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Health Module Intervention of Physical Activity (PA) in Controlling Blood Sugar Levels of People With Type 2 Diabetes Mellitus

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Abstract

Background: Physical activity is a part of exercise, considered the cornerstone in treating type 2 diabetes. Physical activity controls blood glucose directly circulating and increases tissue sensitivity to insulin, reduces the risk of cardiovascular disease, and reduces mortality. **Objective**: This study aims to determine the difference in changes in blood sugar given through the Physical Activity Health Module (PA) media. **Design:** This study used pre-experimental using two groups of pre-test and post-test. The sample is 100 people who have DMT2 in Takalar Regency. The research results show a significant difference between the provision of education through the health module media to changes in blood sugar. **Conclusion:** Giving the Physical Activity (PA) health module can reduce blood sugar levels in patients with Diabetes Mellitus type. **Recommendation**: The Physical Activity Health (PA) module is the evidence base to assist decision-makers, especially for nurses holding the Diabetes Mellitus program, in making relevant policies. It is also essential to design effective promotion and prevention programs to improve health services, especially promoting physical activity programs for DMT2 patients.

Keywords: diabetes mellitus, physical activity, module, blood sugar

Introduction

Diabetes mellitus type 2 (DMT2) is a chronic metabolic disorder characterized by persistent hyperglycemia and abnormal carbohydrate metabolism due to the body's inability to produce and even respond to insulin. (1,2). This can be caused by the ineffectiveness of the insulin produced or a lack of insulin by the pancreas (3)(4). It is hoped that DMT2 does not have the potential to cause chronic exposure to hyperglycemia and cause microvascular and macrovascular complications (ADA 2019). For example, it affects the nerves, kidneys, and eyes and increases the risk of cardiovascular disease (4).

Several epidemiological studies (5,6) show a tendency to increase the incidence and prevalence of type 2 DM in various parts of the world. Over the past few decades, the number of DM cases globally doubled from 153 million in 1980 to 425 million in 2017. (7). An estimated 415 million people worldwide are now living with diabetes, and the number of adults living with DM worldwide is projected to increase to 642 million by 2040. In 2010, approximately 285 million people were diagnosed with DM, and 90% had T2DM, an almost perfect percentage (8). In Asia, the prevalence of T2DM continues to increase, projected to increase from 78 million in 2015 to 140 million in 2040 (7,9).

Physical exercise in people with diabetes has a significant role in controlling blood sugar levels, by doing physical activity, there is an increase in the use of glucose by active muscles, which can directly cause a decrease in blood glucose. (10–12). PA from the American College of Sports Medicine and American Diabetes Association is 150 minutes per week and additional resistance training at least 2-3 days per week parallel to pharmacological treatment (13).

PA allows controlling blood glucose directly circulating and increases tissue sensitivity to insulin, reducing the risk of cardiovascular disease (14) and reducing mortality (15). PA can prevent complications related to DM, and the quality of life of diabetics will improve if it is carried out continuously (16).

Self-management of DM patients through PA is expected to help avoid morbidity and mortality. Self-management is the primary form of getting diabetes care and is believed to increase self-esteem (17) Self-intention in DM patients will develop through an education program.

Fundamentals which are significant demands for improving health care providers take a lot of time (generally without compensation), specialized training, teaching and communication skills, a supportive attitude, and a readiness to listen and negotiate. (17). A media or assistive device is needed to conduct education so that health messages are successfully delivered and clearer, and the community can receive the person's message clearly and precisely (18). The media can be in the form of print media, billboard media, and electronic media.

The strategy for developing health promotion media in disease prevention management has been carried out in various ways. Several studies of educational intervention strategies have been carried out that can reduce blood sugar levels (19–21). Several intervention models can affect the clinical outcome of blood sugar (GD, HbA1C).

In this study, PA can be increased by the intervention of the Health module of physical activity, which is used on changes in blood sugar. Several studies used modules focusing on multiple interventions by combining self-management such as diet, physical exercise, and medication for changes in blood sugar (22) (23). Thereby, the researchers tried in this study to focus on PA intervention by using the physical activity health module media used on changes in blood sugar.

METHOD

Design

The type of research used is quantitative research using the Quasi-Experimental method using the Two group pre-test and post-test design approach.

Sample, sample size, and sampling technique

Participants This study was conducted on patients with type 2 diabetes in Takalar Regency. Four health centers were randomly selected in Takalar District. Of the 105 types, two diabetes patients enrolled in the four health centers, and 100 participated in this study. Fifty participants in the intervention and 50 for the control group were enrolled in the baseline survey. All of these were followed up after the intervention for two months. The sampling method is a purposive sampling technique.

The instrument for data collection

The instrument used in this study was a glucometer as a tool to measure blood glucose levels, a watch, and an observation format. Measurement results will be read in 5-10 seconds.

Intervention

The intervention stage was given education in 3 sessions, each for 30 minutes. The first session discussed the basic concepts of DM, the second session discussed physical activity/exercise, and the third session concerned nutrition/foot care, diet, and monitoring that needs to be done. After attending the education on the same day, the treatment group was given a physical activity health education module and explained in detail the contents of the PA Health module. The control group provides unstructured education through leaflet media.

Data collection

After obtaining the number of respondents following the expected sample size, the respondents were divided into two intervention and control groups with the same number. Furthermore, respondents are expected to be present in the hall of the PHC, filling in data on the characteristics of the respondents. At this stage, the respondents also took peripheral blood samples to check blood sugar levels. The initial data were grouped according to the treatment and control groups for one month each.

Statistical Method

Continuous variables are expressed as mean and standard deviation (SD) or median and interquartile range (IQR), while categorical variables are presented as frequencies and percentages. Analysis was performed using SPSS-21 and a probability level of 0.05 was used throughout. Chi-squared and t-tests were used to determine the comparability of the intervention and control groups.

Ethical consideration

This research was conducted with the approval of LPPM STIkes Tanawali Takalar. With research code of ethics: 0.24/LPPM STIKES TANAWALI. VII. 2022. Informed consent and consent were obtained from participants.

RESULTS

Characteristic of respondents

Table 1 shows the baseline characteristics of all participants in the two groups. No significant difference was observed between the two groups in age, the mean age was 55.07 years (SD = 9.94, range: 31-79). (Intervention group: 54.72 years and control group: 56.70 years).

Comparison of FBG between intervention and control groups after receiving treatment

The difference shows that after being given treatment, it appears that the

difference in FBG in the intervention group has decreased after receiving treatment in the form of a physical activity health module with a p-value of <0.05.

Table 1 Characteristics of Respondents

Characteristics	Group			
	Intervention		Control	
	n	%	n	%
Gender				
Man	7	14	11	22
Woman	43	86	39	78
Total	**50**	**100**	**50**	**100**
Education				
No/Never been to school	1	2	3	6
Did not finish elementary/middle school	3	6	5	10
Graduated SD/MI	10	20	14	28
Graduated from junior high school/junior high school	10	20	6	12
Graduated high school / high school	15	30	14	28
Graduated D3/D2/D1	2	4	3	6
Graduated College	9	18	5	10
Total	**50**	**100**	**50**	**100**
Work				
Doesn't work	12	24	12	24
Civil servant	5	10	6	12
Private employees	2	4	0	0
Self-employed	5	10	5	10
Farmer	6	12	4	8
Fisherman	0	0	0	0
Labor/Driver/IRT	4	8	12	24
Retired	16	32	11	22
Total	**50**	**100**	**50**	**100**
Long time suffering from DM				
≤ 5 Year	23	46	22	44
≥ 5 Year	27	54	28	56
Total	**50**	**100**	**30**	**100**
Treatment				
Oral	30	60	39	78
Injection	11	22	9	18
Oral/Injection	9	18	2	4
Total	**50**	**100**	**50**	**100**

Table 2 Comparison of FBG between intervention and control groups after receiving treatment

		Mean	SD	Diff. Mean	P
Post FBG	Intervention	170.58	62.22	-29.48	0.007
	Control	200.06	55.82		

Mean Differences of FBG before and after receiving treatment in both groups

Table 3 shows that the difference in FBG results before and after receiving treatment in the treatment group using the Wilcoxon FBG test decreased by -39.18 points and had a significant value of p 0.000, namely p <0.05. Meanwhile, in the control group, the FBG of respondents in the control group also decreased even though they did not receive treatment in a Health Module as in the intervention group. However, the decrease in scores on these variables is minimal. The change in FBG yield decreased by -10.26 and had a significant value (p 0.000 for p<0.05).

Table 3. Mean Differences of FBG before and after receiving treatment in the intervention group and control group

Intervention Group					
Variable		Mean	SD	Different Mean	P
FBG	Before	209.76	76.57	-39.18	0.000
	After	170.58	62.22		
Control Group					
FBG	Before	210.32	54.65	-10.26	0.000
	After	200.06	55.82		

Discussion

Based on table 3 shows that there is a significant effect of providing Health Education with physical activity Health module media or using prolanis education media on changes in blood sugar clinical outcomes. The only differences from before and after treatment from the two groups

show that the Health module intervention media activity and The physical therapy given are more effective in changing blood sugar than the usual treatment through education through the Prolanis program.

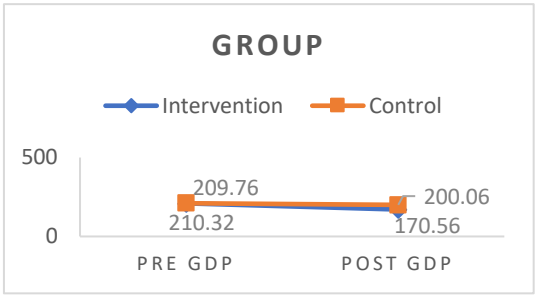

Figure 1 Differences between intervention and control group

The provision of Health Education using the Health module significantly influences changes in blood sugar. Based on the researcher's assumption, one of the factors is the media module is a suitable educational medium based on the characteristics of respondents who can provide precise information regarding the importance of physical activity. Supported the features of respondents based on the level of education shows that about 30% of respondents have a high school education. The level of education strongly supports the receipt of information and changes in respondent behavior. The media used is designed to display information related to essential activities in lowering blood sugar.

Some research (24–26) explained the same in this study, providing education on self-care behavior can lower blood sugar. Teaching with the Physical Activity Health module can change the behavior of DMT2 patients to be able to be physically active with information related to the importance of physical activity in controlling blood sugar. The ability of respondents to control their blood sugar cannot be separated from many factors, one of which is the ability of respondents to understand the contents of the modules provided clearly. The physical activity health module is designed with information that is easy to understand and combined with educational pictures from references from the Ministry of Health regarding the importance of physical activity in controlling blood sugar.

There is no difference between the FBG values in the intervention and control groups. They both have a significant effect, but if the delta values of each group are compared. Statistical testing is performed, and it can be seen that there are substantial differences between the intervention group and the control group, which can be seen in table 3. Providing Physical Activity Health Module Education with the Prolanis program education media significantly reduces FBG more than the prolanis program media. However, using the prolanis program media can also reduce FBG.

This difference in results occurs because every individual needs continuous education on an ongoing basis. The current educational media that is widely used, namely leaflets, are generally used by Puskesmas. It cannot answer demands for such education due to the nature of brochures, which are easily damaged and only last for a while. The existence of a media module to carry out DM self-management more effectively can meet the patient's need for long-term education. Thus it can be said that maintaining glucose levels near normal can help delay or prevent complications of diabetes and reduce the impact of excessive.

Changes in blood sugar cannot be separated from many factors, one of which is activating self-efficacy in the Health module. According to (27), efficacy-activated processes consist of cognitive, motivational, practical, and selection processes. Cognitive processes in this study were clearly shown from the provision of education. The provision of education will stimulate individuals directly to be able to change the mental processes of self-DMT2 patients for physical activity to control their blood sugar. Likewise, the education provided will be

able to change self-efficacy for physical activity in controlling blood sugar.

This study has several limitations, namely, not directly observing PA levels using the International Physical Activity Questionnaire (IPAQ) based on the Metabolic Equivalent of Task (MET) - hours/week. The study was only conducted in the Takalar region, so the results of this study cannot be generalized to other places and populations around the world. Compliance with drug therapy consumed by respondents during the study could not be appropriately controlled.

CONCLUSION

In short, education through health media and physical activity can significantly contribute to changes in FBG. Further research is continued with interventions focusing on exercise in T2DM patients in Takalar Regency.

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