

The Behavior of TB-DM Patients in Controlling Blood Sugar Concentration in Medan City Community Health Center

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Abstract— North Sumatra is the region with the highest prevalence of pulmonary tuberculosis in Indonesia, 759 per 100,000 population aged > 15 years. The male group had a higher prevalence of TB than women (1,083 versus 461). The incidence of pulmonary tuberculosis in Medan is still high (129 per 100,000 population). This showed that the burden of TB in Indonesia is still high. Patients with type 2 diabetes are more susceptible to pulmonary TB than non-DM, even though they get good nutrition and were established socio-economically. This is because microorganisms grow well in high blood glucose concentrations when the body is weak and DM complications. Pulmonary infection worsens DM and increases blood sugar concentration (BSC). This study aims to analyze the behavior of TB-DM patients in all Community Health Centers in Kota Medan in controlling the BSC. The design of this study was a cross-sectional study with a population of all TB-DM patients who took medication at the Medan City Community Health Center. The sampling technique used accidental sampling for two months with a sample size of 68 respondents. Data collection was done by interviewing the TB-DM patients. The results showed that people aged ≥ 40 years and most were men with low education. Respondents' knowledge about DM was low, respondents' knowledge about TB-DM was high, while respondents' attitudes and behavior were good. The chi-square analysis test showed no relationship between knowledge about DM and the behavior of TB-DM patients. There was no relationship between knowledge about TB-DM and the behavior of TB-DM patients, but there was a relationship between the attitudes and behavior of TB-DM patients.

Keywords— Knowledge; attitudes; behavior; patient with TB-DM.

Manuscript received 4 Dec. 2019; revised 15 Mar. 2021; accepted 27 Apr. 2021. Date of publication 31 Oct. 2021.
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I. INTRODUCTION

Tuberculosis and Diabetes Mellitus are hitting Asian countries currently; therefore, it is called a double burden [1]. Diabetes Mellitus (DM) patients are more likely to develop pulmonary tuberculosis than non-DM patients [2]. Hyperglycemia in DM patients causes the impaired function of neutrophils and monocytes, affecting chemotactic function, phagocytosis, and decreased bacterial killing power. The decreased immunologic response in a person facilitates the development of infectious diseases, including mycobacterium tuberculosis. Defects cause the increased incidence of pulmonary tuberculosis in DM patients in immune cell function and defense mechanisms. In addition, it is also determined by the reduced leukocyte bactericidal activity in DM patients, especially for those whose blood glucose concentrations are not controlled.

Patients with diabetes type 2 are more susceptible to pulmonary TB compared to non-DMs, though they are well-nourished and established socio-economically. This is because microorganisms grow well if the blood glucose level is high. Therefore, the body's defense mechanism is weak. Patients with TB-DM can reduce the body's immunity and cause impaired innate and adaptive cellular responses. However, this cellular response has an especially important role as a barrier to the spread of TB infection. The incidence of TB-DM is 5.6% in India, 7.3% in Turkey, and in Indonesia, 14.8% of all DM patients. Tuberculosis has a relationship with DM. Research by Alisjahbana *et al.* in Susilawati and Muljati [3] showed a risk of TB 4.7 times in people with DM and 4.2 times in glucose intolerance compared to normal blood glucose levels. DM patients tend to feel hungry, so they need a snack that is low in carbohydrates and high in protein and vitamin B6, Vitamin D, and Zinc.

Controlling blood sugar levels can prevent complications from other diseases. Therefore, the intervention to reduce sugar levels in diabetes is to increase knowledge, attitudes, and behaviors, such as low consumption, physical activity, and proper diet. Management for DM patients is to maintain blood glucose concentration to keep them under control by regulating the nutrition consumed. The DM diet arrangement includes three elements (type, amount, and meal schedule). Based on the above problems, the purpose of this study was to analyze the behavior of TB-DM patients in Medan City Community Health Center in controlling blood sugar concentrations. The objective of this study was to prevent DM patients from tuberculosis as well. By looking at the behavior of TB-DM patients in controlling their blood sugar concentration, it can provide knowledge so that the disease gets well.

II. MATERIALS AND METHODS

A. Design, Time and Location Research

This cross-sectional study was conducted to see the relationship between the attitudes and behavior of TB patients, the relationship between TB-DM knowledge and the behavior of TB-DM patients in Medan City, and the relationship between knowledge about DM and the behavior of TB-DM patients.

B. Population and Sample

Population and sample were all TB-DM patients who did the treatment at Community Health Centre in Medan City within two months of research. The sampling technique used accidental sampling for two months. The total samples are 89 respondents. Data collection was conducted by interview using a questionnaire at the community health center—data analysis using Chi-Square.

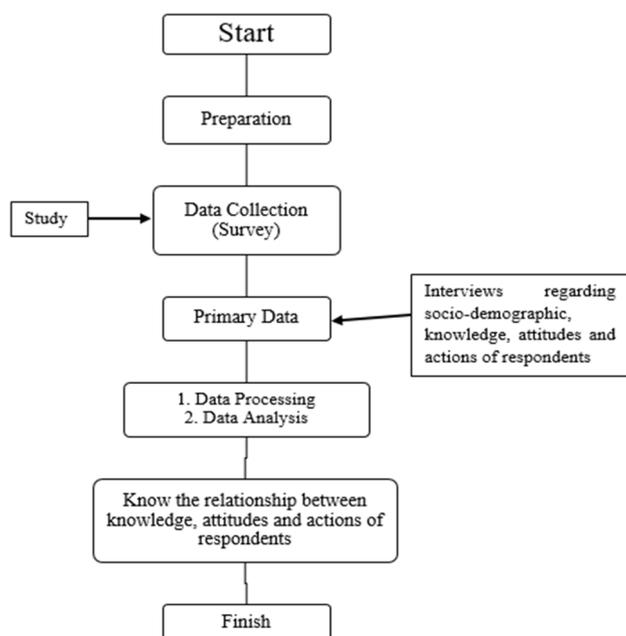


Fig. 1 Study Design Framework

According to Green [4], the factors that cause behavior are predisposing factors (knowledge, attitudes of trust and belief), enabling factors (facilities, infrastructure), reinforcing factors

(family support and health workers). Therefore, to change DM patients' behavior to prevent them from becoming TB, we used Green theory [4] for the approach.

III. RESULTS AND DISCUSSION

A. Characteristics of TB-DM Patients

Based on Table I, the results showed that most of the age group of TB-DM patients are aged ≥ 40 years (97.1%), similar to a previous study [5] that most TB patients were 49-61 years old. Commonly TB occurred in adults for two reasons. First, adults who have been infected with primary TB in their environment as a child but were not properly prevented so that it appears again in adulthood. The second possibility is the activity and work environment in adult groups who interact with TB patients or in an environment that makes it easy for them to become infected.

TABLE I
THE CHARACTERISTICS OF TB-DM PATIENTS

No	Characteristics of TB-DM Patients	N	%
1	Age (year)		
	• < 40	2	2.9
	• ≥ 40	66	97.1
2	Gender		
	• Man	44	64.7
	• Woman	24	35.3
3	Education level		
	• Low	40	58.8
	• High	28	41.2
Total		68	100

The group that experienced the most TB in this study were men (64.7%). This is also the same as Fauziah's research [5] in the Internal Medicine Inpatient Installation of Dr. M. Djamil Padang showed that most pulmonary TB patients with DM were men, as many as 17 people (58.62%). The crude prevalence rate slightly higher in males compared to females [6]. Research by Hapsari and Muhammad [7] in Tambaksari Subdistrict Surabaya showed that TB patients with DM are most likely found in males, as many as 23 people (60.5%). This is under WHO report [8] that more men suffered from TB globally. There are several reasons why men are more at risk than women, such as smoking habits in men. Smoking can increase the risk of contracting TB by two times [9].

In this study, the education of most respondents was low education (58.8%). Harso study [10] stated that most TB patients with DM have formal education until graduating from Senior High School is 49 people (43%). Education is a factor that influences a person in seeking treatment. A person's education will impact the occupation that is leading to access to get better healthcare also improve.

B. Body Weight, Height, Blood Sugar Concentration at Time, House Size, Ventilation Area of TB-DM Patients

Pulmonary TB is living in a densely populated house. A previous study showed that density is strongly associated with TB occurrence [11]. Selviana research [12] in the working area of Sungai Durian health center showed a 60% density level. From the table above, we found the house size was around 103.01 with 63.07 of Standard Deviation. It is shown

that there was a variability of house size in this study. The Health Ministry of Indonesia recommends that many house sizes consider the number of residents of the house. If house size is not proportional will cause overcrowded. In addition, it also causes a lack of oxygen, and transmission of infectious diseases will be easier. The number of residents of the house was about four people. Hence, it still fulfills the standard of health house size.

TABLE II
DISTRIBUTION OF TB-DM PATIENTS BY BODY WEIGHT, HEIGHT, BLOOD SUGAR LEVELS AT TIME, HOUSE SIZE, NUMBER OF RESIDENTS, VENTILATION AREA

Characteristic	N	Mean (Min-Max)	SD
Body Weight	68	59.25 (37-90)	11.06
Body Height	68	163.84 (145-185)	7.84
Current Blood Glucose Concentration	68	233.85 (66-100)	105.39
House Size	68	103.01 (16-323)	63.07
Number of residents of the house	68	4.40 (1-11)	1.97
Ventilation Size	68	5.59 (1-20)	4.73

Research by Ricardo *et al.* [13] in the work area of the Health Centers East Kelayan stated that there was a significant relationship between the condition of ventilation of the house with the incidence of pulmonary TB with a p-value = 0.001. Sulung and Nunung's research [14] also stated a significant relationship between nutritional status, ventilation, smoking habits, and the role of health workers with pulmonary TB events in the work area of the Health Centers.

C. Knowledge, Attitudes, and Behaviors of TB-DM Patients

Almost all patients can answer questions correctly about the nature of DM disease, which has a non-communicable disease and can occur due to heredity, causes, and symptoms of DM. 5.9% of patients answered this question incorrectly by answering that DM was a contagious disease. The knowledge that is still not understood correctly is that side dishes or processed foods can quickly increase blood sugar levels, behaviors took if blood sugar levels are normal, and the cause of DM patients is more easily infected with TB.

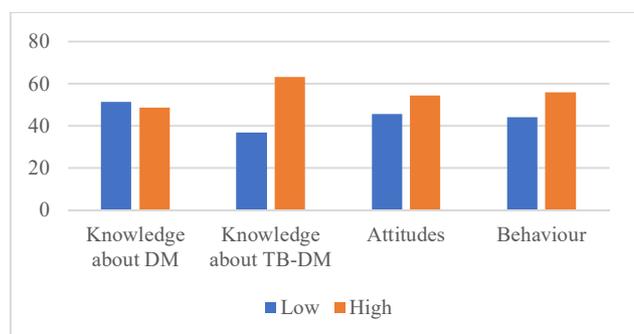


Fig. 2 Distribution Of Tb-DM Patients Based On Knowledges, Attitudes, and Behavior

Nurmalini's research results [15] in patients at H. Adam Malik General Hospital also showed that 75.8% of patients correctly answered questions about the symptoms of DM.

Questions about the symptoms of DM were answered correctly almost by all patients because it was felt by patients when exposed to DM.

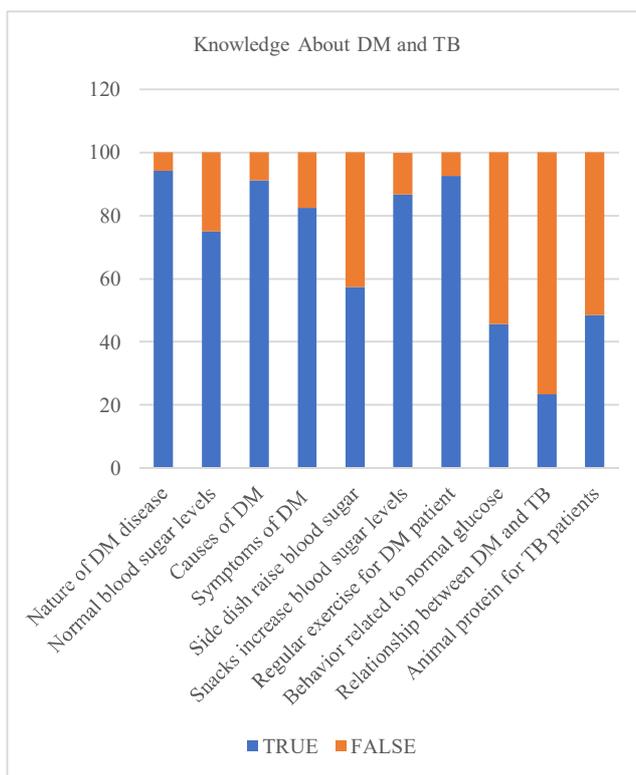


Fig. 3 Knowledge about DM and TB

Apart from eating patterns, physical activity exercise is also an influential thing in controlling blood sugar levels. Based on the study results, as many as 92.6% of patients were able to answer correctly about exercise functions for people with DM. Based on Ermawati's research [16] at Panembahan Senopati Hospital in Bantul, respondents' knowledge about sports questions in DM management was divided into 3 types of questions: intensity, time, and type of exercise. All respondents (100%) can correctly answer questions about exercise intensity, 20% correctly answer questions about exercise time, and 33.3% correctly answer sports-type questions in DM management.

The statement that DM TB patients were more difficult to recover than TB patients alone, as much as 94.1%. This is in line with the knowledge score in the high category about the difference between DM or TB patients and DM TB patients as many as 88.2% of patients answered the questions correctly. Patients correctly answer that DM TB patients must take longer, more drugs, have more difficulty recovering, so it was more difficult to manage food consumption than TB patients alone. This showed that patients already have attitudes that are in line with the knowledge gained.

Based on Figure 3, most of the respondents answered wrong about the relationship between DM and TB. They did not know that DM patients tend to get TB easily. In general, we can summarize that respondent had good knowledge about DM and TB, except for the association between DM and TB.

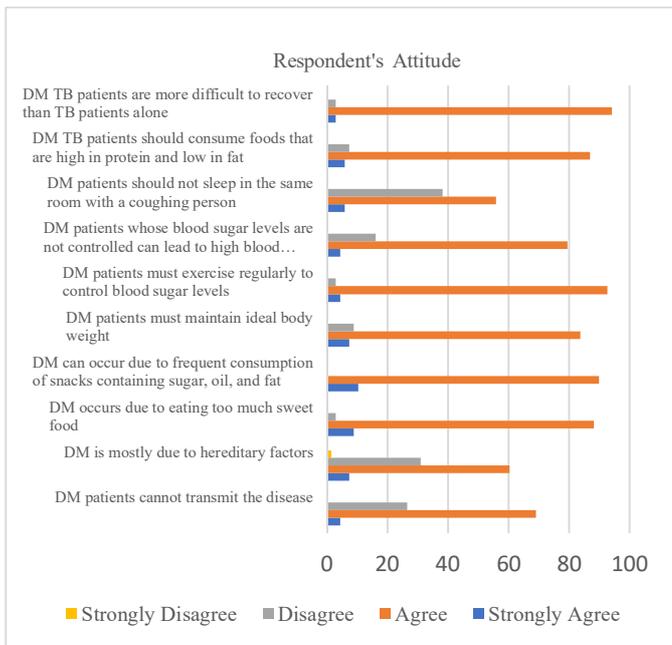


Fig. 4 Respondent's Attitude

The attitude of respondents was in line with their knowledge. Most of the respondents agreed that DM patients cannot transmit the disease. DM is related to hereditary factors and occurs due to eating too much sweet food. DM can occur due to frequent consumption of snacks containing sugar, oil, and fat. DM patients must maintain ideal body weight and must exercise regularly to control blood sugar levels. DM patients whose blood sugar levels are not controlled can lead to high blood pressure. DM patients should not sleep in the same room as a coughing person. DM TB patients should consume foods that are high in protein and low in fat. DM TB patients are more difficult to recover than TB patients alone.

There were 54.4% of respondents doing physical activity regularly. Compared to the knowledge and attitude about exercise regularly, we found that most respondents have better knowledge and attitudes than the practice. This was shown that positive behavior does not always follow positive knowledge or attitudes and vice versa. According to Green [4] three factors can influence behavior, namely: predisposing factors (knowledge, attitudes of trust and belief), enabling factors (facilities, infrastructure), reinforcing factors (family support and health workers).

Most of the respondents open windows every day (92.6%). Based on the interview, the respondent opened the window from morning to evening and already knew that opening the window intended to allow air exchange in the house. Some respondents did not open the window because it was uncomfortable because of outside noise and influenced by the respondent's knowledge. Based on the results of Susanti's research [17], it was found that as many as 66.67% of respondents routinely open windows every day. The results of statistical analysis showing p -value = 0.064. It can be concluded that there was no relationship between opening a window with pulmonary TB incidence. The results of this study differ from the incidence of pulmonary TB in the provinces of DKI Jakarta, Banten, and North Sulawesi, with p -value = 0.046 and OR = 1.731 with 95% CI = 1,008-1,836.

The difference in results can be due to knowledge about pulmonary TB prevention behavior [17].

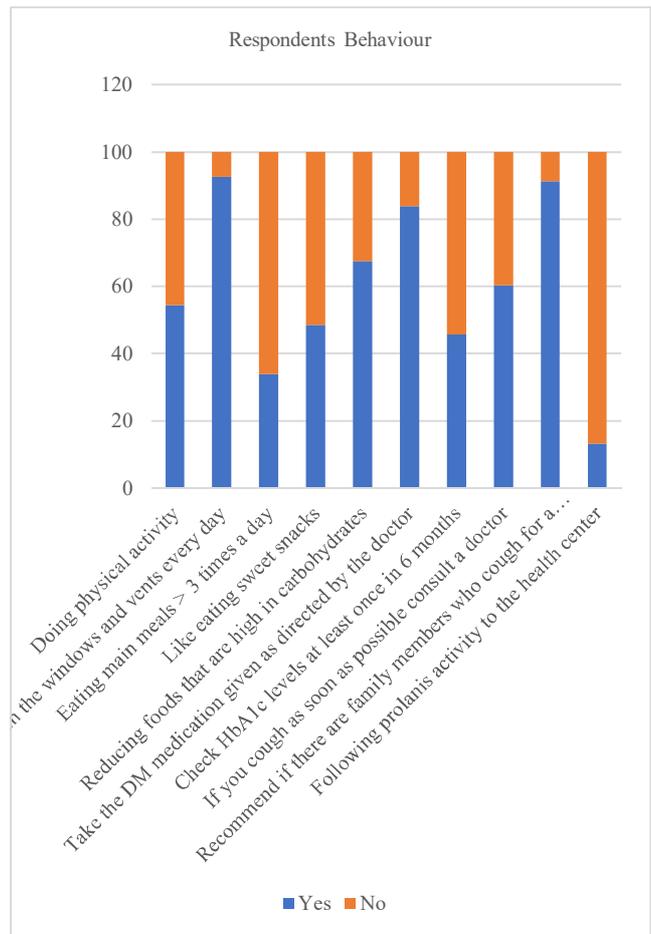


Fig. 5 Respondent's Behavior

Okatiranti and Nuraeni's research [18] in the Polyclinic in Bandung City Hospital showed that most DM patients had less knowledge as many as 26 people (44.06%). This is different from the research of Patimah *et al.* [19], showing that of the 30 respondents studied, most DM patients had good knowledge totaling 16 respondents (53.3%). Budi [20] showed that in Palembang City, out of 192 people slum community, there were 60.42% who did not have good knowledge about the causes of tuberculosis, transmission and prevention of disease 39.58% were good and supportive. By this study, we found that TB-DM patients still have a habit of eating sweet food. Dietary patterns are one of the leading factors of Diabetes Mellitus [21]. We also found that only 13.2% of respondents went to health center for prolines activity. A previous study shown that there was a relationship between prolines activity with the prevention of chronic diseases [22].

D. Relationship of Knowledge about DM with Behaviors of TB-DM Patients in Medan City

Based on table III, it shown that 35 respondents who have low knowledge have bad behaviors by 54.3%, while respondents with high knowledge level of bad behaviors amounted to 33.3%. From the results of the statistical test analysis p value > 0.05 which means there is no relationship

between knowledge about DM with the behaviors of TB-DM patients in Medan City.

TABLE III
RELATIONSHIP OF KNOWLEDGE ABOUT DM WITH BEHAVIORS OF TB-DM PATIENTS IN MEDAN CITY

Knowledge	Behavior						PR (95% CI)	p
	Not good		Good		Total			
	n	%	n	%	N	%		
Low	1	54.	1	45.	3	10	2.375 (0,889	0.13
	9	3	6	7	5	0		
High	1	33.	2	66.	3	10	-	5
	1	3	2	7	3	0		

According to the previous study, this result stated that subjects who had higher knowledge about DM tend to have good behavior [23]. This was not the same with Perdana research [24] stated that there was a relationship between the knowledge about DM of DM patients with blood glucose control. The better level of knowledge about DM of DM patients, the more controlled their blood glucose concentration. Based on the research results during the interview process in the field with respondents, the average respondent had long suffered from DM. Respondents have knowledge about DM disease from healthy centers staff who conduct counseling at health centers and family or friends. Even though the respondents knew about DM disease, some did not carry out their behaviors. For example, respondents know that DM patients should control the consumption of sweet foods, but respondents still consume these sweet foods. Some also know that people with diabetes should take anti-diabetic medication regularly, but they do not take medicine even though it has been recommended by a doctor or health staff [24].

E. Relationship of Knowledge about TB-DM with Attitudes of TB-DM Patients in Medan City

Table IV shows that out of 25 respondents who know low TB-DM have adverse behaviors of 56%. In comparison, respondents who have high knowledge of unfavorable behaviors were 37.2%.

TABLE IV
RELATIONSHIP OF KNOWLEDGE ABOUT TB-DM WITH ATTITUDES OF TB-DM PATIENTS

Knowledge	Attitudes						PR (95% CI)	p
	Not good		Good		Total			
	n	%	n	%	N	%		
Low	14	56	11	44	25	100	2.148 (0.788-	0.211
High	16	37.2	27	62.8	43	100	5.856)	

The statistical test analysis p value > 0.05 means there is no relationship between knowledge about TB-DM with the behaviors of TB-DM patients in Medan City. This is the same as Kurniawati's [25] research on the knowledge and behavior of tuberculosis patients about their disease and its treatment that with high knowledge about their illness respondents have behaved positively toward behavior in preventing disease transmission. The higher or better a person's level of

knowledge or understanding of an object, the better the person's attitude to that object. Based on the results of research on TB-DM respondents, some have high knowledge.

F. Relationship between Attitudes about TB-DM with Behaviors of TB-DM Patients

Based on table V it can be seen that 31 respondents who had bad attitudes with bad behaviors amounted to 67.7%. In comparison, respondents who had good attitudes with unfavorable behaviors were only 24.3%. From the statistical test analysis results, the value of p < 0.05 means that there is an influence between attitude and behaviors of TB-DM patients in Medan.

TABLE V
RELATIONSHIP BETWEEN ATTITUDES ABOUT TB-DM WITH BEHAVIORS OF TB-DM PATIENTS

Attitude	Behavior						PR (95% CI)	p
	Not Good		Good		Total			
	n	%	n	%	N	%		
Not Good	21	67.7	10	32.3	31	100	6.533 (2.256-	0.001
Good	9	24.3	28	75.7	37	100	18.924)	

This was the same as Rizana's [26] research on knowledge, attitudes, and behaviors in preventing pulmonary tuberculosis transmission that there is an influence of health education on attitudes and behaviors in preventing TB transmission. Likewise, in Suradnyana's research [27], there is a link between individual attitudes and behaviors. The individual's attitude was based on knowledge which will then carry out or practice something that is known (judged good). Based on Ariani [28] regarding the regularity of taking medicine for patients with pulmonary tuberculosis in the working area of Modayag Health Centre, Bolaang Mongondow Regency that there was a significant relationship between attitude and regularity of taking medication, with OR value of 8,800.

IV. CONCLUSION

The results showed a relationship between the attitudes and behavior of TB-DM patients (p = 0.001). There was no relationship between TB-DM knowledge and the attitudes of TB-DM patients in Medan City (p = 0.211). There was no relationship between knowledge about DM with TB-DM patient behavior in Medan City. (p = 0.135). Thus, TB control programs should focus on knowledge improvement and changing attitudes and behavior. Based on Green Theory [4], behavior is determined by three factors. This study shows that knowledge, attitudes, and behavior did not always work in accordance. Green Theory [4] proves that besides predisposing factors (knowledges and attitudes), enabling factors and reinforcing factors also need to form a TB-DM patient behavior. In the future, this study should be broadened with enabling factors and reinforcing factors to see how predisposing, enabling, and reinforcing factors made a positive behavior to prevent TB-DM patients. A study about how strong relationship between attitudes and behavior of TB-DM patients should be conducted in the future.

ACKNOWLEDGMENT

The researchers are grateful to Kemenristik-Dikti that funded this research through DRPM Kemenristekdikti funds in 2019. Researchers also are obliged to all the respondents (TB-DM patients) willing to be sampled in this study.

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