

Effectiveness of the Role of the Family-based as Observer Direct Treatment for Tuberculosis Transmission Control

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Abstract: In Tapanuli Tengah, Indonesia, 2142 positive TB cases were found. At 2886 cases of TB, 2384 cases (82.6%) of new cases were found and 502 cases (17.4%) of cases of MDR (Multiple Drug Resistance) were found. This study aims to examine the effectiveness of the family-based-based DTO (Direct Treatment Observers) intervention's model for drug adherence in TB patients. Participants in this study consisted of 92 families as direct treatment observers who were determined using a non random consecutive sampling method. Data analysis was performed with one-way ANOVA at the level of significant $\alpha = 0.05$. The results of the analysis showed that there were differences in the effectiveness of the family-based-based DTO (Direct Treatment Observers) and Health Officers-based DTO (Direct Treatment Observers) with a score of 3.5 ($p = 0.001$), the effectiveness of the environmental control of the family-based-based DTO (Direct Treatment Observers) and the Health Officers-based DTO (Direct Treatment Observers) with score 7.5 ($p = 0.001$), effectiveness of the family-based-based DTO (Direct Treatment Observers) droplet control with the Health Officers-based DTO (Direct Treatment Observers) with a score of 3.8 ($p = 0.001$). It is recommended that the Dinas Kesehatan Tapanuli Tengah to make training for families and health workers as observer for taking medicine in the DOTS program.

1 INTRODUCTION

In Tapanuli Tengah, Indonesia at 2018 found 2384 new cases of TB (Purba, 2018). It is estimated that the number of all new and old cases is 2,886 with MDR (Multiple Drug Resistance) cases reaching 502 cases (Sis, 2017). The high MDR TB cases show that the duration of TB treatment is increasing with an average of 2 years (Daptes Tapteng, Dinkes, 2017). In Puskesmas Gonting Mahe, Tapanuli Tengah, in the period of January-December 2018, there were 142 positive cases of TB. At 142 TB cases, 89 cases (62.6%) were new cases and 53 cases (37.4%) were MDR-TB. From the records of TB case at Puskesmas Gonting Mahe, it was found that the success rate of TB increased from 2015 to 2018, respectively from 76.4%, 78.8%, 83.7% and 89.6% with an average increase of 4.4 % per year (Dinas Kesehatan Sumatera Utara, 2018).

Tuberculosis is a disease caused by micobacterium tuberculosis which can be transmitted by removing nucleus droplets into the air through coughing and sneezing (Mathema, 2017).

TB transmission can be controlled through medication, environmental control, and control of droplet nuclei (CDC, 2019).

TB transmission is caused by the low control of the treatment of active TB cases, environmental control, and controlling the behavior of removing phlegm and sputum (droplet nuclei) by sufferers (CDC, 2019; Mathema, 2017). Compliance with medication, environmental control, and control of droplet nuclei or called compliance with taking medication can be defined as the level of obedience of patients carrying out all instructions given in treatment, provision of a sanitary environment, and the behavior of closing the mouth when coughing and sneezing and expelling sputum in a closed container (Mathema, 2017).

Controlling transmission requires special attention from patients and family-based members. Liang in her research found that family-based-based DTO (Direct Treatment Observers) was more effective than other DTO in taking medication compliance (Liang, 2018). WHO stresses the important role of DTOs in the DOTS (Directly

Observed Treatment Short Course) program to achieve zero TB in 2030 (WHO, 2017). The role of DTO in handling TB cases becomes very important due to the physical, economic, psychological, and social DTO and TB patient's inability to face a long treatment process (Sis, 2017). According to Martin motivation is an important element for DTO in carrying out their work (Martin, 2016). According to Teroi Protection Motivation states that patient compliance in consuming drugs is influenced by the motivation of patients and their families. Pulmonary TB treatment requires a long period of time between 6-9 months. This makes the patient has less motivation or desire because they often experience despair and risk not being compliant in taking medication. To ensure regularity, the desire to take medication requires a motivation both internal and external and DTO has a role in supervising patients every time they take medicine. Research conducted by Prasetya and Nadin found a strong relationship between family-based motivation and medication adherence (Prasetya, 2017; Ratnaningsih, 2016). Martin found the effect of age, sex, marital status, and socioeconomic on patient compliance (Nawell, 2016). The CDC found a strong relationship between patient noncompliance and low TB knowledge and high TB transmission (WHO, 2016). The handling of TB cases in Puskesmas is carried out based on the DOTS strategy. The DOTS program that is run at the Puskesmas is one of the TB treatment control programs with the aim of thoroughly treating TB patients (success rate 100%) (WHO, 2017). Based on this the effectiveness of the family-based-based DTO in treatment control, the environment, and nuclear droplets needs to be investigated.

2 METHOD

This research uses rexplicative method with cross sectional approach. Effectiveness of treatment control, environment, and droplet nuclei of family-based DTO with health officers-based determined by the value of product moment (r) correlations. This research was carried out at Puskesmas Gonting Mahe Sorkam, Tapanuli Tengah in 2019 with a period of 6 months from January-June 2019.

Participants in this study were 92 DTO families of tuberculosis patients who were undergoing DOTS treatment program in Puskesmas Gonting Mahet 2019. The comparison group consisted of 96 DTO health workers from Puskesmas Sorkam with almost

the same characteristics as puskesmas Mahe gonting. Family-based-based DTO inclusion criteria: aged 15-60 years, core family-based members of TB patients, have a health BPJS payment system and exclusion criteria: HIV / AIDS TB patients, diabetes mellitus TB, unable to, and refuse to participate.

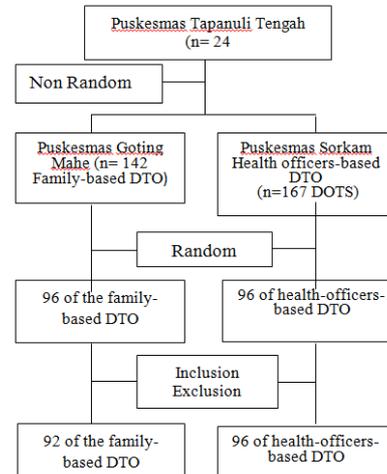


Figure 1: DTO participant listing.

The sample size was determined based on a minimum sampling formula from Lameshow with a probability value of the occurrence of tuberculosis unknown ($p = 0.5$). Based on the value of $p = 0.5$ The number of samples in this study was determined based on the following formula:

$$n = \frac{\left(Z - \frac{1}{2}\alpha\right)^2 p \cdot q}{d^2} = \frac{Z^2 p(1-p)}{d^2}$$

Source: Senedecor GW, Cochran WG (1997); Lameshow (1997)

This formula provides an illustration of n is the number of samples needed, $Z_{1-\alpha/2}$ is the value of Z in the degree of significance ($95\% = 1.96$), p is the proportion of a particular case to the population ($p = 0.5$) and d is the degree deviations from the desired population: $10\% (0.10)$.

The research instrument used the Self Dertermination Questionnaire (SDT) from Deci and Ryan with dimensions of competence, autonomy, and relations. The questionnaire used first tested the validity (corrected item total correlation) $CITC > 0.5$ and Cronbach's Alpha reliability > 0.6 . Data analysis was performed by one way ANOVA statistical test at the significance level $\alpha = 0.05$.

3 RESULTS

The characteristics of the family-based-based DTO and health officers-based DTO are important elements in this study. This is because in addition to internal factors, individual motivation is also inseparable from the characteristics and other external factors of the individual concerned. The characteristics of DTO in this study are focused on people, education, relationships with TB patients, treatment control, environmental control, and droplet nuclei control.

The mean age of family-based-based DTOs in this study was lower (38.9 ± 9.7 years) compared to health officers-based DTO (39.4 ± 10.4) years. School years of family-based DTO were also found to be lower (7.2 ± 4.3) years compared to health officers-based DTO (14.5 ± 2.3) years. The control of family-based DTO treatment was higher (13.1 ± 1.5) compared to health officers-based DTO (9.6 ± 2.0), environmental control of family-based DTO was higher (14.7 ± 2.1) compared to DTO health officers-based (7.2 ± 2.2), and control droplet nuclei were higher in family-based DTO (12.1 ± 2.2) compared to health workers DTO (8.3 ± 2.5). Family-based DTO motivation was also higher found in family-based DTO (85.1 ± 10.0) compared to the motivation of health officers-based DTO (78.5 ± 5.0).

Table 1: DTO characteristics in puskesmas getting mahe in 2019.

Characteristic s	Family-based DTO (n=92)		Health workers DTO (n=96)	
	Mean	SD	Mean	SD
Age	38.9	9.7	39.4	10.4
School year	7.2	4.3	14.5	2.3
Kontrol Pengobatan	13.1	1.5	9.6	2.0
Kontrol Lingkungan	14.7	2.1	7.2	2.2
Kontrol Droplet Nuclei	12.1	2.2	8.3	2.5
Motivasi	85.1	10.0	78.5	5.0

DTO: Direct Treatment Observers; n: Number of Samples; SD :Standard Deviation

Differences in the motivation of treatment control, environmental and family-based DTO nucleus droplets and health officers-based DTOs with the one way ANOVA test also showed significant differences.

From the table above it can be seen that there are differences in the control of family-based DTO

treatment with health officers-based DTO ($p = 0.001$; $p < 0.05$). In the case of environmental control also found a significant difference in the DTO of the family-based and the DTO of the health officers-based ($p = 0.001$; $p < 0.05$). In the control category droplet nuclei also found significant differences in DTO of family-based with health officers-based DTO ($p = 0.001$; $p < 0.05$). Likewise, the motivation of the family-based DTO was found to be different from the of the health officers-based DTO ($p = 0.03$; $p < 0.05$).

Table 2: Differences in the Effectiveness of Family-Based DTO and Health Officers-Based DTO.

Category	Family-based DTO (n=92)	Health officers-based DTO (n=96)	Difference	p
Treatment	13.1±1.5	9.6±2.0	3.5	0.001
Environment	14.7±2.1	7.2±2.2	7.5	0.001
Droplet nuclei	12.1±2.2	8.3±2.5	3.8	0.001
Motivation	85.1±10	78.5±5.0	6.6	0.03

p = Probability of significance at $\alpha = 0.05$

4 DISCUSSION

From the results of statistical analysis found a significant difference in the motivation of family-based DTO and health officers-based DTO motivation's to control the tuberculosis transmission in the work area of Gonting Mahe,, Tapanuli Tengah. Transmission control compared with DTO motivation of health officers-based.

The results of this study are consistent with a variety of previous research. Liang in his study found family-based DTO was more effective than other DTOs in controlling tuberculosis treatment (Liang, 2018). WHO emphasizes the important role of DTOs in the DOTS program to achieve zero TB by 2030 (WHO, 2016; WHO, 2017). The role of DTO in handling TB cases is very important due to the physical, economic, psychological, and social disability of DTOs and TB patients in dealing with a long treatment process (Sis, 2017; Cameron, 2018).

WHO's DOTS strategy has helped improve outcomes in TB in many ways: new resources have been channelled towards TB control programmes, drug supplies and information systems have been

strengthened and targets have been set. The strategy has helped ensure that national governments take notice of TB control efforts in their countries and also that advances have been made in the coverage and quality of TB control globally. WHO has refined the global programme in the Stop TB Strategy.¹ To ensure that patients benefit from these efforts, it is clear that good health services are necessary but not sufficient. Patients still need to choose to take the drugs (Purba, 2018).

Many studies centred on the influence of patients' understanding of treatment, including its duration and the consequences of defaulting, on adherence to treatment. The long treatment period was poorly understood by patients and adherence appeared to be facilitated where patients understood the importance of completing treatment. One study on adherence to prophylaxis reported that nonadherent patients had little information on TB as a disease, but were very aware of the potential adverse effects caused by treatment (Mathema, 2017).

Patients beliefs about the efficacy of treatment, both positive and negative, may impact on adherence. Patients may question the efficacy of the pills or think that only injections are medicine, or even question the validity of diagnostic tests that are not considered sophisticated enough for such a dangerous disease. Belief in treatment efficacy appeared to be related to patient confidence in the medical system; in some cases community-based treatment programmes increased confidence among community members that TB could be cured. Another study noted that patients preferred to consult traditional healers (Purba, 2018).

People occupying this polarity believe that poor adherence is a problem for the public health system caused by recalcitrant patients; these patients don't know, don't care and don't understand why they need to complete the full course of treatment. The natural response to this set of beliefs is to devise a menu of policies to educate, to motivate, to watch and to punish patients if they do not do as instructed (Purba, 2019).

At the other extreme, policy-makers and providers consider it their job to deliver an intervention that is generally highly effective against a life-threatening and debilitating disease. For this approach to succeed, health-care practitioners must work within an effective health system that delivers care appropriate to people's needs. If a large proportion of people do not complete treatment, then it is the health-care system that has failed, by not delivering what it is supposed to. This viewpoint

emphasises that a health-care system should operate in a way that is appropriate to people's needs, rather than emphasising the development of means for providers to control patients' behavior (Purba, 2018).

Fear and denial of diagnosis were common themes across the included studies. Some patients had difficulty accepting their diagnosis, often wanting to hide their disease. In other studies, patients' desire to be cured was cited as a motivator for adherence in people presenting with TB symptoms, and patients' fear of the negative consequences of irregular treatment was associated with treatment adherence. Patients could be nonadherent if they were taking other western or traditional medicines and perceived there to be negative consequences if these were taken concurrently with TB medication. Two studies mentioned a relationship between pregnancy and nonadherence, one of which noted that female patients believed that pregnancy would increase intolerance to drugs and make TB drugs ineffective (Mathema, 2017).

The difference in motivation between the family-based PMO and the health officers-based PMO is because the family PMO in the work area of the Puskesmas Goting Mahe Community is a close family member who has emotional connections with tuberculosis patients. In this context, the family-based PMO can be the TB patient's wife, parents, and siblings or sister of the patient. In controlling the treatment of TB patients, the family has a dual role as the observers of taking the medicine and also as a close family member of the patient (Cameron, 2018).

The difference in motivation effectiveness of family-based DTOs compared to health officers-based DTOs is due to cultural factors. In the work area of Puskesmas Goting Mahe Community, all tuberculosis patients come from the Batak tribe. Batak tribes have been known to have a very strong kinship relationship in the family-based. The nature of helping in the family-based, especially in difficult situations, is one of the characteristics of the Batak people.

During the research process it was also found that family-based members in the Batak tribe such as tulang, naboru, bapa tua, brothers often gave assistance to the family-based DTO. This assistance can be in the form of transportation assistance to take medicine to the Puskesmas and help with money to buy milk and nutritious food (Samuel,

2016). In certain custom events DTO families also often get motivation from other relatives to be able to deal with tuberculosis problems that are faced by family-based members.

Likewise, TB patients often get certain advice from relatives in certain traditional events. These advice can certainly be a motivation for DTO families and TB patients to be more confident and motivated to improve medication adherence behavior. According to protection motivation theory, if the family-based DTO is motivated to treat and supervise TB patients taking medication and TB patients also feel motivated to take medication regularly then this motivation will manifest into controlled actions (Sirur, 2016).

From observations made during the research process in the work area of Gonting Mahe Health Center, North Tapanuli Regency, that family members such as bones, namboru, elderly fathers, brothers often provide assistance to DTO families, for example in taking drugs to the puskesmas delivered by relatives who have vehicles. Financial assistance is also often given to buy milk and nutritious food in tuberculosis patients. In certain custom events DTO families also often get motivation from other relatives to be able to deal with tuberculosis problems being faced by family DTO family members. Likewise, TB patients often get certain advice from relatives in certain traditional events. These advice can certainly be a motivation for family DTOs and TB patients to be more confident and motivated to improve their compliance with medication. According to the protection motivation theory, if the family DTO is motivated to treat and supervise TB patients taking medication and TB patients also feel motivated to take medication regularly then this motivation will manifest in controlled actions.

Family DTO has a dual role in controlling tuberculosis treatment which is different from other DTOs which only have a single role. The role of the family DTO is to carry out the supervision process in accordance with instructions given by health workers and care for tuberculosis patients. Caring for patients who are family members themselves is also a moral responsibility held by the family DTO. And in the tradition of the Batak tribe, it is the responsibility to treat patients until they recover despite spending their possessions in the process of treatment (Purba, 2018).

The emotional, psychological, values, and cultural relationships that are adopted are distinguishing factors that influence the motivation of the family DTO with the motivation of the DTO

health workers, DTO teachers, and DTO community leaders in the work area of Sorkam, Central Tapanuli Regency. Motivation is the driving force of an individual to act on something both influenced by intrinsic factors and extrinsic factors. The emotional, psychological, values and cultural relationships are elements of a relationship based on the formation of motivation in accordance with the opinion of Deci and Ryan (2012) in the theory of self-determination. If these intrinsic elements are still maintained and developed, and training in family PMOs is consistently carried out, then control of tuberculosis treatment can be effectively carried out. This is also consistent with Deci and Ryan's theory which states that high motivation in individuals to take an action if the individual is given the right relationship, freedom, and competence to do the action (Purba, 2019).

Family-based DTO has a dual role in controlling tuberculosis transmission which is different from health officers-based DTO who only have a single role. The role of the family-based DTO is to carry out the supervision process in accordance with instructions given by health workers and care for tuberculosis patients. Caring for patients who are family-based members themselves is also a moral responsibility held by the family-based DTO. In the tradition of the Batak tribe, it is the responsibility to treat patients until they recover despite spending their possessions in the process of treatment.

The emotional, psychological, values, and cultural relationships that are adopted are distinguishing factors that affect the motivation of a family-based DTO with the motivation of a health officers-based DTO. Motivation is the driving force of an individual to act on something both influenced by intrinsic factors and extrinsic factors.

Emotional, psychological, value and cultural relationships are elements of relationships based on the formation of motivation in accordance with the opinions of Deci and Ryan (2012) in the theory of self-determination (Maclean, 2016; Martin 2016, Sis, 2017). If these intrinsic elements are still maintained and developed, as well as training on DTO families consistently carried out so controlling tuberculosis transmission can be effectively carried out (maclean, 2016). This is also consistent with Deci and Ryan's theory which states that high motivation in individuals to take action if individuals These relations are given the right, the freedom, and the competence to carry out these actions (Mathema, 2017).

Health Officers are the first and foremost jargon in overcoming all health problems faced by

each individual, group, and community. From the results of the analysis in this study found a significant difference in the control of family-based DTO treatment with health officers-based DTO. This means that family-based DTO in controlling tuberculosis transmission have more effective motivation than health officers-based DTO (Martin, 2016; Mathema, 2017).

The difference in motivation of family-based DTO and health officers-based DTO in the work area of Puskesmas Gonting Mahe Community, Tapanuli Tengah is due to the perception of the local community on health officers. At first the DTO established by the DOTS program in the supervision of eating medicine was a health officers. As time goes by, Health officers-based DTO cannot serve all TB patients in one work area, so DTO can be recruited from teachers, family-based members and community leaders who are first given training. In carrying out their duties the DTO is given an honorarium in accordance with the work stipulated in the DOTS program (WHO, 2016; WHO, 2017).

The results of the analysis in this study indicate that there are differences in the effectiveness of environmental control and nucleus droplets of families-based DTO with health-officers based DTO in tuberculosis transmission control. This result of this study are consistent with previous studies which also found that there are differences in environmental control and control of nuclei droplets of family-based DTO with health officers-based DTO in tuberculosis transmission control (Prasetya, 2017; Sis, 2017).

Health literacy has become very important in improving the control of treatment of TB patients, especially in rural areas where access to information is still very low. Increased individual health literacy will depend on individual interests, intentions, interests, and beliefs (Martin, 2015). This lack of interest, intention, and belief makes PMO teachers and PMO community leaders not as motivated as effectively as the motivations of family PMOs and health workers (Purba, 2019).

The results of the analysis in this study indicate that there is no difference in the motivation of PMO teachers and PMO community figures for tuberculosis treatment control. This shows that the placement of PMO teachers and PMO community leaders are not effective in controlling the treatment of tuberculosis patients. The results of this study are consistent with previous research which also found that there was no difference in the influence of PMO teachers and PMO community leaders on

tuberculosis treatment control (Prasetya, 2009; Sis, 2004).

PMO teachers and PMO community leaders are two types of PMO that are not related to familial relations with tuberculosis patients. The PMO was initially appointed by local health workers to replace the PMO of health workers in places where health workers are very poor especially in rural areas. The teacher's PMO and community leaders' PMO in carrying out their duties are only based on the incentives received, but emotionally very different from the family's PMO.

PMO teachers and PMO health workers also do not have special expertise in the field of health despite receiving certain training. Community perceptions of teachers and community leaders will be very different from perceptions of health workers. Observations during this research process showed that TB patients felt that PMO teachers and PMO community leaders did not work effectively and were also unable to answer TB patients' questions completely.

5 CONCLUSION

Motivation of family-based DTO was 6.6 score, control treatment was 3.5 score, environmental control was 7.5 score and control of nucleus droplet was 3.8 score compared to health officers-based DTO in controlling tuberculosis transmission. Family-based DTO has motivation, treatment control, environmental control, and droplet nuclei control which is more effective on controlling tuberculosis transmission compared to health officers-based DTO.

6 SUGGESTION

It is recommended to the Dinas Kesehatan Tapanuli Tengah to develop TB control programs through family-based-wide DTO until tuberculosis transmission can be effectively controlled.

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