



TUBERCULOSIS SUSPECT IN THE COMPANIES IN SEMARANG DISTRICT INDONESIA; CASE-CONTROL STUDY

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Abstract

In Semarang district, the population at the companies were 83120 workers. The number of smear positive cases in 2011 were 258 and 3898 suspected tuberculosis. Case-control study was conducted to analyze the risk of TB suspect infection among workers in the factory. We recruited 194 suspects and 197 controls who visited the factory clinic. The most common symptom was coughing with sputum (63 %) and then followed by malaise, chest pain, sweating at night, weight loss, dyspnea, anorexia, cough more than 2 weeks, sub febris and hemoptoe. Around 47 % both of the suspects and controls don't know received Bacillus Calmette-guérin (BCG) or not. The multivariate analysis showed the dominant factors that influence the occurrence of TB suspect, "education", "income", "ashamed of having TB", "TB treatment is very costly", and "share dish".distribution of health education booklet to teachers and parents.

Introduction

Pulmonary Tuberculosis (TB) is an infectious disease that remained a major public health problem in Indonesia. Global Tuberculosis Report 2012 reported that Indonesia was ranked 4th (0.4 million-0.5 million) as a contributor to global TB case after India (2.0 million-2.5 million), China (0.9 million-1.1 million), and South Africa (0.4 million-0.6 million). Based on a 2011 report of TB prevalence survey in Indonesia, the prevalence of smear-positive pulmonary TB was 194,780 inhabitants (Ministry of Health, 2012).

Pulmonary TB is a problem for people

in Semarang District. The population in 2011 was 938,802 inhabitants. The number of smear-positive cases in 2011 was 258, and 3,898 were suspected to have TB (Health Department 2011). When viewed from the scope of the detection of Acid -Fast Bacilli (AFB), the Case Detection Rate (CDR) was 25.70%; the TB case detection coverage is still far below the national target of at least 70% (Health Department, 2011).

Most people with TB are in the productive age group (15-55 years old). According to data from the Department of Labor of Semarang District, in 2011 the number of people in their productive age was 572,788 people, 70.59% of

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which was labor force who spent most of their time at work (Central Bureau of Statistic, 2012). This means that the working population could suffer TB.

In Semarang District in 2011, there were 175 major industries and 1,434 small to medium-sized industries where 83,120 people are working at (Central Bureau of Statistic, 2012). Every workplace has a risk for the development of TB disease in workers. However, in such workplaces, many people worked together and the risk seems higher than any other occupation especially for the blue collar workers (e.g. hygiene sanitation workers, social workers, hygiene company workers, etc.) due to low education, ignorance of TB information, and so on. In addition to transmitting TB to other workers, workers who suffered TB will have decreased productivity; their work performance will decline and will ultimately result in losses for the company. On the other hand, such workplace is also a good place to perform TB prevention for groups of workers. Employers are expected to have active participation of TB prevention in the workplace, such as selection and education of workers, hygiene and sanitation in the company, and cooperation with local health workers. TB surveillance in the workplace provides tangible benefits to the company and the community. The new case detection and early treatment will provide benefits for people, companies, and national TB eradication program.

The government, in this case the Ministry of Health, through the National TB Program, has been working with the hospitals, Non-Governmental Organizations (NGOs), private practice doctors, and religious organizations in order to enhance the cooperation with community groups and employers. Increased attention from employers against TB in the business sector is indispensable. To address the problems of TB in Indonesia and succeed in TB control activities, elimination of TB in the workplace using the DOTS strategy (Directly Observed Treatment, Short-course) recommended by WHO, is the most appropriate approach at this time and it must be implemented seriously. DOTS implementation in company clinic is an active role and a good partnership between employers and community workers

to improve TB prevention in the workplace (Ntshanga, 2009). Efforts to control TB in the workplace include promotive, preventive, curative, and rehabilitative measures.

In this study, the differences in socioeconomic status, basic knowledge, attitude, and behavior were compared between TB suspects enrolled in 2012 at the factory clinic in Semarang and controls that visited the same clinic but have different diagnosis.

Methods

This case-control study was conducted from January to September 2012. TB suspects (194) were recruited from the workers who visited the factory clinic in the 3 companies. They have TB symptoms and the attending doctors reported them as cases of suspected TB. The age-and gender-matched controls (197) were recruited from those who visited the same factory clinic in each company but were given different diagnosis. This research was approved by the ethical committees of Kanazawa University School of Medicine, Japan and Diponegoro University School of Medicine, Indonesia and Semarang State University, Indonesia. All participants approved this study by written informed consent.

Aside from age and gender, demographic information of both from the suspects and the age-and gender-matched controls was collected; information about education, origin, BCG history, smoking, possession of pets, income, and housing condition were also collected. The information regarding the symptoms of TB suspect was also collected, that is: productive cough, coughing for more than 2 weeks, hemoptysis, dyspnea, chest pain, malaise, anorexia, weight loss, night sweat, and subfebrile fever for more than 1 month. Answers for the following question were also recorded: from which source did you get information about TB, what was a sign of TB*, how does a person contract TB*, how does a person prevent themselves from contracting TB* (*multiple answers). The information collected here was; “are you ashamed to have TB?”, “do you want to keep the TB infection a secret?”, “do you think TB treatment is very costly?”, “do you want live in isolation when you contract TB?”, “do you think TB will affect

your work performance?”, “do you think TB affects family responsibility?”, “do you think TB affects relationship with friends?”, “how do you feel about TB patients?”, “how do you do with a TB patient in the community?”, and “do you think HIV-positive people should be concerned about TB?”. The information collected here was: mask usage, time until face mask replaced, washing your hands before eating, eating from the shared plate with your friends, drinking from the shared bottle with your friends,

Table 1. Difference was observed between the suspects and the control

	Suspects		Control	
	N	%	N	%
Gender				
Male	68	35	66	34
Female	126	65	131	66
Age	31.4±8.2		29.8±7.8	
Education				
Senior high school and higher school	128	66	146	74
Junior high school	66	34	51	26
Origin				
Rural	144	74	153	78
Urban	50	26	44	22
BCG				
Received	61	31	56	28
Not received	42	22	48	24
Don't know	91	47	93	47
Smoker				
No	168	87	171	87
Yes	26	13	26	13
Living with smoker				
No	112	58	119	60
Yes	82	42	78	40
Member in room				
1	23	12	33	17
2	120	62	118	60
>=3	51	26	46	23
Income				
>\$150	56	29	43	22
\$100-\$150	116	60	141	72
<\$100	22	11	13	7
Having pet				
No	146	75	155	79
Yes	48	25	42	21

* Significant difference was observed between the suspects and the control ($p < 0.05$, χ^2 test analysis or Student's t-test).

Source : Primary Data

washing your hands after blowing your nose, and coming to work when you are unwell. The differences in the frequency of answers between suspects and controls were estimated using Chi-square (χ^2) test. The differences in the age between the suspects and the controls were estimated using Student's t-test. Thereafter, logistic regression analysis was performed with the suspects/controls as the dependent variable. Whereas the independent variables were defined by groups classified by the above-mentioned questionnaire answers. The degree of association of potential predictor variables for the occurrence of TB was analyzed using bivariate and multiple gradually conditional logistic regressions. To enter predictive variables in an initial multivariate model, statistical significance was specified at $\alpha = 0.25$. The following steps in the multiple logistic regression maintained predictors with a p value < 0.05 , whereas other predictors were excluded until a model was built with all predictors significant at $p < 0.05$. All analyses were performed with SPSS ver. 19 (SAS Institute Inc., Cary, NY). In all analyses, $p < 0.05$ was used to indicate statistical significance.

Results and Discussion

The average age of the TB suspects was 31.4 ± 8.2 , including 35% male and 65% female. The symptoms of the TB suspects were listed in Table 2.

The TB suspects usually have more than one symptom. When they only complained of one symptom, they were diagnosed as TB suspects if the symptom was serious. The most common symptom was productive cough (63%) followed by malaise, chest pain, night sweat, weight loss, dyspnea, and anorexia. Coughing for more than 2 weeks, subfebrile fever, and hemoptysis were not as common. The TB suspects have many symptoms with as many as 2.5 ± 1.2 complaints/person in average.

The 197 age- and gender-matched controls were selected from workers who visited the factory clinic in the company and were not diagnosed as TB suspect. The cases and controls were nearly identical in regard to gender and age. Education level was not different between the suspects and the controls, and around one half of them didn't know whether or not they have received BCG. The

origin of TB suspects were mostly rural area (74%) (Table 1). The number of smokers, whether or not they lived with smokers, number of room-sharing people, and possession of pet were not different between the two groups. However, the income of the controls seemed to be higher than that of the suspects.

Most information sources used were broadcast (70%). Both the suspects and the controls obtained their information from the same sources, whereas the suspects used newspaper more frequently than the controls (Table 3).

The TB suspects complained of a number of symptoms. What TB suspects thought was a TB symptoms were not always different from the controls, excluding "night sweat". "Night sweat" was considered to be a significant symptom for TB (87/197, 45%). There were no significant difference regarding knowledge about 'how can a person contract TB' between the suspects and the controls. However, knowledge about "ways of TB prevention" displayed significant differences; "cover mouth and nose when someone sneezed" in the suspects and "to avoid plate-sharing" and "washing hands after touching items in public

Table 2. Symptoms of The Complaint of the Suspects

	Suspects	
	N	%
Cough Sputum	123	63
Cough>2w	11	6
Hemoptoe	2	1
Dyspnea	59	30
Chest Pain	73	38
Malaise	98	51
Anorexia	37	19
Sweating at night	63	33
Weight loss	63	33
Sub Febris	5	3

The suspects complained at least 1 symptom listed above.

In average, 2.5 ± 1.2 symptoms/person were complained.

Source : Primary Data

Table 3. Differences in Knowledge of TB Between the Suspects and Control

	Suspects		Control	
	N	%	N	%
Source of TB information ^a				
Broadcast	134	69	142	72
Billboards	40	21	41	21
Newspaper	78	40	55	28 *
Medical	85	44	76	39
Acquaintance	73	38	74	38
Symptoms of TB patient would display ^a				
Cough with sputum	97	50	99	50
Cough >3w	104	54	97	49
Hemoptysis	71	37	71	36
Headache	20	10	15	8
Nausea	30	15	26	13
Chest pain	68	35	66	34
Sweat at night	87	45	66	34*
Weight loss	68	35	59	30
Fever	30	15	28	14
Subfever	35	18	22	11
Weakness	48	25	49	25
The way of getting TB ^a				
Hand shaking	20	10	20	10
Eating in a same dish	49	25	64	32
Drink in the same glass	78	40	88	45
Sneeze	141	73	141	72
Smoke	72	37	72	37
Hereditary	44	23	45	23
The way of prevent getting TB ^a				
Cover mouth and nose	139	72	99	50*
Avoid sharing dish	54	28	97	49*
Wash hand after touchig items in public	49	25	75	38*
Take good nutrition	86	44	89	45
Close windows	38	20	50	25
By vaccination	122	63	124	63

^aMultiple answer question. *Significant difference ($p < 0.05$, χ^2 test)

Source : Primary Data

Table 4. Concerns if Suffering TB Between the Suspects and Control

	Suspect		Control		OR	95% CI	
	N	%	N	%		Upper	
Ashamed of having TB							
No	75	39	92	47			
Yes	49	25	63	32	0.95	0.59	1.55
Don't know	70	36	42	21	2.04	1.25	3.34
Hide if having TB							
No	109	56	114	58			
Yes	85	44	83	42	1.07	0.72	1.60
TB treatment is very costly							
No	35	18	45	23			
Yes	159	82	152	77	1.35	0.82	2.21
Isolated when getting TB							
No	111	57	115	58			
Yes	83	43	82	42	1.05	0.70	1.57
TB affect work performance							
No	28	14	29	15			
Yes	166	86	168	85	1.02	0.58	1.80
TB affect relationship with friends							
No	30	15	29	15			
Yes	164	85	168	85	0.94	0.54	1.64
TB affect family responsibility							
No	67	35	75	38			
Yes	127	66	122	62	1.17	0.77	1.76
The feeling for TB patient							
Help	111	57	122	62			
Hesitate	61	32	48	24	1.40	0.88	2.21
No feeling	22	11	27	14	0.90	0.48	1.66
TB in the community							
Support and help	71	37	60	31			
Friendly but avoid	99	51	99	50	0.85	0.54	1.32
Reject	24	12	38	19	0.53	0.29	0.99
HIV positive people should be concerned about TB							
Surely	83	42	77	39			
Not always	73	38	83	42	0.82	0.53	1.27
No	38	20	37	19	0.95	0.55	1.65

*Significant difference ($p < 0.05$)

OR = Odds Ratio, CI= Confidence Interval

Source : Primary Data

Table 5. Behavior at The Work Place Between The Suspects And Control

	Suspect		Control		OR	95% CI	
	N	%	N	%		Upper	
Wear on mask							
Yes	46	24	62	31			
No	34	17	21	11	2.18	1.12	4.24
Sometimes	114	59	114	58	1.35	0.85	2.14
Time to replace the face mask							
>=3/w	87	45	96	49			
1-2/w	77	40	82	42	1.04	0.68	1.59
never	30	15	19	9	1.74	0.92	3.32
Wash hands before eating							
Yes	149	76	152	78			
No	48	24	42	22	0.858	0.535	1.375
Share the dish							
None	145	75	127	65			
Always	49	25	70	35	0.61	0.40	0.95*
Drink from the same glass/bottle							
None	111	57	113	57			
Always	83	43	84	43	1.01	0.67	1.50
Wash after blowing							
Always	76	39	77	39			
Sometimes	91	47	102	52	0.90	0.59	1.38
None	27	14	18	9	1.52	0.77	2.99
Work when unwell							
Sometimes	122	63	115	58			
Always	72	37	82	42	0.83	0.55	1.24

*Significant difference ($p < 0.05$)

OR = Odds Ratio, CI= Confidence Interval

Source : Primary Data

place” in the controls were considered to be more important.

In univariate analysis related to “concerns if suffer TB” and “behavior at workplace”, there were no differences between the suspects and the controls, except for “ashamed of having TB” and “plate-sharing” (Table 4 & 5).

Factory workers have greater risk of contracting infectious diseases, including pulmonary TB, because they work with many people in one place. It is making easier transmission. If there are workers who smoke, the smoke will be inhaled by other workers, so the workers’ lungs will be more susceptible to

disease, including pulmonary TB (Nurjanah, et. al., 2014).

Low frequency of “plate-sharing” was as expected by the result in Table 3. Thus, we applied multiple logistic regression, and several factors that influence the occurrence of TB were extracted as risk (e.g. low “education”, low “income”, “ashamed of having TB”, “TB treatment is very costly”) and as protective (e.g. “plate-sharing”) (Table 6).

Morbidity and mortality due to TB have significant consequences on the economic problems of individuals, families, communities, companies, and countries. Companies are a

Table 6. Dominant Factors for TB Suspect: Comparison of Suspect and Control

(Multivariate Analysis)	OR		ρ
	Lower	Upper	
Education ^a			
Senior high school and higher school			
Junior haigh school	1.642	1.002	2.691
Income ^a			
>\$150			0.035
\$100-\$150	0.527	0.313	0.887
<\$100	0.864	0.365	2.046
Ashamed of having TB ^b			
No			0.008
Yes	0.987	0.596	1.633
Don't know	2.119	1.262	3.558
TB treatment is very costly ^b			
No			
Yes	1.744	1.021	2.978
Share the dish ^c			
None			
Always	0.555	0.349	0.885

Analysis using table 1,4 and 5

^aDemographic

^bConcern about TB

^cBehavior at the work place

Source : Primary Data

potential place of infectious TB and a potential environment in TB control. The results of the recruitment of patients who visited the company clinics found about 60% of patients with suspected TB have symptoms of productive cough. The initial symptom of TB and the most commonly found (over 85% of cases) was coughing (English et al., 2006). This finding has an important implication for the TB program in Indonesia. With the screening of TB, the transmission of TB is expected to decrease in the workplace and CDR achievement in Semarang District will reach 70 %. Approximately 60% of TB suspects have low income. TB is always associated with socioeconomic status. Socioeconomic status related to dense neighborhoods, as well as nutrition status, will increase the transmission of TB (Wu and Dalal, 2012, Oxlade and Murray, 2012, Barter et al.,

2012). More than 70% of TB suspects are from rural area. This is in accordance with the results of Basic Health Research in Indonesia in 2007, which found that the prevalence of pulmonary TB was three times higher in rural area than it is in urban area. BCG vaccination, supported with adequate nutrition will provide 80% protection against TB for 15 years. However, almost one half of both suspects and controls did not know whether or not they have received BCG. Around 40 % of both the suspects and the controls live with smokers. Exposure to cigarettes will increase the risk of TB in adults and in children (Arcavi and Benowitz, 2004, Lienhardt et al., 2005, Gajalakshmi and Peto, 2009, Gajalakshmi et al., 2003).

Nugrahaeni's study in Bandung explained that knowledge affects the occurrence of drug-resistant TB. No side effects on patient and that

the health service is not implementing DOTS also affect research on the occurrence of drug-resistant TB (Nugrahaeni et al., 2015).

Knowledge of how to get exposed to TB was not significantly different between the suspects and the controls. However, they showed differences in knowledge of how to prevent TB; the suspects thought “cover your mouth and nose when someone sneezes” was more important whereas the controls thought “to avoid sharing plates” and “wash your hands after touching items in the public places” was. In fact, the suspects rarely share plates. Knowledge will affect perception and initiate one of the factors that play a role in influencing a person’s decision to behave healthily. The broadcasts, which include television, was the other main source of information in this study, consistent with other study which reported that television was the most common source of information (Mushtaq et al., 2011, Khan et al., 2006, Ali et al., 2003). The mass media could play an important role in TB program on passive case finding (Jaramillo, 2001). The dominant factors affecting TB suspects were “education”, “income”, “shameful feeling of having TB”, “TB treatment is very costly”, and “plate-sharing”. These factors are related to knowledge, economy, perception, and habits (English et al., 2006, Hill et al., 2006).

Conclusion

In addressing the problems of TB in Indonesia, the DOTS strategy in the clinic enterprise is the proper approach. To achieve the appropriate national targets of CDR, TB screening is routinely required in the workforce in the company. The laborers at the company can be infected with TB; it can be seen from the knowledge, economic status, perception, and behavior in the workplace.

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References

Ali, S. S., Rabbani, F., Siddiqui, U. N., Zaidi, A. H., Sophie, A., Virani, S. J. & Younus, N. A. 2003. Tuberculosis: Do we know enough? A study of patients and their families in an out-

- patient hospital setting in Karachi, Pakistan. *Int J Tuberc Lung Dis*, 7, 1052-8.
- Arcavi, L. & Benowitz, N. L. 2004. Cigarette smoking and infection. *Arch Intern Med*, 164, 2206-16.
- Barter, D. M., Agboola, S. O., Murray, M. B. & Barnighausen, T. 2012. Tuberculosis and poverty: the contribution of patient costs in sub-Saharan Africa--a systematic review. *BMC Public Health*, 12, 980.
- Central Bureau of Statistic, S. D. 2012. Profile of Employment of Semarang District 2011. Jl. Garuda No.7 Ungaran 50511,BPS Semarang District.
- English, R. G., Bachmann, M. O., Bateman, E. D., Zwarenstein, M. F., Fairall, L. R., Bheekie, A., Majara, B. P., Lombard, C., Scherpbier, R. & Ottomani, S. E. 2006. Diagnostic accuracy of an integrated respiratory guideline in identifying patients with respiratory symptoms requiring screening for pulmonary tuberculosis: a cross-sectional study. *BMC Pulm Med*, 6, 22.
- Gajalakshmi, V. & Peto, R. 2009. Smoking, drinking and incident tuberculosis in rural India: population-based case-control study. *Int J Epidemiol*, 38, 1018-25.
- Gajalakshmi, V., Peto, R., Kanaka, T. S. & Jha, P. 2003. Smoking and mortality from tuberculosis and other diseases in India: retrospective study of 43000 adult male deaths and 35000 controls. *Lancet*, 362, 507-15.
- Health Department , S. D. 2011. Reported TB Cases in Semarang District. Semarang District,Central Java, Indonesia.
- Hill, P. C., Jackson-Sillah, D., Donkor, S. A., Otu, J., Adegbola, R. A. & Lienhardt, C. 2006. Risk factors for pulmonary tuberculosis: a clinic-based case control study in The Gambia. *BMC Public Health*, 6, 156.
- Jaramillo, E. 2001. The impact of media-based health education on tuberculosis diagnosis in Cali, Colombia. *Health Policy Plan*, 16, 68-73.
- Khan, J. A., Irfan, M., Zaki, A., Beg, M., Hussain, S. F. & Rizvi, N. 2006. Knowledge, attitude and misconceptions regarding tuberculosis in Pakistani patients. *J Pak Med Assoc*, 56, 211-4.
- Lienhardt, C., Fielding, K., Sillah, J. S., Bah, B., Gustafson, P., Warndorff, D., Palayew, M., Lisse, I., Donkor, S., Diallo, S., Manneh, K., Adegbola, R., Aaby, P., Bah-Sow, O., Bennett, S. & Mcadam, K. 2005. Investigation of the risk factors for tuberculosis: a case-control study in three countries in West Africa. *Int J Epidemiol*, 34, 914-23.
- Ministry of Health , R. O. I. 2012. Profile of Health

- Data of Indonesia in 2011. Jakarta, Indonesia: Ministry of Health of The Republic of Indonesia.
- Mushtaq, M. U., Shahid, U., Abdullah, H. M., Saeed, A., Omer, F., Shad, M. A., Siddiqui, A. M. & Akram, J. 2011. Urban-rural inequities in knowledge, attitudes and practices regarding tuberculosis in two districts of Pakistan's Punjab province. *Int J Equity Health*, 10, 8.
- Ntshanga, S. P. & Mabaso, M. L. 2009. A pilot study to assess workplace tuberculosis control activities in four districts in KwaZulu-Natal, South Africa. *Public Health*, 123, 623-4.
- Nugrahaeni, Dyan Kunthi. & Malik, Upep Saiful. 2015. Analisis Penyebab Resistensi Obat Anti Tuberkulosis. *KEMAS*, 11(1), 8-15.
- Nurjanah., Kresnowati, Lily., Mufid, Abdun, 2014. Gangguan Fungsi Paru dan Kadar Cotinine Pada Urin Karyawan yang Terpapar Asap Rokok Orang Lain. *KEMAS*, 10(1), 43-52
- Oxlade, O. & Murray, M. 2012. Tuberculosis and poverty: why are the poor at greater risk in India? *PLoS One*, 7, e47533.
- Wu, J. & Dalal, K. 2012. Tuberculosis in Asia and the pacific: the role of socioeconomic status and health system development. *Int J Prev Med*, 3, 8-16.