level of tuberculosis (TB) prevalence compared to the one in the previous survey, amounting to 759 per 100,000 in the population aged 15 years and above, and the prevalence of all forms of TB reached 660 per 100,000 population for all ages. These numbers indicate that Indonesia is a high-risk country for *Mycobacterium tuberculosis* (M.tb.) infection. On

Corresponding Author:

Ella Nurlaela Hadi  
ellanh@ui.ac.id

Received: 21 January 2018

Accepted: 8 April 2018

Published: 17 May 2018

Publishing services provided by  
Knowledge E

© Asep Surahman et al. This article is distributed under the terms of the [Creative Commons Attribution License](#), which permits unrestricted use and redistribution provided that the original author and source are credited.

Selection and Peer-review under the responsibility of the 2nd International Meeting of Public Health 2016 Conference Committee.

 OPEN ACCESS

a global level, risk factors for exposure to TB include, among others, socio-economic factors, contact with people with active TB, living in areas with high TB prevalence, poor ventilation, immune system disorder, smoking habits, alcohol consumption, and sex and age factors [3, 9, 10, 14]. The research, based on current data, found that smoking habits are responsible for 23% of TB suspect cases, while environmental factors are responsible for 26% of all cases [10]. Moreover, the rate of infection risk caused by environmental factors has shown that there is an epidemiological association amounting to 99.2%, being significantly affected by close contact [15, 16].

TB in certain populations, including in educational institutions, has been reported among students in low-endemic countries, such as England, Italy, Ireland, and several states in the USA [15]. Similar research conducted in China in 2015 reported a case of TB outbreak in a middle school with 46 active TB cases (17.8%) among 258 students and 15 teachers [11]. A population at risk of *M.tb.* infection is residents at Islamic boarding schools (*pondok pesantren*), whose characteristics include living in dormitories, close interaction with peers, and other differences compared to public schools [11, 17]. The relatively crowded conditions of *pondok pesantren*, where several residents live together in crowded rooms, increase the susceptibility and predisposition to *M.tb.* infection. There are still many areas that need to be worked on by *pondok pesantren* in terms of physical health of the residents, starting from the health service, healthy lifestyles, and a healthy environment, the lack of which contribute to the prevalence of TB cases [2, 6]. In some cases of TB in *pondok pesantren*, lack of knowledge has caused the lack of student awareness of the symptoms of TB, such as chronic coughs that last over 14 days.

## 2. METHODS

The underlying concept of our study was developed from the theory of the risk factors of TB transmission [10]. This study had a cross-sectional design, applying two stages of the cluster sampling formula, in which 429 samples were selected from six *pondok pesantren* in Garut District. The data were collected through interviews using a questionnaire, pre-tested for their reliability and validity and analyzed using a logistic regression approach.

### 3. RESULTS

This study found that approximately 22% students at *pondok pesantren* suffered from chronic cough lasting for at least 2 weeks (TB suspect). Half of them (50.8%) are women, who either live in high-risk areas for TB (62.5%) with poor health literacy on TB (70.6%) or low TB preventive measures (52.7%), and around 37% are smokers.

TABLE 1: Distribution of Proportion based on TB Suspect, Sex, Environment, Knowledge, Preventive Measures, and Smoking Habits 2016.

Variable	%	Variable	%
TB Suspect		Knowledge	
- No	78.1	- High	29.4
- Yes	21.9	- Low	70.6
Sex		Preventive Measures	
- Male	49.2	- Good	47.3
- Female	50.8	- Poor	52.7
Risky Environment		Smoking	
- No Risk	37.5	- No	63.4
- Risky	62.5	- Yes	36.6

From the data analyses, it is clear that sex and smoking habits are related to TB susceptibility (Table 2). A further analysis discovers that a smoking habit constitutes the most dominant risk factor among TB suspects after being controlled by knowledge on TB (Table 3).

The risk of becoming a TB suspect for a smoker is 2.7 times higher than for a non-smoker. Further, the risk of becoming a TB suspect among those with broad knowledge of TB is 0.6 times less than those with limited or no knowledge.

### 4. DISCUSSION

To substantiate long-term TB prevention, it is necessary to complement prevention strategies with the effort to mitigate risk and improve other social determinants. Among other individual characteristics, the study also discovers that there is a relationship between sex or gender and TB suspect incidents. This condition might be related to an unhealthy lifestyle, where men are more likely to be identified with smoking habits and alcohol consumption. On the other hand, women are typically more prone to psychological problems such as stress, which might affect their immune systems [8]. This finding is in line with previous research conducted in South India. That study looked at differences in TB patients categorized by their sex and found that women

TABLE 2: Relationships between Sex, Environment, Knowledge, Preventive Measures, and Smoking Habit and TB Suspects among Students of *Pondok Pesantren* in Garut District 2016.

Variable	TB Suspect		p	OR CI 95%
	No (%)	Yes (%)		
Sex				
- Male	83.5	16.5	0.009	1.9 (1.2-3.1)
- Female	72.5	17.5		
Risky Environment				
- No Risk	73.3	26.7	0.683	0.5 (0.1-2.5)
- Risk	84.0	16.0		
Knowledge				
- High	73.0	27.0	0.131	0.7 (0.4-1.1)
- Low	80.2	19.8		
Preventive Measures				
- Good	81.3	18.7	0.162	1.4 (0.9-2.3)
- Poor	75.2	24.8		
Smoking Habit				
- No	84.2	15.8	0.001	2.6 (1.6-4.1)
- Yes	67.5	32.5		

TABLE 3: Logistic Regression Multivariate Final Model on TB Knowledge, Smoking Habits, and TB Suspects among Students of *Pondok Pesantren* in Garut District 2016.

Variable	Coef	Std error	OR	95% CI	p
Knowledge High Low	-0.058	0.255	0.6	0.4-1.0	0.046
Smoking Habit	0.958	0.241	2.7	1.7-4.3	0.001

were more prone to TB infection than men by a ratio of 100:68 [1]. Depression and stress levels can have adverse effects on cell-mediated immunity system and may increase the risk of developing TB [13].

Another individual risk factor that plays an important role in TB prevention is the knowledge of TB, where broad knowledge can prevent and help avoid the transmission of *M.tb*. [4]. Knowledge can make a large contribution to the prevention of TB, where broader knowledge means greater awareness of TB and its signs, and a higher capability of preventing TB infection. The extent of the role of knowledge has been explored in previous research, where the TB risk for people with less knowledge is 3.5 times higher than for those with more knowledge [7]. Knowledge of TB is not common in Indonesia since Islamic boarding schools emphasize religion studies over other sciences. Students have limited opportunities to gain information on health issues, because the daily curriculum focuses heavily on Islamic teachings [12]. Consequently, knowledge of TB among students is relatively low, proven by the fact that they were not aware of TB

symptoms such as a chronic cough that lasts for more than two weeks. In addition, knowledge, in this study, acts as a confounding variable, which means that the lack of awareness of students who smoke relates to poor understanding of the effects of smoking as a risk factor of TB.

Exposure to smoking constitutes an unhealthy lifestyle, which can increase the risk of developing TB [8]. The findings show that smoking is the most dominant risk factor for TB suspects. The smoking habit has an adverse effect on the immune system; consequently, reducing tobacco consumption may help prevent development of the disease. This is in line with previous research conducted in South Africa on the effects of exposure on several risk factors, which discovered a connection between smoking and the risk of TB development [5]. The rates of TB development among smokers are greater than among non-smokers. Quitting smoking and avoiding exposure of tobacco smoke are essential steps in the disease control of TB. Unfortunately, there is generally no smoking prohibition at *pondok pesantren*; students can easily obtain cigarettes and other tobacco-based products and smoke with their peers or individually. In addition, there is a lack of supervision by school administrators and family members, since the students mostly live far from home. This can be observed from the percentage of students who smoke, which amounted to nearly 37% of the total students, and their risk of developing TB may be 2.7 times higher than their peers. The smoking rate of students at *pondok pesantren* is greater than that of the general population, where 23% are estimated to be smokers [10].

## 5. CONCLUSION AND RECOMMENDATIONS

The conditions of *pondok pesantren* in the Garut District contribute to the risk level of TB development among students, further aggravated by the characteristics of the students living in such *pondok pesantren*. Smoking constitutes the most dominant risk factor among the TB suspects, where the risk of developing TB among students with a smoking habit is 2.7 times greater than among non-smoking students, after controlling for knowledge of TB. Information concerning TB needs to be disseminated and supported by the policies prohibiting smoking near schools.

## ACKNOWLEDGMENTS

This research was funded by Universitas Indonesia's grant for Indexed International Publication of Students' Final Papers, contract number 1971/UN2.R12/HKP.05.00/2016. The researchers are grateful for the motivating support for this study.

## References

- [1] Balasubramanian, R., Garg, R., Santha, T., Gopi, P. G., Subramani, R., Chandrasekaran, V & Niruparani, C.(2004). Gender disparities in tuberculosis; report from rural DOTS programme in south India.*The International Journal of Tuberculosis and Lung Disease*, 8(3), 323-332.
- [2] Chudlori, M. Y. (2015). Pondok Pesantren Dalam Perspektif Kesehatan,. *RMI PBNU Jateng*. <https://rmi-jateng.org/iqro/2405-pondok-pesantren-dalam-prespektif-kesehatan>, accessed on 20 Aug 2016.
- [3] Corbett, E. L., Watt, C. J., Walker, N., Maher, D., Williams, B. G., Raviglione, M. C., & Dye, C.(2003). The growing burden of tuberculosis: global trends and interactions with the HIV epidemic.*Archives of Internal Medicine*, 163(9), 1009-1021.
- [4] Gilson, L., Doherty, J., Loewenson, R., & Francis, V. (2007). Knowledge Network on Health Systems; WHO Commission on social determinants of health. Final report. London: Centre for Health Policy.
- [5] Harling, G., Ehrlich, R., & Myer, L.(2008). The social epidemiology of tuberculosis in South Africa: a multilevel analysis. *Social Science & Medicine*, 66(2), 492-505.
- [6] Haryono, I., Prabandari, Y.S. Widodo Hariyono, W. ,(2008). Environmental Health Education through Kultum.*Berita Kedokteran Masyarakat*, 24(1), 8-15.
- [7] Hossain, S., Zaman, K., Quaiyum, A., Banu, S., Husain, A., Islam, A., ... & van Leth, F.(2015). Factors associated with poor knowledge among adults on tuberculosis in Bangladesh: results from a nationwide survey.*Journal of Health, Population and Nutrition*,34(1), 2.
- [8] Kjellstrom, T., Mercado, S., Barten, F. ,(2007). Our cities, our health, our future: Acting on Social Determinants or Health Equity in Urban Settings. Report to the WHO Commission on Social Determinants of Health from the Knowledge Network on urban settings. Kobe: World Health Organization Kobe Center.
- [9] Lin, H.,Ezzati, M.,& Murray, M. (2007). Tobacco smoke, indoor air pollution and tuberculosis: a systematic review and meta-analysis. *PLoS Medicine*, 4(1), e142.

- [10] Lonnoth, K., Jaramillo, E., Williams, B. G., Dye, C., & Raviglione, M. (2009). Drivers of tuberculosis epidemics: the role of risk factors and social determinants. *Elsevier, Social Science and Medicine*, 68(12), 2240-2246.
- [11] Ma, M. J., Yang, Y., Wang, H. B., Zhu, Y. F., Fang, L. Q., An, X. P., ... & Zhang, Z. Y. (2015). Transmissibility of tuberculosis among school contacts; an outbreak investigation in a boarding middle school, China. *Center for Inference and Dynamics of Infectious Diseases, Infection, Genetic and Evolution*, 32, 148-155.
- [12] Parker, L. (2008). The Experience of Adolescent Students in Modernist Islamic Boarding Schools in West Sumatra, Indonesia. Asian Studies, M211, School of Social and Cultural Studies. The University of Western Australia.
- [13] Prince, M., Patel, V., Saxena, S., Maj, M., Maselko, J., Phillips, M. R., & Rahman, A. (2007). No health without mental health. *Lancet*, 370(590), 859-877.
- [14] Rieder, H. (1999). *Epidemiologic basis of tuberculosis control*. Paris: International Union Against Tuberculosis and Lung Disease.
- [15] Stein-Zamir, C., Volovik, I., Rishpon, S., Atamna, A., Lavy, A., & Weiler-Ravell, D. (2006). tuberculosis outbreak among students in a boarding school. *European Respiratory Journal*, 28(5), 986-991.
- [16] The Lodi Tuberculosis Working Group. (1993). A school and community-based outbreak of Mycobacterium tuberculosis in Northern Italy, 1992-3. *Epidemiology and Infection*, 113, 83-93.
- [17] Zuhriy, M. S. (2011). Budaya Pesantren dan Pendidikan Karakter pada Pondok Pesantren Salaf. UIN Sunan Kalijaga Yogyakarta, *Jurnal Penelitian Sosial Keagamaan*, 19(2), 287-30.