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Behavioral Counseling of Theory of Planned Behavior-Based to Increase Tuberculosis Patients` Obedience in Medication Nutrition, and Prevention of Transmission: Randomized Control Trial

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ABSTRACT
Background: Adherence behavior of tuberculosis patients become the most crucial factor in achieving success treatment, including adherence to compliance with medication, prevention of transmission, and nutritional compliance.
Purpose: This study aims to determine the effect of behavioral counseling based on Theory of Planned Behavior (TPB) in improving adherence of TB patient.
Methods: Quasy-experiment pre-post-test with control group were conducted on 108 patients with pulmonary tuberculosis at a Puskesmas located in Subang with simple random sampling technique. This study was conducted by behavioral counseling of TPB-Based in the treatment groups for 2 months. The statistical test used was the independent t test and chi-square.
Results: There were significant differences ($p<0,05$) between treatment and control groups on attitude toward behavioral variables (ATB), subjective norm (SN), perceived behavior control (PBC), intention, medical adherence, prevention of transmission and nutritional compliance.
Conclusion: There were significant differences ($p<0,05$) between treatment and control groups on attitude toward behavioral variables (ATB), subjective norm (SN), perceived behavior control (PBC), intention, medical adherence, prevention of transmission and nutritional compliance. Behavioral counseling of TPB-Based proven to have an effect in improving the ATB, SN, PBC, intention, medical adherence, prevention of transmission, and nutrition compliance of TB patients.

Keywords: adherence, theory of planned behavior, tuberculosis

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BACKGROUND

Tuberculosis (TB) is an infectious disease that is of global health concern (Browne et al., 2018). TB control with the DOTS strategy has been implemented in many countries since 1995, but until now it is still a global problem that is difficult to solve (Adiutama, Fauzi, et al., 2021).

Indonesia is one of the largest contributors to tuberculosis in the world, ranking second after India, which is 10% of all sufferers in the world (WHO, 2015). This becomes a very serious problem because of the long duration of treatment and requires high compliance from the patient. Drug resistance is one of the consequences of poor medication adherence, both due to dosing problems and failure to complete the treatment program (Guix-Comellas et al., 2017). The average patient adherence to long-term treatment programs in developed countries is only 50%, while lower rates are found in developing countries (WHO, 2015). Compliance with treatment programs has an important role in preventing transmission, death from TB, recurrence and drug resistance (Addisu et al., 2014).

The 2015 Indonesian Health Profile places TB disease as a top priority in disease control, possibly because TB disease has a wide impact on quality of life, the economy, and the high number of TB cases that result in death. One of the most influential factors in efforts to suppress or control the incidence of TB is medication adherence (Kemenkes RI, 2018). Measurement of adherence is important to achieve treatment success (Browne et al., 2018). TB patients are required to have high adherence to the treatment program as an effort to reduce the burden of TB. Therefore, this study was intended to measure TB treatment adherence, nutrition adherence, and transmission prevention adherence. This study uses the Theory of Planned Behavior (TPB) as a conceptual framework. The main factor for TBP has been shown to have a close relationship with intention (Miller et al., 2015). The TBP construct can predict a person's intentions to form behavior (Peleg et al., 2017). The long duration of TB treatment requires high adherence and stability of the patient's intentions. Education to improve TB patient compliance based on the Theory Of Planned Behavior (TPB) is something that must be done in order to maintain the intention of TB patients to behave obediently.

Based on this, the authors offer an intervention by combining SMS-based interactive nursing reminders and face-to-face education to maintain the stability of TB patients' intentions in complying with the treatment process using the Theory of Planned Behavior approach. In this study, we explored the effect of behavioral counseling based on Theory of Planned Behavior (TPB) in improving adherence of TB patient.

OBJECTIVE

This study aims to determine the effect of behavioral counseling based on Theory of Planned Behavior (TPB) in improving adherence of TB patient (medication adherence, Nutrition, and Prevention of Transmission).

METHODS

Quasy-experiment pre-post-test with control group was conducted on pulmonary tuberculosis patients with positive AFB test (Acid-Fast Bacilli) at a Puskesmas located in Subang (n = 108). The criteria for the sample of the intervention and control groups were the same to maintain the equality of characteristics between the two groups, patients who were recruited to become respondents were patients who had cellphones and could operate them, used Indonesian communication, patients in the intensive treatment stage, and patients with 9 years of basic education status. Patients with musculoskeletal, hearing, mental health disorders, acute complications, and patients who changed telephone numbers at the time of the study were

excluded from the study. Recruitment of respondents using the simple random sampling. Data collection was carried out from August 1 to December 1, 2021. This study was conducted by conducting a TPB-based educational intervention in the treatment group for 2 months. There is a combination of interactive nursing reminders to send reminder messages via SMS (Short Message System) 2 times a day for 2 months, and face-to-face nursing education is carried out 4 times. This research protocol has been approved by the Health Research Ethics Commission of STIKES Buleleng with the ethical number: 114/EC-KEPK-SB/V/2020.

This study used a questionnaire as a data collection instrument. Medication adherence was measured using the MMAS-8 (Morisky et al., 2008), prevention of transmission and nutritional adherence was measured using a questionnaire from Sukartini et al. (2015), while ATB, SN, PBC, and Intention were measured using an instrument developed from the standard TPB instrument.

Independent t-test was used to analyze differences in ATB, SN, PBC, Intention, Medication Adherence, Nutritional Adherence, and Infection Prevention Adherence between the two groups after behavioral counseling based on planned behavior theory. The determined level of significance is $p < 0.05$.

RESULTS

The socio-demographic characteristics in table 1 show that 108 respondents in this study gave a 100% response. Based on the results of the chi-square test, it shows that there is no difference in the characteristics of the respondents on gender, age, and marital status with a p value > 0.05, meaning that the two groups are equal.

Table 1 Socio-demographic Characteristics (n=108)

	Group				p-value
	treatment (n=54)		Control (n=54)		
	n	%	n	%	
Gender					
Male	32	65,6	28	53,1	0,309
Female	22	34,4	26	46,9	
Age					
15-45	29	56,3	30	59,4	0,801
45-60	25	43.7	24	40,6	
Occupation					
Working	27	81,3	29	56,3	0,061
Nor working	21	18,7	25	43,7	
Marital status					
Unmarried	18	56,3	17	53,1	0,802
Married	14	43,7	15	46,7	

The difference in the value of delta between the dependent variables was tested using the independent t-test. The results of the different test results for the delta values of ATB, SN, PBC, intention, medication adherence, nutrition adherence, and prevention of transmission adherence on both of group can be seen in table 2. The results of the independent t-test showed a significant difference in the delta value between both of groups on the variable ATB, SN, PBC, intention, medication adherence, nutrition adherence, and prevention of transmission adherence, with a significance value ($p < 0.05$).

Table 2 The statistical test results (n=108)

Variable	Group				P value
	Treatment		Control		
	delta	SD	delta	SD	
ATB	18	19,16	0,19	6,83	0,04
SN	13,5	17,89	0,13	2,24	0,03
PBC	15,8	18,85	0,28	8,37	0,02
Intention	2,84	2,85	0,03	1,09	0,01
Medication Adherence	1,38	1,07	0,19	0,592	0,02
Nutrition Adherence	2,22	2,41	0,19	0,693	0,02
Prevention of transmission	3,25	2,907	0,34	1,31	0,01

DISCUSSION

A. Attitude Toward Behavioral

The results showed that there was an effect of educational intervention based on the Theory of Planned Behavior on the Attitude Toward Behavior of TB patients. After receiving an educational intervention based on the Theory of Planned Behavior, the TB patients' Attitude Toward Behavioral scores increased. This increase can be achieved by forming a positive attitude towards tuberculosis treatment with a beliefs approach, with a 2-month routine intervention where researchers and patients interact face-to-face 4 times and send reminder messages intensively every 2 days once the patient gains confidence that he can and is able to undergo therapy. difficult tuberculosis.

The results of this study are in line with other research on education in promoting TB adherence based on beliefs, a study conducted on 68 TB patients in Barcelona revealed that belief-based education was very effective in building attitudes that support medication adherence behavior (Guix-Comellas et al., 2017) . Meta-analysis of chronic disease treatment interventions concludes that beliefs-based interventions have a more positive impact on adherence attitudes and behavior (Rich et al., 2015). Another counseling study during tuberculosis treatment in Rio de Janeiro illustrates that beliefs-based attitudes are more lasting than attitudes formed from medical recommendations (Costa et al., 2017).

B. Subjective Norm

Statistically, educational intervention based on Theory of Planned Behavior is proven to affect the subjective norm (Subjective Norm) of tuberculosis patients. Before the intervention, the subjective norm values in the control group and the intervention group were not much different, but after 2 months of intervention, there was a difference in values. The intervention group tends to show a more significant increase in subjective norm values, educational interventions based on Theory of Planned Behavior have been shown to cause positive perceptions of social pressure or a number of people who are considered important in advocating for treatment, while in the control group, although they experienced an increase, the increase was not statistically significant. Improvements in the intervention group can be achieved by regular interaction through face-to-face education 4 times with the patient's family and sending reminder messages 2 times a day for 2 months.

The results of another study on education in promoting tuberculosis adherence in 68 TB patients in Barcelona confirmed that belief-based education was effective in setting subjective norms that support the treatment of tuberculosis patients (Guix-Comellas et al.,

2017). A nearly identical study on tuberculosis treatment adherence concluded that social and psychological interventions should be optimized to improve treatment adherence with TB patients (Yan et al., 2018). Good adherence to medication can be achieved by leveraging social influence through educating family members about how to support medication adherence to sick relatives (Kopelowicz et al., 2015). A meta-analysis of medication adherence in chronic disease also reveals that interventions using a trust approach will have a longer lasting effect (Rich et al., 2015). Another study on the adherence of tuberculosis patients confirmed that good social support was shown to increase adherence (Akeju et al., 2017).

C. Perceived Behavior Control

The results showed that educational interventions based on the Theory of Planned Behavior had a significant effect in increasing the perceived behavior control of tuberculosis patients. The increase was seen in the intervention group after face-to-face education was carried out 4 times and reminder messages 2 times a day for 2 months, while in the control group there was no increase.

This research is supported by studies on education in promoting adherence of tuberculosis patients that belief-based education is effective in increasing the control of perceptive behavior of tuberculosis patients in completing treatment (Adiutama & Fauzi, 2020). Perceived behavioral control in this study is about a person's perception of whether an individual is easy to perform a behavior and reflects previous experience and obstacles that can be anticipated. The more supporting factors and fewer inhibiting factors that are felt by individuals to be able to carry out a behavior, the greater the control they feel over the behavior and vice versa. Conception is determined by a person's beliefs or also called control beliefs to control the factors that inhibit or encourage the emergence of a behavior (Mcdermott et al., 2015).

D. Intention

Statistically, educational interventions based on the Theory of Planned Behavior have been shown to influence the intention of tuberculosis patients to comply with treatment, nutrition, and prevention of transmission. Before the intervention, the intention value in the control group and the intervention group was not much different, but after the intervention was carried out for 2 months, there was a significant difference in the value. The intervention group tends to increase the value of intention to comply with treatment, nutrition, and prevention of transmission. While in the control group, although there was an increase, the increase was not statistically significant. A significant improvement in the intervention group can be achieved by regular interactions through face-to-face education 4 times with the patient's family and sending reminder messages 2 times a day for 2 months.

The results of this study are almost identical to a study conducted at the University of Pennsylvania Hospital which reported that reminder messages proved effective in maintaining dose intention (Reese et al., 2016). Another similar study states that chronic disease patients who use reminders show compliance, reminder systems are useful for increasing adherence intentions, adherence attitudes, compliance behavior, and self-management. Patients who use a reminder system in their treatment will get immediate support and benefits (Foster et al., 2017).

A previous study on intention in the Theory of Planned Behavior explained that intention and behavior in the context of Theory of Planned Behavior can explain the intentions and behavior of adherents of treatment. Adherence in treatment also depends on the individual's own personal orientation. The cognitive education model moderated by the TPB construct has been shown to be effective in maintaining one's health intentions and behaviors (Peleg et al., 2017). The results of the above study are also supported by research which states that health

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education using SMS reminders is proven to increase patient compliance intentions and behavior in the treatment process, and SMS reminders can also be well received by patients (Akeju et al., 2017).

E. Medication Adherence

The results showed that educational intervention based on Theory of Planned Behavior had a significant effect on increasing treatment adherence of tuberculosis patients. After receiving an educational intervention based on the Theory of Planned Behavior, the intervention group saw a significant increase in medication adherence. The effect of medication adherence was obtained by routine intervention for 2 months where researchers, patients, and families interacted face-to-face 4 times, as well as by sending reminder messages (Interactive Nursing Reminder) intensively 2 times a day for 2 months, so that adherence to subjects who had formed can be realized or raised as consistent behavior. This compliance increases because respondents are satisfied with the caring behavior of nurses who always remind and educate every day. Caring is the main thing used by health services to achieve patient satisfaction (Ellina et al., 2019).

The results of similar studies indicate that the reminder method can be used as an alternative method to help patients achieve compliance in undergoing long and tedious treatment (Reese et al., 2016). Randomized control trials reveal the idea that reminder methods are effective in improving medication adherence (Dai et al., 2017). Short Message System (SMS) is very effective in increasing patient adherence to drugs (Akeju et al., 2017). This opinion is also supported by research which states that health education using SMS reminders is proven to improve patient compliance in the treatment process and SMS reminders can also be well received by patients (Adiutama, Fauziah, et al., 2021).

F. Nutrition Adherence

Statistically, educational intervention based on Theory of Planned Behavior has a significant effect on increasing nutritional compliance of tuberculosis patients. This increase was obtained by conducting face-to-face education about recommended nutrition, and growing respondents' confidence that good nutrition can have a positive impact on the treatment process. This education is supported by a reminder message system that contains eating 3 times per day, appetite to avoid fast food and foods that trigger coughs, such as artificial sweeteners, and oily foods. An increase in nutritional compliance was also found in the control group, but the increase found was not statistically significant, this could be due to the education of health workers and the number of recommended food posters at the study site.

The results of other similar studies show that chronic disease patients who use reminders show compliance, a reminder system that is useful for improving compliance attitudes, compliance behavior, and self-management (Malek et al., 2017). Patients who use a reminder system in their treatment will get immediate support and benefits (Foster et al., 2017). Other supporting studies on nutrition or dietary adherence in chronic disease have shown that SMS is very effective in increasing patient adherence to diet and medication (Akhu-zaheya & Shiyab, 2017).

G. Prevention of Transmission

The results showed that there was an effect of educational intervention based on Theory of Planned Behavior in increasing adherence to prevention of transmission in tuberculosis patients. In this study, the control group also experienced an increase but statistically the increase was not significant, this could be because the control group was also informed about prevention of transmission through health promotion in local health services. Increased infection prevention in the intervention group was obtained through face-to-face education about transmission prevention and an explanation of the environment that supports

transmission prevention, supported by interactive nursing reminders that intensively remind the importance of preventing transmission. In this intervention, respondents were given an understanding of how to cough and sneeze properly, how to get rid of phlegm, use eating and drinking utensils, and the home environment so as not to get infected. The belief approach can encourage individuals to display or perform certain behaviors (Adiutama et al., 2018).

Educational intervention based on Theory of Planned Behavior directs patients on how to interact with their environment so that patients know how to prevent infection transmission and not harm others around them, patients are also taught how to have a healthy environment so that transmission does not occur. Along with the formation of intentions and understanding about prevention of transmission, reminder messages are sent intensively so that intentions and understanding can be changed into consistent behavior, so that patients are able to apply prevention of transmission both in hospitals, at home and when interacting with the social environment (Adiutama, Hijriani, et al., 2021).

CONCLUSION

There are no differences in the characteristics of respondents on gender, age, occupation, and marital status with a p value > 0.05, meaning that the two groups are the same or equal. Educational interventions based on Theory of Planned Behavior have been shown to have an effect on increasing ATB, SN, PBC, intention, medication adherence, prevention of transmission, and nutritional compliance of TB patients.

Further research is needed in health services with MDR-TB respondents. The design of the interactive nursing remainder prototype must also be done because although the interactive nursing remainder has direct benefits in maintaining the stability of intentions and consistency of adherence to the tuberculosis treatment program, the application of the reminder system via SMS still has weaknesses and needs to be considered because the message cannot confirm whether the patient is really complying with the message or not.

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