

EFFECT OF A TUBERCULOSIS HEALTH PROMOTION PROGRAM ON MEDICATION ADHERENCE AMONG TUBERCULOSIS PATIENTS

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Abstract:

The purpose of this quasi-experimental study was to examine the effect of a tuberculosis health promotion program on medication adherence among patients with tuberculosis. Sixty-eight persons with tuberculosis, recruited from the Klari, Karawang public health center in West Java, Indonesia, were randomly assigned to an experimental or control group, with 34 persons assigned to each group. The participants in the experimental group participated in the Tuberculosis Health Promotion Program, whereas, those in the control group received conventional nursing care. Based on the Pender's Health Promotion Model, the 8-week tuberculosis health promotion program comprised health education related to TB, personal counseling, group discussion and individual monitoring. The outcome was assessed by the 8-item *Morisky Medication Adherence Scale*. Data were analyzed using Dependent t-test and Independent t-test. The results indicated that after participating in the tuberculosis health promotion program, there was a significant improvement in medication adherence in TB patients in the experimental group which was shown by significant difference in mean score of medication adherence. In addition, after participating in the program, there was a significant difference in mean scores of medication adherence between the experimental group ($\bar{X}=6.38$, $SD=0.85$) and the control group ($\bar{X}=3.64$, $SD=1.04$), $p<0.01$. This TB health promotion program appears to be effective in improving medication adherence among TB patients.

Keywords: Tuberculosis, Medication adherence, Health promotion program, Indonesia

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INTRODUCTION

Tuberculosis (TB) remains a major problem globally. Worldwide, the incidence rate of the disease is 128 cases per 100,000 persons [1]. According to a World Health Organization (WHO) report, in 2011 there were 5.8 million newly diagnosed TB cases worldwide which was higher than 3.4 million recorded in 1995 [1]. A standard long-duration TB treatment, which generally lasts for at least six months, has shown to have a high risk of treatment default [2]. Poor adherence to TB treatment may result in the emergence of resistant strains of *Mycobacterium tuberculosis*, increasing mortality and prolonging treatment duration [3].

Medication adherence is defined as "the extent to which a person's behavior [in] taking medication corresponds with agreed recommendations from a health care provider" [1]. Gochman says that medication adherence is recognized as a health behavior for its patterns, actions and habits that relate to health maintenance, health restoration, and health improvement [4]. Four main structural factors affecting adherence included poverty and gender discrimination, social factors, health service factors and personal factors including knowledge, attitude, and beliefs about the treatment, may impact patient medication adherence [2]. Thus, efforts to improve medication adherence could be more effective when multiple factors that influence adherence behaviors are addressed.

In 2014 the WHO reported that Indonesia accounted for the fourth largest TB population in

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the world. It is the second cause of death after cardiovascular disease, and the first cause of death from all infectious diseases. By the year 2012 the estimated prevalence and incidence rates of all forms of TB in Indonesia were 297 and 185 per 100 000 population, respectively [5]. Directly Observed Therapy-Short Course (DOTS) is promoted by the World Health Organization (WHO) to solve the TB problem in developing countries as it is considered to be the most effective method for increasing medication adherence [3]. Over the years, DOTS programs have improved with the adoption of a multiple approach that includes the provision of patient health training, incentives, client-focused regimens, defaulter tracing and social support.

Nevertheless, there are some challenges in the implementation of the DOT strategy in West Java, Indonesia. One of the primary challenges is providing a health promotion program as part of the effective DOTS strategy that would strengthen and ensure adherence to the treatment regimen [6]. Such program is rarely implemented on a continuous basis in Indonesia especially in public health centers, which serve as the main provider of TB treatment. Thus, proper health promotion programs related to TB are less than expectations, whereas nurses, who play an important role to change behaviors and achieve a healthy lifestyle, have been at the forefront of tuberculosis prevention, care and treatment, need to take on a more crucial point [7].

Regarding tuberculosis treatment, a concern to medication adherence should be given high priority. Adherence to a daily medication regimen requires individual developing proper behaviors. Chronic condition like TB requires long-term treatment with medication and optimum medication adherence behavior is needed for maximum benefit. Pender defined health-promoting behaviors as "...continuing activities that must become an integral part of an individual's lifestyle"; in that sense, medication adherence can be seen as a health-promoting behavior [8]. According to the Pender's Health Promotion Model, which has been effectively implemented in several studies including the development of health promotion program, the significant determinants of health promotion behaviors include factors regarding behavior-specific cognitions, such as perceived benefits of action, perceived barriers, and self-efficacy [7, 9].

To enhance medication adherence behaviors, persons with TB should have adequate knowledge and skills regarding the disease and the importance

of completing full TB treatment should be imparted through health promotion efforts. Thus, the purpose of this study, based on Pender's Health Promotion Model, is to examine the effect of the Tuberculosis Health Promotion Program on medication adherence among persons with tuberculosis.

METHOD

This quasi-experimental study was conducted at the Klari, Karawang Public Health Center in West Java, Indonesia from January to March 2014. The study had 68 participants, equally divided into 2 groups with 34 participants in each group, with TB registered at the public health center who met the following criteria: 1) those newly diagnosed with active tuberculosis, 2) aged 20-59 years, 3) a citizen of Indonesia, 4) following tuberculosis treatment from public health center, 5) free for suffering from any other disease, 6) able to read and write in the Bahasa Indonesia language, and 7) be able to communicate with mobile phone. The sample size calculation was based on effect size of 0.50, $\alpha=0.05$, a desired of power = 0.80, plus an additional 20% for attrition. Using systematic random sampling procedure, the eligible participants who attended the public health center from Monday to Wednesday were assigned into the experimental group and those who visited from Thursday to Saturday were included in the control group.

ETHICAL CONSIDERATION

To protect participants' human rights, the study proposal was approved by the Office of the National and Political Unit of the Karawang sub-district government. All participants were provided with information explaining the study's purpose, procedure and benefits. Those who agreed to take part in the study indicated their consent by signing a consent form.

TUBERCULOSIS HEALTH PROMOTION PROGRAM

The program utilized in this study incorporated three components of Pender's Health Promotion Model: perceived benefit to action, perceived barrier to action, and perceived self-efficacy. The program was divided into 4 sessions: health education related to TB, personal counseling, group discussion and individual monitoring. Health education related to TB focused on enhancing participants' knowledge/ skills related to TB. Two research assistants experienced in the field of TB for more than 2 years assisted the researcher. The health education included two topic presentations,

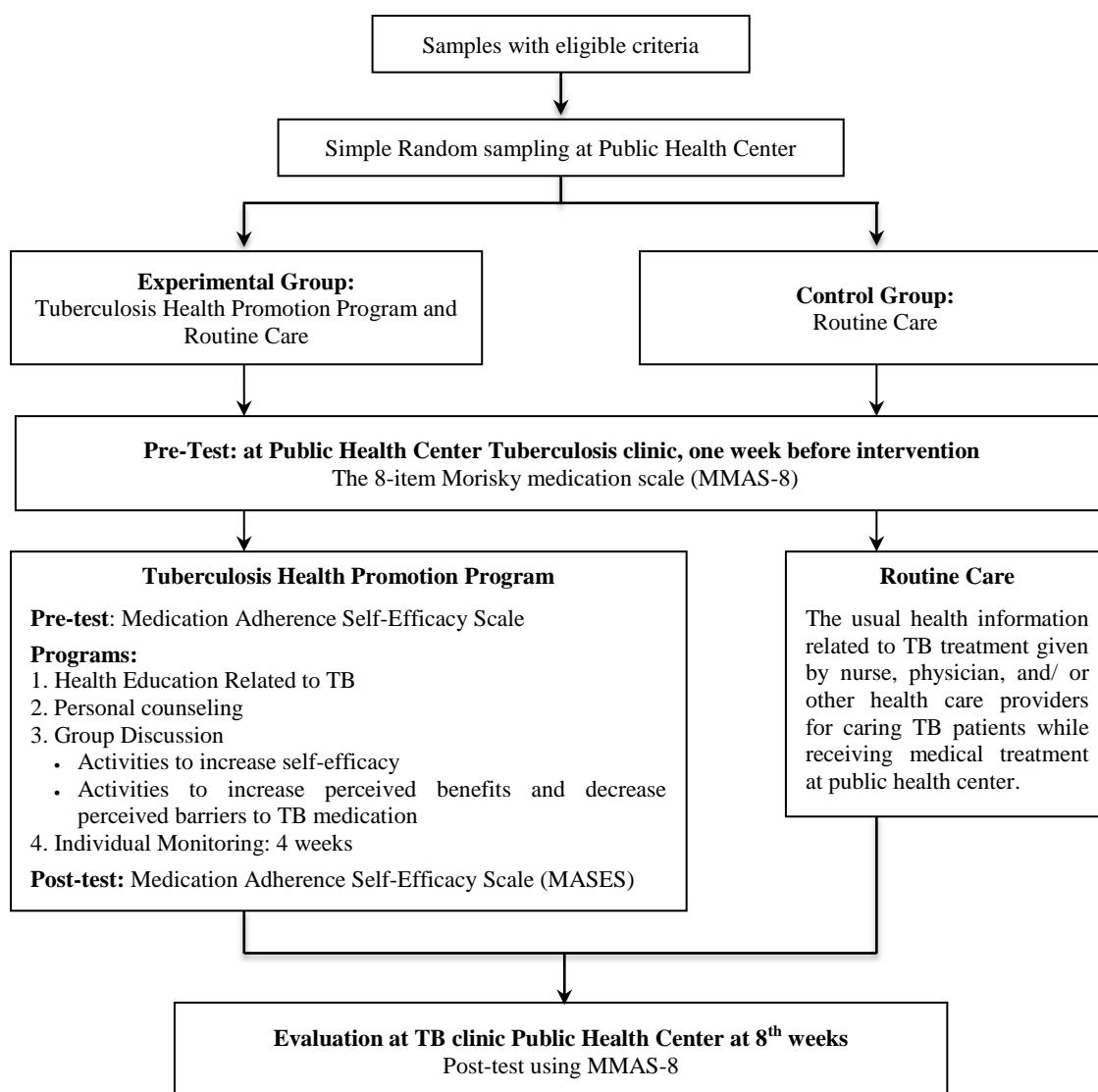


Figure 1 Scheme of the Tuberculosis Health Promotion Program

during the 1st and 2nd weeks. Each session comprised 45-60 minutes of teaching and discussion about tuberculosis. Each participant was provided a Patients' Handbook of Tuberculosis that contained topics presented at each health education session. Two individual counseling sessions of 30 to 35 minutes were scheduled during the 2nd and 3rd week of the program at the public health center. These sessions were designed to guide TB patients regarding issues they might encounter as they implemented medication adherence (i.e., barriers to take the medication properly such as: side effects and feeling much better after taking their medication over several days). Group discussions were scheduled 3 times, during the 4th, 5th, and 6th weeks. Their activities included: demonstration of taking TB medication properly, guidance on personal goal setting, verbal reinforcement/ support

related to medication taking and group discussions about participants' experiences during their medication process. The participants also received SMS motivation and medication taking reminders during the first month to monitor the medication adherence and support participants. An SMS was sent 6 times in a week and would provide motivation to maintain their TB medication (i.e. "Tuberculosis can be cured. Take your medication today and take steps to protect against TB. Fight against TB") (Figure 1). Those in the experimental group participated in the TB health promotion program that included: 2 sessions of health education related to TB, 2 sessions of individual counseling, 3 sessions of motivational activities, with each session lasting 45-60 minutes, and monitoring via SMS texting for a month. Those participants in the control group received usual TB

Table 1 Distribution of frequency and percentage of the experimental group and the control groups by socio-demographic characteristic

Socio-Demographic Characteristics	Experimental group N = 34		Comparison group N = 34	
	Number	Percent	Number	Percent
Sex				
Male	23	67.65	20	58.82
Female	11	32.35	14	41.18
Age (years)				
20-29	5	14.70	3	8.82
30-39	6	17.65	15	44.13
40-49	8	23.53	11	32.35
50-59	15	44.12	5	14.70
Marital Status				
Single	2	5.88	3	8.82
Married	31	91.18	30	88.24
Divorced/Separated	1	2.94	1	2.94
Educational Level				
Illiterate	1	2.94	4	11.77
Primary Education	32	94.12	30	88.23
Higher Education	1	2.94	0	0
Residence area:				
Urban	25	73.53	24	70.59
Rural	9	26.47	10	29.41
Occupation				
Unemployed	17	50	12	35.30
Labor	9	26.47	10	29.41
Farmer	3	8.82	2	5.88
Trader	4	11.77	10	29.41
Government staff	1	2.94	0	0
Monthly Income				
< US\$87	20	58.82	21	61.77
≥US\$87	14	45.18	13	38.23
(1\$=Rp 11.500,-)				

care from the public health center consist of health information in how to take the medication and patients' visitation schedule (Figure 1).

INSTRUMENT FOR DATA COLLECTION

With permission, the Morisky Medication Adherence Scale (MMAS) was used to measure the level of medication adherence. The MMAS consists of 8 items of questions with binary response (yes/ no) scales. Several studies, for example, a study of Malaysian patients with diabetes, showed that the eight-item MMAS had good test-retest reliability (0.816) with good convergent validity and sensitivity (77.61%) but lower specificity (45.37%). For the convergent validity, a high correlation ($r = 0.792$) indicates that the translated eight-item MMAS correlates well with the translation of the previous four-item Morisky scale, and this improved convergent validity. The MMAS-8 is a generic assessment tool that can be utilized for specific health condition [10]. The instruments were examined prior to use

for clarity, language appropriateness and content validity, by five experts: 2 faculty members, who are experts in research design; 2 nursing lecturers who are experts in TB; and 1 physician, who is an expert in lung disease (pulmonologist). The reliability of the instrument was tested to establish each questionnaire internal consistency, using 30 persons who had the same characteristics as the sample (Cronbach's $\alpha = 0.848$).

DATA COLLECTION

Demographic characteristics of the participants were obtained at the start of the program to determine a picture of the TB patient population in this community. Both groups underwent pre-test and post-test evaluations using the Medication Adherence Self Efficacy Scale (MASES) as the instrument for experimental monitoring and MMAS as the instrument for data collection.

DATA ANALYSIS

Demographic characteristics data were collected

Table 2 Mean score and standard deviation of medication adherence in the control group and the experimental group, before and after participating in the program (Dependent T – test)

Medication adherence	\bar{X}	SD	df	T	p - value
Experimental group (N = 34)					
Before	4.58	1.04	33	8.212	0.01
After	6.38	0.85			
Control group (N = 34)					
Before	4.29	0.97	33	1.888	0.68
After	3.64	1.04			

Table 3 Mean scores and standard deviation of medication adherence between the control group and the experimental group, before and after participating in the program (Independent T – test)

Medication adherence	\bar{X}	SD	t	df	p - value
Before					
Experimental group	4.58	1.04	1.201	66	0.234
Control group	4.29	0.97			
After					
Experimental group	6.38	0.85	8.791	66	0.01
Control group	3.64	1.04			

before the program was started and measured by using the frequency and percentage of categorical variables. To evaluate the effectiveness of the program, the mean scores of medication adherence and standard deviations in the control group and the experimental group were measured before and after participating in the program, using Independent t-test. The mean scores and standard deviation were also calculated in the experimental and control groups before and after participating in the program, using dependent t-test with a level of significance <0.01 .

RESULTS

Participant characteristics

This study involved 68 persons with active tuberculosis registered and receiving regular TB medication at the Klari, Karawang public health center in West Java, Indonesia. The majority of participants were males (67.65% and 58.82%, respectively). Dividing age into four ranges, the majority in the experimental group was 50-59 years old (44.12%), compared to the control group with the majority aged 30-39 years (44.13%). More than 85% of the participants were married (91.18% and 88.24% respectively), most of patients in both groups had primary level education (94.12% and 88.23% respectively), and many were unemployed (50% and 35.30% respectively) with a monthly salary under \$87 (58.82% and 61.77% respectively) (Table 1).

Medication adherence

There was a significant difference of the mean scores of medication adherence in the experimental

group between pre-test ($\bar{X}=4.58$, $SD=1.04$) and post-test ($\bar{X}=6.38$, $SD=0.85$) with $p < 0.01$. Those in the control group remained almost the same between pre-test ($\bar{X}=4.29$, $SD=0.97$) and post-test ($\bar{X}=3.64$, $SD=1.04$), $p > 0.01$; this shows no significant difference in the control group (Table 2). To analyze the mean score of medication adherence to TB treatment, within the experimental group and the control group before the program, t-test analysis was used. It showed that there was no significant difference found between the two mean scores for medication adherence for the experimental group ($\bar{X}=4.58$, $SD=1.04$) and control group ($\bar{X}=4.29$, $SD=0.97$), $p > 0.01$. The result after the program showed that there was a significant difference of mean scores between the experimental group ($\bar{X}=6.38$, $SD=0.85$) and the control group ($\bar{X}=4.35$, $SD=1.04$), $p < 0.01$ (Table 3).

DISCUSSION

The findings of this study clearly suggest that TB health promotion contributes to improving medication adherence. The active TB patients assigned to the experimental group outperformed those who were provided general health care and health information by the public health center. From pre-test and post-test evaluation, those in the experimental group showed particular strengths in the task achievement element of the assessment, suggesting that the medication regimen assisted by the health promotion program definitely helped participants to understand and focus on the purpose of their TB medication. As pointed out by Pender and colleagues, individuals are more likely to adopt

a recommended health promoting behavior in which the perceived benefits outweigh the perceived barriers [8]. Thus, congruent with previous research, this study uncovered, by addressing perceived benefits and perceived barriers to medication adherence, that promotion and maintenance of medication adherence among TB patients could be influenced. It also seems that the individually directed nature of the information material helps TB patients to focus on their own specific needs, strengthen their perceived self-efficacy and assist in deciding how to proceed with their own medication plan and health status. Several studies have proven the effectiveness of information on improving health behavior [7, 9]. By providing activities based information, TB patients more easily understood the information related to TB medication, and they were able to implement positive behavior into their medication plan. This led to increased awareness and endurance, followed by a decision to practice correctly.

Other studies that have worked effectively with Pender's Health Promotion Model found that self-efficacy had a strong correlation with medication behavior [8, 11-13]. The result of this study showed similar outcomes. In association with motivation factor, self-efficacy serves as a strong determinant and a predictor of the level of accomplishment one attains. In the context of TB treatment, the self-efficacy model could be a method for TB control, focusing on motivating the patient to follow the treatment through completion. Healthcare providers, treatment supporters or family members as well as other patients currently under treatment or who have previously completed it could act as motivators through verbal persuasion. Patients need to believe that if they comply with TB treatment, they can achieve the desired outcome, which is to be cured (outcome expectations). Self-efficacy was addressed in this study through step-by-step mastery experiences (i.e. demonstration of proper TB medication taking; guidance in maintaining TB medication adherence; and support in setting personal goals to achieve a healthy life through verbal persuasion and emotional focus).

Another key strategy in this study was personal counseling and group discussion. Personal counseling was carried out via face-to-face meetings with each participant. The purpose was to address personal needs and solve patients' personal problem related to TB medication adherence. Group discussions were also arranged to help

participants improve their self-learning ability through others' experience. Through these activities, participants were guided to gain positive perceptions of proper health behavior as they revealed their perceptions of barriers they faced during their treatments. It was expected that they would be able to make the right decision in any situation. Therefore, they would have better behavior related to TB medication [2, 7].

Furthermore, SMS texting was employed to help maintain TB medication adherence among those in the experimental group. The effectiveness of SMS texting was not clearly identified, even though those in the experimental group who received SMS texting had a better score. This happened because there was no measurement in this study utilized to identify the correlation between SMS texting and medication adherence. However, interventions that support medical service delivery could be more effective using IT communications, like SMS text messages. This way information can be more easily and widely disseminated, making it more acceptable and efficacious for every individual [14-17]. A study involving a population of people screened for TB Mantoux in the United States described how patients in the experimental group who received an automated telephone message reminding them to return for a follow up exam in two or three days showed significant improvement in their participation. Reminders to patients to attend clinic appointments or to take medication properly should be considered as a part of any TB control program [6].

CONCLUSION

This study suggests that health promotion programs are effective in improving medication adherence which has been a crucial problem in TB treatment. The program can be led by nurses to promote and maintain medication adherence among TB patients in rural centers in Indonesia. Nurses who served in the public health center could deliver the program, which would include their regular services, working with other health professionals. Increasing medication adherence could achieve a greater impact on the health of the population than any improvement in specific medical treatments. Studies consistently find significant cost-savings and increased effectiveness of health interventions to improve medication adherence. However, training related to TB treatment, staff hiring, and financial support are required to make the program work effectively.

LIMITATIONS

This study recruited the participants from one public health center, limiting generalizability of the findings to TB patients from other health centers. Thus, future studies need to utilize multi centers located in various regions, across Indonesia in order to understand the benefits of the of TB Health Promotion program in a larger population.

RECOMMENDATIONS

For nursing practice

The Health Promotion Model employed in this study shown some effectiveness in increasing medication adherence, especially for persons with active TB. For health promotion program nurses can be involved and organize focus groups to assess problems and look for solutions.

For nursing education

After appropriate training, nurses could provide a proper health education programs for patients with tuberculosis. Thus, development of adherence training program for nurses is encouraged.

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