

Nutrition Status Related to Diabetic Ulcer

Mahfud¹, Saktya Yudha Ardhi Utama¹, Heru Ginanjar Triyono¹

¹Departement of Nursing, Faculty of Health Science, Universitas Alma Ata, Jalan Brawijaya No. 99
Yogyakarta, Indonesia 55183

ABSTRACT

Background: Diabetes Mellitus (DM) patients often have wounds on the feet called diabetic ulcers. Pathologically diabetic ulcers undergo changes due to an infection that causes ulceration. This ulceration is associated with abnormalities in the neurological system and peripheral diseases to varying degrees. Body Mass Index (BMI) was used to measure the nutritional status. A balanced of BMI has an effect on the wound healing process.

Objectives: Knowing the nutrition status (BMI) related to the degree of diabetic ulcers in the Internal Medicine Polyclinic.

Methods: The research method used was observational analysis with a cross sectional study approach using purposive sampling technique and Spearman rank statistical analysis. The sample in this study were 24 respondents who were outpatient in the internal medicine clinic.

Results: The results showed the value = 0.003 means that $p < 0.05$. The results showed significant relation between nutrition status (BMI) and the degree of diabetic ulcer with a correlation coefficient of 0.588 with a moderate correlation strength of 0.4-0.6. The results showed that most respondents were female with age between 50-64 years, most worked as farmers. Nutrition status (BMI) shows that most of the pre-obesity with the highest degree of ulcer is grade 2.

Conclusion: Nutrition status (BMI) related to ulcer diabetic degree.

Keywords: BMI, Diabetic Ulcer

INTRODUCTION

Complications of Diabetes Mellitus are diabetic ulcers that occur in the legs, called diabetic ulcers in DM patients because they experience pathological changes due to infection, giving rise to ulcerations associated with neurological abnormalities, and peripheral diseases of varying degrees (1). In 2017 the prevalence of diabetic ulcers in Indonesia was 15% of the total DM patients and 23% was the cause of amputation (2).

Previous research by Irwan (2016) mentions that one of the risk factors for diabetic ulcers is the poor diet of DM patients (3). DM patients with complications of diabetic ulcers need nutrition management so that glucose levels go down and be maintained properly, so that the wound healing process becomes fast. Maintaining nutrition in patients with diabetic ulcers is important by regulating a balanced diet, the right composition and the correct amount of food portions, regularly, so that glucose levels can be controlled (4).

The description of nutritional status can be known through nutritional prevalence based on Body Mass Index Indicators (BMI). In adult women the weight is heavier than in adult men. At the age of 35-59 years men and women gain an average weight gain (2). The prevalence of obesity in the average population is influenced by lifestyle, because there are many instant food choices and unhealthy lifestyles, thus causing an increase in the number of DM diseases, so it is necessary to adjust the eating schedule (5).

Based on preliminary studies conducted at the Internal Medicine Polyclinic that the visit of diabetic ulcer patients in the last three months was an average of 75 patients. This means that every month on average 25 patients. Based on a preliminary study, the researcher intends to find out the relationship between nutritional status and the degree of diabetic ulcer.

MATERIALS AND METHODS

This type of research is a correlative quantitative study (Correlational Studies), using observational analysis methods with a cross sectional study approach. The purposive sampling technique uses the Spearman Rank statistical test. This research was conducted in 2018 at the Internal Medicine Polyclinic with a total of 24 patient respondents

RESULT AND DISCUSSION

Respondents' characteristic

Table 1. Respondents' characteristic distribution based on sex, age and occupation.

Respondents' characteristic	Freq	Presentation(%)
Sex		
male	8	33.3
female	16	66.7
Age		
very productive 15- 49	7	29.2
productive 50-64	17	70.8
Occupation		
IRT	6	25.0
farmer	10	41.7
worker	1	4.2
entrepreneur	4	16.7
not working	3	12.5

Premier data 2018

Table 1 shows that the characteristics of respondents are mostly female with a total of 16 people (66.6%), productive ages 50-64 years with a total of 17 people (70.8%), most of them work as farmers, 10 people (41.7%)

Univariate analysis

Nutrition Status (BMI)

Tabel 2. Nutrtition status frequency

Nutrition status (BMI) (kg)	Freq	Presentation (%)
Underweight : < 18,5	0	0
Normal : ≥ 18,5 – 24,9	10	41.7
Overweigh ≥ 25	0	0
Pra – obesitas ≥ 25,1- 29,9	12	50.0
Obesity grade 1 ≥ 30,0 - 34,9	2	8.3
Obesity grade 2 ≥ 35,0 – 39,9	0	0
Obesity grade 3 ≥ 40	0	0

Premier data 2018

Based on Table 2 that most respondents nutritional status (BMI) in the pre-obesity category were 12 (50.0%) with nutritional status level 1 obesity as many as 2 (8.3%) and in the normal category were 10 people (41.7%), which means that nutritional status (BMI) affects pre-obesity

Ulcer Diabetic Degree

Tabel 3 Frequency distribution of the degree of diabetic ulcers in diabetics in DM patients

Degree of Ulcer Diabetic	Freq	Presentation (%)
Degre 0	0	0
Degre 1	7	29,2
Degre 2	12	50,0
Degre 3	5	20,8
Degre 4	0	0
Degre 5	0	0
Total	24	100

Premier Data 2018

Based on **Table 3** shows that the highest number of diabetic ulcers is grade 2 diabetic ulcers with the number of patients 12 people (50.0%) means that the most frequent dipole clinic in diabetics is from degree 2 of the number of respondents as many as 24 patients

Bivariat analysis

Nutrition status (BMI) related to with the degree of diabetic ulcer with the Spearman rank test on both variables with an ordinal scale

Table 4. Nutritional status (BMI) is related to the degree of diabetic ulcer

Nutrition status (BMI)	Diabeticum Ulcer Degree												p-value	Corelation					
	D0		D1		D2		D3		D4		D5				total				
	n	%	n	%	n	%	n	%	n	%	n	%			n	%			
Underweight < 18,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0.588
Normal ≥ 18,5 – 24,9	0	0	6	25,0	3	12,5	1	4.2	0	0	0	0	0	10	41.7				
Overweight ≥ 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Pra – obesity ≥ 25,1 – 29,9	0	0	1	4.2	9	37.5	2	8.3	0	0	0	0	0	12	50.0				
Obesity stage 1 ≥ 30,0 – 34,9	0	0	0	0	0	0	2	8.3	0	0	0	0	2	8.3					
Obesity Stage 2 ≥ 35,0 – 39,9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Obesity Stage 3 ≥ 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

Premier data 2018

Based on **Table 4** shows that respondents with nutritional status (BMI) in the normal category amounted to 10 with presentations (41.7%) the highest average number of degrees of ulcer level 1 with a total of 6 patients (25.0%). In the nutritional status (BMI) mostly occurs in pre-obesity with a total of 12 respondents in the category of ulcer degree 2 with a total of 9 respondents (37.5%).

Based on the cross table of statistical tests using the Spearman Rank obtained $p\text{-value} = 0.003$, meaning that the $p\text{-value}$ is less than 0.05, it can be concluded that there is a significant relationship between nutritional status (BMI) with the degree of diabetic ulcers with Spearman correlation coefficient values A rank of 0.588 means that the direction of the positive correlation means that the worse the nutritional status, the higher the degree of the ulcer. The correlation strength is in the 0.4-0.6 category

DISCUSSION

Respondents' character

Sex

In **Table 1** shows that the characteristics of respondents based on female sex is the most with the number of 16 respondents (66.7%), compared with male respondents number 8 (33.3%). This means that DM is often found in the sexes of women compared to men.

DM often occurs in women because women have higher LDL or bad triglyceride cholesterol compared to men. Besides the amount of fat in adult men between 15-20% of total body weight, while women between 20-25%, meaning that increased levels of lipids (blood fat) in women are higher than men, so the risk factors for DM occur in females are higher than males (6). The results of previous studies

conducted by Purwanti (2013) said that diabetic ulcer sufferers were more common in the sex of women with frequency (64%) compared to men.

Other studies say that women at the age of menopause (40-45 years) have decreased estrogen production and insulin resistance, so hormonal changes in menopausal women will increase the risk of developing DM. Hormonal changes can affect the body's sensitivity to insulin, so menopause can increase blood sugar levels and can cause DM (7).

Based on research conducted, it can be concluded that women with an age range between 40-45 years with lifestyles and poor nutrition are vulnerable to the occurrence of diabetic ulcers.

Age

The results of research conducted on respondents with diabetic ulcers show that the average age of respondents at the most productive age is 50-64 years, namely as many as 1 respondent (70.8%) Human physiological changes will decrease after the age of 45 years. Increasing age of a person suffering from DM risk of diabetic ulcers due to decreased glucose homeostatic function resulting in insulin retention in the blood, this is caused by 4 factors namely a decrease in the composition of blood in the body, decreased physical activity resulting in a decrease in the number of insulin receptors, changes in diet and changes neurohormonal insulin (8).

Previous research said that there were 23 respondents (79.3%) aged = 50 years suffering from diabetic ulcers and there was a significant relationship between age and the occurrence of diabetic ulcers with an 18 times greater risk (9).

Based on the results of research conducted, it can be concluded that a person with a productive age range of 50-64 years has a high risk of diabetic ulcers, because with age, the physiological function of the body decreases such as decreased pancreatic function, so blood glucose control becomes unbalanced and causes complications like diabetic ulcers.

Occupation

Based on the results of the study showed that the respondents most employed as farmers were 10 respondents (41.7%), Works as IRT which is 6 respondents (25.0%), Working self-employed 4 respondents (16.7%), did not work as many as 3 respondents (12.5%), and working as a worker was 1 respondent (4.2%). The results of previous research suggested that the sufferer of diabetic ulcer is the

type of work that works as a farmer (33.3%) (10). Other research results show that respondents who work as civil servants are more organized in foot care compared to farmers (11). The results of research conducted by researchers are respondents who have jobs as self-employed more routinely do foot care and control of blood sugar, so that diabetic ulcers that they suffer on average are at 1 degree and have Nutritional status (BMI) in the normal category. Based on the results of the study can be concluded that the more established in the work of a person then they will have the ability to improve their health especially in the prevention of occurrence of diabetic ulcers By going through regular check of leg injuries to health workers or purchasing special footwear tailored to the shape of the legs.

Nutrition Status (BMI)

The indicator for measuring nutritional status in this study is BMI. Nutritional status (BMI) in this study was predominantly in the pre-obesity category (≥ 25.1 - 29.9 kg) of 12 (50.0%), normal nutritional status (BMI) category (18.5 - 24 , 9 kg) is not much different from pre-obesity which is 10 (41.7%), while the nutritional status (BMI) level 1 (≥ 30.0 - 34.9 kg) is 2 (8.3%), nutritional status (BMI) underweight (< 18.5 kg as much as 0 (0%), obesity level 2 (≥ 35.0 - 39.9 kg as much as 0 (0%), obesity level 3 (≥ 40 kg as much as 0 %).

Body Mass Index (BMI) is an indicator that can be done to assess fat reserves in the body. Increased BMI shows an increase in body mass proportion. Obesity occurs due to an imbalance between the entry and exit of energy from the body and due to a decrease in physical activity, causing fat accumulation in adipose tissue (12). Based on previous research shows that there is a significant relationship between obesity and the incidence of diabetic ulcers ($p = 0.034$), obesity is a risk factor for diabetic ulcers because obesity has a risk of diabetic ulcers of 2.8 times compared to non-obese (13). The results of this study are reinforced by the theory that the risk factors of type 2 diabetes mellitus are obesity / obesity factors that experience lifestyle changes from traditional to western lifestyles, for example: overeating, and relaxed living (lack of exercise) (4).

Nutritional status (BMI) in the normal category is not much different from the amount of pre-obesity nutritional status (BMI) which is as much as 10 (41.7%) because researchers limit the age of respondents 64 and below. Respondents with normal nutritional status (BMI) are found at very productive

ages, namely ages 15-49, where respondents can still control their nutritional status (BMI).

Ulcer Diabetic Degree

The degree of ulcer in this study was measured using the classification of ulcer degrees according to Wagner. Most of the diabetic ulcer degrees in this study were respondents who were in the 2nd degree ulcer category with a total of 12 respondents (50.0%). Diabetic wounds are a type of wound found in people with DM. Predisposing factors for diabetic ulcer formation are minor trauma, local infection, or local action (eg nail extraction) (14).

This theory is reinforced in a study conducted by Veranita (2016) that most respondents were in the degree of diabetic ulcer of degree 2 and diabetic degree 3. Diabetic ulcer is a chronic wound that is not easy to heal due to wound healing that is disturbed by several factors, one of which is the sufferer with more body weight and high blood glucose levels which results in a decrease in the ability of blood vessels to contract or relax so that the tissue perfusion of the distal part of the limbs becomes poor and if there is a diabetic ulcer then it becomes a fertile environment for the proliferation of pathogenic germs that are anaerobic, because blood plasma of people with diabetes mellitus that is not controlled and has a high viscosity so that the diabetic ulcer becomes inflated (15).

When the study was conducted several respondents with a degree of diabetic ulcer 2 - the average nutritional status (BMI) in the pre-obesity category who had a bad diabetic ulcer wound condition before treatment measures were taken for diabetic ulcers. Some respondents who control diabetic ulcer treatment but the condition of diabetic ulcers do not improve but get worse because they feel bored with long-standing illnesses, disobedient to take medication, irregular diet, irregular blood sugar control and disorderly conduct in treating ulcers diabetic.

Based on the results of the study it can be concluded that in maintaining the condition of diabetic ulcers so that there is no increase in the degree, patients with diabetic ulcers must pay attention in controlling nutritional status, diet, blood sugar control, regular treatment of diabetic ulcers, regular consumption of drugs so that the healing process of diabetic ulcers become faster.

Relationship between Nutritio Status (BMI) with diabetic ulcer degree

Based on the analysis conducted in this study that the majority of respondents nutritional status (BMI) are in the pre-obesity category that is 12 respondents or (50.0%), and the degree of diabetic ulcers on the average respondent is in the category of degree 2 ulcers with the number of respondents 12 respondents (50.0%). The Spearman Rank correlation coefficient value of 0.588 shows that the direction of the correlation is positive, which means the worse a person's nutritional status (BMI), the higher the degree of ulcer. The strength of the correlation between the two variables is moderate which is in the 0.4-0.6 category. BMI is a simple way to monitor the nutritional status of adults, especially those related to underweight and overweight. Maintaining a normal weight is a way to reach a longer life expectancy. Someone who is overweight is one of the causes of degenerative diseases and if you have less weight it will become susceptible to infection (16). DM sufferers will experience complications if they are not obedient in implementing the diet program so that they may be obese and increase blood glucose levels (1). In this study it was found that the average respondent had nutritional status (BMI) in the pre-obesity category. The results of previous studies show that obese patients have a 6 times higher chance of experiencing diabetic ulcers in the legs compared with patients without obesity conditions (3).

The results of this study were strengthened by the Shon study which showed patients with a Body Mass Index (BMI) > 25 kg / m² or more body weight had a higher risk of having diabetic ulcers in the legs than patients with normal BMI. (17). The results of the cohort study shows that the main factor for DM is overweight or fat. People with more weight have excessive calories because of the consumption of food which causes a lot of accumulation of fat tissue under the skin. Insulin resistance will arise, where fat tissue builds up will inhibit the action of insulin in the body's tissues and muscles so that glucose cannot be transported into cells and accumulate in blood vessels, and glucose will increase so that it will affect healing of diabetic ulcers (18) In this study respondents the most is in the 2nd degree category which is 12 respondents or (50.0%). This study is in line with research that mentions the majority of diabetic ulcer respondents on average with second-degree injuries, as many as 17 people (54.84%) (19). Based on the results of the study it can be concluded that someone with nutritional status (BMI) in the obesity category has a great chance of developing diabetic ulcers and affects the degree of diabetic ulcers. In patients with DM so that diabetic ulcers do not occur, care must be taken to maintain normal nutritional status, maintain adherence to therapy, wound care, control blood sugar, and take medication regularly.

CONCLUSION RECOMMENDATION

Based on the results of research and discussion, it can be concluded that:

Female respondents are the most respondents with a number of 66.7% or 16 respondents, the age of most respondents ranged from 50-64 years as many as 17 respondents or (70.5%), respondents worked more as farmers, as many as 10 respondents (41.7%). The most nutritional status (BMI) is pre-obesity as many as 12 (50%) respondents. The highest degree of diabetic ulcer is degree 2 with 12 (50%) respondents. There is a significant relationship between nutritional status (BMI) and the degree of diabetic ulcer, where the value (P value: 0.003), is smaller than the value of α (0.05), with a correlation value of 0.588 which means that the direction of the positive correlation with moderate correlation strength.

REFERENCES

- 1 Brunner dan Suddarth. Keperawatan Medikal Bedah Edisi 12. Jakarta: EGC; 2013.
- 2 Kementrian Kesehatan R.I, *Laporan Riset Kesehatan Dasar 2017*. Jakarta: Kementrian Kesehatan R.I; 2017.
- 3 Mustafa, I. A. H. Determinan Epidemiologis Kejadian Ulkus Kaki Diabetik pada Penderita Diabetes Mellitus di RSUD Dr. Chasan Boesoirie dan Diabetes Center Ternate (Doctoral dissertation, Universitas Airlangga). [Internet] 2016; Available from: <http://repository.unair.ac.id/53837/>.
- 4 Fransisca Kristiana. *Awas Pancreas Rusak Penyebab Diabetes*. Jakarta : Cerdas Sehat ; 2012.
- 5 Sumangkut, S., Supit, W., & Onibala, F. Hubungan Pola Makan dengan Kejadian Penyakit Diabetes Mellitus Tipe-2 di Poli Interna Blu. RSUP. PROF. DR. RD Kandou Manado. *Jurnal Keperawatan*. [Internet] 2016; 1(1). Available from <https://ejournal.unsrat.ac.id/index.php/jkp/article/view/2235>.
- 6 Perkeni. 2011. *Empat Pilar Pengelolaan Diabetes*. [online]. (diupdate 2 Februari 2011). <http://www.smallcrab.com>
- 7 Purwanti, O.S. (2013). Analisis faktor- faktor risiko terjadi ulkus kaki pada pasien diabetes melitus di rsud dr.moewardi . Skripsi. Jakarta : Universitas Indonesia
- 8 Fajrin, Nurmaulinda. Hubungan dukungan keluarga dengan kepatuhan diet dan minum obat pada pasien diabetes mellitus di wilayah kerja Puskesmas Pandak 2 Bantul, Yogyakarta. 2016. Universitas Alma Ata Yogyakarta.
- 9 Prastica, V.A. Perbedaan angka kejadian ulkus diabetikum pada pasien diabetes melitus dengan dan tanpa hipertensi di RSUD dr. Saifudin anwar malang. Tugas akhir. Malang. 2013: Universitas Brawijaya.
- 10 Sugiarto, I. (2013). faktor risiko yang berhubungan dengan terjadinya ulkus diabetik pada pasien diabetes mellitus tipe 2 di rsud. dr. margono soekarjo purwokerto. Skripsi. Purwokerto: Univeritas Jenderal Soedirman.
- 11 Indriani, R, Asyrofi, A, & Setianingsih, S. (2017). Studi kejadian ulkus diabetikum dan tingkat stres klien diabetisi. *Jurnal keperawatan*, 30-37.
- 12 Iswanto Yudi. Hubungan Indeks Massa Tubuh, Usia dan Kadar Glukosa Darah dengan Kadar total Kolesterol dan Trigliserida pada Anggota TNI AU di RSPAU dr Suhardi Hardjulukito. 2015. Universitas Alma Ata.
- 13 Hastuti, R. T. Faktor-Faktor Risiko Ulkus Diabetika pada Penderita Diabetes Mellitus (Studi Kasus di RSUD Dr. Moewardi Surakarta) (Doctoral dissertation, Diponegoro University). 2010
- 14 Delang S. F. (2010). Hubungan kadar glukosa darah dan lama menderita diabetes dengan derajat retinopati diabetika di rsup dr. kariadi semarang. Semarang. Univeritas Diponogoro.
- 15 Ferawati, Ira. Faktor-Faktor yang Mempengaruhi Terjadinya Ulkus Diabetikum pada Pasien DM Tipe 2 di RSUD Prof. Dr. Margono Soekarjo. [Internet] 2014. Ilmu Keperawatan Universitas Jenderal Soedirman, Purwokerto. Available from: <https://journal.umbjm.ac.id/index.php/healthy/article/download/67/7>
- 16 Supariasa, D.N, Bachyar, B dan Ibnu, F. Penilaian Status Gizi. Jakarta: EGC. 2012
- 17 Sohn, M.W, E. Budiman-Mak, T.A. Lee, E. Oh, dan R.M. Stuck. 2011. Significant J-Shaped Association Between Body Mass Index (BMI) and Diabetic Foot Ulcers. *Diabetes /Metabolism Research and Reviews* 27

- 18 Hu, F. B., Manson, J. E., Stampfer, M. J., Colditz, G., Liu, S., Solomon, C.G., dan Willett, W. C. 2011. Diet, Lifestyle, and the Risk of Type 2 Diabetes Mellitus in Women. *New England Journal of Medicine* 345.
- 19 Apriansyah, F. Hubungan Kontrol Glukosa Dengan Derajat Ulkus Pada Pasien Diabetes Melitus Di Poliklinik Kaki Diabetik RSUD Ulin Banjarmasin. [Internet] 2015. Available from: [Http: // Www. Academia. Edu / 23894836/ Hubungan Kontrol Glukosa Dengan Derajat Ulkus Pada Pasien Diabe Tes Melitus Di Poliklinik Kaki Diabetik Rsud Ul In Banjarmasin Tahun 2015.](http://www.academia.edu/23894836/Hubungan_Kontrol_Glukosa_Dengan_Derajat_Ulkus_Pada_Pasien_Diabetes_Melitus_Di_Poliklinik_Kaki_Diabetik_RSUD_Ulin_Banjarmasin_Tahun_2015)