



**THE ANALYSIS OF THE RELATIONSHIP BETWEEN COMPLIANCE  
ACTIVITIES OF DIABETES MELLITUS PATIENTS AND THE EVENT OF  
DIABETIC ULCUS**

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**ABSTRACT**

Diabetes Mellitus is a chronic disease that causes various complications, one of which is diabetic ulcers. This requires maximum management and compliance of DM patients. Activity compliance is one of the factors that influence the incidence of diabetic ulcers. This study is a correlation study that aims to determine the relationship between the activity compliance of diabetes mellitus patients with the incidence of diabetic ulcers. The research method used is a cross sectional study. The sampling method used consecutive sampling technique with a total sample of 22 samples. The research site was conducted in five wound care clinics spread across the district of Yogyakarta Province. Based on the results of the study, it is known that the highest age is 56-65 years (50%), the highest level of education is at the junior high and high school levels (27.3%), the most type of work is self-employed (40.9%), the most type of DM is DM type 2 (68.2%), the duration of suffering 10-15 years (50%), the highest degree of ulcer was grade 1 (45.5%), and as many as 77.3% patients were not obedient in carrying out physical activities. Based on the results of the correlation test, it is known that activity compliance is not associated with the incidence of diabetic ulcers ( $p$  value > 0.05). Activity compliance is not associated with diabetic ulcers.

**Keywords:** diabetes mellitus; diabetic ulcer; physical activity compliance

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**INTRODUCTION**

Diabetes Mellitus (DM) is a metabolic disorder in which the human body cannot produce or use insulin properly. Diabetes Mellitus (DM) is a metabolic endocrine disorder disease characterized by a lack of the insulin hormone in the body. It is the most common disorder affecting more than 100 million people worldwide. Diabetes, which is caused by a lack of the insulin hormone, can damage many systems in the body, especially blood vessels, eyes, kidneys, heart and nerves (Nagesh et al., 2020). Insulin is a hormone that the body needs to convert sugar into energy. In the absence or reduced amount of insulin in the body will cause an abnormal process in which blood sugar levels become high beyond tolerance limits. DM is the oldest type of disease and causes many deaths from the 14th century (Chaudhary & Tyagi, 2018). It is estimated that 300 million people worldwide will suffer from diabetes by 2025 (Jupiter et al., 2015).

Globally, there are 463 million people with diabetes worldwide, an increase of 51%. In North America and the Caribbean, it has reached 48 million sufferers. Parts of Central and South America reached 32 million sufferers. Africa has 19 million and Europe has 9 million

sufferers. Parts of North and East Africa, it has reached 55 million sufferers. The West Pacific region has 163 million sufferers and Southeast Asia alone 88 million sufferers. Indonesia ranks 7th with a prevalence of 10.7 million people with DM, of which 73.7% are adults to the elderly (International Diabetes Federation, 2013). In the Province of the Special Region of Yogyakarta (DIY), the prevalence of DM is on average 2.44% in residents of all ages in five districts and cities. The highest prevalence is in the city of Yogyakarta, which is 3.86% (Kemenkes, 2019).

In DM patients, the most serious complication is foot problems. Foot problems are a serious problem and require large costs for patients, and extra care (Schaper et al., 2016). Diabetic foot ulcer is one of the complications of diabetes that is directly related to major morbidity, mortality, and decreased quality of life and is the most serious complication of diabetes mellitus (Jupiter et al., 2015). The prevalence of the incidence of diabetic foot incidents is still increasing. Diabetic foot disease has several pathologies, especially diabetic peripheral neuropathy and peripheral arterial disease resulting in foot ulceration. Diabetic foot ulceration can lead to amputation, especially when wound infection occurs (Amin & Doupis, 2016). According to the 2013 International Diabetes Federation (IDF), it is estimated that there is at least one limb lost due to diabetic foot in the world every 30 seconds (International Diabetes Federation, 2013). The results show that the prevalence of diabetic foot among diabetic patients ranges from 3% to 13% globally (Zhang et al., 2019). Diabetic foot is the most common cause of hospitalized diabetic patients and has a major socio-economic impact (Khan et al., 2017). Patients with diabetic foot have a more than two-fold increased risk of death compared to diabetic patients without diabetic foot (Chammas et al., 2016).

In the management of diabetic patients, an appropriate and optimal treatment is needed. DM treatment is something that is not easy, requires a long form of treatment and support from all parties. Several studies, including those conducted in 2013 (Klein et al., 2013) and 2014 (Brunisholz et al., 2014) showed the same results that the management of diabetic patients with health knowledge is very important because the information provided helps them to manage their own health conditions, maintain blood glucose levels and prevent damage. Some forms of management of DM patients include; utilization of health services, blood glucose management, diet control, and physical activity (Schmitt et al., 2013).

The existence of a form of physical activity carried out by DM sufferers can have a significant influence on the occurrence of diabetes mellitus (Ponzo et al., 2021). This is also reinforced by research which states that there is a significant relationship between lifestyle such as diet and physical activity on the incidence of diabetes mellitus (Hariawan et al., 2019). The secretory system in the body will run more slowly if the patient does not do physical activity. As a result, there will be a buildup of fat content in the body which causes weight gain. Lack of physical activity causes a decrease in muscle contraction so that membrane permeability decreases as a result of high glucose levels in the blood. Physical activity is very beneficial in DM patients, but it will be very risky for DM patients with diabetic foot. Research (Tran & Haley, 2021) shows that physical activity such as exercising does not have a relationship or correlation with the incidence of diabetic foot. Based on this, further research is needed to determine the relationship between physical activity and the incidence of diabetic foot in patients with diabetes mellitus.

## **METHODS**

This study is a correlation study that aims to determine the relationship between the activity compliance of diabetes mellitus patients with the incidence of diabetic ulcers. The research method used is a cross sectional study. The sample in this study were DM patients who had diabetic ulcers who performed wound care in five wound care clinics spread across various districts in the Province of D.I. Yogyakarta. The number of samples in this study were 22 samples.

Sampling method using consecutive sampling technique, namely sampling by selecting samples that match the inclusion criteria until a certain time limit is met. The instrument used in this study was an activity or exercise compliance instrument consisting of 6 question items. Respondents are said to be obedient if they do sports or work with light or moderate physical activity regularly for 3-4 times / week and the total duration of activity is 90 minutes per week. It is said to be non-compliant if it is done irregularly or the total amount of activity is less than 90 minutes per week. This research has been declared ethically feasible by the Health Research Ethics Committee of Surya Global Yogyakarta STIKES with a letter of ethics number 1.31//KEPK/SG/III/2020.

## **RESULTS**

Table 1.  
 Characteristics of Respondents (n= 22)

Respondent characteristics	f	%
<b>Age</b>		
36-45	1	4.5
46-55	7	31.8
56-65	11	50.0
66-75	3	13.6
<b>Education level</b>		
Not school	5	22.7
Elementary school	2	9.1
Junior high school	6	27.3
Senior high school	6	27.3
Diploma	2	9.1
Bachelor	1	4.5
<b>Job</b>		
Civil servant	1	4.5
Enterpreuner	9	40.9
Farmer	8	36.4
Police/Soldier	2	9.1
Not employment	1	4.5
Retirement	1	4.5
<b>Type of DM</b>		
Type 1	7	31.8
Type 2	15	68.2
<b>Duration</b>		
<10 years	5	22.7
10-15 years	11	50.0
15-20 years	2	9.1
>20 years	4	18.2

Respondent characteristics	f	%
Grade of diabetic ulcer		
1	10	45.5
2	6	27.3
3	4	18.2
4	2	9.1
Physical activity compliance		
Compliance	17	77.3
Not compliance	5	22.7

Table 2.

The relationship between physical activity compliance with the incidence of diabetic ulcers (n=22)

	Correlation coefficient	p value
Physical activity compliance with the incidence of diabetic ulcers	0.158	0.481

The characteristics of the respondents in this study were based on age, education level, occupation, type of DM, length of suffering, ulcer degree and activity compliance level. From the results of the analysis, it is known that the highest age is 56-65 years (50%), the highest level of education is at the junior and senior high school levels (27.3%), the most type of work is self-employed (40.9%), the type of DM is type 2 DM (68.2%), length of suffering 10-15 years (50%), the most ulcer degree is grade 1 (45.5%), and as many as 77.3% patients are not obedient in carrying out physical activities. diabetic ulcer (p value>0.05).

## DISCUSSION

Respondents in this study are 22 patients with the highest number in the age group 56-65 years by 50%. The highest level of education is at the junior high and senior high school levels with the same number of 27.3% each. The type of occupation of most respondents is self-employed with a total of 40.9%. The most common type of DM suffered is type 2 which amounted to 68.2%. The longest patient suffering from DM is 10-15 years (50%). The results of previous studies conducted in Rio de Janeiro related to adherence in DM patients also obtained data that the highest age is in the 65 year age group and the longest duration of suffering from DM is 8 years (Marinho et al., 2018). Another study of DM patients with diabetic ulcers conducted in America found that the average age of DM patients is 66.3 years and in general the average age of DM patients is 65.8 years (Ramsey et al., 1999). The results of research conducted on type 2 DM patients in Iran found the characteristics of the highest level of patient education at the high school level, namely 38.6% with an age range of 45.8% between 50-64 years (Mirahmadizadeh et al., 2020).

The most common ulcer degree experienced by patients in this study was grade 1 as much as 45.5%. Data about the degree of ulcer is important to know to determine the treatment of the wound experienced by the patient. The most frequently used ulcer grade classification is the Meggitt Wagner classification which is divided into five degrees, namely only pain in the legs (grade 0), skin surface ulcers (grade 1), deeper ulcers (grade 2), ulcers involving the bones of the feet (grade 2). 3), gangrene of part of the leg (grade 4) and gangrene of the whole leg (grade 5). The research conducted at RSUD dr. Zainal Abidin and RSUD Meuraxa Banda

Aceh also found that the most common ulcers experienced by patients were grade 1 in the form of ulcers with minimal exudate, edged like cliffs, pink with minimal inflammation and occasional pain (Fitria et al., 2017).

A total of 77.3% of patients in this study did not adhere to physical activity in order to maintain health and control blood sugar levels. The category of physical activity in this study was light physical activity with a monitored pulse, involving the cardiovascular muscles and carried out for 20-30 minutes regularly 3 times a week. The recommended physical activities for DM patients are jogging/walking, cycling and gymnastics. Strenuous sports such as badminton, tennis and aerobics are not recommended.

Based on these criteria, the results of research conducted in the working area of the Rowosari Health Center Semarang City also showed that 59% of DM patients were not compliant with physical activity (Zakiyyah et al., 2019). The results of this study are supported by previous studies on type 2 DM patients in Rio de Janeiro that only 22.5% of patients had good adherence to sports or physical activity. Non-adherence to this activity is associated with high blood sugar levels of the patient. In addition, pain and neuropathy suffered by patients are also the cause of non-adherence to these physical activities (Marinho et al., 2018).

Most of the patients in this study belonged to the elderly group, the age factor was also the cause of non-adherence to physical activity. This is reinforced by previous studies, where elderly patients and women were equally uninterested in physical activity. Elderly patients have physical limitations related to age as well as several complications of the disease so that they feel unable to carry out physical activities (Cartagena & Tort-nasarre, 2021). Non-adherence to physical activity can be caused by internal and external factors of the patient. Self-decision not wanting to do physical activity is an internal factor, while pain, fatigue and depression are external factors (Qiu et al., 2012).

Compliance with physical activity is not related to the degree of ulcer suffered by the patient. An important factor related to knowledge and health literacy is the level of education. Patients with a high level of education will have good knowledge and health literacy so that they will adhere to medication, diet and physical activity. Increasing adherence to physical activity in DM patients will help achieve therapeutic goals and prevent disease complications (Soares et al., 2020).

The results of another study stated that there was no significant relationship between dietary compliance, physical activity and age with the incidence of diabetic ulcers in DM patients. Variables that have a significant relationship with the incidence of diabetic ulcers are duration of diabetes mellitus, exercise habits, medication adherence, exposure to cigarette smoke, use of footwear, foot care and history of ulcers (Mitasari et al., 2014). Other studies have found that factors related to physical activity compliance are age, gender, occupation, perceived obstacles, self-efficacy, family support and support from health workers (Zakiyyah et al., 2019).

## **CONCLUSIONS**

There were 77.3% of DM patients with diabetic ulcers who did not adhere to physical activity in this study. Compliance with physical activity has no relationship with the degree of diabetic ulcers in patients.

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