

## Short Message Service (Sms) Texting On Medication Adherence Among Tuberculosis Patients

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### ABSTRACT

The study was conducted to examine the effect of Short Message Service (SMS) Texting on medication adherence among tuberculosis patients. 68 persons diagnosed with tuberculosis and registered in the public health center in Klari, Karawang, West Java, Indonesia, were randomly appointed to an experimental or control group; 34 persons assigned to each group. Participants in the experimental group received routine SMS Texting, while those in the control group receive none. Data were analyzed using Dependent t-test and Independent t-test. The results indicated that after participating by receiving SMS texting, 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 meaningful difference in mean scores of medication adherence between the experimental group ( $X=6.38$ ,  $SD=0.85$ ) and the control group ( $X=3.64$ ,  $SD=1.04$ ),  $p<0.01$ . The SMS Texting method appears to be effective in improving medication adherence among TB patients.

Keywords: Tuberculosis, Medication adherence, SMS texting, Indonesia

### DISCUSSION

Tuberculosis (TB) remains a major problem worldwide. Over the world, the incidence rate of the diseases is 128 cases per 100,000 populations. Consequently, it arises a global health concern with the incidence rate of the disease is still increasing over the years (WHO, 2012). According to the report from the World Health Organization (WHO), there were 5.8 million newly diagnosed cases worldwide in 2011, which is higher than the 3.4 million incident case in 1995 (WHO, 2012). A long duration of standard TB treatment, which generally lasts for at least six months, has shown a higher risk of treatment default (Munro et al., 2007). Consequently, persons with TB are facing difficulties in taking appropriate medication for some reasons such as: feeling better or having medication side effects; thus, lack of the

quality of adhering the medication is elevated. This condition may result in the emergence of resistant strains of *Mycobacterium tuberculosis*, increasing mortality and prolonging the treatment duration. It escalates the risk of morbidity, mortality, medication resistance at both individual and community, and also contributes to failure in eradicating the disease globally.

Directly Observed Therapy-Short Course (DOTS) is promoted by World Health Organization to figure out problems associated with TB in developing countries which consists of five elements strategy for TB control: 1) political commitment, 2) improved laboratory analysis, 3) direct patient observation while taking medication, 4) a drug supply that provides for the correct complete short-course anti-TB drug combination for free, and 5) a reporting system that

documents the progress in curing the patient. DOTS strategy is recommended and considered to be the most effective method for increasing treatment adherence (WHO, 2006). The positive effect of the strategy can be strengthened by combination with other interventions, such as provision of health education and incentives (Volmink & Garner, 2006).

WHO in its annual report stated that Indonesia was distinguished the country's fourth largest TB population in the world. It is the second cause of death after cardiovascular disease, and the first cause of death from all infectious diseases. The estimated prevalence and incidence rates of all forms of TB were 297 and 185 per 100 000 population, respectively, in 2012 (WHO, 2014).

Incomplete treatment of TB is highly resulted in prolonged infection, relapse, drug resistance and death (WHO, 2011, 2012; Widjanarko, Prabamurti, & Widyaningsih, 2006). DOTS strategy has been employed on a government service basis since early 1970s. Although this strategy has been implemented for over thirty years, the treatment completion rate and incident number fails to meet the WHO standard, the number of TB patient is still remained (Widjanarko et al., 2006). Over the years, DOTS program has improved to adopt a multiple approach which includes the provision of patient health training, incentives, client-focused regimens, defaulter tracing and referral of social support.

Nevertheless, there are some challenges in the implementation of the DOT strategy in Indonesia. A new task to be faced is to increase the need for information sharing of the DOTS strategy and others related to TB such as administration of MDR-TB. In addition, the limited number of staff, rotation of personnel in health care facilities and health services as well as continuity between the training, is also a challenge in the development of human resources in a decentralized environment.

Consequently, several tasks related to TB treatment could not be well implemented.

Such program is rarely implemented on a continuous basis in Indonesia due to limitations of resources, manpower, and finances of the public health centers, as it mentioned before. Limitation of nurses in the public health center also becomes the reason why information about TB treatment can only be given at the time the patient come to a public health center for medical assessment; there are no further method could convince whether proper information related to medication and how to deal with the effect of medication after that (Chani, 2010; Munro et al., 2007; Widjanarko et al., 2006).

A study revealed remained problems in the implementation of the public health center care for patients with pulmonary tuberculosis in Indonesia. Nursing care focused only on individuals who diagnosed with active TB with deficiency of family members caring. The activity centered only on curative aspects with passive case finding. As a result of overloaded task, nurses did not effectively work as part of an integrated team of TB care. This condition is also encountered the Public Health Center Klari, Karawang, West Java, Indonesia. According to 2004 Tuberculosis National Survey, it was estimated that there is 2.295 new cases of TB every year in Karawang. The Case Detection Rate (CDR) for 2012 also decreased from 94 cases to 78 cases from the target of 100 cases per year. The CDR number was one of factors that related to the success of TB treatment; more closer the CDR from the expected target more successful the TB treatment.

Holding through this situation, nursing role conducted a crucial point. Nurses are at the forefront of tuberculosis prevention, care, and treatment (Ghebrehiwet, 2006). They play an important role in working collaboratively with the patient or client to change behaviors and achieve a healthy lifestyle. It is expected that patients would

comply the treatment regimen when they were addressed with proper information about the treatment process. When caring for TB patients, nurses provide treatment information, including medication benefits and side effects in order to improve medication adherence.

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" (WHO, 2003, p. 3). Gochman (1997) said 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.

A number of interventions have been developed to improve medication adherence. Munro and colleagues (2007) revealed four main structural factors that may impact patient medication adherence: poverty and gender discrimination, social factors, health service factors and personal factors including knowledge, attitude, and beliefs about the treatment. Thus, efforts to improve medication adherence could be more effective when multiple factors that influence adherence behaviors are addressed.

A better understanding of TB treatment among active TB patients will lead to a greater success of whole TB treatment (Widjanarko et al., 2009). Poor understanding of the treatment will lead not only failure of TB treatment but also spread the infection rapidly. Several studies related to TB health promotion intervention described that medication adherence can be improved by providing proper health informations to TB patients (Volmink et al., 2006). Hence, to enhance medication adherence behaviors, persons with TB should have adequate information that could be fulfilled by applying SMS texting. Thus, the purpose of this study is to examine the effect of SMS Texting on medication adherence

among persons with tuberculosis.

## **METHOD**

This study was piloted at the Klari, Karawang Public Health Center in West Java, Indonesia from January to March 2014. The study involved 68 participants, equally divided into 2 groups with 34 participants in each group; all participants were diagnosed with TB and recorded at the public health center. Participant should 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 respect and protect the human rights of the participants, this study was approved by the Office of the National and Political Unit of the Karawang government. Participants were delivered with information explaining the study's purpose, procedure and benefits. Those who decided to take part in the study implied their consent by signing research permission form.

## **INSTRUMENT FOR INTERVENTION**

The participants received SMS motivation

and medication taking reminder during the first month. The aim is to monitor the medication and also to support participants. The SMS was given 6 times in a week. The text contains are provided motivation in staying with TB medication.

## DATA ANALYSIS

Demographic characteristics data were gathered before the program was started. It was 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. 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
<b>Sex</b>				
Male	23	67.65	20	58.82
Female	11	32.35	14	41.18
<b>Age (years)</b>				
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
<b>Marital Status</b>				
Single	2	5.88	3	8.82
Married	31	91.18	30	88.24
Divorced/Separated	1	2.94	1	2.94
<b>Educational Level</b>				
Illiterate	1	2.94	4	11.77
Primary Education	32	94.12	30	88.23
Higher Education	1	2.94	0	0
<b>Residence area:</b>				
Urban	25	73.53	24	70.59
Rural	9	26.47	10	29.41
<b>Occupation</b>				
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
<b>Monthly Income</b>				
< US\$87	20	58.82	21	61.77
≥US\$87	14	45.18	13	38.23

(1\$=Rp 11.500,-)

### SMS Texting

There was a significant difference of the mean scores of medication adherence in the experimental group between pre-test ( $X=4.58$ ,  $SD=1.04$ ) and post- test ( $X=6.38$ ,  $SD=0.85$ ) with  $p < 0.01$ . Those in the control group remained almost the same between pre-test ( $X=4.29$ ,  $SD=0.97$ ) and post-test ( $X=3.64$ ,  $SD=1.04$ ),  $p > 0.01$ ; this shows no significant difference in the control group (Table 2). To analyze the mean score of medication adherence 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 ( $X=4.58$ ,  $SD=1.04$ ) and control group ( $X=4.29$ ,  $SD=0.97$ ),  $p > 0.01$ . The result after the program showed that there was a significant difference of mean scores between the experimental group ( $X=6.38$ ,  $SD=0.85$ ) and the control group ( $X=4.35$ ,  $SD=1.04$ ),  $p < 0.01$ .

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
<b>Experimental group (N = 34)</b>					
Before	4.58	1.04	33	8.212	0.01
After	6.38	0.85			
<b>Control group (N = 34)</b>					
Before	4.29	0.97	33	1.888	0.68
After	3.64	1.04			

Table 3. Mean score and standard deviation of medication adherence in 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
<b>Before</b>					
Experimental group	4.58	1.04	1.201	66	0.234
Control group	4.29	0.97			
<b>After</b>					
Experimental group	6.38	0.85	8.791	66	0.01
Control group	3.64	1.04			

### DISCUSSION

Previous study in a population of TB patients in the United States explained that those patients in the experimental group who received an automated telephone message reminding them to return for medication in two or three days has significant improvement. Return failures were lower in the experimental group (7%) rather than the control group (12%) in a total of 701 participants (RR 1.05, 95% CI 1.00 to 1.10). Patient's notification to attend clinic appointments

or to take medication properly should be considered as a part of TB control programs (Volmink & Garner, 2006). Simple measures such as reminder letters were uncovered to be of benefit even when patients were illiterate. There is also some evidence that prospective telephone reminders are useful for helping people keep scheduled appointments. These findings are coherent with those of a previous review that concluded reminders are helpful in reducing broken appointments in a variety of settings (Volmink & Garner, 2006).

In term of TB promotion and prevention program, SMS texting was used to help maintain TB medication adherence among those in the experimental group. Those in the experimental group who received SMS texting had a better score in medication adherence and perceived self-efficacy even though the effectiveness of SMS texting was not clearly identified. This occurred because there was no measurement in this study utilized to identify the correlation between SMS texting and medication adherence.

Nevertheless, any interventions that backing up medical service delivery could be more effective using IT communications, like SMS text messages. The spread of medication related information could be more easily, making it more acceptable and efficacious for every individual. For example, studies revealed that text messages as reminder have led to increased clinic attendance for outpatients in developed and newly industrialized countries (Perron et al., 2010; Downer et al., 2006), and are acceptable for use as reminders for clinic return (Person et al., 2011).

The fast improvement in mobile telephone connections in developing countries displays an affordable and far-reaching opportunity to improve health outcomes. Text messages are also effective for improving uptake of public health interventions (Free et al., 2011). Thus, reminders to patients to attend clinic appointments or to take medication properly should be considered as a part of any TB control program.

## CONCLUSION

This study recommends that delivering SMS texting as medication remember method are effective in improving medication adherence which has been a crucial problem in TB treatment. The program could be controlled by nurses in order to promote and maintain medication adherence among TB patients, especially

those in rural area in Indonesia. Nurses who worked in the public health center could deliver the information, which focus on medication taking reminder and clinical appointment schedule. Increasing medication adherence of TB patients could give greater benefit on the health of the population. Studies consistently discover significant cost-savings and increased effectiveness of health interventions to improve medication adherence. However, training related to the program and financial support is required to make the program work effectively.

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