ORIGINAL ARTICLE

The Medication Adherence and the Conversion of Acid Fast Bacilli of Pulmonary Tuberculosis Patients: A Retrospective Cohort Study in the Centre for Pulmonary Health Semarang

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ABSTRACT

Background: Tuberculosis (TB) remains a significant health problem in Indonesia. Anindicator to monitor and to evaluate TB program is the smear conversion rate.
Aim: Toanalyze the association between medication adherences and conversion of acid fast bacillus of pulmonary tuberculosis patients.
Method: This was a cohort study with retrospective design. Study subject was 66 pulmonary tuberculosis patients, which was selected by purposive sampling technique. Diagnose of pulmonary tuberculosis was established by positive acid fast bacilli (positive smear) in the Centre for Pulmonary Health Semarang. The subject was divided into exposed (non-adherence) and unexposed (adherence) groups. The data wasanalyzed bychi square test.
Results: The result of the study showed that the percentage of male and female respondents was similar. Most subjects were >45 years old (33.3%). Active drug supervisors (43.9%) were less than the passive ones (56.1%). Statistical analysis showed conversion rate was related to medication adherence (p=0.011, RR=4,712, 95%).
Conclusion: It can be concluded that the medication adherence is significantly related to smear conversion in patients with smear-positive pulmonary TB in the Centre for Pulmonary Health of Semarang. It is suggested to provide health education to patients to increase the medication adherence using a variety of medias.
Keywords: Tuberculosis, Conversion, Acid Fast Bacilli, Adherence

INTRODUCTION

Pulmonary Tuberculosis (PTB) is an infectious disease caused by *Mycobacterium tuberculosis*.[1]PTB is diagnosed by the finding of acid fast bacilli (AFB) through direct sputum smear microscopy[2]. Prompt treatment is fundamental in reducing morbidity, mortality, and preventing spread of infection[3]. After an effective treatment, in the first two months (intensive phase) patients with positive AFB (AFB+) are supposed to be converted into negative AFB (AFB-). An indicator to monitor and evaluate the PTB treatment is the conversion rate of AFB[4]. The conversion rate of PTB in Indonesia during 2009-2014has been decreasing continuously. On the other hand, the conversion rate in Central Java Province slightly increased from 76%in 2011 to 83.7% in 2012. The conversion rate in Semarang City waslower than provincial rate, i.e. 72%in 2012[1,5].

There are several factors that affect conversion rate, for example age, gender, patient's behaviour, knowledge, health education, drug supervisor, side effect, and nutritional status, as well as the medication adherence.[3, 6-9]The adherence is an important key for the successful of medication[10]. Adherence during the six-month medication has a strong relation with the adherence in intensive phase, which is marked by AFB conversion[6]. AFB conversion after two months of medication in intensive phase is very important for PTB recovery[6,11,12,13]. This study is aimed to analyze association of the adherence of medicine with conversion of AFB in PTB patients in the Centre for Pulmonary Health Semarang.

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METHOD

This was an observational analytical study with cohort retrospective design to determine the association of adherences and AFB conversion during intensive phase of medication.
Population and Sample: Population in this study was all PTB with positive AFB who underwent medication in the Centre for Pulmonary Health of Semarang. Subject was 66 PTB patients, who were selected by purposive sampling technique. The subjects were divided into two groups, the exposed (non-adherence) and unexposed (adherence) groups. Each group consisted of 33 subjects.
Data Collection and Analysis: Primary data was collected by interview with PTB patients using structured questionnaire. The variables were sex, age, occupation, income, comorbidities, role of drug supervisor, medication adherence. Secondary data was collected from TB-01 Form in the Centre for Pulmonary Health Semarang. TB-01 contained data related to medication (type of patient, medication phase, AFB conversion). The data were analysed by chi square test, while the association by Relative Risk (RR).
Ethic Statement: Ethical issues (including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy) have been completely observed by the authors. Ethical approval was obtained from the Committee of Public Health Research Ethics, Diponegoro University (561.1/EC/FKM/2016). Informed consent was acquired from all subjects.

RESULTS AND DISCUSSION

The percentage of male was higher (53%) than that of women. Most of subjects (33.3%)were≥45 years old (Table

1). Based on the previous studies, male had greater chance to experience conversion failed than female[6,14]. More male commonly has smoking behaviour, which decreases immunity.Thus,medicine effectivenessalso decline, so that will result in AFB conversion failed[15]. Female has greater chance to experience AFB conversion due to hormonal factor. Female has estrogen hormone,which increases the secretion of INF-γ and activates macrophage activities. On the contrary, male has testosterone, which blocks immune respond[16,17].

Other study showed that most PTB cases were distributed in productive age, ≥48 years old.[6]In the ageof ≥ 45 years old, atrophy of the thymus gland has appear, which cause the decrease of immunity. Decreasing of immunity enables PTB patients to experience conversionfailed[18,19]. Similarly, several previous studies showed theAFB conversion is decreasing in the age of>40 years old,which is caused by decreasing of immunity[13,20,21]. The older the age, macrophage response against T cell is decreasing and T cell production by thymus gland is diminishing[18,21].

Table 1: Characteristics of Respondent (n=66)

Characteristic	Frequency	%age
Gender		
Male	35	53.0
Female	31	47.0
Age (years)		
15-24	10	15.2
25-34	19	28.8
35-44	15	27.7
> 45	22	33.3
Job		
Labor	6	9.1
Housewife	8	12.1
Trader	5	7.6
Private	33	50.0
Student	1	1.5
Civil servant	4	6.1
Unemployed	9	13.6
Income level		
≥Regional Minimum Wages (RMW)	28	42.4
<RMW	38	57.6

Table 2: Proportion of the adherence of medicine intake, the supervisor of tuberculosis drug role and morbidities

Variables	Frequency	%age
Adherence of medicine intake		
Regular	33	50.0
Non-regular	33	50.0
Supervisor of tuberculosis drug role		
Active	29	43.9
Passive	37	56.1
Morbidities		
Not available	56	84.8
Available	10	15.2

In this research, mostsubjects were private employee(50%) with low income (57.6%) (Table 1). Occupation has strong association with income[22]. Low income level will affect psychological stress, while stress will aggravate patient's immunity so low that it will affect medication process, thusyieldedin bad medication result[23]. On the other hand, higher income level will affect the nutrition of patient. The increase of nutritional status will improve immunity, which resulted in enhancing PTB recovery[24]. Several previous studies supported that income level is the risk factor of tuberculosis medication result[15,20,25].

Table 3. Association between adherences of medicine intake with conversion of acidfast bacillus

Adherence of medicine intake	Output		Total
	Conversion	Failed Conversion	
Regular	29(87.9%)	4(12.1%)	33(100%)
Non-regular	20(60.6%)	13(39.4%)	33(100%)
Total	49(74.2%)	17(25.8%)	66(100%)

P value= o.011 RR=4.712
95% CI= 1.341-16.566

This study showed a non-adherence PTB patientshas 4.712 times higher risk ofconversion fail than the adherence patients. Regular anti-tuberculosis drug will increase the permeability of bacteria cell wall, enabling the drug to enter the cell easier. The drugthus blocking the synthesis of nucleic acid and DNA transcription by bonding with RNA polymerase that catalyses the DNA. In the first week of medication, the DNA level of bacteria is decreasing, causing the infected patient turns into non-infected in two weeks[26-28]. During regular medication, the RNA transcription is disturbed then the RNA chain will be damaged. Under this condition bacteria cell wall will not be formed, and lead to bacteria death (AFB-). Taking the medicine regularly also blocks the formation process of fatty acid thusinhibits *M. tuberculosis* growth[27,28]. The number of *M. tuberculosis* decreases along with medication, causes the change of positive AFB into negative in two months[29]. Non-adherence patient causes reactivity of *M. tuberculosis*. Although the number of bacteria is low, they remain able to reproduce and cause failure of medication or failed conversion[30,31].

This study is in accordance with other previous studies on the effectiveness of anti-tuberculosis drug in PTB treatment[8,29]. However, conversion from positive AFB into negative AFB needs treatment adherence. Besides, drug supervisor plays an important role to monitor patients' behaviour in taking the drug, as well as appropriate dosage and time[6,13] . The adherence of medication in this study consisted of medicineintake, daily intake, time to take medicine during the intensive phase. The non-adherence in this study was mostly caused by work load and the feelingof cured from PTB. Many subjects took the drug after meal. Theoretically, the drug is more effective if consumed before meal or before bed.

CONCLUSION

There is an association between the adherence of medicine intake with conversion of acid fast bacillus of pulmonary tuberculosis patients on the last intensive phase medication in The Centre for Pulmonary Health of Semarang. It is suggested to improve the knowledge of the patients about the adherence of anti-tuberculosis medicines to prevent from conversion failed during intensive phase, as well as not to spread the pulmonary tuberculosis to the family and other societies.

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