Effect of Family-Based DOTS Support Program on Adherence to Health Behaviors in Patients With Pulmonary Tuberculosis in Indonesia

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ABSTRACT

Adherence to health behaviors is essential to achieve successful TB treatment. This study aimed to examine the effect of a family-based DOTS support program on adherence to health behaviors in patients with pulmonary TB. The program was designed using Orem's Self-Care Deficit Nursing Theory.

Sixty TB patients and their families were selected using cluster randomization of community health centers. The subjects were assigned into a control group, who received the routine care, and an experimental group, who received both routine care and care from the family-based DOTS support program. The program was operated by taking a patient's family as a nursing client. Four major methods – teaching, guiding, supporting, and providing environment – were used throughout the program's implementation to develop system of care. Three components of care operations were enhanced: 1) estimative operation: helped the clients to gain understanding on TB overview, TB & medications/ diet/ exercise/ environment/ transmission/ risk factors using teaching techniques; 2) transitive operation: assisted the clients' decisions on care activities by providing choices and discussing their benefits and limitations; and 3) productive operation: encouraged the clients to make action plans to care for the patients. The follow-ups included two telephone follow-ups and a face-to-face meeting. The TB care booklet was used to enhance the learning

about care within the family context among the patients and their families. The pretest and post-test data were collected at two points in time, five weeks apart, using adherence to health behaviors questionnaire that had Cronbach's alpha of .78 and had been validated by three experts. Paired t-test was used to assess changes within the group while the independent t-test was applied to determine the difference between two groups. Additionally, ANCOVA was employed to examine the effectiveness of the program by adjusting the covariates.

The total score of adherence to health behaviors in the experimental group was significantly higher after receiving care from the family-based DOTS support program than the pretest score, (t = -10.34, $p < .001$). In addition, after adjusting length of treatment and joint pain as the covariates, the adherence to health behaviors in the experimental group significantly improved on the fifth week compared to those of the control group ($p < .001$).

This study recommended that the family-based DOTS support program could enhance adherence to health behaviors among patients with pulmonary TB. Suggestions were made to expand the application of this program in various contexts and to extend knowledge for nursing practices and research.

Keywords: Self-Care Deficit Nursing Theory, family-based DOTS program, pulmonary Tuberculosis, adherence, health behaviors,

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CHAPTER 1

INTRODUCTION

This chapter details the study's background significance, objectives, research questions, theoretical framework, hypotheses, definitions of terms and significance.

Background and Significance of the Problem

Tuberculosis (TB) persists as a public health burden worldwide and is one of the leading causes of death by infectious diseases (World Health Organization [WHO], 2010a). In 2009, WHO has updated mortality rate (excluding Human Immunodeficiency Virus [HIV]) to be approximately 20 per 100,000 people globally. In addition, the incidence and the prevalence of TB worldwide were estimated at 140 per 100,000 people and 164 per 100,000 people, respectively (WHO). Global prevalence and incidence rates have been declining, except in South-East Asia region, where incidence rate has been stable (WHO).

Indonesia is one of five countries in the world with the largest number of TB incidences in 2009 (WHO, 2010a), with rates of mortality, incidence, and prevalence recorded at 27 per 100,000 people, 189 per 100,000 people, and 285 per 100,000 people, respectively (WHO). Unfortunately, Indonesia's TB data and most high-burden countries' do not include high-quality data for mortality rate (Mathers, Fat, Inoue, Rao, & Lopez, 2005). Although the multi-drug resistant (MDR) rate in Indonesia is lower than the estimated South Asian region's average of 4%, preventive

actions should still continue (WHO, 2009a). Nonetheless, the HIV/ AIDS epidemic has made it difficult to control TB in many countries including Indonesia (WHO, 2006).

TB is treatable by a 6-month drug regimen. Therefore, treatment plays important roles for TB patients, from curing the disease, restoring quality of life and productivity, preventing death and even possible relapses, reducing transmission of TB to others, to preventing drug resistance (WHO, 2009b). However, the treatment could prove to be challenging, for both patients and health providers, as patients are required to take multiple medications for a minimum of 6 months (American Thoracic Society [ATS] and Centers for Disease Control [CDC] as cited in Jasmer et al., 2004). Failure of TB treatment often occurs due to patients not adhering to the drug regimen (the most common reason), extensive cavitary disease at the time of diagnosis, drug resistance, malabsorption of drugs, laboratory error and biological variation in response (ATS, CDC, Infectious Diseases Society of America, 2003). Patients are often not adhering to the drug regimen due to symptomatic improvement (McInerney et al., 2007), co-morbidity (Ai et al., 2010), reaction to side effects (Ai et al., 2010; Munro et al., 2007; Xu et al., 2009) and feeling better (Cramm, Finkenflügel, Møller, & Nieboer, 2010; Kaona, Tuba, Siziya, & Sikaona, 2004). Therefore, the key success of treatment requires maintenance of patient's health, including healthy behaviors and taking medications.

To achieve successful TB treatment, the patients must adhere to the TB drug regimen. However, effective TB treatment also requires the patients to follow healthy behaviors. TB is strongly correlated to poverty, malnutrition, overcrowding, sub-standard housing, and inadequate health care (Smeltzer & Bare, 2003). Villamor

et al (2008) stated that TB patients are often deficient in micronutrients: vitamins A, C, and E, the B vitamins, and selenium. Supplementing micronutrient is thus correlated with lower rate of TB treatment failure (Villamor et al., 2008). Overcrowded housings, which tend to be associated with poor socioeconomic status, is also an important factor (Schmidt, 2008). Howden-Chapman (2004) found that overcrowding is linked with higher rates of infectious diseases. TB spreads through talking, sneezing, or coughing so the patients must prevent the disease transmission. Smoking is also closely connected with TB; TB patients are more likely to be smokers (Gajalaksmi et al., as cited in Siddiqi & Keng, 2009). Changing these behaviors thus influences the results of TB treatment.

Adherence to health behaviors is essential to successful TB treatment, particularly increasing the chance of cure, decreasing the risk of relapse after treatment, and minimizing drug resistance (Maartens & Wilkinson, 2007). WHO (2003) defined adherence as the extent to which the patient follows medical instructions. Most research merely concerned adherence to medication (Martins, Grace, & Kelly, 2008; Li, Munsiff, Tarantion, & Dorsinville, 2010; McInerney et al., 2007; Trajman et al., 2010) but adherence also includes health-promoting behaviors that extend beyond complying to the medical regimen. For example, the definition of long-term adherence is “the extent to which a person’s behavior – taking medication, following a diet, and/or executing lifestyle changes – corresponds with agreed recommendations from a health care provider” (WHO, 2003, p.4). Biswas (2010) included the following health behaviors in her study: complying with anti-TB medication, following healthy diets, performing physical exercise, maintaining

environmental hygiene, preventing disease transmission, and avoiding the risk factors of TB.

Adherence to health behaviors is one concern that affects TB control. Poor adherence is recognized as a major cause of treatment failure, relapse and drug resistance (WHO, 2003). The effectiveness of TB control will be improved by high rate of adherence (Long as cited in Li, Munsiff, Tarantion, & Dorsinville, 2010). Therefore, certain health behaviors such as treatment adherence and other contributing behaviors can predict the treatment completion (Trajman et al., 2010).

Pursuing high-quality, directly observed treatment short-course (DOTS) expansion and enhancement has a pivotal role in promoting TB treatment (WHO, 2006). Success of DOTS can be seen from the treatment outcomes, measured at 90 % success rate, which included rate of cure and completion of treatment, and at 70% detection rate (WHO, 2009b, 2010a). Data showed that 41 millions of TB patients were successfully treated in DOTS programs and up to 6 million lives, including 2 million women and children between 1995 and 2009, were saved (WHO, 2010a, 2010c). Indonesia had 67% of case detection rate and 91% of treatment success rate among the cohort of patients registered in 2008 (WHO, 2011).

DOTS facilitates the success TB management through treatment adherence and health-related behaviors. One method that helps ensure the adherence to health behaviors is identifying directly observed treatment (DOT) supporters for each TB patient. These supporters can be a healthcare provider, a family member, and a community health volunteer. Sanchez and Bertolozzi (2009) stated that limited number of health care providers and resources to meet patients' needs are obstacles of DOTS implementation.

However, it is worth noting that an effect of each DOT supporter on the final outcomes has shown varying, and in some cases conflicting results. The TB patients who were observed by health care providers (HCP) and family members (FM) had more success in two months and again at the end of TB treatment course than those who were self-administered (SA) (Anuwatnonthakate et al., 2008; Mathema et al., 2001). Other studies found that FM DOT helped achieved higher success rate than health care volunteer (HCV) DOT (Maciel, Guidoni et al., 2010; Okanurak, Kitayaporn, Wanarangsikul, & Koompong, 2007). Furthermore, FM is better than SA in achieving success rate of TB treatment (MacIntyre et al., 2003). Conversely, a review from Volmink and Garner (2007) found that there was no significant difference of cured rate of TB treatment between the patients who observed by DOT (HCP, FM, & HCV) and those who were SA. In addition, there was also no significant difference in clinical outcomes between DOT by HCP, FM, and HCV. This finding is similar with the studies of MacIntyre et al. (2003), Walley et al. (2001) and Wright et al. (2004). Regarding to the unsuccessful using FM DOT may cause unwell prepare the family to gain ability to care for the patient.

A family member can serve as a DOTS supporter for the TB patients. Nasution (2007) found that a group of patients who were successful in complying with DOTS received more family support than those who were unsuccessful in complying with DOTS in Medan, Indonesia. Family support is therefore associated with health behaviors in TB patients. Biswas (2010) found that there was a statistically and significantly positive correlation between health behaviors and family support among patients with pulmonary TB. Frieden and Sbarbaro (2007) stated that treatment observation must be performed by a person who is accessible to and

accepted by the patient, therefore, a family member is the most suitable. Pungrassami, Johnsen, Chongsuvivatwong, Olsen, & Sørensen (2002) indicated that family bonds have more benefits in terms of general care and psychological support. Therefore, family participation during TB treatment will help encourage a patient adhere to health behaviors and as a result achieve successful treatment.

The topic of using family members as DOT supporters have been studied in both developed and developing countries. However, these studies are dominated by epidemiological research. Though nursing research exists, none has been conducted in Indonesia. The self-care deficit nursing theory (SCDNT) provides a structure to help examine the meaning of family from a nursing perspective (Taylor, 2001). For this reason, Orem's SCDNT will be used as a theoretical framework in this study, particularly dependent care agency, where supports to TB patients are provided by family along with supportive educative nursing system. Helping methods, which refer to teaching, guiding, supporting, and providing environment (Orem, 1995, 2001), will be used to increase adherence to health behaviors among pulmonary TB patients.

Supportive educative program has been used in diabetic patients and the results showed that the mean of total self care practices and the mean of each sub variables – dietary control, exercise, medication, exercise, stress management, and personal hygiene – were significantly higher than standard care group in Malaysia (Mohamed, 2005). Similarly, this program had positive effects on self-care practices for chronic obstructive pulmonary disease (COPD) patients (Kamsee, 2004) as well as knowledge level, self-efficacy expectation, and self-care behaviors among TB prisoners in Thailand (Ngamtrairai, 2003). Consequently, the researcher would like to

test the effect of a family-based DOTS support program on TB patients' adherence to health behaviors. The findings of this study will provide evidence regarding the practice of family-based DOTS support program in Indonesia and, hopefully, the program will be used as a guideline to provide care for TB patients at home.

Objectives of the Study

The objectives of this study are as follow:

1. To compare adherence to health behaviors of pulmonary TB patients before and after receiving family-based DOTS support program.
2. To compare adherence to health behaviors of pulmonary TB patients who receive family-based DOTS support program and those who receive routine care program.

Research Questions

The research questions of this study are stated as follow:

1. Is the mean score of adherence to health behaviors among patients with pulmonary TB after receiving family-based DOTS support program higher than the score measured before the intervention?
2. Is the mean score of adherence to health behaviors among patients with pulmonary TB who receive family-based DOTS support program higher than the score of those who receive routine care?

Theoretical Framework

This study aimed to test the effect of family-based DOTS support program on adherence to health behaviors among patients with TB. The theoretical framework of this study was derived from the conceptualization of the theory of self-care by Orem. Orem (1995) described the self-care framework to be consisting of the theory of self-care, the theory of self care deficit, and the theory of nursing system.

First, the theory of self-care was used to assess the self-care requisites and evaluate the therapeutic self-care demands. The demands of TB patients compose of adhering to treatment, recovering health status, and preventing transmission. Treatment success is a desired outcome of TB treatment (through DOTS program). Differing from treatment success, adherence to health behaviors measures medication-taking behaviors and other health related behaviors including taking healthy diet and/or executing lifestyle changes (WHO, 2003). Administering self care during TB treatment is essential and adhering to the routine is required to achieve success. Mc. Donnel, Turner, and Weaver (2001) stated that adherence was one aspect of self-care behaviors.

Self-care is a practice in which individuals initiate and perform on their own behalf in maintaining life, health and, well-being (Orem, 1995, p. 104). Self-care consists of universal, developmental, and health care (health deviation) needs (Orem, 2001). Adherence represents one of Orem's health deviation self-care requisites for prescribed therapeutic activities (Ailinger, Moore, Nguyen, & Lasus, 2006). The calculation of adherence to health-related activities was done by comparing actual behaviors and determined standard (Konradi & Lyon, 2000). In addition, adherence was also defined as client's self-care based on deliberate action (Ailinger & Dear,

1998). Deliberate action means an activity that is driven by purposeful goal or result and has two related phases: 1) estimative and transitional operations; and 2) production and evaluation operations (Orem, 1995, 2001).

Second, the theory of self-care deficit was used to identify the self-care agency (SCA). Since the TB patients are required to take medication for a long period of time and follow the health behaviors to recover well, the family as dependent care agency (DCA) also serves as an extension to the healthcare providers of the self-care agency. Orem categorized family into three types of situation, namely, family as basic conditioning factors, family as structure for dependent care unit, and family as unit of service (Taylor & Renpenning, 1995). Taylor (2001) stated that a family has specific purposes to create, maintain, and promote the social, mental, physical, and emotional development of each and all of its members. Taylor thus defined family as a system or a unit of person-in-relations, with strong social bonds, with commitment and attachment. In this study, family is viewed as a structural dependent care unit, which provides the kind of care needed by TB patients. Therefore, the participating families were prepared to meet the TB patient's demand by increasing the family's abilities and resources. In order to meet the therapeutic self-care demands, there are many systems to be developed through role allocation and interaction as well as some combination of independent and interdependent actions (Taylor, 2001).

The structure of the self-care agency concept was formalized into three structures – a set of power components enabling performance of self-care operations, five sets of foundational capabilities and dispositions, and the self-care operational capabilities, (Orem, 2001). Foundational capabilities and disposition are utilized as baseline and context. Orem (1995, 2001) described three self-care operations that will

be enhanced, namely, investigative-estimative, judgment and decision-making, and productive operations of self-care agency. Estimative operation helped the clients to gain understanding on TB overview, TB & medications/ diet/ exercise and management of symptoms and side effects of medications. Transitive operation assisted the clients' decision on care activities by providing choices and discussion about their benefits and limitations. The productive operation encouraged the clients to make action plans for the patients.

Third, the theory of nursing system was applied to identify type of nursing system. Orem (2001) established three nursing systems, namely, wholly compensatory, partly compensatory, and supportive-educative. The nursing system for TB patients is supportive-educative system since the patients are generally independent and need support during medication phase. In order to provide supportive-educative program, four helping methods of Orem (2001) were used – teaching, guiding and directing, supporting, and providing environment. Five factors influencing an adherence to health behaviors had been identified and classified into patient-related factors, therapy-related factors, socio-economic factors, disease-related factors, and health system factors. These factors were used to established contents in family-based DOTS support program, which provided four helping methods.

The four helping methods were teaching, guiding and directing, providing healthy environment, and physiological and psychological support. Teaching techniques covered TB overview and health-related behaviors. Guiding and directing methods, performed by the families identify barriers and ways to overcome them. Providing healthy environment meant to provide environmental conditions that motivate the patients and to establish appropriate goals and adjust behavior to achieve

results. Physiological and psychological supports were provided to assist the patients while going through an unpleasant or painful condition so they can control and direct their actions in such situation. These helping methods were employed to develop three aspects of self-care operations.

This study focused on minimizing the self-care deficits of TB patients by improving self-care agency, meeting their therapeutic self-care demands, and establishing therapeutic self-care systems. Improving self-care agency was employed by maximizing function of the family as a dependent care agent in DOTS support program. Self-care demands of TB patients referred to treatment, recovery, and preventing transmission by adherence to health behaviors. For TB patients, health behaviors mean complying with the anti-TB medication regimen, following healthy diet, maintaining environmental hygiene, performing physical activity, preventing disease transmission, and avoiding risk factors. Establishing therapeutic self-care system is to provide the supportive-educative program to TB patients through dependent care agency, using the family as DOT supporter. Lastly, the telephone follow-ups were conducted one and two weeks after the intervention to provide support to the family to overcome post-intervention obstacles during family-based DOTS support program. Additionally, face-to-face follow-ups were performed at the fourth and fifth weeks after intervention.

Figure 1 shows the SCDNT theory which guided the construction of the family-based DOTS support program aiming to increase adherence to health behaviors among patients with pulmonary TB in this study.

Hypotheses

The hypotheses of this study are:

1. The total mean score of adherence to health behaviors among patients with pulmonary TB, after receiving family-based DOTS support program, is higher than the score measured before the intervention.
2. The total mean score of adherence to health behaviors among patients with pulmonary TB, who receive family-based DOTS support program, is higher than the score of those who receive the routine care.

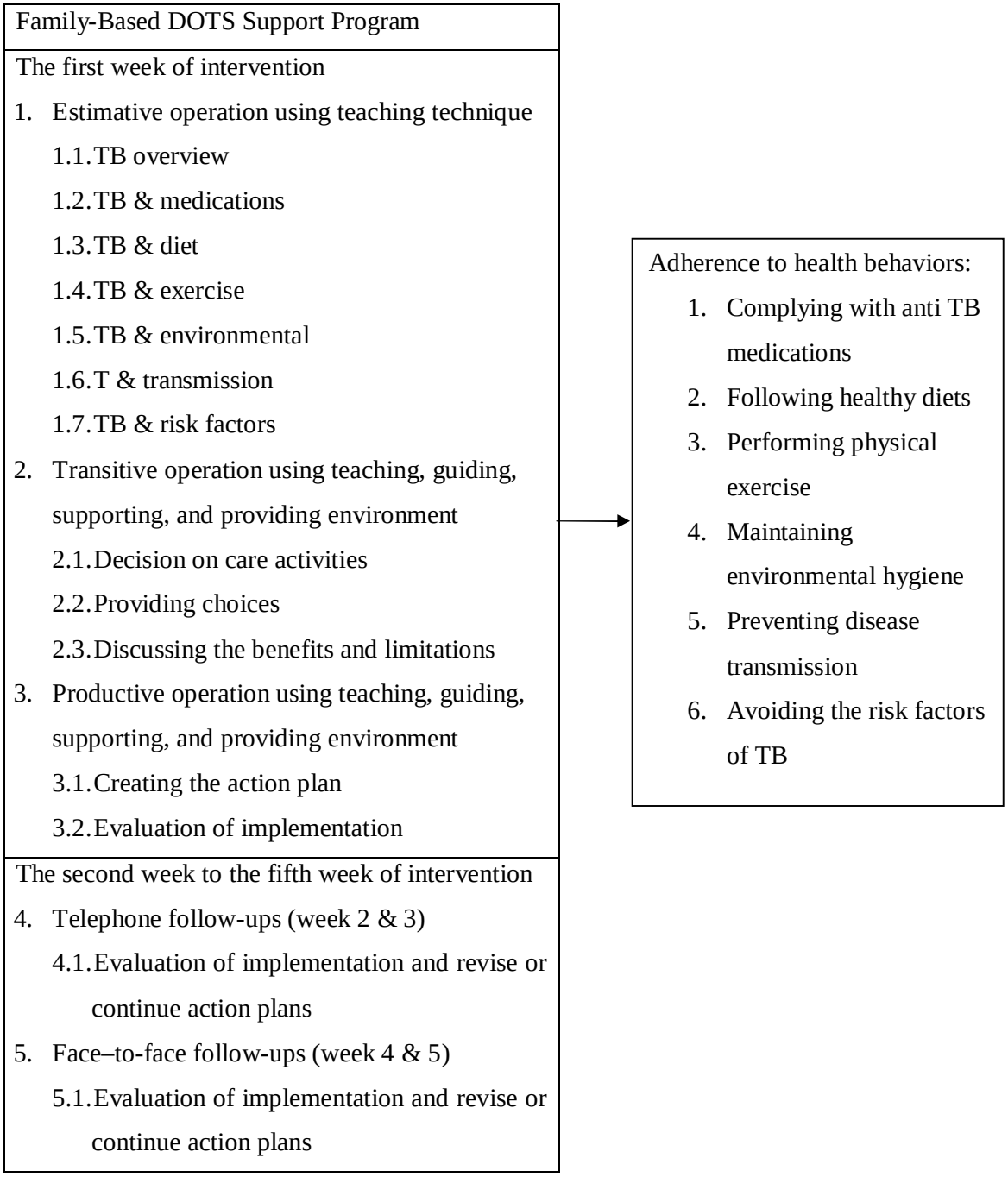

Figure 1. Theoretical framework of the effect of family-based DOTS support program on adherence to health behaviors in patients with pulmonary TB

Definition of Terms

Family-based DOTS support program refers to the fifth-week program developed by the researcher based on Orem's SCDNT theory (1995, 2001). The program aims to assist TB patients increase their adherence to health behaviors. This program also involves family as a dependent care agent whose role is to provide support to the patients. Four major methods are used throughout the implementation of the program: teaching, guiding, supporting, and providing environment to develop system of care. The program includes three structures of care operations, namely, estimative operation, transitive operation, and productive operation. Moreover, this program includes two follow-up telephone calls at the second and third week, following the treatment, with the TB patient and his/ her family. Additionally, face to face follow-ups are conducted at the last two weeks of intervention.

Routine care program refers to the regular care services provided by the TB patient's health care provider at the community health center facility. The services include regular check-ups, taking medications every week in the intensive phase and every two weeks in the continuation phase, laboratory examination, and educational program. The educational program is individualized, using traditional approach in the beginning of TB treatment for every TB patient, and the topics are generally related to TB disease and its treatment.

Adherence to health behaviors refers to measurement of frequency of time in a week when the TB patients following through certain activities – complying with anti-TB medication, following healthy diets, performing physical exercise, maintaining environmental hygiene, preventing disease transmission, and avoiding the risk factors of TB. These behaviors are measured two times in the first week and

again during the fifth week of the intervention by the using modified Tuberculosis health behaviors questionnaire, which was originally developed by Biswas (2010). Higher scores indicate the better adherence to health behaviors.

Significance of the Study

The outcomes of this study will provide evidence regarding the utilization of family-based DOTS support program in improving adherence to health behaviors among patients with pulmonary TB. The evidence will prove that DOTS can achieve success outcomes, particularly cure rate and treatment completion rate. In addition, the results of this study will provide valuable information for future studies regarding adherence to health behaviors and family-based DOTS support program in Indonesia.

CHAPTER 2

LITERATURE REVIEW

In order to understand key concepts of this study, relevant literatures are explored and reviewed. The outlines of this review are presented as follow:

1. Situation of Tuberculosis control
    1.1 Incidence and prevalence of Tuberculosis
    1.2 Tuberculosis treatment and control update
    1.3 DOTS programs
    1.4 Evaluation outcomes of Tuberculosis control
2. Adherence to health behaviors
    2.1 Concept of adherence
    2.2 Components of health related behaviors of TB
    2.3 Factors influencing adherence to health behaviors
    2.4 Measurements of adherence to health behaviors
3. Family-based DOTS support program for patients with TB
    3.1 Concept of family support
    3.2 Family as dependent care agent
    3.3 Evidence-based practices of FM DOT supporter for TB patients
    3.4 Family-based DOTS support program for TB patients in increasing adherence to health behaviors
4. Summary

Situation of Tuberculosis Control

The situation of TB control can be described by incidence and prevalence of TB, updates on TB treatments and control, DOTS programs, outcome evaluation of TB control, and factors influencing adherence behaviors.

Incidence and prevalence of Tuberculosis

Tuberculosis worldwide. TB persists as a major public health problem worldwide for it has caused high rates of morbidity and mortality caused (WHO, 2008). The global incidence rate of TB was estimated at 140 per 100,000 people and the prevalence rate was 164 per 100,000 people in 2009 (WHO, 2010a). Nonetheless, the mortality rate was estimated at 19 per 100,000 people in the same year. This infectious, airborne disease has contributed around nine million new cases of infections and close to two million of deaths each year (WHO, 2010c). TB has affected every country around the world but 85% of the cases occur in Africa (30%) and Asia (55%). Furthermore, a challenge posed on TB control by HIV and MDR-TB, which make up over 10% and 0.5% of TB cases respectively each year.

TB is one of many diseases that are covered by the sixth goal of Millennium Development Goals (MDGs). Recently, MDGs has reported to achieve 90% treatment success rate in 7 million new cases (WHO, 2010a). One of MDGs' missions that specifically targets TB control is to halt and begin to reverse the incidence of TB, among other major diseases, by 2015. Reduction of incidence, prevalence, and death rates among the TB-infected as well as proportion of TB cases detected and cured under DOTS are indicators of MDGs' accomplishment (WHO, 2010c).

WHO (2010a) reported that though the prevalence rate has been falling in six regions of the world but the MDGs' 2015 target is out of reach. However, this target could be achieved in three regions, namely, the Americas, the Eastern Mediterranean, and the Western Pacific. In addition, incidence rates were also reported to have decreased in five regions –Africa, the Americas, Europe, the Eastern Mediterranean, and the Western Pacific – while the incidence rates in South-East Asia has been stable. Between 1990 and 2009, mortality rate has dropped significantly for about 35%, therefore, the ambitious target of 50% decrease by 2015 could materialize if the current rate continues to decline.

Nevertheless, this ambitious mission will surely face some challenges along the way particularly drug resistance and co-morbidity with HIV/ AIDS. An interrupted, erratic or inadequate TB therapy would easily cause drug resistance. WHO (2010b) reported that 440,000 people had MDR TB worldwide and a third of them died. Of those MDR cases, 50% cases occur in China and India. Obviously, it is estimated that 490,000 new MDR will occur each year. In addition, the incidence of MDR-TB is at higher risk because TB patients are co-infected with HIV.

Tuberculosis in Indonesia. In 2009, Indonesia ranked fifth for having the highest TB burden in the world, after India, China, South Africa, and Nigeria (WHO, 2010a). This rank has been down compared to the previous year when the country ranked third place. Furthermore, prevalence and incidence rates of TB in Indonesia were estimated 285 and 189 per 100,000 people respectively in 2009 (WHO, 2010a). Mortality rate of TB, excluding HIV, in Indonesia was 27 per 100,000 people in 2009. Incidence rate of TB in Indonesia is assumed to be steady and so the

country has a good chance to achieve the target of halving the 1990 mortality rate by 2015.

In West Java, one of the provinces in Indonesia, had an estimate of 44,407 new cases of TB in 2009 (Indonesia Ministry of Health, 2009) which was reported to be the highest number of TB cases in all of Indonesia. Composite development, economy, population, behavioral and biological risk factors, health services, and TB control programs are the determinants of the high level of incidence TB (Dye, Lönnroth, Jaramillo, Williams, & Raviglione, 2009). These determinants occur in West Java, particularly the high number of population, the significant number of HIV/ AIDS cases, and the significant number of smokers, and the environmental problems. Case detection rate of TB in this province in the year 2009 was 70.4%. This disease usually occurs among the productive age group, ranging from 15 to 64 years. There were 85.1% of patients who were treated in 2008 and the achieved success rate of treatment was 91% (Indonesia Ministry of Health, 2009).

Like dealing with TB at a global level, Indonesia also faces challenges to control TB. Both drug-resistant and co-morbidity with HIV/ AIDS should be overcome properly. Cases of MDR-TB are reported to be 2.2% among all TB cases nationally while HIV cases are estimated at 3% among all TB cases (WHO, 2009a). Even though the MDR rate in Indonesia is 4% lower on average than the estimated rate in South Asian region, the anticipated actions should continue.

Tuberculosis treatment and control update

TB is an infectious disease caused by *Mycobacterium Tuberculosis.* The disease spreads when droplet nuclei of *Mycobacterium tuberculosis,* that is

suspended in the air, are inhaled. Initial infection has minimal clinical manifestation so most patients are asymptomatic. However, cough and dyspnea commonly occur while symptoms are present (Schlossberg, 2010). Furthermore, chest pain, sore throat, weight loss, night sweat, and systemic complaints of fever and malaise also occasionally take place (Jacob, Mehta, & Leonard, 2009; Schlossberg, 2010).

Daley et al presented that higher risk of TB is related with age (climax between 15 and 29 years), HIV, increasing tuberculin skin test size, and inversely from time of exposure (Jacob, Mehta, & Leonard, 2009). Reactivation happens in at least two thirds of adult TB cases and it is more likely acute in symptom presentations. HIV infection, insulin-dependent diabetes, transplant, or chronic renal failure are risk factors of reactivation and might be affected by older age, ethnicity, and duration of latent infection (Horsburgh, 2004).

TB commonly affects human lungs. Nevertheless, *Mycobacterium Tuberculosis* could spread from the lungs to other organs such as pleura, lymph nodes, abdomen, genitourinary tract, skin, joints and bones, and meninges (WHO, 2009b). Since this contagious disease is treatable, treatment has important roles for TB patients for curing, restoring quality of life and productivity, preventing death from active TB or its late effects, preventing relapse of TB, reducing transmission of TB to others, and preventing the development and transmission of drug resistance (WHO, 2009b).

The essential first-line of anti-Tuberculosis drugs. There are five essential TB drugs recommended by WHO: Isoniazid (H), Rifampicin (R), Pyrazinamid (Z), Streptomycin (S), and Ethambutol (E). All drugs should be stored in well-closed containers and away from light to prevent damage of drugs.

Isoniazid consists of hydrazide of isonicotinic acid and it is an effective bactericidal against replicating tubercle bacilli (WHO, 2009b). Dosage of this medication is 5 mg/Kg daily and 10 mg/Kg three times weekly. The maximum dosage is 300 mg daily and 900 mg three times weekly (WHO, 2009b). Possible adverse effect of this regimen is systemic or cutaneous hypersensitivity reactions particularly during the first week of treatment (WHO, 2009b). However, hepatitis is the most important adverse effect and the risk will increase because of age and underlying liver disease (Mandell, Bennet, & Dollin, 2009).

Rifampicin as a complex macrocyclic antibiotic has role in inhibiting ribonucleic acid synthesis in a broad range of microbial pathogens (WHO, 2009b). Dose of rifampicin for adults is 10 mg/kg and 600 mg maximum dose daily. Effect of a potent sterilizing can act against tubercle bacilli in both cellular and extracellular locations. Orange discoloration of the urine, tears and other body fluids are common side effects (Sahbazian & Weis, 2005). In addition, pruritus and gastrointestinal distress rarely occur but influenza-like syndrome is a more serious adverse effect of Rifampicin.

Pyrazinamide is used as primary drug in the initial and intensive phase of active TB therapy (Sahbazian & Weis, 2005) and it is also highly helpful with acute inflammatory (WHO, 2009b). Shortening the usage of this drug has been enabled so to reduce the risk of relapses. The dose for adults is 25 mg/ kg for daily

administration and 35 mg/kg for trice weekly administration (WHO, 2009b). The drug may cause gastrointestinal intolerance as side effect.

Streptomycin is sensitive gram negative infection and effective for TB treatment. This is administered via deep intramuscular injection and therefore could incur rash, induration or sterile abscess around injection sites (WHO, 2009b). In addition, cutaneous hypersensitivity reactions can arise. The given dose is 15 mg/kg daily or intermittently and maximum dose daily is 1000 mg.

Ethambutol has been proven effective for pulmonary TB treatment. It is to be combined with both Isoniazid and Rifampicin during the initial treatment to prevent or delay the emergence of resistant strains (Doster, Murray, & Newman, as cited in Sahbazian & Weis, 2005; WHO, 2009b). Daily dose is 15mg/kg and 30 mg/kg for three times weekly.

Treatment regimens. The standard treatment for TB has two phases: the intensive phase and the continuation phase. Treatment can be given daily and intermittently. However, optimal result will be achieved from daily drug administration rather than three days a week. The intermittent drug administration, or three times a week regimen, is only acceptable for patients receiving DOTS who do not live with other HIV patients or stay in locations where HIV is prevalent (WHO, 2009b).

Every patient should take standardized regimen, which means all patients in a defined group receive the same treatment regimen (WHO, 2009b). In order to assign standard regimen, patients are grouped by their insurance registration, new patients and previously treated patients. New patients are those who have never received a treatment for TB or have taken anti-TB drugs for less than 1 month.

Conversely, previously treated patients refer to those who have received 1 month or more of anti-TB drugs in the past. Table 1 presents registration group of TB (WHO, 2009b, p. 27).

Table 1

WHO's Registration Group of TB

Registration group		Bacteriology	Outcome of latest treatment
New		+ or -	-
Previously treated:	1. Relapse	+	Cured Treatment completed
	2. Failure	+	Treatment failed
	3. Default	+	Defaulted
Transfer in: A patient who has been transferred from another TB register to continue treatment		+ or -	Still on treatment
Other		+ or -	All cases that do not fit the above definitions.

WHO (2009b, p. 37 & 43) has updated the standard regimen for both new and previously treated TB patients. Table 2 presents categories recommended treatment.

Table 2

WHO's Standard Regimens for TB Patients

Registered Group	Intensive Phase	Continuation Phase	Comments
New patients	2 Months of HRZE	4 Months of HR	For TB Meningitis, Ethambutol should be replaced to Streptomycin
	2 months of HRZE	4 months of HRE	Applied in countries with a high level of resistance of Isoniazid and Isoniazid drug susceptibility testing is not done
Previously treated patients: failure, relapse, and default	2 months HRZES/ 1 month HRZE	5 months HRE	Regimen should be modified once DST available

The adverse effects inhibit patients from taking medications. Therefore, it is important for health care providers or supporters to recognize the adverse effects of each TB medication and how to handle them. There are two types of side effects which are major and minor side-effects. Patient should inform that every side effect requires an intervention from healthcare providers and to stop taking medication if exhibiting serious side effects. However, patients may continue taking

medication for minor side effects although drug doses should be reassessed. Table 3 presents the adverse effects of TB medications and the dealing actions appropriate interventions (WHO, 2009b, p. 61).

Table 3

Side Effects of TB Medications

Side-effects	Probable Causes	Management
Major		
Skin rash with or without itching	Streptomycin, Isoniazid, Rifampicin, Pyrazinamid	Stop TB medications
Deafness (no wax on otoscopy	Streptomycin	Stop Streptomycin
Dizziness (vertigo and nystagmus)	Streptomycin	Stop Streptomycin
Jaundice (other causes excluded), Hepatitis	Isoniazid, Pyrazinamide, Rifampicin	Stop TB medications
Confusion (suspect drug-induced acute liver failure if there is jaundice)	Most of anti-TB drugs	Stop TB medications
Visual impairment (other causes excluded)	Ethambutol	Stop Ethambutol
Shock, purpura, acute renal failure	Rifampicin	Stop Rifampicin
Decrease urine output	Streptomycin	Stop Streptomycin

Table 3 (continued)

Side-effects	Probable Causes	Management
Minor		
Anorexia, nausea, and abdominal pain	Pyrazinamide, Rifampicin, Isoniazid	Take drugs with small meals or before bedtime and advise patients to swallow pills slowly with small sips of water
Joint pain	Pyrazinamide	Aspirin or non-Steroidal anti-inflammatory or Paracetamol
Burning, numbness, or tingling sensation in the hands or feet	Isoniazid	Pyridoxine 50-75 mg daily
Drowsiness	Isoniazid	Reassurance and give drug before bedtime
Orange/ red urine	Rifampicin	Reassurance. Patient should be informed when starting treatment that the symptom may occur and is normal.
Flu symptoms (fever, chills, malaise, headache, bone pain)	Intermittent dosage Rifampicin	Change from intermittent to daily Rifampicin administration

In conclusion, TB treatment consists of intensive and continuation phases over six months period. Isionazid, Rifampicin, Pyrazinamid, Streptomycin, and Ethambutol are main medications for TB. These medications can be taken daily or intermittently. Like other medications, these medications also have side effects that require management.

DOTS program

Since TB still continues as major global health concern particularly in developing countries, WHO has designed the TB stop partnership strategy to reduce global burden TB and this program is in line with the millennium development goals including: 1) pursueing high-quality DOTS expansion and enhancement; 2) addressing TB/ HIV, MDR-TB and the needs of poor and vulnerable populations; 3) contributing to health system strengthening based on primary health care; 4) engage all care providers; 5) empowering people with TB, and communities through partnership; and 6) enabling and promoting research (WHO, 2010a; WHO, 2010b). There are two pillars to control effectively through early case detection and treatment (Maciel, Silva et al., 2008). These pillars are similar with MDGs that has two measurements related to TB specifically DOTS implementation and TB impacts (Dye, Watt, Bleed, Hosseini, & Raviglione, 2005). Both case detection and treatment success are used to measure implementation of DOTS whereas incidence, prevalence, and death rates are indicators for impact of TB control.

DOTS is the most effective strategy available to control TB (WHO, 1999). DOTS has been introduced since 1995 and has been effective and successful in decreasing TB (WHO, 2010a). DOTS program has been successfully applied in many

developed and developing countries. The number of TB patients who were successfully treated in DOTS program is 41 million between 1995 and 2009. In addition, more than 6 million people, including children and women, have been saved. Therefore, DOTS is claimed to be a program that has been proven to control TB. DOTS is thus recommended for TB control, requiring its essential five elements: sustainable government commitment, quality assurance of sputum microscopy, standardized short-course treatment (including direct observation of therapy), regular supply drugs, and establishment of reporting and recording systems (WHO, 2010a). DOTS activity could be done in various setting such as chest clinics, general health centers, hospitals, patient's work place, patient's resident, and schools.

Sanchez and Bertolozzi (2009) listed DOTS strength: 1) there is a dialogue and sharing of information between health professionals and patients which creates bonding; 2) it can identify patients' needs; 3) it reduces possibility of relapses; 4) it facilitates correct method of medication; and 5) it reduces resistance to medication; 6) it helps health professionals to provide educational information. In addition, one of the most important aspects of DOTS strategies is that it is applicable in a diverse social, economic and political context (Frieden & Driver, 2003). At the same time, limitations of DOTS were also specified: 1) limited number of health care providers and lack of collaboration with professionals of other disciplines; 2) limited resources to meet patients' needs; 3) resistance from some health professionals to provide care to patients; 4) deficiencies in the referral network and the system of health information.

The limitations of DOTS should not however stop the continuation of the program considering its mounting benefits. Directly Observed Treatment (DOT)

as part of the wider DOTS is important at least during the intensive phase of treatment to make sure that the drugs are taken in the right combinations and for the appropriate duration (WHO, 1999). DOT is a trained and supervised person who observes the patient swallowing the medication (WHO, 2002). A family-based DOTS support program provides knowledge and understanding to DOT supporters, not only about the medication but also all health behaviors. A patient who has a DOT supporter is believed to achieve better results than one who is self-supervised. Kamolratanakul, et al (1999) assessed effectiveness of DOT and self-administered (SA) on treatment outcomes and found that both cure and completion rates were significantly higher in the DOT cohort than in the SA. Furthermore, they analyzed that district and provincial hospitals confirmed the benefits of DOTS more than referral centers.

Health care providers are well aware of problems with their clients adhering to a drug regimen because they have the responsibility to ensure that treatments are carried out (Pascucci, Leasure, Belknap, & Kodumthata, 2010). However, Mesfin, Mishra, Hansen, Sabroe, Kafle (2006) found that those health professionals who have poor-grade communication were significantly associated with non-adherence. Newell et al (2006) also stated that patients, whose treatment supervisors were not properly trained and were incapable of managing illnesses occurring during treatments, were more likely to interrupt their treatments. The choice of treatment supporter should be based on access, patient's preference and availability of HCV resource (Wright, et al., 2004)

Furthermore, in order to deal with the limitations of DOTS, maximizing the role of DOTS supporters besides the healthcare providers might be helpful. DOT supporters can be healthcare provider, family members and community

members. However, there are no robust confirmations in identifying the best DOT supporter for TB patients because of varying results in each attempting study. Since family is the closest and most basic source of support for patients, the health care providers can facilitate a patient's family to take part throughout the participation in DOTS. Maciel, Silva, et al (2008) found that DOT which was supervised by family members has proven to help patients to more likely be adherent to treatments.

Million patients have received treatments under the DOTS approach (WHO, 2005). Sanchez and Bertolozzi (2009) argued that DOTS has a role in treatment adherence and promotes interfaces and conversations between care providers and patients, which help identify health needs and appropriate interventions. Nonetheless, implementation of DOTS faces some challenges: health sector reforms, the worsening HIV epidemic, and the emergence of drug resistance of TB. Adherence to treatment is essential to achieve treatment goals. Utilization of DOTS will help improving adherence to treatment (Branley, 2009).

Overall, DOTS implementation needs to be improved by escalation the strength and overcoming the limitations. DOTS supervision would help TB patients to achieve succesful treatments by having adherence behaviors. Healthcare providers, family members and community health workers are possibly DOTS supervision. The implementation of DOTS program only focused on medication instead of the wholly of health behaviors. Family members as DOT supporters in the DOTS program had not been prepared well and they were only assigned without clear explanation of the roles as DOT supporter. A family-based DOTS support program that emphasize the role of family as dependent care agent and concerns all health behaviors of TB will increase effectiveness of DOTS. Therefore, family participation in every aspect of

care for TB patients by providing knowledge, taking part in decision making and action plan needed to be enhanced. As a result, family as DOT supervision will help a TB patient to gain greater adherence behaviors and successful treatment.

Evaluation outcomes of Tuberculosis control

Evaluation outcomes of TB control refer to case detection rate and successful TB treatment. In addition, the outcomes can also be divided into treatment outcome and behaviors outcome. According to WHO (2009b), the case detection rate is calculated by number of new smear positive cases notified divided by number of new smear positive case estimated for that year. WHO (2009b) defined treatment outcomes into some criteria including cure, completed treatment, treatment failure, died, default, and transferred out. Successful treatment is the main goal of TB control and is dependent on some factors, such as susceptibility of the bacterial strain to anti-TB drugs, the regimen employed and its duration, the availability of drugs and the adherence of both treatment provider and patient (WHO, 2009b). The definition of each treatment outcome will be explained in the following paragraph.

Cure means a patient whose sputum smear or culture is positive at the beginning of the treatment but then found to be negative in the last month of treatment and on at least one previous occasion. Completed treatment means if a patient who has completed treatment and does not have negative sputum smear or culture result in the last month of treatment and on at least one previous occasion. Treatment failure means a patient whose sputum smear or culture is positive at the 5th months or later of treatment and if a patient is found to harbor a multidrug-resistant strain of TB any time during therapy. Died refers to a patient who dies for any reasons during

treatment. Default means patient whose treatment was interrupted for two consecutive months or more. Transferred out refers to a patient who has been transferred to another recording and reporting unit though his treatment outcome is unknown. Finally, successful treatment means a sum of cured and completed treatments.

These treatment outcomes are used by healthcare providers to report TB management. Successful treatment requires adherence behaviors to a minimum of 6 months of treatment with multiple drugs (Jasmer, Seaman, Gonzalez, Kawamura, & Osmond, 2004). Medication adherence is only one of the adherence or health behaviors, all of which should be obeyed by patients. A long duration of TB is not only a barrier to global TB control (Bayer & Wilkinson, as cited in Anuwatnonthakate, Limsomboon, Nateniyom, Wattanaamornkiat, & Komsakorn, 2008) but possibly also produces low adherence to treatment. Maartens & Wilkinson (2007) stated that this condition reduces the cure probability, inclines the risk of relapse after treatment and possibility of drug resistance (Anuwatnonthakate et al., 2008). Therefore, to achieve good treatment outcomes, adherence health behaviors should be increased during TB treatment.

Adherence to Health Behaviors

Adherence to health behaviors is an important issue related to chronic disease, specifically TB, since patient has to take medication for 6 months. The concept, influencing factors and measurement of adherence behavior will be explicated in the following paragraph.

Concept of adherence

Adherence is often used interchangeably with compliance and concordance. WHO (2003) has however stressed a need to differentiate adherence from compliance. Obviously, concordance is a manifestation of adherence. A concordance model will change how patients feel about adhering after healthcare providers shifting their perceptions and attitudes (Rose et al., Bissell et al., as cited in Bissonnette, 2008). However, a concept analysis study has defined and concluded that there is no specific differentiation between the concepts of adherence and compliance that have been used in most research (Bissonnette, 2008).

In the 1970s, compliance research was dominated by physicians and behavioral scientists and then Marston promoted a concept that nursing should tone its experience and understanding of patient compliance (Sackett & Haynes, as cited in Bissionnate, 2008). Therefore, since 1973 non-compliance is categorized as a nursing diagnosis based on North American Nursing Diagnosis Association (NANDA). NANDA stated that there are certain implications of non-compliance that focus on shared decision-making and agreement between patient-healthcare professional (NANDA-International, as cited in Lehane & McCarthy, 2009).

Compliance is as “an active responsible act of care in which the individual works to maintain health in close collaboration with the health care personnel” (Murphy & Canales, as cited in Cohen, 2009). Moreover, Lutfet & Wisher declared that compliance is without consideration to the patients’ independence, autonomy and ability to take an active role in their health care and patients just obey and conform to the provider’s instruction (Robinson, Callister, Berry & Dearing, 2008).

Consequently, WHO introduced the term adherence to replace compliance because compliance implies blame on the patients while adherence includes patients' agreement to the prescribed recommendations rather that passively following ones (WHO, 2003). This approach is similar to one by Bissionnate (2008), who has identified that the most common attributes identified in the adherence literature include decisional conflict, predictability, personal experience, power, agreement and pervasiveness. WHO (2003) defined adherence as the extent to which the patient follows medical instructions. Most researches concern adherence to medication but adherence actually also covers health-related behaviors beyond prescribed medications. Haynes and Rand defined adherence of long-therapy as "the extent to which a person's behavior–taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider" (WHO, 2003, p.4). Benner et al (2002); Carpenter (2005); Chatterjee (2006); Treharne et al., as cited in Cohen (2009), defined adherence as determination in the practice and continuation of desired health behaviors and this is the result of active participation and agreement.

Furthermore, Machtinger and Bangsberg (2005) mentioned that both terms adherence and non-adherence are defined to be nonjudgmental and accounts of fact rather than expressions of blame to the patient or health care provider. Hearnshaw and Lindenmeyer, as cited in Lehane and McCarthy (2009), categorized adherence into five types: 1) coincidence of patient behavior with professional advice; 2) relationship as part of the process of care; 3) outcome and process targets; 4) taking medication as prescribed; and 5) other factors influencing behavior category. This definition includes the bio-psycho-social approach that adherence is built in patients'

motivation, health beliefs and habits. Equally, Rose, et al., as cited in Bissionnate (2008), defined adherence as a collaborative effort between healthcare providers and consumers to achieve mutually derived health goals. It is completed by Sabate´, as cited in Bissionnate (2008), that included patient related and healthcare system related as consequences of adherence in addition to healthcare-professional related. Recognizing the patient's right to choose whether to follow treatment recommendation is important aspect of adherence (Robinson, Callister, Berry & Dearing, 2008). Therefore, adherence is seen as being more patient-centered than compliance because adherence concerns more on patient involvement and the patient-health care provider's relationship.

Concordance is the next step of adherence (Cohen, 2009). It was initially defined as an agreement reached after a negotiation between a patient and a health-care professional which respects the beliefs and wishes of the patient in determining whether and how medicines are taken (Royal Pharmaceutical Society of Great Britain [RPSGB], as cited in Lehane & McCarthy, 2009). National Prescribing Centre developed and defined concordance as a process of prescribing and medication-taking based on partnership based on basic principles such as patients have enough knowledge to participate as partners, health professionals are prepared for partnership, prescribing consultations involve patients as partners and patients are supported in taking medicines (Lehane & McCarthy, 2009). As a result, it is not known as the actual of medication-taking behavior but it predominantly concerns the dynamic of the healthcare professional and patient's interaction (Bell, Airaksinen, Lyles, Chen, & Aslani; Cribb, Barber, as cited in Lehane & McCarthy, 2009). On the other hand, Treharne et al (2006) stated that there is a process of enlightened

communication between the patient and the healthcare professional leading to an agreed treatment and ongoing assessment to achieve optimal course (Snowden, 2008). Hobden (2006) mentioned that the concordance aims to support patients involvement in their health care sequentially to increase patient satisfaction with their service. Therefore, patients' perspective is focused by the true concordance.

Cohen (2009) stated that rates of non-adherence are approximation between 50% - 80% for chronic disease management, medication, and lifestyle changes. DiMatteo as cited in Cohen (2009), stated that patients' adherence are judged while they do what the healthcare provider recommends. Unlike compliance, which is believed to imply a passive relationship, adherence involves active participation in the treatment regimen, collaboration, persistence in practice, and maintenance of behavior (Benner et al., 2002; Carpenter, 2005; Chatterjee, 2006; Treharne et al., as cited in Cohen, 2009). Furthermore, Cohen (2009) mentioned that concept of adherence should be expanded to cover patient-provider concordance or therapeutic alliance to reflect a change in healthcare provision that includes consensual prescribing, mutual goal setting, and shared decision making. Additionally, credible health education, goal setting, decision support, healthcare provider influence, and presence of a collaborative relationship, self-efficacy, and social-demographics influencing will affect adherence. Open communication and support in decision making would help patients increase adherence to healthy behaviors (Barlow, Wright, Sheasby, Turner, & Hainsworth, 2002; Schaffer & Yoon, as cited in Cohen, 2009).

Nowadays, adherence is preferred in the field of medication-taking behavior because this concept integrates certain important dimensions of both

compliance and concordance (Aronson, 2007; Lehane & McCarthy, 2009). Active participation in the treatment regimen, collaboration, and persistence in practice, and maintenance of behavior are entailed by adherence (Benner et al., 2002; Carpenter, 2005; Chatterjee, 2006; Treharne et al., as cited in Cohen, 2009).

Adherence in this study is parallel with SCDNT theory. Adherence is viewed as self-care behavior that is associated with and affected by certain characteristics of the health problem, the patient, and the health care system (Mc. Donnell, Turner, & Weaver, 2001). In addition, adherence also is defined as client's self care based on a deliberate action (Ailinger & Dear, 1998). Orem (1995, 2001) stated that self care is the regulation of one's functioning and the development that is necessary to maintain health. Self care consists of universal, developmental, and health care (health deviation) needs (Orem, 2001). Adherence represents Orem's health deviation self-care requisites to perform prescribed therapeutic activities (Ailinger, Moore, Nguyen, & Lasus, 2006).

To sum up, adherence in this study is defined as part of self-care behaviors in performing prescribed therapeutic activities. It includes not only medication behaviors but also other health behaviors. In the context of TB, the adherence may be divided into process and outcome. Outcome refers to the outcomes of TB treatment, such as success rate, cure rate, complete rate, and default.

Components of health-related behaviors of Tuberculosis

Health behavior is broken up into: personal attributes, such as beliefs, expectations, motives, values, perceptions, and other cognitive elements; personality characteristics, including affective and emotional states and traits; other patterns of

behaviors, actions and habits that are related to health maintenance, health restoration, and health improvement (Gochman, 1988). In addition, health behavior includes not only observable, over actions, but also the mental events and states of feeling that can be reported and measured. Health behaviors for TB are complying with TB medications, following healthy diets, performing physical exercise, maintaining environmental hygiene, preventing disease transmission, and avoiding risk factors of TB (Biswas, 2010).

Complying with TB medications. Tb is a treatable infectious disease. Since TB patients must take medications for over 6 months, complying with medications is essential for TB patients to achieve successful treatment. In addition, medication adherence to the long course of TB treatment is complex and with a lot of influencing factors on medication-taking behaviors (Munro et al., 2007). Treatment adherence refers to adherence to regimens of multiple drugs, taking medications regularly, and continuation of medication for a prescribed period. McDonnel, Turner, and Weaver (2001) viewed medication adherence as a self-care health behavior that is correlated with and influenced by certain characteristics of the health problem, the patient, and the health care system. The reasons of patients stopping the medications are adverse effects, feeling cured and bored to take medications.

Following healthy diets. Since TB patients have nutritional problems, good nutrition is thus required to maintain and enhance the nutritional status of TB patients. The association between malnutrition and TB has in fact been identified. Nutritional status is affected by TB at the time of diagnosis as well as during treatments. This may occur because of increasing energy expenditure, decreasing energy intake, or insufficient use of food. In taking and maintaining healthy nutrition

would help speed up recovery, reduce the duration of infection, and provide a chance to regain the weight as needed.

Karyadi et al., as cited in Abala et al (2005), found that there was a significant difference of micronutrient status between TB patients and healthy controls. Generally, it was found that TB patients had poor micronutrient in Indonesia. However, low serum albumin is only found in malnourished TB patients, not in well-nourished TB patients. Kennedy et al (1996) found data that shows that patients with TB in Tanzania frequently have malnutrition both before and after TB treatment.

Therefore, TB patients should receive sufficient nutrients. Total calories for TB patients is suggested at 4500 Kcal/day, specifically intake of carbohydrate, protein, and fat must be approximately 600, 900, and 160 g/day respectively (Coker et al., 2005). Healthy and good nutrition would thus help TB patients to gain more weight and improve nutritional status. Furthermore, weight gain is used to assess the patient's response to treatment and poor weight gain is considered to be a dangerous sign (Kennedy et al., 1996).

Performing physical exercises. WHO (2010d) has recommended that the adults who aged 18-64 years should put in at least 150 minutes of moderate activity a week. Physical activity includes recreational activity or physical activity during leisure time, transportation (walking or cycling), occupational work, household chores, play games or other activity. Like any healthy people, TB patients should perform physical exercise. However, the type of physical exercise should be modified since TB patients cannot handle activities requiring high exertion. TB patients could

perform light exercises such as walking and breathing exercise. More energy used would positively influence the recovery of patients.

Maintaining environmental hygiene. Housing is an essential element to provide and control environmental hygiene. Health standards of housing that is suitable for TB conditions are sanitation; households need to be kept in a clean and sanitary condition. There are three ways of obtaining TB – primary progression of infection called primary TB, endogenous reactivation of latent bacilli from a previous infection, and exogenous re-infection following resolution of a previous infection. The last two are known as post primary TB (McKinney, Jacobs & Bloom, as cited in Acevedo-Garcia, 2000). Key factors of TB transmission are therefore the homes and the workplaces that are overcrowded and lack ventilation. Howden-Chapman (2004) has revealed that crowded housing is associated with higher rates of infectious disease transmission. Bailie & Wayte (2006) stated that crowded housing is more likely to worsen the range of health effects of environmental smoke.

Department of Family and Community Services (Bailie & Wayte, 2006) proposes nine healthy living practices, some of which are recommended for TB conditions – removing waste safely, improving nutrition, reducing crowding, and reducing dust are appropriate for TB conditions. Free from dust and polluted air would help TB patients during treatment. Therefore, it is important that a patient's household is also free of smokers. In addition, crowded home must be avoided.

Preventing disease transmission. TB is a communicable disease and can be transmitted via expelled airborne droplets. Therefore, individuals who repeatedly breath air contaminated by an infectious patient may become infected. Generally, close contact with the infected will likely lead to infection. According to

CDC and ATS (1991), 30 % of those who are in close contact will be infected while only 15% of those who have non-close contact get infected (Acevedo-Garcia, 2000). The individuals who have history of contact with active TB will have no cellular immune response within the first 24 hours of contact, the response will however occur after 4-8 weeks (Dunlap & Briles; Peloguin & Berning, as cited in Acevedo-Garcia, 2000). The exposed individuals will be sick while the cellular immune response cannot control the TB organism so progression to active state arises. The probability of individuals developing active TB is about 10% -- 50% of these cases occur within the first 2 years of infection and the other 50% occur later while the immune systems weakens (Murray, Styblo, & Rouilon; Peloguin & Berning, as cited in Acevedo-Garcia, 2000).

Therefore, it is essential to prevent disease transmission. TB patients possibly transmit the disease to healthcare providers, family members, and others. Prevention can take place several ways, such as asking patients to conceal their mouth, proper waste of sputum, for example. Furthermore, the number of people in a house will increase the risk of disease transmission.

Avoiding TB risk factors. Cigarette smoking is known as a major risk factor of TB. Beck and Doyle differentiated smokers into two groups: light and heavy smokers (Abala et al., 2005). Those who smoke 20 or fewer cigarettes per day is classified as light smokers and those smoking more than 20 cigarettes a day are heavy smokers. However, Abala et al (2005) found that smoking independently did not influence the smear conversion.

Other risk factors are stress, drug abuse, and use of alcohol. TB patients also have negative emotions such as anxiety and fear (Marra, Marral, Cox, Palepu, & Fitzgeral, 2004).

Factors influencing adherence to health behaviors

Based on the literature review, there are five main factors contributing to adherence – patient-related factors, social-economic factors, condition-related factors, therapy-related factors, and health system factors. Those factors can be contributors and barriers to achieve adherence. However, the adherence from the reviewed articles are dominated by adherence to medications, either process or outcomes adherence.

Patients-related factors. These factors have major contribution to adherence. It is related to characteristics of patients. Age is one of the variables of demographic characteristics. Relationship between age and adherence in TB patients is still debatable. It is found that there is no relationship between age and adherence (Compton, Bello & Itiola, 2010; Hovell et al., 2003; Kaona, Tubal, Siziya, & Sikaona, 2004; Wongyou, 2005). However, younger and older patients are more likely to be non-adherent (Munro et al., 2007). As age increases, so does chronic illnesses. Older patients may be at a higher risk than their younger counterparts for non-adherent and subsequent adverse health outcomes due to declining physical conditions of advancing age, low literacy level, poor education, and complex regimens (Hayes, 2005, as cited in Pascucci, Leasure, Belknap, & Kodumthata, 2010).

Culture is that complex whole which includes knowledge belief, art, law, morals, custom, and any other capabilities and habits acquired by man as a

member of society (Skolnik, 2008). A study among Latino populations found that most of the barriers to medication adherence known were not limited to cultural issues (Compton, Haack & Phillips, 2010). Conversely, Munro et al (2007) found that particular ethnic group may affect adherence such as in Hispanic patients in the US. Marín and Marín as cited in Page (2005) stated that different cultural traditions, including race or ethnicity, may encompass a variety of behaviors. In addition, bicultural adolescents are positively associated with adherence in regression study (Hovell et al., 2003). Culture is an important issue in health problems including adherence since there are many different aspects in each culture.

Education, as one of demographic variables, has contribution in treatment adherence. Education can be education level and literate condition. Education level has a positive correlation with adherence (Ai, et al., 2010; Hovell et al., 2003). Conversely, it is also found that there is no association between education levels and adherence (Kaona, Tubal, Siziya, & Sikaona, 2004; Wongyou, 2005) because it was not guaranteed that those patients with high level of education would necessarily have good knowledge or awareness about the disease. Some researchers also use the term literate to describe education level. Those patients who are illiterate are more likely to be non-adherent (Albuquerque et al., 2007; McDonnel, Turner, & Weaver, 2001; Xu et al., 2009).

Knowledge and education seem like synonyms and there is actually not much difference between them, but one is interrelated to the other. Correlation between knowledge and adherence is still ambiguous. However, some studies found positive correlation (Amuha, Kutyabami, Kitutu, Odoi-Adome, & Kalyango, 2008; Martin, Grace and Kelly, 2008; Bello & Itiola, 2010). Wongyou (2005) stated that

there was no correlation between knowledge and adherence. Specific knowledge that is correlated with adherence is required – side effect and its management (Wongyou, 2005), knowledge about benefits of completing a treatment (Kaona, Tubal, Siziya, & Sikaona, 2004), and the general knowledge of TB disease and its treatment (Munro et al., 2007).

Adherence is affected by patient's belief which could be both positive and negative (Munro et al., 2007). Patient's belief consists of belief and perception about treatment regimens, belief and perception about capability, and belief and perception about the illnesses. Patient's belief is related to traditional belief, underlying health belief, and contradictory messages. Appropriate health beliefs, such as perceived seriousness of diseases, vulnerability to complications, and the efficacy of treatment, can predict better adherence (Brownlee-Duffeck et al., as cited in Dellamater, 2006). Also, belief in the usefulness and benefits of medication influence patients to more likely be adherent (McDonnel, Turner, & Weaver, 2001). Patients in Dili prefer to use traditional medicine which is deemed as obstacles (Martins, Grace, & Kelly, 2008). This result is similar to many patients who feel that consulting traditional healers is the norm and more natural (Sanou, Dembele, Theobald, & Macq, 2004). Likewise, patients who have belief that they are unrecoverable are more likely to be non-adherent (Jakubowiak et al., 2008).

Emotional response related to TB diagnosis is various. It could be positive ones such as calm and accepting or negative feelings like shocked/surprised or devastated, worried/concerned or depressed, and helplessness (Marra, Marral, Cox, Palepu & Fitzgeral, 2004). These negative responses have influenced negatively on adherence (Naidoo & Mwaba, 2010). Furthermore, the feeling of shame was a

significant predictor for non-adherence based on a study in Russia (Woith & Larson, 2008). Having negative emotional state influences patients to more likely be non-adherent (Jakubowiak et al., 2008). Fear and denial of diagnosis have negative consequences to adherence treatment as well (Munro et al., 2007).

Motivation is another patient-related factor. Lack of willingness to continue treatment makes patients to more likely be non-adherent (Jakubowiak et al., 2008). Food incentives that are provided makes patients increase motivation to be adherent (Martin, Grace, & Kelly, 2008). In addition, religion and personal motivation have positive consequences to adherence (Munro et al., 2007). Therefore, it can be concluded that motivation positively affect adherence.

In conclusion, patient-related factors have contributed to treatment adherence among patients with TB. These factors can be protective (enabling) factors: education, knowledge, and motivation. On the other hand, patient-related factors could be the barriers such as age and psychological factors. However, there are some factors that need further clarification, for instance culture and patient's belief, because those factors can be both protective and enabling factors depending on the contexts. In addition, there may be other patient-related factors influencing treatment adherence that have not yet been identified by this review.

Social-economic factors. Social-economic factors mean everything related to economic activity and social life. Income, occupation, social support, residence and stigma are part of the social-economic factors. Marital status can also be considered a social-economic factor; patients who were divorced or widowed were more likely to be non-adherent (Xu et al., 2009).

Income is an important aspect of daily life especially for individuals who need heth care. Income has diverse association with adherence. Demissie, Getahun, and Lindtjorn (2003) stated that patients know once they have TB that they are going to be affected economically. Sanou, Dembele, Theobald, and Macq (2004) stated that there is an unwillingness to spend money on health-related expense since it seems more practical and in some cases more important to some patients to spend the money to sustain the family's livelihood instead. Monthly income is not correlated with adherence (Wongyou, 2005). However, other studies (Dodor & Afenyadu, 2005; Martin, Grace, & Kelly, 2008; McDonnel, Turner, & Weaver, 2001; Xu et al., 2009) found that financial difficulties influence patients to more likely be non-adherent. Woith & Larson (2008) supported that financial security is a significant predictor of medication adherence.

Income and occupation are interrelated because they contribute to the decision of patients whether to continue treatment. Occupation is not related to adherence (Wongyou, 2005). However, conflicts between work and treatment influence adherence (Munro et al., 2007); required work, dilemma getting treatment or going to work could cause non-commitment to treatments. Unemployment and loss of employment prevent patients from being adherent (Bogorodskaya et al., as cited in Sagbakken, Frich, & Bjune, 2008). Controversially, being a health care worker is associated with non-adherence (Maciel, Brioschi et al., 2009).

Social support includes emotional support, appraisal support, informational support, and instrumental support (House as cited in Wongyou, 2005). Social support can be provided by peers, family members, community members, and others. Social support encourages patients to more likely be adherent (Dodor &

Afenyadu, 2005; McDonnel, Turner, & Weaver, 2001; Naidoo & Mwaba, 2010; Sagbakken, Frich, & Bjune, 2008). Nasution (2007) found that family support for pulmonary TB patients influences significant statistical difference between those who were successful and unsuccessful in complying with the DOTS program. Nonetheless, Wongyou (2005) found that was no relationship between social support and adherence.

The patients whose residence are in a congregate setting (nursing home, shelter, or jail are two times more likely to be non-adherent (Horsburgh et al., 2010). Moreover, studies found that those patients who are mobile, such as immigrant patients, are more likely to be non-adherent (Deiss et al., 2009; Munro et al., 2007; Xu et al., 2009).

Stigma is part of infectious diseases especially for TB and HIV/ AIDS patients. It has significant negative association to adherence (Munro et al., 2007; Woith & Larson, 2008; Xu et al., 2009). Most patients may hide their diagnosis because they feel shame and guilt toward others.

To sum up, social-economic factors can be barriers in terms of unemployed patients, mobile residential status among immigrant patients, and negative stigma. However, social-economic factors can be a protective factor for patients who have financial and social support.

Condition-related factors. Condition-related factor means patient's conditions during treatment and the factors are symptoms, side effects, and co-morbidity. Condition-related factors can also be identified as disease-related factors.

The symptoms most complained by patients with TB is weight loss and coughing (Bello & Itiola, 2010). Lack of appetite and fever are initial symptoms

for TB that influence adherence to treatment (Ai et al., 2010). Martin, Grace and Kelly (2008) have found that worsening of patients' condition is usually the reason for non-adherence. Symptomatic improvement on the other hand inspires patients to more likely be adherent (McInerney et al., 2007). However, patients feeling better or cured makes patients stop taking medications (Cramm, Finkenflügel, Møller, & Nieboer, 2010; Kaona, Tuba, Siziya, & Sikaona, 2004; Munro et al., 2007; Shargie & Lindtjorn, 2007). In addition, no significant progression makes patients to more likely be non-adherent (Sagbakken, Frich, & Bjune, 2008). Therefore, symptoms have a role in improving adherence for TB patients and the health care providers should be aware of them.

Side effects are the barriers to achieve adherence. The side effects that patients most complain about are dark urine (72.1%), nausea and vomiting (25.4%) (Bello & Itiola, 2010). Fatigue and rash are other side effects that make college students with TB not complete the treatment (Hess, Goad, Wu, & Johnson, 2009). Side effect has negative consequences to adherence (Ai et al., 2010; Munro et al., 2007; Xu et al., 2009). Severe side effects make patients to more likely be non-adherent. Conversely, Wongyou (2005) has found that there is no association between side effects and adherence. Patients report that healthcare providers often do not inform or warn them about side effects and patients also do not mention side effect to care providers. These side effect conditions influence patient's decision to continue treatment. Therefore, healthcare providers must pay heed to side effects.

Co-morbidity is a major predictor for adherence (Ai et al., 2010). HIV as co-morbidity with TB is correlated with non-adherence (Maciel, Brioschi et al., 2009). Patients who also took antiretroviral therapy were significantly associated with

non-adherence (Amuha, Kutyabami, Kitutu, Odoi-Adome, & Kalyango, 2008). Consequently, having both diagnosis of TB and HIV cause non-adherence for TB treatment (McDonnel, Turner, & Weaver, 2001).

In summary, side effects and co-morbidity can be barriers for treatment adherence and symptoms have both enabling and barrier factors depending on the context.

Therapy-related factors. There are several available drugs for TB patients such as Isoniazid, Rifampicin, Pyrazinamide, Ethambutol, and Streptomycin. However, Isoniazid and Rifampicin are the most essential drugs because they provide the best possibility in term of preventing resistant strains from emerging (Girling, as cited in Branley, 2009). TB treatment has two phases, namely, initial phase and continuation phase. Initial phase takes place for two months and patients take drug regimens, for instance, Isoniazid, Rifampicin, Pyrazinamide, and Ethambutol. Isoniazid and Rifampicin are given continuously during continuation phase, which lasts for four months. Rates of drug resistance are higher among patients who take drug regimens three times a week than those who take medicine daily, particularly Rifampicin and Isoniazid (WHO, 2009a).

The shorter Rifampicin regimen shows the better adherence (Hess, Goad, Wu, & Johnson, 2009; Li, Munsiff, Tarantion, & Dorsinville, 2010; Trajman et al., 2010). Both patients and providers stated that quality of TB medication is poor at health care center which in turn makes patients become non-adherent (Munro et al., 2007). Horsburgh et al (2010) found that non-adherence is related to the 9-month Isoniazid regimen. The patients who receive re-treatment are given same drugs as for new cases though adding Ethambutol for the full six months (Albuquerque et al.,

2007). Surprisingly, there is no association between drug regimen and adherence (Wongyou, 2005). Costs of treatment also affect adherence to TB treatment (Munro et al., 2007). However, some countries provide free TB medications.

To be brief, health care providers should be aware of treatment-related factors when implementing adherence intervention. The need for lower cost for treatment and shorter drug regimen will help patients to stay adherent to the TB treatment. These aspects can be enabling factors.

Health system factors. Health system factors consists of relationship between patients and health care provider, health services, and access to health center. The increasing contact of patients and providers has a positive impact to adherence (McInerney et al., 2007; Munro et al., 2007). In addition, Demissie, Getahun, and Lindtjorn (2003) found that close relationship between the community members and a health centre helps patients gain confidence in health care. Additionally, patients who have negative feelings toward health providers are more likely to be non-adherent (Jakubowiak et al., 2008).

Long waiting times or queues, lack of privacy, physical condition of the clinics and inconvenient appointment times are problems related to health facilities based on patients' viewpoint (Munro et al., 2007). The study found that community-based care is preferred over hospital care, which should be used only for the very ill patients. Counseling is one service provided by health care providers to patients with TB. Counseling has positive consequences to adherence (Hovell et al., 2003; Bello & Itiola, 2010).

DOTS as main intervention has been introduced by WHO since 1995. It is found that there is no relationship between DOTS and adherence (Wongyou,

2005) possibly because patients are not routinely receiving DOTS. However, some studies found that DOTS has a good influence on adherence. Cox, Morrow, and Deutschmann (2008) stated that the implementation of the DOTS strategy has undeniably improved the outcomes for many millions of patients but treatment regimens that can produce good outcomes under best conditions are strictly used in high burden settings. DOT supervisor has positive correlation with adherence (Ai et al., 2010; Xu et al, 2009).

Access to health facility depends on patient's physical condition, distance, and available transportation (Munro et al., 2007). In this systematic review for ethnography study, it is found that both patients and providers show preference toward the nearest clinic because patients can come more regularly (Munro, et al., 2007). Similarly, adherence is better in urban area than rural area (Johansson, Long, Diwan & Winkvist, 1999, as cited in Munro et al., 2007). In addition, private practitioners are more accessible to patients. TB clinic too far from home causes patients to default on treatment (Shargie & Lindtjorn, 2007).

Briefly, relationship between patients, healthcare providers, and health services as well as short distance of health services contribute to adherence to treatment. Some of those factors – age, culture, education level, income, occupation, symptoms, side effects, medications, and characteristics of health services – are collected in the data demographic form and to be analyzed to determine whether they influence the outcomes. Co-morbidity is excluded in this study. Noticeably, knowledge, patient's belief, emotional response, motivation, social support, stigma, symptoms, side effects, and DOTS are included in the developed program.

Measurements of adherence behaviors

Counting pills that have been taken (Ailinger, Martyn, Lasus & Garcia, 2010; Clark, Karagoz, Apikoglu-Rabus, & Izzettin, 2007), visit follow-up, (Clark, Karagoz, Apikoglu-Rabus, & Izzettin, 2007), urine analysis (Clark, Karagoz, Apikoglu-Rabus, & Izzettin, 2007), electronic monitoring, and patient reports are tools for measuring medication adherence. Out of the adherence behaviors measurements, there is no gold standard for measuring it. In addition, most adherence questionnaires are predominated by medication adherence only. Many methods are used including patient report, pill count, and electronic using barcode or microchip technologies. The best way to measure compliance is using nonjudgmental, nonthreatening, and direct questions.

Counting pills taken will be analyzed based on the number of pill that patients have taken. It is similar with visit follow-up that is based on whether patients have gone to the health center for follow ups or not. In addition, Berroa (1998) as cited in Hsieh, Lin, Kuo, Chiang, and Su (2008) measured adherence based on calculation from the daily observation of the patient's medication intake. The adherence level was above 80% if the patients have fewer than five times of drug interruption in a month, on the contrary, the adherence level was less than 80% if the there were greater or equal to five times of drug interruption in a month.

Electronic monitoring (EM) devices are also used to measure adherence. One review studied about the effectiveness of electronic devices and found that adherence decreased while the number of daily doses rose (Claxton et al., as cited in Dulmen et al., 2007). Moreover, one consistent and robust evidence that has increased adherence is by simplifying medication dosage schedules.

Many instruments have been developed to measure adherence using patient's report. These instruments are the UCSF (University of California, San Fransisco), the Tuberculosis General Adherence Scale (TBGAS), the Tuberculosis Adherence Determination questionnaire, and the Morisky questionnaire. The UCSF adherence questionnaire has three categories, namely, reasons for not taking medications, number of medication missed, and length of time since missing a medication (DiIorio et al., 2003). First, reasons for not taking medications will be assessed within 30 days. It has four options (0= never, 1= rarely, 2= sometimes and 3= often). Possible range for this sub category is 0 to 42 where lower scores will represent fewer reasons for missing medications. Second, number of medication missed will be asked of patients during the past 4 days. All missing doses for each medication will be recorded and the result will be presented by percentage of missing doses, calculated by dividing the number of missed dose by the number of prescribed dose for each of the past four days. Third, length of time since missing a medication will be asked in the first two response categories, (within the past week, 1 to 2 weeks ago), the middle two categories (2 to 4 weeks ago, 1 to 3 months ago), and the last two categories (more than 3 months ago, never skip medications). There is no information about validity and reliability of this instrument.

The Tuberculosis General Adherence Scale (TBGAS) is originally derived from Sherborne et al (McDonnel, Turner, & Weaver, 2001). This scale has five items with 6 Likert scale and alpha reliabilities range from 0.78-0.81. This same instrument is also developed for HIV/AIDS patients known as the Antiretroviral General Adherence Scale (AGAS). DiIorio et al (2003) stated that the AGAS has 0.70 the alpha coefficient for responses in the current sample of participants. It is also

developed by McDonnel et al (2001) that is used for HIV/ AIDS patients. It has five items that assess the ease and the ability of patients during the past 30 days. The ratings range from 1 (none of the time) to 6 (all of the time). A total score is computed by summing up numbers across the five items after recoding the two negatively worded items. A possible score ranges from 5 to 30.

Moreover, one study used the Tuberculosis Adherence Determination questionnaire that consists of 38 items and 7 scales, which are relevant to 7 theoretical determinants of adherence (McDonnel, Turner, & Weaver, 2001). The scales are interpersonal aspect of care (IPAC), perceived severity of illness (PSV), perceived susceptibility of illness (PS), perceived utility of treatment, subjective norms (SN), intention to adhere of treatment plan (INT), and support and barriers to adherence (SB). This questionnaire has reliability coefficient of 0.65-0.85 but the sub variables of PS, PSV and SB are below 0.7.

Morisky, Green, and Levine created Self-Reported Medication Taking Scale to measure treatment adherence (Morisky & Dimatteo, 2011). Originally, the Morisky questionnaire had four items: 1) Do you ever forget to take your medicine?; 2) Are you careless at times about taking your medicine?; 3) When you feel better do you sometimes stop taking your medicine?; 4) Sometimes if you feel worse when you take your medicine, do you stop taking it?. There are two options – 'yes' that received score 0 and 'no' received score 1 – to answer each question. Therefore, the possible score is anything between 0 to 4. Patients with higher scores exhibit adherent behaviors. Later, Morisky Self-Reported Medication Taking Scale has expanded to eight items. The reliability of this tool varied in each research. One study found that

Cronbach alpha for this tool to be 0.59 (Morisky, Malotte, Ebin, Davidson, Cabrera, et al, 2001).

Biswas (2010) designed health behaviors questionnaire for TB patients and it had .76 Cronbach alpha coefficients. This questionnaire offers four options for answer which are never, sometime, most of time, and all the time. There are six sub-variables, namely, complying with anti-TB medication, following healthy diet, performing physical exercise, maintaining environmental hygiene, preventing disease transmission, and avoiding risk factors of TB. This questionnaire will be used in this study but the researcher will need to conduct face validity and reliability test due to different settings; this study will be conducted in Indonesia but Biswas's study was conducted in Bangladesh.

In conclusion, many measurements have been developed to assess medication adherence. Every tool has its strength and weaknesses, therefore, and it is necessary that the treatment adherence tool and health related behaviors measurement have high validity and reliability.

Family-based DOTS Support Program for Patients With TB

In order to explain the family-based DOTS support program to patients with TB, the concept of family support, family support based on Orem's theory, evidence-based practices of FM DOT supporter for TB patients, and Family-Based DOTS support to increase adherence to health behaviors of TB patients are described in the following section.

Concept of family support

Family support has been defined differently. Terminologically, family is a provider of social support called family support. Procidano and Heller, as cited in Xiaolian et al (2002), has defined family support as a person's perceived need for moral, emotional, and intimacy support as well as the need for information and feedback fulfilled by the family. In addition, family support can be considered as the functional component of family system. Family is thus the cornerstone of social support (Roach, as cited in Komjakraphan, Isaramalai, Boonyasopun, & Schneider, 2009).

Social support is defined as a reciprocal process that creates positive results for the ones receiving support as well as for the ones giving support as both have greater feeling of control over their lives (Valla, as cited in Pedro, Rocha, & Nascimento, 2008). Support consists of information, either spoken or written or materials, that is offered by groups or individuals. Social support has systematic contact and emotional effects or positive behaviors. Social support is multidimensional and often differentiated into four major dimensions, namely, social network, social interaction, perceive or subjective support, and instrumental support (Koenig et al., as cited in Hakker-Scheek, Stevens, van Horn, 2004).

Finfgeld-Coneet (2005) classified social support based on the preference of providers guided by family, friends, neighbors, church members, support group participants, and acquaintances. Dimensions of family support system are also different. Li et al (2006) divided family support for HIV patients into five dimensions, namely, support during the disclosure process, financial assistance, daily activities, medical care, and psychological support.

Actually, there are several types of social support: appraisal, emotional, informational, and instrumental support (Bullock, 2004; House, 2001, as cited in Pedro, Rocha, & Nascimento, 2008). Differently, Finfgeld-Coneet (2005) divided social support into two categories, namely, emotional, and instrumental support. Emotional needs are correlated to stressors for examples low self-esteem, sadness, frustration, anger, loneliness, anxiety, and uncertainty. Instrumental support consists of the lack of tangible goods, transportation services, and financial support. Family support might influence adherence behaviors through motivation, providing information, and feedback. Therefore, the following topic will describe family support based on Orem's theory.

Family as dependent care agent

Orem's self care deficit nursing theory (SCDNT) consists of three interrelated theories, namely, theory of self care, theory of self care deficit, and theory of nursing system. Taylor, Renpenning, Geden, Neuman and Hart (2001) stated that corollary theory to Orem's theory of self care is a theory of dependent care. In addition, Taylor et al (2001) declared that the foundation of dependent care theory is knowledge of self care. Orem (1995, 2001) has introduced the terms dependent care (DC), dependent-care agency (DCA), and dependent-care agent since 1970s to meet the need to develop SCDNT.

DC is a practice in which responsible and mature persons initiate and perform on behalf of socially dependent persons for a period of time on a continuing basis in order to maintain livelihood and contribute to health and well-being of the dependents' (Orem, 1995, p. 457). Furthermore, Orem (1995) stated that dependent-

care agency is the power and capabilities to take on dependent care. Orem further explained DCA and DC actions as part of her conceptualizations about family (Taylor et al., 2001, p.39). Orem (1995) views family in three aspects, namely, basic conditioning factors, the setting for infant and children care and for dependent care systems associated with health-deviated care, and as unit of care.

Family can serve as a dependent care agent, who accepts and fulfills the responsibility to know and meet the therapeutic self-care demand those who are socially dependent upon them or to regulate the development or exercise as these individuals' self-care agency (Orem, 1995). In order to respond to dependent-care demand, dependent care needs to be provided (Taylor, 2001). In addition, dependent-care system consists of courses and sequence of actions that are performed by the dependent-care agent to meet self-care requisite of the dependent person (Orem, 1995, 2001, p. 457).

Orem (1995) views nursing as a helping service involving a person who needs help and a person who provides help. There are five methods to fulfill the demands, namely, acting or doing for another, guiding and directing, providing physical or psychological support, providing and maintaining an environment that supports personal development, and teaching.

First, acting or doing for others does not apply to a conscious person because the helper aids the person to inquire, decide and plan whenever possible and with prudence. Second, guiding others requires the guider to make choices and pursue a course of action by providing suggestions, instructions, directions or supervision. Third, the helper, who has ability to initiate or preserve a task, to think about a situation, or to make a decision to provide physical and emotional support. Fourth,

providing a developmental environment would motivate the helped to maintain appropriate goals and adjust behaviors to achieve results specified by the goals. Lastly, teaching another benefit the person who needs instruction to develop knowledge or certain skills. The methods can be used separately or in combination.

In of dependent care unit for TB treatment and control, a patient is the dependent person who has multiple roles as an individual, a person in relationship, a recipient of care, and a participant in care. Family consists of family members who have roles particularly as persons in relationship and as provider of care. Therefore, family should provide support system as dependent-care agent. TB patient who is in treatment phase needs to perform several activities. These activities are related to achieve the treatment outcome, especially adherence behaviors and successful treatment. Family may provide dependent care system wholly compensatory, partly compensatory or supportive-educative.

Dependent care agent's characteristics may influence the outcome of the recipient of care. Most dependent care agents are female. Studies found the difference in ways the dependent care agent's roles are fulfilled. Women provide more intensive care than men do, especially in forms of hours of care and levels of care (National Alliance for Caregiving, 2009). Miller and Cafasso (1992) stated that gender of caregivers contribute the difference in the involvement and provision of care. Mosher and Danoff-Burg found (2004) that female caregivers provide higher levels of support than male participants, specifically the emotional support. The role of dependent care agent is differently perceived by their age. The younger dependent care agents are more unhappy and resentful about their roles than the older caregivers (Barusch & Spraid, 1989). Therefore, the dependent care agent's characteristics must

be taken into consideration in this current program by way of matching the age and gender of family as DOTS supporter.

Evidence-based practices of family members DOT supporter

Initially, DOT supporter is performed by health care providers. Nowadays, there are three types of DOT supporter, namely, health care provider DOT, family member DOT, and community health worker DOT. Pungrassami, Johnsen, Chongsuvivatwong, Olsen, and Sørensen (2002) found that among those supporters who have been assigned as DOT supporters: 11% of healthcare providers, 23% of community health workers and 35% of family member did not practice DOT. Nonetheless, many health care providers did not choose this approach because of some specific reasons such as the overload of works, the limited number of healthcare providers as well as budget and transportation. There is an idea to involve person close to the patients to substitute the health care providers in this role. Family is the best support system and most important influences on everyone including TB patients. Therefore, DOTS support program has expanded the supporters to include family as DOTS supporters as well.

The family member DOT supporter is preferred by the TB patients. However, TB patients should be informed about the disease, the treatment and DOT, and also about selecting a DOT supporter before starting the treatment program. Interventions that aim to improve adherence behaviors should have criteria, which are educating patients about the importance of adherence, having DOT provider, and periodic patient home visits. Family DOT supporter must meet these criteria. Frieden and Sbarbaro (2007) stated that treatment observation must be performed by a person

who is accessible and acceptable to the patient and is also accountable to the health system.

The benefit of having family as a DOT supporter is still debatable. The Centers for Disease Control and Prevention in the United States suggests that family members DOT supporter is risky due to their emotional ties. It may not be a family bond but a lack of perceived need. It is clear that family support contributes to adherence of TB treatment. Maher (2003) confirmed that family support is obviously important for the TB patients. However, since family members are typically not neutral or objective about the patient's health, it is not recommended that family members be responsible for observing or recording medication regimens (Farmer, 2005). Nonetheless, Pungrassami, Johnsen, Chongsuvivatwong, Olsen, and Sørensen (2002) found that family bonds in Thailand can benefit general care and psychological support. In addition, FM observation will help a patient who has poor performance status.

The studies about family member DOT supporter has been conducted in both developed country such as Australia (MacIntyre et al., 2003) and developing countries like Brazil (Maciel, Guidoni, Brioshi, do Prado, & Freagona, 2010), Nepal (Mathema et al., 2001; Newell, Baral, Pande, Bam, & Malla, 2006), Pakistan (Walley, Khan, Newell, & Khan, 2001), Swaziland (Wright et al., 2004), and Thailand (Anuwatnonthakate et al., 2008; Kingkaew, Sangtong, Amnuaiphon, Jongpaibulpatana, & Anuwatnonthakate, 2008; Okunarak et al., 2007; Pungrassami & Chongsuvivatwong, 2002). Appendix A describes further the general information of the articles mentioned in this review.

Existing research on effectiveness of FM DOT supporter is dominated by epidemiological research and the outcomes for these studies are mostly WHO's outcomes for TB, specifically success rate including cured rate and completed rate. However, there is one study using compliance as its outcome that is measured by Isoniazid levels in urine (MacIntyre et al., 2003). FM DOT supporter is a household member that is trained by TB program staff to properly administer anti-TB drugs and to mark the patent's treatment card after each dose of drug was administered.

There are three types of DOT supporter – HCP, FM, and HCV. Nonetheless, there is a condition for which patients take medication by themselves called SA. HCP DOT has a higher success rate than FM DOT (Anuwatnonthakate et al., 2008; Kingkaew et al., 2008; Mathema et al., 2001; Pungrassami & Chongsuvivatwong, 2002; Walley et al., 2001; Wright et al., 2004). Conversely, Maciel et al (2010) found that FM has a greater success rate than HCP DOT. In addition, Newell et al (2006) stated that FM is better than HCV but Pungrassami & Chongsuvivatwong (2002) found the reverse result. FM also facilitates higher success rate than SA (MacIntyre et al., 2003; Pungrassami & Chongsuvivatwong, 2002, Okunarak et al., 2007). On the other hand, Walley et al (2001) mentioned that SA is better than FM.

Family member DOT supporter has proven to achieve the targeted 85% of success rate in TB treatment (Anuwatnonthakate et al., 2008; Maciel et al., 2010; MacIntyre et al., 2003; Newell et al., 2006; Okunarak et al., 2007; Pungrassami & Chongsuvivatwong, 2002). However, there are studies that have failed to achieve the WHO's target (Mathema et al., 2001; Kingkaew et al., 2008; Walley et al., 2001; Wright et al., 2004). RCT studies found no significant different of success rate

between FM, HCP, and SA (Walley et al., 2001); FM and HCP (Wright et al., 2001); FM and SA (MacIntyre et al., 2003).

Due to many different results of each study, further analysis may help understand the variations. Participants' characteristics in those studies vary in age, type of TB, TB history, HIV condition, and MDR. First, there were studies whose participants represented all ages (Anuwatnonthakate et al., 2008; Kingkaew et al., 2008; Mathema et al., 2001; Pungrassami & Chongsuvivatwong, 2002; Wright et al., 2004): Those who were 15 years and older (MacIntyre et al., 2003; Newell et al., 2006; Okunarak et al., 2007; Walley et al., 2001), and only adult (Maciel et al., 2010). Second, some studies took only pulmonary TB (Anuwatnonthakate et al., 2008; Kingkaew et al., 2008) but others took both pulmonary TB and extra pulmonary TB (Mathema et al., 2001; Maciel et al., 2010; MacIntyre et al., 2003; Wright et al., 2004; Walley et al., 2001). Third, the studies also differed in aspects of TB history: some only involved new TB (Anuwatnonthakate et al., 2008; Kingkaew et al., 2008; Newell et al., 2006; Okunarak et al., 2007; Walley et al., 2001), some chose both new and had history of previous TB (Wright et al., 2004), and some did not mention TB history at all (Maciel et al., 2010; MacIntyre et al., 2003; Mathema et al., 2001). Fourth, HIV/ AIDS patients were included in some studies (Anuwatnonthakate et al., 2008; Kingkaew et al., 2008; Maciel et al., 2010; Pungrassami & Chongsuvivatwong, 2002) though one research did not participate HIV/ AIDS patients (MacIntyre et al., 2003) and information for some others were not available (Mathema et al., 2001; Newell et al., 2006; Okunarak et al., 2007; Wright et al., 2004; Walley et al., 2001). Lastly, MDR patients were not included in the study of Anuwatnonthakate et al (2008) and the rest of studies did not state this clearly.

Validity of each study can be evident in design, sample size, and outcomes or instruments. Both cohort (60%) and RCT (40%) are slightly balanced in numbers of each study. Subject selection and failure to follow up are major potential bias for the cohort design (Mann, 2003). All studies have large sample size and equal in each group but few studies might be jeopardized (Anuwatnonthakate et al., 2008; Kingkaew et al., 2008). Most studies used success rate as an outcome, that includes completed rate and cure rate. The completed rate means the patients who have completed all treatments but there is no evidence from laboratory whether patients have been cured or not whereas the cured rate refers to the patients who have been judged to have recovered from TB based on laboratory test.

The exposures and interventions that have been conducted differ in every study. There are six cohort studies in this review. Anuwatnonthakate et al (2008) provided health education about TB treatment to FM, who observed and recorded ingestion of anti-TB medications, as well as the patients who were observed by HCP and had to ingest anti TB medications at least five times a week. Similarly, Maciel et al (2010) offered training to FM DOT on how to properly assist patients with anti TB medications and also to record the patients' treatment cards after every dose was administrated while at the same time HCP instructed the patients to attend the outpatient clinic daily to take medications and marked in patients' treatment cards. HCP followed up with the patients who did not attend by making routine contact or trace. Mathema et al (2001) stated that every group (HCP, FM/ HCV, and SA) serves as patients' supervisor during the treatment. In the same way, Pungrassami and Chongsuvivatwong (2002) had HCP, FM, and HCV as supervisors on the first day of treatment patients usually switch or select a different supervisor during the treatment.

Okunarak et al (2007) studied a center-based group who was observed by HCP, a family-based group who was observed by family members, and a community-based group who was observed by the HCV. There is no information regarding the exposures of each group. Kingkaew et al (2008) provided counseling on TB to the patients and relatives who live with the patients. FM group took weekly medication including its remnant to make sure the tablets were completely consumed. HCP group was given medication by HCP once daily.

The RCT studies' interventions also vary. First, MacIntyre et al (2003) compared FM and SA. A patient chose FM and the FM then receives education and training about watching the patient swallowing the anti-TB drugs daily and recording it. The recording was collected every fortnight. FM was followed-up by telephone so they were kept motivated and also to check progress and problems. SA was given standard care and the patients were required to record pill taking themselves. All patients paid a monthly clinic follow-up visit where they took the medications. Second, Newell et al (2006) studied two groups, which were HCV and FM. HCV group was supervised by a female community health volunteer or a village health worker and the medications were given to the supervisor monthly. Patients who discontinued treatment were traced by HCV. FM group was supervised daily by a household member, who is selected by the patient. The medications were given weekly to the supervisor. Government workers conducted dedicated tracing on patients who discontinued treatment.

Third, Wright et al (2004) studied HCV and FM DOT. HCV received training about monitoring the patients' daily medication intake, reminding the patients, and recording the adherence. FM was nominated by the patient and received

training to perform the same roles as HCV. Patients from FM group visited the HCV weekly to monitor side effects, adherence, and for general health education. The defaulter patients from both groups were reported to the diagnostic center. Fourth, Walley et al (2001) studied CHP, FM, and SA. CHP informed patients to attend the clinic six times a week during the intensive phase and patients continued to be self-administrated for the continuation phase and collected the medications fortnightly. FM was chosen by the patient and collected the medications every fortnight. FM received training on recording the medications, the importance of observing drug taking and encouraging the patient to complete the treatment. SA took medications fortnightly from the most convenient health facility.

Those studies were conducted in different settings which could vary the results. The meaning of family may differ in every country. The developed country like Australia has a completely different culture from the developing countries in Asia and Africa. There is usually a stronger bond within a family in developing countries when compares to developed countries, particularly collectivity and individual approach.

In sum, FM DOT supporters may not perform their duties properly even though they have been trained by a healthcare provider. However, no study mentioned clearly what the contents of the training were. Obviously, FM DOT supporters would not perform well because they are not medical professionals. Therefore, family is required to be prepared efficiently before being assigned as DOT supporter. The family-based DOT supporter program may help to improve adherence behaviors in TB patients.

Family-based DOTS support program in increasing adherence to health behaviors

Family-based DOTS support program is designed to help TB patients to improve adherence behaviors and achieve treatment success. Hsieh, Lin, Kuo, Chiang, Su, et al (2008) stated that direct daily observation, health education, and the long-term follow ups are the golden triangle in insuring TB patient's adherence. The efficacy of family member DOT supporter has been recently conducted in a significant number of research which has pacified an increasing need for the guaranteed value of this approach. Since none of the family-based DOTS support programs has been standardized, the researcher would like to design a protocol for this program to increase adherence behaviors patients with TB. Adherence behaviors reflect the active role of the patients in self-management during treatment and the importance of cooperation between patient and provider (Sumartojo, as cited in Anastasio, 1995, p. 12). The researcher will design the protocol of family-based DOTS support program consisting of four methods: helping, inspired by Orem (1995, 2001), guiding and directing; providing physical and psychological support; providing and maintaining an environment; and teaching.

Since none of the previous studies has used Orem's theory in increasing adherence to health behaviors in patients with pulmonary TB, the researcher would like to adopt Orem's theory in other chronic diseases. However, most of the studies utilized an individual approach instead of family involvement in their interventions. Appendix B provides general information regarding studies of supportive educative program in other diseases.

The characteristics of the study include selected population of the study, setting of the study, intervention approach, and design. The supportive educative program has been used for variation of diseases, including hypertension (Kauric-Klein, 2011), COPD (Kamsee, 2004), asthma (Kiatthitinun, 2005), TB (Ngamtrairai, 2003), chronic heart failure (Rau, 2000), breast cancer (Wonghongkul et al., 2008), diabetes (Mohamed, 2005), children with long-term tunneled catheter (Sirireung, 2005), premature infants (Taya, 2004), pregnant with premature labor pain (Wongtongchareon, 2003), and metabolic syndrome (Lauren, 2007). The studies were conducted in different countries such as Malaysia (Mohamed, 2005), Thailand (Kamsee, 2004; Kiatthitinun, 2005; Ngamtrairai, 2003; Sirireung, 2005; Taya, 2004; Wonghongkul et al., 2008; Wongtongchareon, 2003), and the United States (Kauric-Klein, 2011; Lauren, 2007; Rau, 2000). The interventions were given to the patients (Kamsee, 2004; Kauric-Klein, 2011; Lauren, 2007; Mohamed, 2005; Ngamtrairai, 2003; Rau, 2000; Wonghongkul et al., 2008; Wongtongchareon, 2003) and family as caregiver (Kiatthitinun, 2005; Sirireung, 2005; Taya, 2004). The studies used quasi-experimental design (Kamsee, 2004; Kiatthitinun, 2005; Lauren, 2007; Mohamed, 2005; Ngamtrairai, 2003; Rau, 2000; Sirireung, 2005; Taya, 2004; Wonghongkul et al., 2008; Wongtongchareon, 2003) and RCT studies (Kauric-Klein, 2011).

The outcomes of the studies are self-care practices (Kamsee, 2004; Mohamed, 2005), self-care behaviors (Kiatthitinun, 2005; Kauric-Klein, 2011; Lauren, 2007; Ngamtrairai, 2003; Taya, 2004), medication self-cares (Rau, 2000), dependent-care behaviors (Sirireung, 2005), quality of life (Wonghongkul et al., 2008), and self-care agency and outcome of pregnant (Wongtongchareon, 2003). Most studies have shown positive results indicating that the educative-supportive

program facilitates significantly better self-care practices (Kamsee, 2004; Mohamed, 2005), self care behaviors and severity of asthma (Kiatthitinun, 2005), blood pressure self-regulation and blood pressure self-care behaviors (Kauric-Klein, 2011), level of knowledge, self-efficacy expectation, and self-care behaviors (Ngamtrairai, 2003), dependent-care behaviors and the occurrence of complications (Sirireung, 2005), maternal self-care behaviors and health outcome (Taya, 2004), and self-care agency and pregnant outcome (Wongtongchareon, 2003). Conversely, the study of Rau (2000) found that the supportive educative program had no significant statistical difference on medication self-cares and hospital readmission. Similarly, Wonghongkul et al (2008) found that there was no significant difference of quality of life between experimental group and control group. Unfortunately, the mean of quality of life in experimental group did not increase after receiving the supportive educative program. Likewise, Lauren (2007) found that there was no significant difference in weight loss or perception of self care between the two groups.

Some studies only provided abstract so the researcher has no complete information about the interventions that have been done (Kiatthitinun, 2005; Taya, 2004; Wongtongchareon, 2003). The intervention was provided in the first day of hospitalization and maintained two weeks after discharging at patient's home (Kamsee, 2004). Kauric-Klein (2011) provided education session and 30 days of post intervention for follow ups, reinforcement for goals met and problems solving were provided if goals were not met in the intervention group that had had 12 weeks of intervention. On the other hand, the control group received standard care that consisted of blood pressure monitoring and medication adjustment by health care providers weekly. Ngamtrairai (2003) provided information about TB, group

discussion, self-care behaviors guidance, providing psychological and economic support and coordination for supportive environment. In order to increase self-care practice, the supportive-educative nursing system was given in three sessions. Sirireung (2005) provided extra supportive educative nursing systems and a handbook for each of the patients in experimental group. Rau (2000) compared the intervention group that received several helping techniques (guiding, teaching, and support) in self-management and weekly visits for 8 weeks while the placebo group that received health promotion education regarding immunization for adults, ways to decrease risk for falls, general nutrition, normal aging, and general health maintenance. However, there was a significant statistics indicating improvement of medication self-cares within the experimental group ($p < 0.05$). Mohammed (2005) provided the interventions including five methods of helping (teaching, guiding, supporting, providing a healthy environment) and a handbook about dietary control, exercise, medication taking, stress management, & personal hygiene.

Based on the studies that have used Orem's theory as theoretical framework particularly supportive educative nursing system, the researcher would like to design a supportive educative program that is suitable for TB patients in hope to increase adherence to health behaviors. Four of the helping techniques will be used in this study, namingly, teaching, guiding and directing, supporting, and providing environment.

As aforementioned, teaching methods refers to increase knowledge and belief about TB for both patients and their families. Symptoms and side effects managements belong to disease and treatment factors in this study. Additionally, there are few possible barriers that may happen during treatment process, by guiding and

directing will help patients, through help of the family, to maintain adherence behaviors. Risk factors and preventing disease treatment are also important points so by providing both psychological and physiological support the patients will stay adherent. Finally, motivation is also very important for TB patients and so needs to be provided regularly.

To sum up, in order to improve adherence to health behaviors, the TB patients need to have a good understanding about what the treatment entails, and how health providers expect them to modify their behavior. They also need to understand how to control aspects of their behavior. Patient, clinic or treatment barriers to adherence must be identified and modified. Patients require direct and continual feedback on their performance in order to reinforce positive behavior modification. The social support for the patient during treatment proves to be beneficial. These aspects are provided through four methods of helping – teaching, guiding and directing, providing physical or psychological support, and providing and maintaining an environment. The influencing factors (i.e., age and gender) of DOT supporter may contribute to the implementation of the program.

Summary

The literature review revealed valuable information for the development of family-based DOTS support program to enhance adherence to health behaviors among patients with pulmonary TB. TB remains a public health concern worldwide and also in Indonesia. Adherence has been defined differently in many studies. Obviously, adherence in this study is parallel with self-care deficit nursing theory which defines adherence as part of self-care behaviors. Health behaviors are

important for pulmonary TB patients in achieving successful TB treatment. Five major factors have been identified: patient-related factors, social-economic factors, condition-related factors, therapy-related factors, and health system factors. Of those factors, knowledge, patient's belief, emotional response, motivation, social support, symptoms and side effects of TB, and DOTS are taken into account in developin the program. The existing tools of measuring adherence have been reviewed and the researcher recognizes that the tools have limited validity and reliability.

The findings of the literature review discover that DOTS has achieved success in TB treatment. DOT supporter as part DOTS program can be health care provider, family, and community health worker. The family as DOT supporter is considered as the best supporter. However, the findings of the effectiveness of family as DOT supporter vary. The variation of findings possibly occur because of the difference in subject's characteristics, i.e., age, type of TB, TB history, co-morbidity, and MDR and research methodology, i.e., study design (cohort and RCT), sample size, and the outcomes and its tools. The interventions and exposures may also influence the results. The family has been trained by the health care provider before serving as DOT supporter but appropriate DOTS program is required so to ensure efficient and sufficient trainings be delivered to the family.

Self-care deficit nursing theory is used to guide the program. Family support has been defined by Orem's SCDNT theory as dependent care agent, who fulfills the responsibility to know and meet the therapeutic self-care demands. The nursing system used for TB patients is supportive educative program. The review of effectiveness of supportive educative program found that this program has achieved better outcomes, i.e., self-care behaviors and self-care practices of chronic diseases

and conditions. Most studies used helping methods – teaching, guiding, supporting, and providing environment. Differently, in the present program, the researcher would like to combine the helping methods and self-care operations, estimative operation, transitive operation, and operative operation. Therefore, it is important to conduct a study to investigate the effect of family-based DOTS support program on adherence to health behaviors in Indonesia.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter presents research design, variables, setting, population and sample, sampling procedure, research instrument, validity and reliability of instruments, translation of instruments, ethical consideration, data collection methods, and data analysis.

Research Design

The design of this study was a cluster randomized design with two-group: pre-test and post-test design. This study aimed to examine the effects of the family-based DOTS support program on adherence to health behaviors among patients with pulmonary Tuberculosis. The control group received routine care program and the experimental group received the family-based DOTS support program and routine Tuberculosis care. The research design is depicted as follows:

		Pre-test		Post-test
Control group	R	O_1	⟶	O_2
Experimental group	R	O_1	— X ⟶	O_2

R refers to cluster randomization for the community health centers

O_1 refers to the baseline data (pre-test score) of adherence to health behaviors

X refers to the family-based DOTS support program

O_2 refers to the score of adherence to health behaviors after receiving family-based DOTS support program (post-test score)

Variables

The independent variable in this study was the family-based DOTS support program while the dependent variable was adherence to health behaviors among patients with Tuberculosis. The factors that might influence adherence to health behaviors were controlled by matching technique and using statistical approach. Matching technique was used on selection of family DOT supporters to control the potential confounding variables of age (±5 years) and gender (female and male). Data regarding patients-related factors (age, culture, education, knowledge, and emotional response), social-economic factors (income, occupation, and residence area), condition-related factors (symptoms, side effects), therapy-related factors (medications), and health care provider and health system factors (characteristics of community health centers) were collected and taken into account for statistical control. In addition, some factors were restricted through the following inclusion criteria: age, type of TB, type of registered group, and co-morbidity.

Setting

The cluster randomized trial, either the experimental group or the control group, was conducted in community health centers in Bandung, a capital city of West Java Province, Indonesia. Bandung, a large city with population density of 14,228 people in one kilometer squares, has 63 community health centers. The community health centers that had high number of patients with Tuberculosis were chosen. Of 63 community health centers, 10 health centers participated in this study. There was no equal number of patients in each of the participating community health centers. Regardless of minor variations, community health centers provided TB

diagnosis and TB treatment by having DOTS standard in their practices.

DOTS consisting of five components has been applied in Indonesia. DOTS is mostly operated by the community health centers. The services include the surveillance, diagnosis and the treatment of TB. One component of DOTS implementation is to engage family as DOT supporter. Family is assigned as DOT supporter at the starting point of treatment and health education is provided to gain understanding about TB care. The health education is mainly provided to the patient. The DOT supporters could receive the health education if they accompany the patient at the starting point of treatment. No routine follow up or evaluation of the DOT supporter performance is conducted by the community health centers. Patient, who has been diagnosed of TB, visits a community health center to take the medications and regular checkup every week in the intensive phase and every two weeks in the continuation phase. The service of TB care includes the sputum investigation exam on the second month, the fifth month, and the sixth month. Though services are free of charge, patients must make a contribution of less than 1 USD per visit.

Population and Sample

Patients with pulmonary Tuberculosis and their DOT supporters residing in the participating the community health centers in Bandung, Indonesia, were included in the study population. The subjects of this study consisted of 60 pulmonary TB patients and their 60 families who met the inclusion criteria and also agreed to participate.

Sample size

The sample size of this study was estimated by using power analysis and the effect size was determined by calculating the effect size of the findings previous study. Mohamed (2005), who used the supportive-developmental nursing program to improve self-care practices of patients with type 2 diabetes, found that the subjects who received the supportive-developmental nursing program demonstrated significantly greater self-care practices (M = 193.66, SD = 21.25) than those subjects who received standard care (M = 134.50, SD = 37.83). According to Cohen (1998), the required sample size for significant criterion is .05, power = .80, and effect size d =1.92 (Appendix C) exceeded a *"d"* = 1.4. However, the Mohamed's study was different from the present study in terms of population and intervention approach. Therefore, the researcher used large effect size (d = .80) for sample estimation and yielded the necessary sample size of 26 subjects per group. Increasing the number of sample size in cluster randomized trials was needed to prevent any bias (Graudeau & Ravuqal, 2009) and for statistical analysis purposes (Campbell, Elbourne, Altman, & CONSORT Group, 2004). Keeping these aspects in mind, the researcher added about 20% subjects of each group so there were 30 subjects in each group and a total of 60 subjects. In Addition, Cohen (1988) stated that 30 participants per group should lead to about 80% power to detect difference.

Inclusion criteria

The inclusion criteria to identify eligible subjects were: 1) must be older than 15 years of age; 2) had confirmed diagnosis of pulmonary Tuberculosis and was at the intensive phase of TB treatment; 3) was a new case of Tuberculosis

treatment; 4) no diagnosis of MDR-TB; 5) no other underlying diseases with long-term treatment, namely, diabetes, hypertension, chronic renal failure, and others; 6) no diagnosis of HIV/ AIDS; and 7) able to write and read Indonesian language. Since this study involved a family member to serve as a dependent care agent, the inclusion criteria of eligible family members were: 1) must be selected as DOT supporter by the patient; 2) must be 18 years or older; 3) live with the patient; and 4) able to write and read Indonesian language.

During the study, the patients were excluded if they: 1) developed a severe condition that caused them to discontinue the participation in the study or unable to perform health behaviors activities and 2) did not complete the study up to the post-test data collection. Fortunately, none of the recruited subjects was excluded from this present study.

Sampling Procedure

The study sample was taken from the participating community health centers using lottery. The community health centers were assigned by lottery to either the experimental group or the control group. The potential subjects and their families who meet the inclusion criteria were approached by a nurse to ascertain their interest in this study. The families as DOT supporters were matched based on age (± 5 years) and gender (male or female). Then, the researcher explained the purpose of the study, procedures, risks, benefits, and confidentiality. The researcher then obtained verbal or written informed consent (Appendix D). The researcher allowed the patients and their families to withdraw from the study at any time without penalty. The sampling procedure proceeded in this method until 60 subjects and their 60 families were

assigned to one of the two groups (30 subjects/ group). Since the subjects and their families of the control group and experimental group lived in different areas surrounding responsible community health centers, the chance of interaction between the two groups was slim.

Instrumentation

There were two instruments — family-based DOTS support program and data collection instruments, including the demographic data form, and the Tuberculosis adherence to health behaviors questionnaire. Each instrument was described as follows:

Family-Based DOTS Support Program

The family-based DOTS support program was developed based on SCDNT by Orem (1995; 2001) by the researcher. This program covered four helping methods – teaching, guiding and directing, supporting, and providing environment – and three self-care operations: estimative, transitive, and operative operations (Appendix E). The duration of program was five weeks. This program included a handbook to guide Tuberculosis patients to maintain adherence to health behaviors at home (Appendix F). The contents of the handbook included definition of Tuberculosis, signs and symptoms, risk factors, tuberculosis treatment, and health behaviors necessary for recovery and prevention of TB transmission.

During the first week (T_1), every subject and his/ her family received three intervention sessions as follow: 1) estimative operation using teaching technique to cover cause and impacts of TB, TB and medications/ diet/ exercise, and

management of symptoms and side effects of medications; 2) transitive operation using teaching, guiding, supporting, and providing environment for decision on care activities, providing choices, and discussing the benefits and limitations of each choice; 3) productive operation using teaching, guiding, supporting, and providing environment for making action plan and evaluation of the implementation (Appendix D). Estimative operation was performed after the subjects signed informed consent and was conducted for about one hour. This session involved not only the patients but also their DOT supporters. Teaching method was employed to provide knowledge about TB overview and health behaviors. In order to facilitate patient's understanding, spoken and written explanations were provided using booklet and leaflet. In addition, the patients and their DOT supporters had opportunities to ask any questions. At the end of the session, the researcher ensured clear understanding by asking the clients about each provided topic. TB overview included TB disease, TB symptoms, impacts of TB, and importance of adherence to health behaviors. Medications, diets, exercise, health environment, transmission, and risk factors were main topics of TB health behaviors adherence.

Transitive and productive operations were conducted within four days after estimative session (M = 2.17 days, SD = 1.15). Both operations lasted about one hour. Making judgments and decisions were main activities of transitive session. The current health conditions and each health behavior were discussed and any barriers/ facilitators were explored. Patients and their families were provided with any obstacles that could possibly happen during the implementation of each health behavior which helped them explore any alternatives and prepare to overcome those difficulties. The researcher ensured and provided psychological support as well as a

warm environment in order to make the clients feel at ease about revealing the problems and seeking solutions for them. Balance sheet for decision making to identify the advantages and disadvantages of each behavior was filled by either the patients (n = 21) or their DOT supporters (n = 9) to help them with decision making in implementing each health behavior. The characteristics of the subjects who received help from their DOT supporters in filling this sheet were three female elder patients, five male patients, and a young female patient. Operative operation continued upon the completion of transitive operation.

Plan of action was the main outcome during operative operation. Both patients and their DOT supporter participated in creating the action plans. Every health behavior was included to the action plan form that was filled by either the patients (n = 21) or their DOT supporters (n = 9). Action plan consisted of goals and the actions indicating when, where, how, and how often. Suggestions and recommendations were provided to assist the clients. Conducive environment and psychological information support were offered in this operation. Lastly, evaluation record form was explained and the patients were asked to fill this form every day in order to help them measure how they achieved adherence of each health behavior. They put (√) in the record form if they had followed the action plan, for each health behavior, completely.

On the second and the third week, the researcher conducted telephone follow up. The researcher asked about the activities and the barriers experienced by the patients. In addition, evaluation of implementation was performed whether the action plan was to be revised or continued. Every patient and his/ her DOT supporter were asked and reminded to fill out evaluation record form.

On the fourth and the fifth week, the researcher conducted face-to face follow up with the patient and his/ her family. These follow ups aimed to assess the patient's current adherence to health behaviors as well as implementation of action plan and also to identify its barriers and make further plans in maintaining and improving his/ her adherence to health behaviors. Positive feedback, encouragement, and supportive environment were created during this session. Five patients who did not complete the record form were three females and two males, three of them had been helped by their DOT supporters in filling out balance decision making sheet and action plan form. The duration of each follow-up visit depended on patient's conditions and needs. Time spent with patients who asked more questions or had complicated conditions were typically longer than those who had no significant problems. Finally, a post-test of the patient's adherence to health behaviors was conducted.

The demographic data form (DDF)

The DDF was developed by the researcher. It consisted of three components, including patient information and patient health-related data, family information, and DOT supporter (Appendix G). This form was completed by the patients. Patient information and patient health-related data composed of age, gender, marital status, religion, ethnic, occupation level of education, income, health insurance, other health problems, length of treatment, length of enrollment and treatment, distance between house and community health center, the symptoms, types of treatment received, and list of problems after taking medications. Family information included family history for caring TB patients, family history for caring

chronic disease patients, family members with chronic disease, family type, vulnerable people, and family size were collected. Data about DOT supporter information included age, gender, marital status, religion, occupation, education level, and caregiver during treatment. Lastly, health related data comprised of medications, diet, physical activity, environmental hygiene, disease transmission, and risk factors.

The Tuberculosis adherence to health behaviors questionnaire (TAHBQ)

The modified version of TAHBQ originally developed by Biswas (2010) was used. The reliability of this questionnaire revealed in Biswas's study yielding Cronbach's alpha coefficient of .76 internal consistency. There were 31 items and six sub-scales, namely, complying with anti-TB medications, following healthy diet, performing physical exercise, maintaining environmental hygiene, preventing disease transmission, and avoiding risk factors of TB (Appendix H). The response format is a 4-point Likert scale [never (1), sometime (2), most of the time (3), and all the time (4)]. The total score ranges from 31 to 124. Higher scores were considered as higher level of adherence to health behaviors. Additionally, the level of adherence to health behaviors was divided into three levels, namely, low (31.00 - 62.00), moderate (62.01-93.00), and high (93.01-124.00).

Due to overlapping statements and some behaviors were not included in the original questionnaire, the researcher modified this instrument to achieve the best fit with health behaviors of TB. In the modification process, the researcher discussed with advisors and experts to identify unmatched items and figured out the most suitable behaviors. The modifications made to this instrument were one item of

following healthy diet and maintaining environmental hygiene subscales was deleted and one item of maintaining environmental hygiene and avoiding risk factors subscales was added.

Translation of the instruments

The instruments were translated using back-translation technique in this study (Brislin, 1970). The instruments were translated from the original English version to an Indonesian version by an Indonesian bilingual translator. Subsequently, Indonesian version of the tool was translated into an English version. Finally, the two English versions were examined for comparability of language and similarity of interpretation. A third translator then assessed any discrepancies and adjusted the identified differences between the original version and the back-translated version by changing the words. The items no 11 and 25 were adjusted in order to be understood by the patients.

Validity of the instruments

The DDQ and the TAHBQ were validated by three experts, each of whom was from Faculty of Nursing Prince of Songkla University, Yala Hospital, and Faculty of Nursing Universitas Padjadjaran, Indonesia. In addition, the family-based DOTS support program, particularly the guidelines, contents, and materials, were evaluated by these same experts. These contents were revised based on the experts' comments and recommendations. The experts suggested the followings: 1) to rewrite the sentences, delete one item, and add two more items in adherence to health behaviors questionnaire; 2) to add particulars contents in the interventions (i.e., health

and TB belief; hazardous of drug resistance, and stigma of TB); and 3) to revise the evaluation record form and provided example in the booklet.

Reliability of the instruments

The TAHBQ was examined for its reliability in 20 patients with pulmonary Tuberculosis. The Cronbach's alpha was used to determine the internal consistency reliability of the adherence to health behaviors questionnaire. The results showed that the Cronbach's alpha coefficient of Indonesian adherence to health behaviors questionnaire .78, which is slightly higher than previous Cronbach's alpha at .76. This result was adequate and accepted.

Pilot Study

A pilot study was conducted. It aimed to test the feasibility of the designed intervention (Polit & Beck, 2008). The pilot study was done with two patients who met the study inclusion criteria. The patients and their families received a brief, one week of the family-based DOTS support program, with a two-time telephone follow up and one face to face follow up.

Generally, the program was applicable in this present study. There was no problem in understanding and applying the intervention and the booklet as well as fulfilling the evaluation form. However, the difficulty was found in terms of appointment for telephone follow up particularly for patients who had no mobile phone. Therefore, further appointment was needed to do telephone follows-up by asking the patient to send message for arranging time for telephone follow up.

Study Protocol and Data Collection Procedures

The data collection was performed at each subject's house or at the community health centers. Two phases – preparation phase and implementation phase – were conducted as follows:

Preparation phase

The preparation phase consisted of the following steps: 1) obtaining official approval from Faculty of Nursing Prince of Songkla University; 2) attaining official permission for data collection from Bandung's local health department office; 3) preparing the materials and the questionnaire packages including the informed consent; 4) testing the validity and reliability of the instruments; 5) recruiting two research assistants (RAs) who had at least a bachelor degree of nursing; 6) conducting training for the research assistants; and 7) conducting the pilot study.

The RAs had responsibility to do pre-test and post-test data collection. There were three steps of training for RAs. First, presenting the objectives, protocol and instruments were used in this study. Second, providing explanation about the RA's role and responsibilities in collecting the pre-test and post-test data were conducted. Lastly, the researcher and the RAs reviewed each questionnaire as well as the method to complete the questionnaire in detail. The RAs asked about any confusion and the researcher clarified them during this process to ensure that the RAs would be able to answer any questions from the patients during data collections. RAs reported that some items (item no 16, 17, 23, 25, 27, 28, and 29) were confusing. Therefore, they were prepared to be mindful of these particular items. Clear explanations and particular examples were provided to both RAs.

Implementation phase

The eligible subjects were approached and asked about his/ her interest and willingness to participate in the present study. They signed informed consent form or provided verbal consent if agreed to participate in the study. No prospective patients of the control group refused to participate in this study, however, one prospective male patient of the experimental group refused the participation because he had not time. The researcher made an appointment to meet with the patients in the experimental group who attended the family-based DOTS support program. The RAs helped the patients to complete the questionnaires. Patient's adherence to health behaviors was assessed two time points, once before intervention (T_1) and at the fifth week (T_2) of treatment.

Subjects in the control group were asked to complete the DDF and TAHBQ. Patient's adherence to health behaviors was measured at T_1 and T_2. After completing the questionnaire on the fifth week, all patients received the booklet about Tuberculosis and a short-course orientation on family-based DOTS support program. Patients were allowed to ask any questions during the meetings or later via telephone. Five subjects of the control group communicated with the researcher via telephone regarding the Tuberculosis and their conditions.

Ethical Consideration

Concerning the rights of human subjects, this study earned an approval from the Ethics Committee of Faculty of Nursing, Prince of Songkla University, Thailand, and was granted a permission from Bandung Local Health Department, Indonesia. The nurses in the community health centers introduced the researcher and

RAs to the potential subjects of this study. All subjects participated in this study received verbal and written explanation about the study. In addition, patients were informed that they were assigned into two groups, namely, the experimental and the control group. A consent form was given based on the subject's interest. Signed consent form or verbal consent to participate were used as forms of consent. The researcher assured the subjects that their participation was voluntary and that they could withdraw their participation at anytime without any negative consequences to the care being provided to them. Moreover, the researcher's contact information (i.e., telephone, and address) was provided to them. All of their information was kept confidential. Any results of this study were presented in an aggregate form and for academic purpose only. Additionally, there was no risk in participating in the study. The patients in the control group received the handbook about Tuberculosis care management after all the data collection was completed.

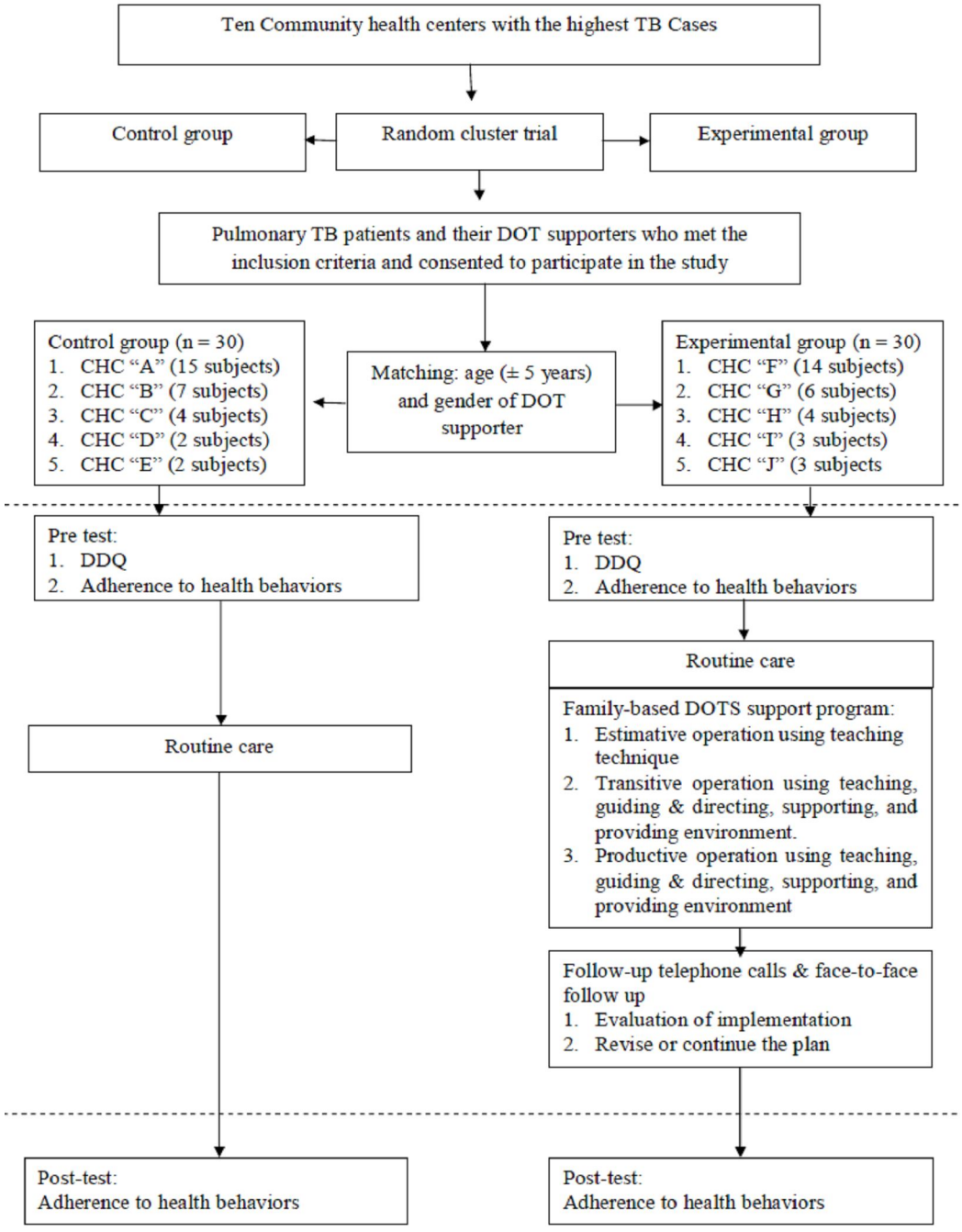

Figure 2. The Implementation phase of data collection procedures

Data Analysis

Data were analyzed using descriptive and inferential statistics to answer the research questions. The demographic data of the subjects were analyzed and described in frequency, percentage, mean, and standard deviation (or median and quartile deviation). In addition, mean and standard deviation (or median and quartile deviation) were used to compare adherence to health behaviors before and after intervention. Chi square, the Fisher's Exact test, continuity correction, and independent t-test were applied to test the equivalence of the proportion or mean difference of demographic data between the experimental group and the control group.

The researcher examined the assumptions of normality and homogeneity of variance of the data sets of adherence to health behaviors. Since the total scores of health behaviors adherence aligned with the assumptions, Paired *t*-test was used to test the difference of adherence to health behaviors within the control group and the experimental group. Independent *t*-test was used to test the difference of adherence to health behaviors between the experimental group and the control group. The level of significance was set at $p < .05$. Two variables of demographic characteristics (i.e., length of treatment and joint pain) were found to be significantly different; ANCOVA was performed to test the effectiveness of the program by taking them as the covariance variables. Before conducting ANCOVA, the assumptions were assessed (Rutherford, 2001) and the results showed that there was not significant interaction between the covariates and the factor (independent variable) in the prediction of dependent variable. The underlying assumption of homogeneity variance for the ANCOVA was met. Therefore, ANCOVA was applied in this study.

CHAPTER 4

RESULTS AND DISCUSSION

This chapter presents and discusses the study's results and findings. The subjects' characteristics, both health-related, and symptoms characteristics, are described, followed by family and DOTS supporters' characteristics. Next, the adherence to health behaviors of the subjects in the experimental and the control groups are illustrated. The effect of the family-based DOTS support program is elaborated and discussed.

Results

Part I: Subjects' characteristics

Subjects' characteristics refer to characteristics of patient, family, and DOTS supporter. Table 4 shows subjects' characteristics in both experimental group as well as control group. Data of experimental group revealed that more than half of the subjects were married (53%) and Sundanese (87%). The average age of this group was 33.50 years (*SD* = 15.42) and gender was equally represented. The subjects of the control group were dominated by Sundanese (97%) and Muslims (100%) with average age of 34.17 years (*SD* = 14.12).

In order to examine the significant differences of patient characteristics between the experimental group and the control group, t-test, Mann-Whitney U test, and chi square were applied. The findings revealed that all patient information between experimental and control groups did not show significant statistical difference.

Table 4

Frequencies and Percentages of Patients' Characteristics of the Experimental Group and the Control Group (N = 60)

Patient Information	Experimental Group (n = 30)		Control Group (n = 30)		Statistics	*p*
	n	%	n	%		
Gender						
Male	15	50.00	14	46.67	.00[b]	1.00
Female	15	50.00	16	53.33		
Marital Status						
Single	13	43.33	11	36.67	1.17[a]	.56
Married	16	53.33	16	53.33		
Widowed/ Divorced	1	3.33	3	10.00		
Ethnicity						
Sundanese	26	86.67	29	96.67	1.96[c]	.35
Javanese	4	13.33	1	3.33		
Occupation						
Occupied	12	40.00	16	53.33	.60[b]	.44
No occupied	18	60.00	14	46.67		

[a] = Chi square, [b] = Continuity correction, [c] = Fisher's exact test, [d] = t-test, [e] = Mann Whitney U test

Table 4 (continued)

Patient Information	Experimental Group (n = 30)		Control Group (n = 30)		Statistics	*p*
	n	%	n	%		
Education Level						
< Senior high school	17	56.67	16	53.33	.00[b]	1.00
≥ Senior High School	13	43.33	14	46.67		
Income (per month)						
< minimum wage rate	16	53.33	18	60.00	.07[b]	.79
≥ Minimum wage rate	14	46.67	12	40.00		
Distance (Km)	*Md* = 2.50		*Md* = 2.00		-1.78[e]	.08
	IQR= 3.00		*IQR*= 2.00			
< 5 Km	27	90.00	29	96.67	1.07[c]	.61
≥ 5 Km	3	10.00	1	3.33		
Age (year)	*M* = 33.50		*M* = 34.17		.18[d]	.86
	SD = 15.42		*SD* = 14.12			
15-29 year	16	53.33	15	50.00	.12[a]	.94
30-44 year	5	1.67	6	20.00		
≥ 45 year	9	30.00	9	30.00		

[a] = Chi square, [b] = Continuity correction, [c] = Fisher's exact test, [d] = t-test, [e] = Mann Whitney U test, *Md* = median, *IQR* = Interval Quartile Range

Table 5 illustrates the comparison of health-related data between the two groups. The experimental group had 77% of smear positive pulmonary TB. The means of length of treatment, medications number and BMI were 18.80 days (*SD* =14.19), 3.00 tablets (*SD* = .53), and 18.70 (*SD* = 2.73), respectively. The control group was dominated by smear positive of pulmonary TB (80%). Length of treatment, medications numbers, and BMI had means 26.10 days (*SD* = 12.18), 2.93 tablets (*SD* = .58), and 18.30 (*SD* = 2.83), respectively.

Independent t-test was used to examine whether the experimental and the control groups had any differences in three characteristics, i.e., length of treatment, numbers of medications taken, and BMI that met with assumptions of t-test. Mann-Whitney U test was employed to data that violated assumptions of t-test (i.e., duration of exercise). The results showed that both number of medications taken and BMI were not significant in statistical difference between the two groups. However, length of treatment for the experimental group was shorter (M = 18.80 days, SD = 14.19) than the control group (M = 26.10 days, SD = 12.18) (t = 2.14, $p < .05$). In addition, chi square was applied for the rest of health-related information and the results indicated no significant statistical difference between two groups.

Table 5

Frequencies and Percentages of Health-Related Characteristics of the Experimental Group and the Control Group (N = 60)

Health-Related Characteristics	Experimental Group (n = 30)		Control Group (n = 30)		Statistics	*p*
	n	%	n	%		
Type of TB						
Smear negative	7	23.33	6	20.00	3.28 [a]	.51
Smear positive	23	76.67	24	80.00		
Health Insurance						
Yes	10	33.33	4	13.33	2.33[b]	.13
No	20	66.67	26	86.67		
Routine activity						
Yes	19	63.33	26	86.67	3.20[b]	.07
No	11	36.67	4	13.33		
Exercise						
Yes	11	36.67	12	40.00	.00[b]	1.00
No	19	63.33	18	60.00		

[a] = Chi square, [b] = Continuity correction, [c] = Fisher's exact test, [d] = t-test

Table 5 (continued)

Health-Related Characteristics	Experimental Group (n = 30)		Control Group (n = 30)		Statistics	*p*
	n	%	n	%		
Exercise Duration (minute/ week)						
0-30 minutes	27	90.00	27	90.00	.00[a]	1.00
30-60 minutes	2	6.67	2	6.67		
60-90 minutes	0	0.00	0	0.00		
90-120 minutes	1	3.33	1	3.33		
Smoking	1	3.33	3	10.00	1.25[a]	.54
Current	9	30.00	7	23.33		
Ex-user	20	6.67	20	66.67		
Never	0	0.00	0	0.00		
Drinking alcohol						
Ex-user	6	20.00	1	3.00	4.44[c]	.10
Never	24	80.00	29	97.00		
Consuming Drugs						
Ex-user	1	3.00	0	0.00	1.02[c]	1.00
Never	29	97.00	30	100.00		

[a] = Chi square, [b] = Continuity correction, [c] = Fisher's exact test, [d] = t-test

Table 5 (continued)

Health-Related Characteristics	Experimental Group (n = 30)		Control Group (n = 30)		Statistics	*p*
	M	*SD*	*M*	*SD*		
Length of treatment (day)	18.80	14.19	26.10	12.18	2.14[d]	.04
Number of Medications	3.00	.53	2.93	.58	-4.65[d]	.64
BMI	18.70	2.73	18.30	2.83	-.56[d]	.58

[a] = Chi square, [b] = Continuity correction, [c] = Fisher's exact test, [d] = t-test

Symptoms of each group are provided in Table 6. Every patient may have had more than one symptom. The most common symptoms experienced by the subjects in the experimental group were cough (77%), nigh sweat (50%), and fatigue (33%). Whilst in the control group, night sweat, itching, and headache were the most common symptoms complained by the subjects. There was no significant statistical difference of the symptoms between the groups. However, the *p* value of joint pain (*p* = .05) was close to the cut point of the significant difference between two groups.

Table 6

Frequencies and Percentages of Symptoms of the Experimental Group and the Control Group (N = 60)

Symptoms	Experimental Group (n = 30)		Control Group (n = 30)		Statistics	*p*
	n	%	n	%		
Fever	6	20.00	7	23.33	.00[a]	1.00
Cough	23	76.67	19	63.33	.71[a]	.40
Night sweat	15	50.00	10	33.33	1.10[a]	.30
Fatigue	10	33.33	6	20.00	.77[a]	.38
Nausea	9	30.00	7	23.33	.09[a]	.77
Vomiting	2	6.67	1	3.33	.35[b]	1.00
Itching	8	26.67	10	33.33	.08[a]	.79
Headache	9	30.00	10	33.33	.00[a]	.1.00
Burn sensation	1	3.33	4	13.33	1.96[b]	.35
Joint Pain	9	30.00	2	6.67	4.00[a]	.05

[a] = Continuity Correction, [b] = Fisher's exact test

Family information is presented in Table 7, which reveals that most family had no chronic diseases in the experimental group (93%). More than half of the subjects in the control group had no TB (53%) or chronic disease (77%). Mann

Whitney U test and chi square were used to test difference in family characteristics between two groups. All family characteristics between two groups showed no significant statistical difference.

Table 7

Frequencies and Percentages of Family Characteristics of the Experimental Group and the Control Group (N = 60)

Family Characteristics	Experimental Group (n = 30)		Control Group (n = 30)		Statistics	*p*
	n	%	n	%		
History of caring of TB						
Yes	15	50.00	14	46.67	.00[b]	1.00
No	15	50.00	16	53.33		
History of caring of Chronic Disease						
Yes	7	23.33	7	23.33	.00[b]	1.00
No	23	76.67	23	76.67		
FM with chronic disease						
Yes	2	6.67	5	16.67	1.46[c]	.42
No	28	93.33	25	83.33		

[a] = Chi square, [b] = Continuity correction, [c] = Fisher's exact test, [d] = Mann Whitney U test

Table 7 (continued)

Family Characteristics	Experimental Group (n = 30)		Control Group (n = 30)		Statistics	*p*
	n	%	n	%		
Family Type						
Nuclear	17	56.67	13	43.33	.60[c]	.44
Non-Nuclear	13	43.33	17	65.67		
Family Size	*Md* = 5.00 *IQR* = 2.25		*Md* = 5.00 *IQR* = 2.00		-.02[d]	.98
2-4 persons	12	40.00	10	33.33	.30[a]	.86
4-8 persons	16	53.33	18	60.00		
> 9 persons	2	6.67	2	6.67		
Vulnerable people						
< five years	16	53.00	14	47.00	.07[b]	.80
Elderly	7	23.00	6	20.00	.00[b]	1.00
Pregnant women	1	3.00	1	3.33	.00[c]	1.00

[a] = Chi square, [b] = Continuity correction, [c] = Fisher's exact test, [d] = Mann Whitney U test, *Md* = median, *IQR* = interval Quartile Range, FM = family member

Since matching technique was used for age (±5 years) and gender of DOTS supporters, both characteristics were equal in the experimental and the control groups. All DOTS supporters were Muslims. In order to examine DOTS supporters'

characteristics, both chi-square and t-test were applied and no significant statistical difference between the two groups were found (Table 8).

Table 8

Frequencies and Percentages of DOT Supporters' Characteristics of the Experimental Group and the Control Group (N = 60)

DOTS Supporters Characteristics	Experimental Group (n = 30)		Control Group (n = 30)		Statistics	*p*
	n	%	n	%		
Marital Status						
Single	2	6.67	3	1.00	.00[a]	1.00
Married	24	80.00	26	86.67		
Widowed	4	13.33	1	3.33		
Occupation						
Employed	15	50.00	16	53.33	.00[b]	1.00
Unemployed	15	50.00	14	46.67		
Education Level						
> Senior high school	24	80.00	24	80.00	.00[b]	1.00
≥ Senior high school	6	20.00	6	20.00		

[a] = Chi square, [b] = Continuity correction, [c] = t- test

Table 8 (continued)

DOTS Supporters Characteristics	Experimental Group (n = 30)		Control Group (n = 30)		Statistics	*P*
	n	%	n	%		
Relationship						
Father/ mother	12	40.00	13	43.33	3.53[a]	.32
Brother/ sister	2	6.67	4	13.33		
Spouse	12	40.00	6	20.00		
Son/ daughter	4	13.33	7	23.33		
Age (year)	*M* = 39.97 *SD* = 11.15		*M* = 40.47 *SD* = 12.43		.16[c]	.87

[a] = Chi square, [b] = Continuity correction, [c] = t- test

Part II: Adherence to health behaviors

The mean pretest score of adherence to health behaviors among the subjects participating in this study was 87.80 (*SD* = 9.06) for the experimental group and 89.73 (*SD* = 10.99) for the control group (Table 9). The total adherence to health behaviors was at a moderate level in both groups. The highest score was the sub-scale complying with anti-TB medications in each group. Performing physical activity sub-scale was the lowest score in both groups and was at a moderate level. The rest of sub-scales were at a high level in every group though with an exception of the sub-scale of preventing disease transmission in the experimental group and the sub-scale

of maintaining environmental hygiene in the control group which were at a moderate level.

Table 9

Pretest, Means Score, and Standard Deviations of Adherence to Health Behaviors in the Experimental Group and the Control Group (N = 60)

Pretest	Experimental Group (n = 30)				Control Group (n = 30)			
	M	*SD*	Min-Max	Level	*M*	*SD*	Min-Max	Level
Complying with anti-TB medications	17.47	2.06	13-20	High	18.70	1.49	16-20	High
Following healthy diet	16.97	2.99	12-22	High	16.33	3.01	12-24	High
Performing physical exercise	9.20	2.75	5-17	Low	10.33	3.43	5-20	Low
Maintaining environmental hygiene	13.63	2.98	9-20	High	13.17	3.87	5-20	Moderate
Preventing disease transmission	10.63	2.68	6-16	Moderate	12.47	3.18	5-16	High
Avoiding risk factors	19.90	2.01	14-24	High	18.43	3.14	12-23	High
Total scores	87.80	9.06	64-108	Moderate	89.73	10.99	67-110	Moderate

Part III: Effect of the family-based DOTS support program

Hypothesis 1. The hypothesis 1 states that the total score of adherence to health behaviors of patients with pulmonary TB after participating in the family-based DOTS support program is higher than the score measured before the intervention. The assumption testing showed that adherence to health behaviors scores at the pretest and the post-test are of normal distribution. The paired t-test revealed that the mean score of adherence to health behaviors after participating in the family-based DOTS support program was significantly higher than the score before the participation (t = -10.34, p < .001). This result completely supported the hypothesis 1. Comparison of pretest and post-test scores of the control group is presented in Table 10. There was no significant statistical difference between the pretest score and the post-test score of the control group.

Table 10

Total Scores and Standard Deviations of the Adherence to Health Behaviors within the Experimental Group and the Control Group (N = 60)

Group	Pretest Score		Posttest Score		*t*	*p*
	M	*SD*	*M*	*SD*		
Experimental Group (n= 30)	87.80	9.06	109.23	13.18	-10.34	.00
Control Group (n= 30)	89.73	10.99	90.60	8.82	-.34	.73

Hypothesis 2. Hypothesis 2 states that the total score of health behaviors adherence of patients with pulmonary TB who receive care from the

family-based DOTS support program is higher than the score of those who receive the routine care. Testing assumption showed that the datasets of adherence to health behaviors in subjects from the experimental group and the control group are normal distribution In order to examine the second hypothesis, baseline health behaviors adherence was assessed to detect any baseline difference of total scores using independent t-test. The result showed that there was no significant statistical difference in the baseline data of the total pretest scores between the experimental group and the control group (Table 11). It revealed that the total score of the experimental group (M = 109.23, SD = 13.18) was significant higher than the control group (M = 90.60, SD = 8.82) (t = -6.43, p < .001).

Table 11

Pre-Test, Means Scores, and Standard Deviations of the Adherence to Health Behaviors Between the Control Group and the Experimental Group (N = 60)

Adherence to health behaviors	Experimental group		Control Group		*t*-test	*p*
	Mean	SD	Mean	SD		
Pretest	87.80	9.06	89.73	10.99	.74	.46
Post-test	109.23	13.18	90.60	8.82	-6.43[1]	.00

[1]= equal variance was not assumed (df = 50.63)

ANCOVA was performed to determine the mean difference of adherence to health behaviors between the experimental group and the control group. The independent variable included the experimental group and the control group. The

dependent variable was the post-test of adherence to health behaviors and the covariates were the length of treatment and joint pain. Before conducting the ANCOVA, the homogeneity of regression was tested, during which time the interaction between the covariates and the factor (independent variable) in the prediction of dependent variable was assessed. The result showed that the interaction was not significant ($F = .56$, $p = .46$). Based on this finding, ACOVA proceeded. The underlying assumption of homogeneity variance for the ANCOVA was met, evidenced by $F = 2.97$, $p = .09$. The ANCOVA was thus significant. Table 12 presents the total score of adherence to health behaviors on the fifth week of post-intervention period, between the two groups. There was a significant statistical difference ($F = 47.71$, $p \leq .001$) using the length of treatment and joint pain as the covariates. Therefore, the result fully supports the hypothesis 2.

Table 12

Comparison of the Experimental and the Control Groups' Post-Test Regarding the Patients' Adherence to Health Behaviors after Controlling Length of Treatment and Joint Pain (N = 60)

Source	Sum of Squares	df	Mean Squares	F	*p*	Partial eta squared
Between groups	5,341.37	1	5,341.37	47.71	.00	.46
Length of Treatment	74.09	1	74.09	.66	.42	.01
Joint Pain	944.04	1	944.04	8.43	.01	.13
Error	6,269.75	56	111.96			
Total	611,507.00	60				

Additionally, the subjects in the experimental group made report every day of the program implementation. The report consisted of six health behaviors performed every day. Percentage of the number of health behaviors performed by patients each day was calculated. The subjects implemented the program for four weeks. The average percentage was calculated based on percentage of health behaviors from day 1 to day 7 in each week. Percentage of each week of all health behaviors is illustrated in Figure 3. The highest percentage of implementation was at the third follow up, whilst the lowest percentage was at the first follow up. The percentage of implementation program increased every week except the last week.

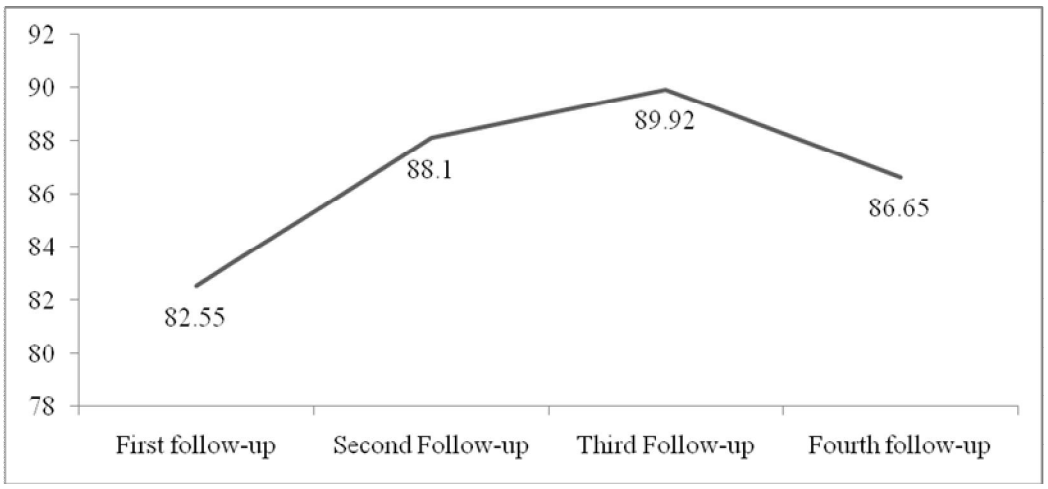

Figure 3. The percentage of health behaviors being performed across four-time follow- up

Discussion

Discussion of the study results consists of subjects' characteristics (i.e., patient information, family information, and DOTS supporters), adherence to health behaviors, and the effect of family-based DOTS support program.

Part 1: Subjects' characteristics

Subjects' characteristics cover patient information, family information, and DOT supporters.

Patient information. There were no significant difference in patient information between the experimental group and the control group. The gender of experimental group was equal, while the number of males in the control group was slightly higher than the female counterparts. These results were in contrary with the previous studies that found male gender as a risk factor of Tuberculosis (Lienhardt et al., 2005; Raj et al., 2012). The study of Usmani, Al-Khajah, Singh, Hussein, and Nurulain (2011) has stated that gender has no bearing on the prevalence of TB. TB is prevalent among men because of they tend to have more social contacts with greater risk of exposure to contagious disease. Moreover, different immunology between men and women contributes to the factor as well.

Age is one risk factor of TB. The age averages were 33.50 years and 34.17 years in the experimental group and the control group, respectively. Age group TB is most prevalent among the productive age (15-49 years), specifically in the age group of 25-34 year old. Atul et al (as cited in Bello & Itiola, 2010) have found that most of Tuberculosis cases occur in the productive age group of 15 - 49 years. This is in contrary to what has been found in the United States of America, where higher risk

of Tuberculosis is among the elderly (above 62 years) and less among those below 50 years of age (Cantwell et al. as cited in Bello & Itiola, 2010).

Most subjects in both groups were married. This result is different from the previous study, which revealed that the risk of TB was higher among the singles than the married (Lienhardt et al., 2005). This present study involved all Muslim subjects, most of whom were Sundanese. The study of Liedhardt et al (2005) revealed that there was no association between TB incidence and religion.

Present study showed that unemployed subjects in experimental group were at a slightly higher risk than the employed subjects. This result was different in the control group. Previous study has revealed that unemployment is one of the significant characters among TB patients (Hoshino, Ohmori, Uchimura, & Yamauchi, 2007). This study was conducted in Bandung, which is the third largest city in Indonesia. In Bandung, the regional minimum wage rate in 2011 was IDR 1,188,435 (USD 131.39). It was observed in both groups that the number of subjects who had income below the minimum wage was slightly higher than those who had income above the minimum wage. Therefore, income had pivotal role in developing TB. TB incidence is more likely to be higher among people with low income. Income has been reported as a significant predictor to adherence to health behaviors (Woith & Larson, 2008).

Income is likely to in line with education level. Low income could be caused by low education level. Subjects of both groups had finished junior high school and below which paralleled with the income level in both groups. Despite the free TB services, most subjects in both groups lacked health insurance. Out of those subjects, most lived short distance from the assigned community health center. The

accessibility to health center was required among TB patients. Health insurance and the distance between home and community health centers influenced the patients' adherence.

Health-related information is included in patient information. There was no significant difference in the health-related data between the two groups, except length of treatment and joint pain. The length of treatment of experimental group was shorter than the control group. Most subjects in both groups had positive smear sputum. This finding is consistent with the study by Rao (2009), who has found higher ratio of smear positive than smear negative among TB patients.

BMI could be used to represent nutrition status. BMI of both groups revealed no significant difference, with average at 18.70 in the experimental group and 18.30 in the control group. The normal range of BMI is 18.5-24.9. The mean BMI in the experimental group indicated normal weight. And in the control group indicated mild underweight. However, there was no significant difference of BMI between these two groups. BMI is a protective factor of TB (Hanrahan et al., 2010). Number of medications depends on body weight – the means of medications for the experimental group and the control group were 3 and 2.93, respectively. Previous study has found that number of medications is the barrier in implementing adherence to medication (Munro et al., 2007).

Cough, night sweat, and fever are the common symptoms of TB and they happened in particular subjects. More than half of the subjects still had cough which was similar with the study of Bello and Itiola (2010). Nonetheless, only few of them still had fever and headache which is similar to the description of Chan, Woo, Or, Chan and Cheung (1995).

Regarding the side effects, none of the subject reported major side effects (i.e., jaundice). Fatigue, nausea, and itching were common in this present study. This finding is similar to the study of Koju, Rao, Shrestha, Shakaya, and Makaju (2005). Pyrazinamide may be responsible for joint pain while itching might occur because of Pyrazinamide, Rifampicin and Isoniazid, and Pyrazinamide and Rifampicin are the possible causes of nausea, vomiting, and anorexia (WHO, 2009b).

Regarding risk behaviors, most subjects never smoked, drank alcohol, and used drugs. However, smoking is consistently found to increase the risk of TB (Liendhardt, 2005). In addition, drinking alcohol and using drugs are more likely among TB patients (Fleming et al., 2010). Regarding their activities and exercises, most subjects in both groups had had no routine activity and exercise which could be because they were required to rest once they were diagnosed.

Family Information. Numbers of families who had had history of caring for TB were almost equal in both group, however most of the participating families had had no experience in caring chronic disease. The burden of family is limited due to most of family was no having chronic disease. Most subjects in the control group had a non-nuclear family but most from the experimental group had a nuclear family. Similar to most Asian countries, extended family also dominates in Indonesia. However, the nuclear family appears mostly in the big city and among young families. More than half of both groups had 4-8 persons in the household. Liendhardt (2005) has unveiled that the risk of TB is enhanced by the number of family member.

There were few elderly and pregnant women in both groups. Meanwhile, children under five years of the experimental group were slightly higher

than the control group. Based on Zevallos and Justan (2003), the elderly are vulnerable to TB because of the weakening immune system. Children and pregnant women also are also vulnerable to TB due to low immune system.

DOTS Supporter. The DOTS supporters were dominated by females and marrieds in both groups. The study of Manders et al (2001) and Phromrak, Hatthakit, and Isaramalai (2008) yield similar gender composition among DOTS supporters to the current study. Based on cultural expectation, women are expected to perform care-giving task. The relationship with the patients was largely conquered by parent relationship and spouse relationship in both groups. The average age of supporters were 39.97 years in the experimental group and 40.47 years in the control groups. In contrast, most DOT supporters in Thailand are children (Phromrak, Hatthakit, & Isaramalai, 2008). This difference could be explained by the fact that the subjects of this present study were younger. Moreover, all DOT supporters were Muslim and most of them had education level below senior high school. The ratio of the employed and the unemployed was equal in both groups. Of all the DOT supporters' characteristics, none showed significant differences between the two groups.

Adherence to health behaviors

The baseline data of total adherence to health behaviors was at a moderate level in the experimental group and the control group. Based on the sub-scales, complying with anti-TB medications had the highest score and performing physical activity had the lowest score.

The highest score in each group was complying with anti-TB medications. Taking medication was the most concern among the TB patients, evidened by the pretest scores that were in a high level for both groups. Additionally, DOTS officers in the community health center focused on this same aspect. Comparing with other health behaviors, medications taking behaviors were the most discussed topic with the patients. Moreover, TB patients only took the medications once a day regimen and the study of Eisen et al (1990), as cited in Martin, Williams, Haskard, & DiMatteo (2005), has revealed that once-daily medication has higher adherence compared to thrice-daily medication among hypertension patients. It seems that the health care providers only focus on medication adherence instead of the whole TB behaviors as indicated by most research (Martin, Grace, & Kelly, 2008; Trajman et al., 2010).

The sub-scale of following health diet was at high level in every group. It was supported by the normal of the BMI average in each group. Out of all items of this sub-scale, “I drink a glass of fruit juice or eat some fruit” and “I eat vegetables at every meal” were the lowest score. The score of fruits and vegetables taking was low in the present study, which is in agreement with the previous finding (Duran, Almeida, & Segurado, 2008).

Sub-variable of physical exercise was the lowest score in both groups. Because of particular symptoms (i.e., fatigue, joint pain), performing physical exercise was challenging to TB patients. The patients preferred to not conduct the exercise because of their weak condition. However, patients who performed physical activity felt healthier. The physical activity depends on patients’ condition and walking, breathing exercise or other mild exercises are more suitable for them. Out of

the six health behaviors during the fifth week, adherence to physical activity was considered to be the most challenging and adherence to medication had a higher score. Martin, Williams, Haskard, & DiMatteo (2005) have stated that exercise commonly creates significant difficulties for patients. These adherence descriptions are similar to the study of Roserahaini, Ayub, and Oduola (2011) in diabetic patients in Brunei Darussalam.

The maintaining environmental hygiene sub-scale was at high level in the experimental group and moderate level in the control group. The items related to polluted environment and poor ventilation had low scores in the experimental group while the items related to overcrowding, ventilation, and polluted environment had low scores in the control group. The TB patients need appropriate living conditions such as reducing the crowdedness, reducing polluted air, and reducing dust (Department of Family and Community Services as cited in Bailie & Wayte, 2006). Schmidt (2008) has stated that crowding, poor ventilation, and smoke produced by cigarettes and stoves are the crucial threats to the environment for TB patients.

The sub-scale of disease transmission had the moderate level in the experimental group as well as in the control group. The item “I dispose the tissues/ masker with sputum immediately into a covered container that contains antiseptic” was the lowest score. Antiseptic is rarely used because TB patients often have no idea the benefit of antiseptics.

The sub-scale of avoiding risk factors was at moderate level in every group. Referring to the characteristics of subjects (Table 5), most of them had no smoking, drinking alcohol, and using drugs that were the risk factors of TB. Out of the items of this sub-scale (Appendix H), “I try to stay away from stressors” had the

lowest score. The stigma of TB is correlated with the stressors of TB patients. Shame, isolation, and fear are linked with TB (Juniarti & Evans, 2010).

Effects of the family-based DOTS support program

Hypothesis 1 and hypothesis 2. Hypothesis 1 states that the mean score of adherence to health behaviors of patients with pulmonary TB after receiving services from the family-based DOTS support program is higher than the score measured before the intervention. Result of hypothesis 1 confirmed there was no maturation of this study. Hypothesis 2 states that the total score of health behaviors adherence of patients with pulmonary TB who receive care from the family-based DOTS support program is higher than the score of those who receive the routine care. The result of this study confirmed the effect of the family based DOTS support program in enhancing adherence to health behaviors. The subjects of the experimental group had significantly improved their adherence to health behaviors after participating in the family-based DOTS support program (Table 12). After receiving care from the family-based DOTS support program, the total score of adherence to health behaviors in the experimental group was significantly higher than those in the control group.

Family-based DOTS support program consisted of family as DOT supporter, supportive educative program, and operational capabilities based on SCDNT's Orem (2001). Information sharing, participation, and collaboration are the main standards of application (Johnson et al., 2008, as cited in Abraham & Moretz, 2012) and were integrated in this program. The patients and their families were prepared by enhancing their knowledge. The patient, family, and the researcher were

involved in planning, delivery, and evaluation of desired outcomes as well as any decision making and action planning. Abraham and Moretz (2012) have stated that application of these partnership and collaborations would provide mutual benefits to the patients and healthcare provider.

The results of this study are consistent with the other studies that used supportive educative program in increasing self-care behaviors of TB patients (Ngamtrairai, 2003), COPD (Kamsee, 2004), diabetic patients (Mohhamed, 2005), pregnant women with premature labor pain (Wongtongchareon, 2003), and hypertension with chronic Hemodialysis (Kauric-Klein, 2011). Some previous studies, which applied supportive educative program by involving family caregiver, have revealed higher dependent care behaviors (Sirireung, 2005) and increase self-care behaviors of children with asthma (Kiatthitinun, 2005).

Adherence to health behaviors is important to achieve the successful TB treatment. The present study revealed the positive outcomes after conducting the program. Some reasons support the positive outcomes of this study were: 1) the program was driven by theoretical foundations; 2) family support and partnership; 3) active involvement; and 4) continuous follow up.

Firstly, the effect of the family-based DOTS support program was largely contributed by using Orem's self-care deficit nursing theory as a theoretical foundation. Self-ability, motivation, and supportive environment are required in order to integrate the adherence to health behaviors as part of self-care.

Self-ability, motivation, and supportive environment are required in order to integrate the adherence to health behaviors as part of self-care. A gradual increase and development of adherence to health behaviors could be achieved through

four helping methods within three phases: estimative, transitive, and operative operations. Estimative phase was conducted by helping the TB patient and his/ her family gain an overview of TB and health-related behaviors. This phase is important to establish the appropriate actions (Orem, 2001). The second and third phases were applied within four days. During this phase, the patients had a chance to perform health behaviors as explained in the estimative phase. Transitive phase was arranged to assist the clients (patient and family) to make judgments and decisions about the care of TB patients especially regarding each health related behavior. The last was operative phase which was to promote patients and their families to make action plans. Since these plans were made by the patients, commitment of implementing health behaviors was elevated.

The helping methods ensure that the patients were able to gain information and knowledge that would be helpful in implementing adherence to health behaviors. These helping methods were applied all through the program. Teaching method was applied in all phases, including TB overview and health behaviors of TB. The knowledge is positively correlated with adherence in TB patients (Kaona, Tubal, Siziya, & Sikaona, 2004; Munro et al., 2007). Considering the background of the patients, simple language and additional media such as flipchart and booklet were applied in this intervention. Patients and their families had opportunity to ask particular questions and requested further explanations that were essential in gaining better understanding. Additionally, written and spoken information including pictures were provided to facilitate teaching process. Houts, Doak, Doak, and Loscalzo (2006) has revealed that using both written and spoken

teaching materials enhance knowledge greater than using one of them especially when pictures are presented.

Guiding method was conducted in transitive and operative phases. This program helped patient to increase the health literacy and therefore enhanced their informed decision by identifying the benefits and limitations of each behavior and promoting action plans. The appropriate guidance is valid while making choice and practicing a course of actions are performed (Orem, 2001). This method was in conjunction with supporting and providing environment methods.

Supporting was conveyed by information and psychological supports. Through these supports, individual is able to make decision, think about the situation, and initiate an action (Orem, 2001). Providing response to every question and supportive communications (i.e., reinforcement, motivation, and appreciation) were significant in increasing patients' assurance in applying health behaviors. Providing environment was employed to ensure comfortable, trusting environment and gain trust. Patients and their families had opportunity to communicate with the researcher besides the scheduled time. In addition, respect and caring for the patients and their families were provided.

Secondly, family support has been proved to encourage health behaviors. The patient's support system contributes to his/her well-being and positive outcomes. Family support is one of the basic conditioning factors that adjust individual's ability (Orem, 2001). In fact, there is a consistent body of evidence regarding positive relationship between family support and health behaviors (Biswas, 2010; Nasution, 2007). Family actively participated in every session of intervention that helped achieve and maintain patients' health behaviors. Therefore, the family also

gained knowledge and information in caring for TB patients regardless of low education level of DOTS supporter. Based on the review of Bevan and Pecchioni (2008), family with low literacy needed written information and close relationship that were provided in this current study.

In Indonesia, family intimacy and cohesiveness tie family in Indonesia. This values motivated family members to maintain and help improve their patient's health in the study. Since DOT supporters were chosen by the patients, they were considered the closest family members (i.e., parents, children, and spouse). Parents as DOTS supporters were believed to be the most authoritative persons in the family as they were greatly appreciated and supported by the family member. Like most Asian cultures, children in Indonesia must help their parents especially while encountering health problems. Spouses as DOTS supporters created and facilitated the commitment to support and help the patients in achieving adherence to health behaviors. This is consistent with the study of Gillibrand and Stevenson (2007), which has revealed that there is an association between social support and adherence reported by the patients and their spouses.

Thirdly, the involvement of the Tuberculosis patient in every activity of intervention made the patients more likely to perform better health behaviors. Patients had opportunity to ask questions and shared their thoughts in every phase. This helped the patients build more commitment and confidence to perform health behaviors. Moreover, the program allowed patients to freely express concerns regarding any barriers that could potentially stop the action plan during the implementation of intervention. Previous studies have revealed that active participation produces better outcomes of health behaviors. Additionally,

communication between the researcher and the clients strengthened the implementation of this program. Various communication strategies were applied in this intervention. Open-ended questions, patient-centered active listening, and directive statements are the best way to enhance concerns about the disease and reduce concern about the medications. Shared decision making was engaged and this strategy could address the barriers (Hahn, 2009). In addition, continuous interaction between researcher and the clients have an effect on the patients' psychological state. Jakubowiak et al (2008) has stated that improving adherence can be achieved by facilitating psychological communication and providing social support and health education.

Lastly, this present study included two telephone follow up and a face-to face follow up. Previous studies have proved that continuous follow up maintains health behaviors of TB. Those follow ups were essential to evaluate implementation of the program as well as to help patient overcome the barriers. Telephone interventions to produce behavioral changes confirmed positive outcomes. However, more favorable outcome are confirmed when including face-to-face follow-up sessions and print materials (Eakin, Lawler, Vandelanotte, & Owen, 2007; Chung & Hwang, 2008).

However, the combination of those aspects strengthened the favorable outcome of this study. In order to change patient's adherence, strategies were used not only by involving patient into decision-making process and teaching particular information and skills but also using effective teaching methods and strategies (Viña, 2005). A follow up is needed to enhance long-term improvement of adherence by providing reinforcement information, monitoring, and ongoing skill training.

Education is an essential resource to address all barriers of adherence. Strengthening and maintaining a collaborative patient-provider relationship could enhance patient's adherence because of satisfying relationship (Rubin, 2005).

Despite the significant difference of base line data of certain health-related variables (i.e., length of treatment and joint pain) between the two groups, the effect of the family-based DOTS support program was established after adjusting the covariates. In spite of the effect of this program, the implementation of health behaviors was not consistent in every follow up. The third follow up showed the highest percentage of heath behaviors adherence implementation while the first of follow up showed the lowest percentage. The first follow up was not at the peak of implementation since the whole intervention had just been completed. Therefore, the patients and their families needed more time to adjust the health behaviors adherence. Benefits of the intervention and encouragements provided during the telephone follow up may have contributed to the climax of implementation at the third follow up. However, the last follow up had unwanted reduction of percentage of implementation. In order to maintain the consistency of implementation of the program, final reinforcements were provided to the patients and their families. Therefore, termination of intervention was essential to establish permanent adherence to health behaviors.

The control group did not receive the same intervention and had steady health behaviors adherence score. The usual program, whose service that was provided by health providers, was routine activities. During each visit, the patients were given the medications and asked about any side effects. There was no information about health behaviors given, apart from the health education that was

often conducted in the first treatment. Most health providers were concerned about medication and so explained the considerably high score of complying with anti-TB medications sub-variable. Moreover, considering the limitations of patients and their families' characteristics, the ability to gain knowledge and skills by themselves was inadequate. More than half of them had low education level and economic status. Education has been proven to be helpful in practicing self-care (Orem, 2001).

Comparing with the previous study of family DOTS supporter for TB patients, this current study had approached health behaviors wholly instead of focusing only on the medications or treatment outcomes. In addition, the effect size of this study was 1.18 and was considered large per Cohen's effect size. This recent study produced practical knowledge in enhancing adherence to health behaviors for TB patients. The family-based DOTS support program was able to enhance health behaviors in pulmonary TB patients. The TB booklet contributed to accomplishing the desired outcomes.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

The conclusion of this study composes of summary of the study based on the research findings, the strength and limitations of the study, as well as implications and recommendations.

Conclusion

This cluster randomized trial with a two-group – pre-test and post-test – design aimed to test the effect of the family-based DOTS support program on adherence to health behaviors. Sixty subjects participating in this study were recruited from ten community health centers in Bandung, Indonesia. The inclusion criteria of the subjects were: 1) older than 15 years of age; 2) had confirmed diagnosis of pulmonary Tuberculosis and was at the intensive phase of TB treatment; 3) a new case of Tuberculosis treatment; 4) had no diagnosis of MDR-TB; 5) had no underlying diseases with long-term treatment, namely, diabetes, hypertension, chronic renal failure, and others; 6) had no diagnosis of HIV/ AIDS; and 7) able to write and read the Indonesian language.

This study was conducted over a four-month period. The subjects in the control group received regular care for five weeks and the subjects in the experimental group received care through the family-based DOTS support program for five weeks. This program consisted of estimative, transitive, and operative operations, including four helping methods – teaching, guiding, supporting, and

providing environment. In addition, two telephone follow-ups and one face-to-face meeting were conducted in this study. Booklets were provided in order to help patients and their families learn about TB. Adherence to health behaviors questionnaire, which had .78 of Cronbach alpha and had also been evaluated by three experts, was used to measure the subjects' pretest and post-test scores of their adherence to health behaviors.

Both descriptive and inferential statistics were used in this current study. The results revealed that there were no significant differences in the subjects' characteristics, except the length of treatment and joint pain symptom. Total score of adherence to health behaviors in the experimental group was significantly higher after receiving care from the family-based DOTS support program than the total score before participating in the program. There was, however, no significant improvement of adherence to health behaviors among subjects in the control group. In addition, total score of adherence to health behaviors of experimental group was significantly higher than the control group on the fifth week. ANCOVA was applied to adjust two covariates (i.e., length of treatment and joint pain). The adjustments helped confirm the success of the program in enhancing adherence to health behaviors in the control group.

Strengths and Limitations of the Study

In order to test the intervention, two groups of the pretest and the post-test were the most appropriate design. Cluster randomization was applied in this study to eliminate selection bias. Matching technique for DOT supporter characteristics (age and gender) was applied to ensure that neither age nor gender would influence the

support provided by the DOT supporters. This program was driven by the theoretical foundations based on Orem's SCDNT, which consisted of estimative, transitive, and operative phases, including four helping methods. Booklets were distributed to help the subjects and their families gain knowledge about TB overview and health behaviors. Two types of follow-up were conducted, specifically two telephone follow-ups and a face-to-face follow-up.

Despite the strength of this study, there are some limitations that should be included in the interpretation of the results. This study used ten community health centers but no equal number of subjects in each location. Therefore, cluster analysis could not be performed. There was no blinding technique applied in this study as it could incur bias.

Implications and Recommendations

The implications refer to implications for nursing research and nursing practices

Implications for nursing research

In spite of its limitations, this study provides evidence that the family-based DOTS support program may be essential to enhance adherence to health behaviors. Presently, no study in Indonesia has tested how a family-based DOTS support program may increase health behaviors adherence. Since the score of performing physical activity sub-scale was at a low level, the patients thus needed to be reminded to follow this health behavior. In addition, each community health center involved the health volunteers in the implementation of TB control. Therefore, some implications that should be encouraged are as follow: 1) there should be a continuity

of care system to examine the consistency of adherence to health behaviors; 2) TB study could involve the health volunteers and the community to improve adherence to health behaviors and maximize TB control and management; and 3) this program may be used on other populations (i.e. HIV/ AIDS or other chronic diseases) though adjustment of materials and testing of the program's effect would be needed for further research.

Implications for nursing practice

The results of this study indicate that the family-based DOTS support program could enhance adherence to health behaviors. The program contains clear intervention guidelines and methods to be applied by nurses to promote adherence to health behaviors. The patients and their families should be involved in the decision making and planning of Tuberculosis care. In addition, this study provides TB booklets that could be helpful for the patients and their families to adhere to health behaviors. The follow-up method is required to ensure the adherence to health behaviors of the patients. However, the duration and frequency of the follow-up need to be adjusted to fit the capacity and condition of the selected community health centers. This program may be considered by health policymakers and nursing system in increasing the quality of care and accelerating TB control and management.

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APPENDICES

Appendix A

General Information of Reviewed Studies of Family Member as DOT Supporter

Author	Country	Study Design	Sample size	Age	Type of TB	TB History	Including HIV/ AIDS	Outcomes	Results
Anuwatnontha kate et al. (2008)	Thailand	Cohort: HCP vs. FM vs. SA	8,312 (4% vs. 59% vs. 18%)	All ages	Pulmonary	No	Yes	Success rate	All meet WHO target except SA HCP>FM>SA
…		…	…	…	…	…	…	…	…
Wright et al. (2004)	Swaziland (Africa)	RCT: FM vs. HCP	1353 (667 vs. 668)	All ages	Pulmonary and extra pulmonary	Yes	N/A	Success rate	There was not significant of compliance rate between FM DOT and HCP groups; Both don't meet with WHO targets (HCP [72%]> FM[66%])

Note. HCP= health care provider, FM= family member, SA= self administered, N/A= not available

Appendix B

General Information of Reviewed Studies of Supportive Educative Program

Author	Country	Study Design	Population	Sample size	Outcomes	Results	intervention
Wonghongkul, et al (2008)	Thailand	Quasi experimental 2 groups	Breast cancer survivor	61 (CG=31, IG= 30)	Quality of life (T1= before, T2= after program and T3= after 3 months)	1. There were a significance differences in quality of life mean score between groups (F =5.313, p= .025) and within groups (F =6.682, p= .002) were shown. 2. The mean score is not higher in experimental group and there was no significant different	4-hour sessions, conducted 4 times continuously with 2 weeks interval
…	…	…	…	…	…	…	…
Mohamed (2005)	Malaysia	Quasi experimental	Diabetes	60	Self-care practices	The self-care practices of patients in experimental group were significantly higher than the control group in all domains (dietary control, exercise, medication taking, stress	The five provisions of helping methods (teaching, guiding, supporting, provide an healthy environment)

Author	Country	Study Design	Population	Sample size	Outcomes	Results	intervention
						management, & personal hygiene)	and handbook about dietary control, exercise, medication taking, stress management, & personal hygiene

Note. IG= intervention group, and CG= control group

Appendix C

Effect Size Calculation

1. Effect Size of the Previous Study

The calculation effect size (*d*) of this study is as follows:

$d = M_1\text{-}M_2/SD_{pooled}$ and where $SD_{pooled} = \sqrt{[(SD_1^2+SD_2^2)/2]}$

Where M_1= mean of experimental group

M_2= mean of control group

SD_{pooled}= standard deviation of the control group and experimental group

$SD_{pooled} = \sqrt{(21.25)^2 + (37.83)^2}/2$

$= \sqrt{(451.56 + 143.11)/2}$

$= \sqrt{941.34 = 30.68}$

$d = M_1\text{-}M_2/SD_{pooled} = 59.16/30.68 = 1.92$

2. Effect Size of the Current Study

Pooled SD $= \sqrt{(13.18)^2 + (8.82)^2}$

$= \sqrt{(173.71) + (77.79)} = \sqrt{251.5}$

$= 15.86$

ES $= \frac{109.23 - 90.60}{15.85} = \frac{18.63}{15.85}$

$= 1.18$

Appendix D
Research Information Sheet

Informed Consent

My name is Desy Indra Yani, I am a master student at Faculty of Nursing, Prince of Songkla University, Thailand. I am also a lecturer of Faculty of Nursing, Padjadjaran University, Indonesia. I am conducting a research entitle "Effect of Family-Based DOTS Support Program on Adherence to Health Behaviors in Patients with Pulmonary Tuberculosis in Indonesia". This study will be held for five weeks and the findings of this study are expected to improve the quality health care of patients with pulmonary tuberculosis. This study has been approved by the Institutional Review Board (IRB) of Prince of Songkla University, Thailand and also has been granted permission from Bandung Local Government and Health Department Bandung District, Indonesia. You are asked to participate in this study. If you are interested, I will begin the procedures as follows:

Explanation Procedures

1. You will be assigned to either the experimental group or the control group.
2. If you are in the experimental group, you will be given family-based DOTS support program during the period of study.
3. If you are in the control group, you will not be given this program. You will continue receiving regular treatment. However, if you want to receive the similar program, you will be given after the end of the study period.

Evaluation and Forms

1. You will be asked to fill the forms about your personal data and general health information. This will take time around 15 minutes.
2. You also will be asked to fill adherence to health behaviors questionnaire in the first week and the fifth week of the intervention. This activity will take time another 15 minutes.

Risk and Comfort

There is no known risk or harm for participating in this study. However, this program may make you spend more time with us. Furthermore, there is neither cost nor payment to you for your participation in this study.

Benefits

The finding of this study will be beneficial specifically having a protocol to the nurses and other healthcare providers in order to provide the better quality of tuberculosis management through family-based DOTS support program by improving patient's adherence to health behaviors. Thus, the improvement of adherence to health behaviors will promote your overall quality of life. In addition, it will be useful for the future research related to this topic.

Confidentiality

All information and your responses in this study will be kept confidential and anonymous. Moreover, only the researcher and research advisors will access the data. The report of this study will not use your name or any identifying information.

Participation and Withdrawal from Participation

Your participation in this project is voluntary. You will be given 30 minutes to think before deciding to participate or refuse from this study. Returning the forms given indicate that you understand what is involved and you consent to participate in this study. You also have right to withdraw from participation in this study at any time without any consequences or penalty. In addition, there is no influence on receiving service and any medical treatment if you decide to withdraw from this study.

Finally, if you have any questions or suggestions, you can directly contact me by phone +628122075874. If you agree to participate in this study, please kindly sign your name on the consent form.

Thank you very much for your kind cooperation.

Desy Indra Yani

Researcher

Research Information Sheet

Family-Based DOTS Support Program Group

During this program you will receive following procedures:

1. The first week of intervention
   a. Initially, you will be asked to fill some forms including the demographic data and adherence to health behaviors questionnaire. Totally this activity will take time around 15 minutes. In this step, the research assistant will help you to complete the forms.
   b. You will join in three sessions' knowing operation, decision-making operation, and actions-plan operations. The discussion will be done in every session to help the patient in increasing adherence to health behaviors.
   c. You will receive the tuberculosis care booklet to facilitate your further learning and will be asked regarding the time for follow-up phone call that you available for.
2. The second and third week of intervention

   In these periods, the researcher will make two follow-up phone calls to evaluate your current progress in implementing this program. During this activity, you will be asked to report your progress regarding your adherence to health behaviors being implemented and revise or continue the plan. In this session you will also be allowed to share any difficulties during implementation or ask questions or suggestions from the researcher to improve adherence to tuberculosis treatment. In addition, the researcher will guide in order to assist you maintain and improve adherence to health behaviors.
3. The fourth week of intervention.

   In the last week of the study, you will be followed up by the researcher at your home in order to review your weekly adherence to health behaviors improvement progress. You and the researcher collaboratively review your daily and weekly health behaviors that you implemented each week. Similar with follow up phone call, in this session you are allowed sharing your difficulties that you face during implementing this program and discussing the possible solutions with the

researcher. In addition, if necessary the researcher will guide in order to assist you solving the difficulties. The process will take time approximately 20 minutes depending on your needs

4. The fifth week of intervention

   At the end of the program, you will be asked to fill the adherence to tuberculosis treatment questionnaire. This will take time around 15 minutes. The research assistant will help you to complete the form.

Inform Consent Form

Title : Effect of Family-Based DOTS Support Program on Adherence to health behaviors in Patients with Pulmonary Tuberculosis in Indonesia

Researcher : Desy Indra Yani (Master Student at Faculty of Nursing, Prince of Songkla University, Hatyai, Thailand)

Patient's Name: ……Age:……

Patient's Consent

I,……, was informed of the detail of the research entitled "Effect of Family-Based DOTS Support Program on Adherence to Health Behaviors in Patients with Pulmonary Tuberculosis in Indonesia" and was assured that no part of my personal information and research result shall be individually revealed to the public. If any problem or issues occur, I would discuss with the researcher. I have the right to withdraw from this project at any time without any effects on any nursing/ medical service and treatment. I am willing to participate in this research project voluntarily and hereby endorse my signature.

Given by :……..(Consenter) Date :……..

Researcher Note:

I gave the detailed information of the research entitled "Effect of Family-Based DOTS Support Program on Adherence to Health Behaviors in Patients with Pulmonary Tuberculosis in Indonesia" to the patient. I provide the opportunity to the patient to ask any question and provide the required answer.

Signature : …….. (Researcher)

Date : …….

Appendix E

Family-Based DOTS Support Program

The program consists of four main activities: 1) estimative operation; 2) transitive operation; 3) productive operation; & 4) follow-up. Those activities were designed based on three phases of care operations: estimative, transitive, & productive. The estimative operation is done on the same day after the participant has signed the consent form. The transitive and productive operations are performed separately within three days. The follow-up is composed of two telephone calls and one face to face meeting. Telephone call follow-ups are performed during the second and third weeks and a face to face meeting is in the fourth week. This program is provided by the researcher and at patients' home.

1. Estimative operation by helping the client (patient and family) gain understanding on overview of TB and health related behaviors.

   Time allocation : 60 minutes

   Method of helping : Teaching by providing knowledge of TB overview and health related behaviors

   Media : Tuberculosis care booklet

2. Transitive operation by assisting the client (patient and family) to make judgments and decisions on care of the patient specifically for each health related behavior of TB, i.e., complying with anti TB medication, following healthy diets, performing physical exercise, maintaining environmental hygiene, preventing, disease transition, and dealing the risk factors of TB.

   Time allocation : 60 minutes

   Methods of helping :

   1. Teaching by providing relevant knowledge for developing each behavior
   2. ……
   3. ……
   4. ……

   Media : Tuberculosis care booklet

3. Productive operation by promoting the client to make action plans in order that the TB patients are able to perform the required actions to meet care demands for each health related behavior of TB

   Time allocation : 30 minutes

   Methods of helping :

   1. Teaching by providing knowledge of the action plans indicators and the factors influencing performance and the results.
   2. ……..
   3. ……..
   4. ……

   Media: Tuberculosis care booklet

4. Follow-up

   Time allocation : Depend on patient's need (minimum 15 minutes)

   Methods of helping :

   1. Telephone calls (week 2 and week 3)

      Guiding and supporting are two main helping methods used for identifying the barriers of implementing the program including supporting and appreciating each health behavior done. The reinforcement is given to maintain and improve each behavior by identifying the important behaviors done, stating directly the behaviors doing well, providing appreciation, and explaining clearly consequences of the behaviors.

   2. Face to face (week 4)

      Guiding and supporting methods are provided in this follow-up as same as the telephone call follow-ups. Providing an environment is given by providing opportunities to continue or revise actions plan (i.e., respect and trust, conducive to designing and participating, and sufficient resources).

   Media : telephone call and tuberculosis care booklet for face to face follow-up (week 4)

Family-Based DOTS Support Framework

Instruction:
The program framework is designed based on Orem's Self-Care Deficit Nursing Theory. This program framework describes wholly activities and the sequences that will be started by providing knowledge, decision-making, and designing the action plans for each aspect of care.

No	Aspects of Care	Knowing (Estimative)			Decision Making (Transitive)			Producing (Productive)		
		Nurse	Family	Patient	Nurse	Family	Patient	Nurse	Family	Patient
1	TB overview	- Discuss on health and TB beliefs - ……..	The family respond actively by: - paying attention to explanation given - ……..	The patient respond actively by: - paying attention to explanation given - ……	- Discuss: 1) recent symptoms, how they influence the activities, and the actions taken to reduce them; 2) understanding and awareness of the impacts of TB - ……..	- Help give explanations of recent symptoms and impacts of TB - ……	- Share the symptoms and answer the questions - …….	- Help in making plans related to symptoms management and TB impacts - …….	- Help the patient in operating the action plans - …….	- Make the actions plan - ……

No	Aspects of Care	Knowing (Estimative)			Decision Making (Transitive)			Producing (Productive)		
		Nurse	Family	Patient	Nurse	Family	Patient	Nurse	Family	Patient
2	TB and medications	- Discuss the importance of TB treatment; how TB is treated, treatment regimen and its side effects - …….			- Ask questions related to conditioning factors/ barriers of medication taking, diets, exercise, healthy environment, disease transmission, and TB risk factors - ……..		- Answer questions - …….	- Help in making plans related to take TB medication - ……...	- Make actions plan with the patient - ……...	- Design the actions plan - ……
3	TB and diet	- Discuss importance of sufficient diet for TB patients and healthy diets for TB patients - …….								
4	TB and exercise	- Discuss importance of exercise for TB patients and kinds that can be done by TB patients								
5	TB and Environment	- Discuss importance of and how to have and maintain								

No	Aspects of Care	Knowing (Estimative)			Decision Making (Transitive)			Producing (Productive)		
		Nurse	Family	Patient	Nurse	Family	Patient	Nurse	Family	Patient
		healthy environment								
6	TB and transmission	- Discuss danger of TB as a contagious disease and how to prevent the disease transmission								
7	TB and risk factors	- Discuss risk factors of TB patient and their impacts on TB treatment and recovery; and how to deal with each risk factor								
8	Follow up (phone in week 2 & 3)	-	-	-	- Reinforce positive actions and ask to continue in engaging the actions - ……..	- Help the patient in providing explanations - ……	- Discuss the implemented actions and the barriers - …….	- Evaluate actions that have been employed	- Help in explaining what has been done and the barriers	- Explains the successful and unsuccessful plans and the barriers of

No	Aspects of Care	Knowing (Estimative)			Decision Making (Transitive)			Producing (Productive)		
		Nurse	Family	Patient	Nurse	Family	Patient	Nurse	Family	Patient
								- …….	- …….	following plans - …….
9	Follow up (face to face in week 4)	-			- Reinforce positive actions and ask to continue in engaging the actions - ……..	- Help the patient in providing explanations - ……	- Discuss actions that have been implemented and the barriers - …….	- Evaluate actions that have been employed - ……...	- Help in explaining what has been done and the barriers - …….	- Explains the success plans and the barriers of following plans - …….

1. Teaching Plan (Guideline) for Estimative Phase (Knowing)

Instruction:
The first session is started using the teaching technique for the estimation phase. Each aspect of care is explained to both the patient and the family. However, the teaching technique is also used for transitive (decision making) and operative (design actions plan) phases if needed to re-explain and remind the patient/ family.

No	Topic	Objectives	Content	Method/ Media/ Time	Activities		Evaluation
					The Researcher	The Patient and the Family	
1.	Introduction		- This intervention is started by providing knowledge and discussing TB and health behaviors. - ……...	Discussion/ 6 minutes	- Explains the topics clearly - ……	- Listen carefully - ……..	-
2	Overview of TB	After completing this session, patient and family are able to: - Have the appropriate belief of TB - ……	- TB disease • Tuberculosis (TB) is a disease caused by germs that are spread from person to person through the air. • ……... • Clarify health belief of TB - TB is serious disease that may kill you but you can be cured if you take all medications completely and correctly. - …… - ……... • …….	Discussion/ TB care Booklet, Flipchart/ 6 minutes			- Family and patient participation in discussion
3	TB and medications	After completing this session, patient and	- The importance of TB treatment The medications are essential to eradicate the germs. Good medication taking	Discussion/ TB care Booklet,			Family and patient participation

No	Topic	Objectives	Content	Method/ Media/ Time	Activities		Evaluation
					The Researcher	The Patient and the Family	
		family are able to: - State the importance of TB treatment correctly - ……..	behaviors will prevent the possible failure of treatment and drug resistance - ……...	Flipchart/ 8 minutes			in discussion
4	TB and diets	After completing this session, patient and family are able to: - State the importance of sufficient diet of TB correctly - …….	- The importance of a sufficient diet for TB patients Having good nutrition will build immunity and make your body fight against the TB germs and prevent a worsening condition. Therefore, weighing routinely is recommended for TB patients. The amount of each food can be seen in the TB booklet. - ……	Discussion/ TB care Booklet, Flipchart/ 8 minutes			Family and patient participation in discussion
5	TB and exercise	After completing this session, patient and family are able to: - State the importance of exercise for	- The importance of exercise for TB patients Exercise helps you to maintain the health - ……...	Discussion/ TB care Booklet, Flipchart/ 8 minutes			Family and patient participation in discussion

No	Topic	Objectives	Content	Method/ Media/ Time	Activities		Evaluation
					The Researcher	The Patient and the Family	
		TB patient correctly - …….					
6	TB and environmental	After completing this session, patient and family are able to: - State the importance of environment for TB patient correctly - ……..	- The importance of environment for TB patients Environment helps provide conducive conditions for patient during treatment and preventing TB transmission. In addition, environment plays an important role in disease recovery. In addition, management of sputum disposal is needed. It can be seen in the TB booklet. - …….	Discussion/ TB care Booklet, Flipchart/ 8 minutes			Family and patient participation in discussion
7	TB and transmission	After completing this session, patient and family are able to: - State the danger of contagious of TB correctly - ……...	- The dangers of TB as a contagious disease TB can spread to others by coughing, sneezing, speaking or singing. The germs can stay in the air for several hours and depend on the environment - ……...…	Discussion/ TB care Booklet, Flipchart/ 8 minutes			Family and patient participation in discussion
8	TB and risk factors	After completing this session, patient and	- The risk factors of TB disease that can make you get worse germs and become sick with the disease are:	Discussion/ TB care Booklet,			Family and patient participation

No	Topic	Objectives	Content	Method/ Media/ Time	Activities		Evaluation
					The Researcher	The Patient and the Family	
		family are able to: - State at least 3 of 5 risk factors of TB disease	• Smoking cigarettes • Drink alcohol • Using injection drug - ……	Flipchart/ 8 minutes			in discussion

2. Questions Guideline for Transitive Phase (Decision Making)

Instruction:
Transition phase aims to help in decision making for each aspect of care. Situations probably occur in the order that selected questions are required to consider the decision. In addition, the patient and family are helped by providing any alternatives in terms of benefits and costs of each alternative.

No	Aspects	Questions
1	TB overview	- Please inform me of your recent complaints (signs of TB)? - ……
2	TB and medications	- Please tell me how you have coped with your medication so far? - ……..
3	TB and diets	- Please compare your present diets and the expected diets for TB patients as explained in the previous session! - ……
4	TB and exercise	- What do you think about your exercise so far? - ……...
5	TB and environment	- What do you think of your environment? Does it help you during TB treatment? - ……
6	TB and transmission	- What have done for preventing transmission? - …….. .
7	TB and risk factors	- What are the factors that you cannot avoid? Why? - ……..

Transitive Operation Phase
Decisional Balance sheet

Instruction:
This sheet is used to help the patient and family for each alternative in the decision making process. Pros refer to the advantages and cons refer to the disadvantages of chosen alternatives.

Health Behaviors	Continuing Behaviors	
	Pros (Benefits)	Cons (costs)
Complying to anti medications		
Following healthy diets		
Performing physical exercise		
Maintaining healthy environment		
Preventing disease transmission		
Dealing with the risk factors		

3. Action Plan and Implementation Form of Family-Based DOTS Support Program for Productive Phase

Instruction:
This form is used to design an action plan. The researcher helps the patients and their families in this phase. The form is filled in by the researcher and if the patients/ families would like to fill it in, they are allowed.
Please fill in this form based on your abilities to perform health behaviors.

1. Set the goal for each behavior
2. State activities/ actions for each behavior
3. Explain how the activities will be implemented in terms of what, when, frequency, and how

No	Aspects of Care	Planning	Actions	Evaluation
1	Complying with anti TB medications	Goals:	What: When: Frequency: How:	Evaluation - Totally complying with anti TB medications - Some behaviors have changed - No behaviors have changed at all - Barriers: 1. 2.
2	Following healthy diets	Goals:	What: When: Frequency: How:	Evaluation - Totally following healthy diets - Some behaviors have changed - No behaviors have changed at all - Barriers: 1. 2.
3	Performing physical exercise	Goals:	What: When: Frequency: How:	Evaluation - Totally performing physical exercise - Some behaviors have changed - No behaviors have changed at all

No	Aspects of Care	Planning	Actions	Evaluation
				- Barriers: 1. 2.
4	Maintaining environmental hygiene	Goals:	What: When: Frequency: How:	Evaluation - Totally maintaining environmental hygiene - Some behaviors have changed - No behaviors have changed at all - Barriers: 1. 2.
5	Preventing disease transmission	Goals:	What: When: Frequency: How:	Evaluation - Totally preventing disease transmission - Some behaviors have changed - No behaviors have changed at all - Barriers: 1.
6	Dealing with the risk factors of TB	Goals:	What: When: Frequency: How:	Evaluation - Totally avoiding the risk factors of TB - Some behaviors have changed - No behaviors have changed at all - Barriers: 1. 2.

Appendix F

Tuberculosis Care Booklet

Tuberculosis

Care Booklet

Desy Indra Yani

Master of Community Health Nursing Student
Faculty of Nursing
Prince of Songkla University, Thailand
2011

Name of Patient :
Address :
Phone Number :

Introduction

This booklet aims to assist in caring TB patient. It helps to remind both the patient and family about TB and health related behaviors. It consists of five components: 1) TB general information; 2) TB health behaviors; 3) Balance sheet for decision making; 4) Actions plan form; and 5) Evaluation record form. Please read this booklet regularly and fill the evaluation record form every day as explained.

"Your adherence to each health behavior helps you in achieving success TB treatment and then you are cured from this contagious disease"

Table of Contents

TB General Information

Tuberculosis

- Tuberculosis (TB) is a disease caused by germs that are spread from person to person through the air.
- TB usually affects the lungs.
- TB can also affect other parts of the body, such as the brain, the kidneys, or the glandular.
- A person with TB will be killed by the disease if he/she does not get treatment

TB and Health Belief

- TB is serious disease that may kill you but you can be cured if you take all medications completely and correctly.
- Once you have been cured from TB, you may get this disease again if you have low immunity
- TB is not related to religion (i.e. punishment from the God, etc)

Appendix G

Demographic Data Form

No Respondent :

Date and Time :

Phone Number :

The following items are some information about yourself. Please fill and answer by putting (√) mark in the square box that is appropriate to you.

A. Patient Information

1. Age …… years
2. Gender ☐ (1) Male ☐ (2) Female

…

B. Health Related Data

1. Medications of TB

   Length of treatment : days

   Medications taken : tablets/ day

Demographic Data Form filled by the Researcher

1. General condition

   Body weight : Kg

   Height : cm

   BMI : kg/m^2

2. ……

Demographic Data Form for Family

No Respondent :

Date and Time :

The following items are some information about your family. Please fill and answer by putting (√) mark in the square box that is appropriate to you.

a. Family history of caring for TB patients: ☐ (1) Yes ☐ (2) No

b. Family history caring for chronic disease patients: ☐ (1) Yes ☐ (2) No

c. Family members with chronic disease: ☐ (1) Yes, specify ☐ (2) No

d. Family Type ☐ (1) Nuclear ☐ (2) Extended
☐ Other, please identify:

e. Family size: persons

f. People living in the household with the patient (you can choose more than one)
☐ Children less than five years old
☐ Elderly
☐ Pregnant women
☐ Others, specify:

g. Environmental health
Cleanliness of house : ☐ (1) good ☐ (2) moderate ☐ (3) poor
Sufficient ventilation : ☐ (1) good ☐ (2) moderate ☐ (3) poor

Demographic Data Form for DOTS Observer

No Respondent :

Date and Time :

Phone Number :

The following items are some information about yourself. Please fill and answer by putting (√) mark in the square box that is appropriate to you.

a. Age: years

b. Gender ☐ (1) Male ☐ (2) Female

c. Marital status ☐ (1) Married ☐ (2) Single

☐ (3) Divorce ☐ (4) others, specify:

4. Religion: ☐ (1) Islam ☐ (2) Christian

☐ (3) Catholic ☐ (4) Buddhist

☐ (5) Hindu

5. Occupation ☐ (1) None ☐ (2) Farmer

☐ (3) Government employee ☐ (4) Private employee

☐ (5) Business ☐ (6) other, please identify:

6. Level of education

☐ (1) No schooling ☐ (2) Elementary school

☐ (3) Junior high school ☐ (4) Senior high school

☐ (5) College or above

7. Caregiver during treatment:

☐ (1) Father and/ or mother ☐ (2) Brother/ Sister

☐ (3) Spouse (husband/ wife) ☐ (4) Son/ daughter

☐ (5) Other, specify:

Appendix H

Adherence to Health behaviors Questionnaire

No Respondent :

Date and Time :

This questionnaire is about your health behaviors during this past week. Please select one of four choices (all the time, most of the time, sometime, and never) that you performed during TB treatment. Please respond to each item as accurately as possible and do not skip any items. Please put a mark (√) next to the item you have selected.

All the time : every day

Most of the time : 5-6 days

Sometime : 1-4 days

Never : not done

No	Statements	All the time (4)	Most of the time (3)	Sometime (2)	Never (1)
Complying with Anti TB Medication					
1	I take anti TB medication regularly				
2	I take anti TB medications timely as prescribed by the doctor				
3	……				

Appendix I

Means and Standard Deviations of Each Dimension of the Adherence to Health behaviors Questionnaire

Table

Pretest and Posttest Means and Standard Deviations of Each Dimension of Adherence to Health Behaviors in the Experimental and Control Group (N= 60)

No	Statements	Experimental Group				Control Group			
		Pretest		Posttest		Pretest		Posttest	
		M	SD	M	SD	M	SD	M	SD
Complying with Anti TB Medication									
1	I take anti TB medication regularly	3.83	.46	3.83	.38	3.97	1.83	3.77	.43
2	I take anti TB medications timely as prescribed by the doctor	3.57	.63	3.73	.45	3.93	.25	3.50	.57
3	……								

Appendix J

List of Experts

Three experts examine the construct and cultural applicability for the Family-Based DOTS Support Program and Adherence to Health Questionnaire, they were:

1. Dr. Piyanuch Jittanoon
   Assistant Professor, Prince of Songkla University, Thailand

2. Dr. Petchawan Pungrassami
   Tuberculosis Practitioner and Director of Tuberculosis Center in Yala Province

3. Neti Juniarti, S.Kp., M.Kes., M.Ng.
   Nursing Lecturer, Unversitas Padjadjaran, Thailand

VITAE

Name Desy Indra Yani

Student ID 5310420033

Educational Attainment

Degree	Name of Institution	Year of Graduation
Bachelor of Nursing	Universitas Padjadjaran, Indonesia	2001-2005

Scholarship Awards during Enrolment

Project	Granting Agency	Year
Scholarship for Indonesian Lecturer	Directorate of Higher Education, Ministry of National Education, Republic of Indonesia	2010-2012
Teaching Assistant	Graduate School, PSU	2011-2012

Work – Position and Address

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List of Publication and Proceeding

Yani, D.I., Isaramalai, S., & Kritpracha, C. (2011). Development of Family-Based DOTS Support Program for Enhancing Adherence to Health Behaviors of Patients with Pulmonary Tuberculosis. *Ist NUS-NUH International Nursing Conference, Singapore, November 17-19, 2011*.

Yani, D.I., Isaramalai, S., & Kritpracha, C. (2012). Development of Family-Based DOTS Support Program for Enhancing Adherence to Health Behaviors of Patients with Pulmonary Tuberculosis. *4th International Conference on Humanities and Social Sciences, Thailand, April 21, 2012.*