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Factors correlated to physical activity among diabetes type 2 patients

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ABSTRACT

Physical activity is an important strategy for the management of diabetes type 2 mellitus. However, this recommendation is related to physical barriers. Diabetes mellitus type 2 patients showed lower scores in energy use, number of steps and duration of physical activity compared to healthy individuals. This study aimed to identify factors that affected physical activity among diabetes type 2 patients. A cross-sectional design was used in this study. This study was conducted in Kabupaten Tuban, East Java, Indonesia. A total of 105 diabetes type 2 patients followed the program Prolanis from the community health center. Data was collected using paper-based questionnaires, which were aslked the demographic characteristics, knowledge about physical activity, diabetes management self-efficacy, and international physical activity questionnaire (IPAQ) during March to October, 2020. Ordinal logistic regression was used to examine the factors that affected physical activity of diabetes type 2 patients. This study found that complication, knowledge and self-efficacy have significantly affected physical activity among diabetes type 2 patients. This information is beneficial to develop nursing care interventions and approaches to increase the physical activity of patients with type 2 diabetes mellitus.

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1. INTRODUCTION

Diabetes is a multisystem disorder associated with complications, and its prevalence is increasing worldwide. The rapid economic changes in Southeast Asia have resulted in a shift in epidemiology leading to a change in the burden of disease from communicable to non-communicable diseases. Furthermore, Asian people have a strong ethnic and genetic predisposition to diabetes incidence and a low threshold for environmental risk factors. Indonesia as part of an Asian country has a prevalence of diabetes type 2 of 18 million people (7%) in 2016, risk factors include being overweight, obesity, and physical inactivity [1]–[4].

Physical activity is an essential strategy for the management of diabetes mellitus type 2 [5], [6]. However, this recommendation for physical activity deals with physical problems in type 2 diabetes mellitus patients [7]–[9]. Patients with diabetes mellitus type 2 experience lower physical activity performance compared to healthy individuals. Furthermore, patients with diabetes mellitus type 2 showed lower values in energy use, number of steps and duration of physical activity when compared to individuals who did not experience diabetes mellitus type 2 [10].

Diabetes is a major health problem all over the world. The international diabetes federation (IDF) estimates that as many as 425 million people in the 20-79 years age group worldwide suffer from diabetes mellitus. This figure is expected to increase to 629 million people by 2,045 if the current trend continues. The

prevalence of diabetes mellitus in Southeast Asia ranks third in the world, namely 8.5%. It is estimated that the prevalence will increase to 11.1% in 2045. Meanwhile, IDF data shows that diabetes mellitus sufferers in Indonesia rank sixth in the world, namely 10.3 million people and are estimated to increase to 16.7 million people in 2045 [11].

Previous studies have shown that people with diabetes mellitus still show low levels of physical activity. Data in the United States shows that only 39% of adults with diabetes engage in physical activity compared to 58% of other adults. Meanwhile in Brazil, from an evaluation of 121 diabetics, it was found that only 26.4% did physical activity. A research in Turkey, of 129 diabetes mellitus sufferers, found that 39.5% of patients who do low physical activity [12]–[16]. Previous research in Indonesia showed that 70% of diabetes mellitus patients still showed light physical activity, only 30% showed moderate-to-heavy activity levels [17].

Patients with diabetes mellitus type 2 experience disturbances in glucose uptake into skeletal muscle cells due to insulin receptor disorders [18]. However, physical activity can help the process of delivering glucose to these skeletal muscle cells. Physical activity can increase glucose transporter type 4, (GLUT 4) help fatty acid oxidation and accelerate glucose absorption. The process of increasing insulin sensitivity can last up to 60 hours and will return to its original state after three to five days. Therefore, physical activity becomes important for patients with diabetes mellitus type 2 in controlling glucose. Conversely, low physical activity results in patients with diabetes mellitus type 2 experiencing impaired glucose control [18]–[21].

Previous studies showed that supervised physical activity resulted in improved values in patients with diabetes mellitus type 2, through observation of glycemic control, body weight and cardiovascular risk factors. The results of this study showed better glycemic control in patients with diabetes mellitus type 2, this was indicated by the improvement in the hemoglobin A1c (HbA1c) value in patients who did physical activity with supervision and physical activity combined with aerobic and weight [22], [23]. The objective of this study was to identify factors that affected physical activity among diabetes type 2 patients.

2. RESEARCH METHOD

A cross-sectional design was used for this study, from March to October, 2020. This study was approved by the ethical review board (ERB) committee of the Poltekkes Kemenkes Surabaya (EA/175/KEPK-Poltekkes_Sby/V/2020). Data were collected by paper-based questionnaires consisted of the demographic characteristics, knowledge of physical activity, self-efficacy of diabetes management, and International physical activity questionnaire (IPAQ), for measuring the physical activity level, during March to October, 2020. The results of the validity and reliability test of the questionnaire showed the Cronbach alpha value 0.71. Purposive sampling method was used in this study 105 respondents met the criteria and were involved in the study.Ordinal logistic regression was used to examine the factors affected diabetes type 2 patients' physical activity. The descriptive data analysis used to analyze patients' demographic characteristics, namely age, gender, body mass index (BMI), duartion of diabetes, complication, diabetic ulcer, knowledge about physical activity, and diabetes management self-efficacy. Spearman rank was used to examine the correlation between the variables ($p<0.05$).

3. RESULTS AND DISCUSSION

3.1. Sample characteristics

Table 1 presents information regarding the characteristics of diabetes mellitus patients in the working area of the public health center (*pusat kesehatan masyarakat*/Puskesmas), Tuban District, Tuban Regency, East Java, Indonesia. Almost half (42.9%) diabetes mellitus patients were in the 55-64 years old. Meanwhile 52.4% patients were female. Most of them were in the range 18.5-25 of BMI (72.4%). Majority (78.1%) of the patients had been diagnosed for more than one year. Furthermore, based on the complications suffered, majority (80%) of diabetes mellitus patients had no complications. Majority (97%) of diabetic patients have no experience diabetic ulcers. Characteristics of knowledge of diabetes mellitus patients indicate that 55.2% still have a low level of knowledge about physical activity. Meanwhile 61.9% of patients showed less self-efficacy.

3.2. Factors correlated to physical activity

Table 2 shows that complications, knowledge and self-efficacy had a statistically significant relationship with the physical activity of patients with diabetes mellitus type 2. Meanwhile, age, gender, BMI, and degree of decubitus ulcer had no significant relationship because the p-value was more than 0.05. Spearman test analysis of the effect of complications on the physical activity of patients with diabetes mellitus type 2 showed a value of $R=0.304$ with a value of $p=0.002$. These results indicate that there is sufficient influence between complications and physical activity with a negative direction, which means that

the more complications suffered by the patient, the lower the level of physical activity. Furthermore, the analysis of the relationship between knowledge and physical activity shows the value of R=0.683 and the value of p=0.000. This result indicates a strong positive correlation between knowledge and physicial activity among diabetes mellitus type 2 patients. Meanwhile, the analysis of the relationship between diabetes management self-efficacy and physical activity shows the value of R=0.752 and the value of p=0.000. This result means that there is a very strong relationship between self-efficacy and physical activity of diabetes mellitus type 2 patients.

Table 1. Respondents' characteristics (n=105)

Characteristics	n	%
Age		
25-34	1	1
35-44	4	3.8
45-54	25	23,8
55-64	45	42.9
65-74	26	24.8
75+	4	3.8
Total	105	100
Gender		
Male	50	47.6
Female	55	52.4
Total	105	100
BMI		
<18.5	6	5.7
18.5-25	76	72.4
>25	23	21.9
Total	105	100
Duration of diabetes		
< 1 year	23	21.9
>1 year	82	78.1
Total	195	100
Complications		
No complications	84	80
One complication	16	15.2
More than one complication	5	4.8
Total	105	100
Diabetic ulcer		
No ulcers	102	97
Grade 1	1	1
Grade 2	1	1
Grade 5	1	1
Total	105	100
Knowledge about physical activity		
Low	58	55.2
Good	47	44.8
Total	105	100
Diabetes management self-efficacy		
Low	65	61.9
Good	40	38.1
Total	105	100

Table 2. Correlation between factors and physical activity (n=105)

Variables	R	p-value
Age	-0.187	0.057
Sex	0.091	0.355
BMI	-0.071	0.469
Diabetes period	-0.122	0.216
Complication	-0.304	0.002*
Diabetic ulcer	-0.135	0.168
Knowledge	0.683	0.000*
Self-efficacy	.752	0.000*

Significant at α=0.05

Table 3 shows the final results of ordinal logistic regression to analyze the factors that affect the physical activity of type 2 diabetes patients in the working area of the Puskesmas, Tuban District, Tuban Regency, East Java, Indonesia. Ordinal logistic regression analysis showed that there were three factors that

significantly affected the physical activity of diabetes type 2 patients, namely knowledge and diabetes management self-efficacy.

Complication has a value of p=0.000 with an estimate value of 25.049. These results indicate a significant effect in a positive direction, with the calculation of the odds ratio (25.049)=75.6. From these results, patients who did not have complications had a 75.6 times chance of having high physical activity than patients who had complications. Knowledge about physical activity has a value of p=0.008 with an estimate value of -1.953. These results indicate a significant effect in a negative direction. The calculation of the odds ratio is (1.953)=7.05. From these results, it was found that patients with less knowledge had a 7.05 chance to do less activity than patients with good knowledge of physical activity.

The results of the self-efficacy analysis show the value of p=0.000 with an estimate value of -3.376. These results indicate a significant effect in the negative direction. The calculation of the odds ratio is (3.376)=29.25. These results suggest that patients with self-efficacy are 29.25 times less likely to show lower physical activity than patients with good diabetes management self-efficacy.

Table 3. Logistic regression of factors correlated to physical activity

		Estimate	Std. error	Wald	p-value	95% CI	
Physical activity	Low	-6.2777	0.840	55.870	0.000	-7.923	-4.631
	Moderate	-1.954	0.472	17.165	0.000	-2.879	-1.030
Complication	No complication	25.049	0.671	1393.168	0.000	23.733	26.364
Knowledge	Less	-1.953	0.738	6.993	0.008	-3.400	-0.505
Self-efficacy	Less	-3.376	0.764	19.505	0.000	-4.874	-1.878

Significance at α=0.05

3.3. Discussion

The study found that there are three factors (complications, knowledge about physical activity and diabetes management self-efficacy) that influenced the physical activity of diabetes mellitus type 2 patients in the Tuban District, Tuban Regency. Patients with no complications have a 75.6 times chance of having higher physical activity than patients with complications. Patients with lower knowledge about physical activity had a 7.05 chance of having lower level of physical activity. Patients with less self-efficacy are 29.25 times less likely to have physical activity than patients with good self-efficacy.

Previous studies indicated many factors that contribute to physical activity in diabetes patients type 2 are physical fitness, strength and flexibility, good sleep at night, and social interactions, attitude and self-efficacy [7], [24], [25]. Study by Kocatepe and Kizilci [26] revealed that physical activity level for diabetic females and males diminish when their income status declines. Physical activity level in females diminishes in line with the increase to their body mass index. Previous study by Linder *et al.* [27] found that physical inactivity is associated with advanced age, poor educational attainment, and low family income, among other risk factors. Study in Botswana by Shiriyedeve *et al.* [28] found that age and siting time (sedentary time) showed negative correlation to physical activity level, instead of it was statistically non-significant.

On the other hand, there are some factors that hinder physical activity, including family responsibilities, busy schedules and a lack of family support, duration of diabetes, obesity and heavy traffic environment, and physical exertion [7], [29], [30]. Meanwhile, there are discriminant factor that determine physical activity for diabetes type 2 patients which are culture and tradition, lack of skill and knowledge, fatigue, safety, lack of time, weather condition and lack of local facilities. However, differently from the result of this study, in a study by Fattahi *et al*. [24] that knowledge does not show a significant relationship.

4. CONCLUSION

The results of this current study indicated a significant influence of complications, knowledge about physical activity and diabetes management self-efficacy. Thus, efforts to increase the level of physical activity of diabetes type 2 patients can be focused on efforts to improve these three factors. This information is beneficial to develop nursing care interventions and approaches to increase the physical activity of patients with type 2 diabetes mellitus.

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