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THE 1st INTERNATIONAL NURSING CONFERENCE

“Complementary Nursing Issues
and Updates in 2015”

STIKES Hang Tuah Surabaya

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THE EFFICACY OF BLOOD GLUCOSE CONTROL FOR REDUCE ULCER FOOT DEGREES AMONG PATIENTS WITH DIABETES MELLITUS

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ABSTRACT

One of the common complications of diabetes mellitus such as ulcer foot, infection, and gangrene. The high number of diabetic foot can caused by the existence of hyperglycemia. This research aim to determine the efficacy of blood glucose control for reduce ulcers foot in Diabetic Clinic RSUD Ulin Hospital Banjarmasin. This research is a quantitative research, the type of correlative research study. The population were outpatients with diabetes mellitus of complications diabetic ulcer which amounts to 31 people using simple random sampling technique. The Results were analyzed with Kendall's tau test. The result of this study has been showed that the majority of respondents fasting blood glucose control is poor (> 126 mg / dl) as many as 19 people (61.3%) and the majority of diabetic ulcers degrees on average patients are at stage II (71.0 %). Kendall's tau test results indicate that there were a significant correlation between blood glucose control with degree of diabetic ulcers in patients with diabetes mellitus. Nurses need to motivate patients with ulcer diabetic to actively control glucose in health care facilities.

Keywords: Glucose, Ulcer, Diabetic Foot

Introduction

Diabetes Mellitus (DM) is a group of metabolic diseases characterized by the increasing of blood glucose levels (Hyperglykemia) caused by abnormalities in insulin secretion, insulin action or both and can cause chronic complications in the eyes, kidneys, nerves, and blood vessels, with lesions on the basement membrane in electron microscopy examination (ADA, 2004 in Smeltzer & Bare, 2008).

Based on preliminary studies in Diabetic Foot Polyclinic Ulin Hospital Banjarmasin conducted by researchers on 22nd, 26th, and 27th November 2014 it is known that the

number of patients annually increased by the number of visits, in year 2011 amounted to 1468 people, the year 2012 amounted to 2194 people, year 2013 amounted to 2892 people, and in year 2014 from January to October total 2704 people.

One of the most common complications of diabetes mellitus is the diabetic foot (diabetic foot), which can be manifested as ulcer, infection, and gangrene (Askandar, 2006). The occurrence of foot problems started with hyperglycemia in people with diabetes that cause to neuropathy disorder and disorders of sensory or motor and autonomic neuropathy would result in various changes in the skin and muscles that

leads to change in the pressure distribution of the sole and will further facilitate the occurrence of ulcer. Their susceptibility to infection causing the infection is easily spread into a widespread infection. Factors of bad blood flow also will further add complexity to the management of diabetic foot (Askandar, 2001 in Wijaya and Putri, 2013).

Results of preliminary studies that have been conducted by researchers at the date of 26th November 2014 it is known that in 2014 from January to October the number of patients in the highest category of ulcer and diabetic ulcer generally suffered by patients was degree II. Average yield of 260-261 people per month visit the patient.

When blood glucose level in diabetic ulcer someone who has not controlled properly it will cause the impact on the sufferer's own leg condition, and therefore contributes to the ulcer degree. Based on the case of diabetic ulcer, 50% of diabetic leg will become infected as a result of the rise of blood sugar emergence fertile environment for the growth of pathogenic bacteria. Due to lack of oxygen supply bacteria will thrive, especially anaerobes. Hyperglycemic state that constantly will have an impact on the ability of blood vessels to contract and relaxation reduced. In addition, the ability of white blood cells 'eat' and kill germs is reduced on the condition of blood sugar levels above 200 mg% (this ability to recover when sugar blood level turned into normal and well controlled) (Maryunani, 2013).

According Isniati (2007) in the Journal of Public Health on "Knowledge Level Relationship Diabetes Mellitus Patients with Uncontrolled Blood Sugar in

Polyclinic Hospital Perjan Dr. M. Jamil Padang Year 2003 ", the result of this study showed that blood glucose control in people with diabetes is low. A total of 67.2% of patients had a fasting blood glucose levels were bad and 59.0% also had bad blood glucose levels 2 hours post-prandial. And according to Rinto, et al (2008) in a thesis on "The Relationship Between bad Attitude, Behavior, and Family Participation Against Blood Sugar Type 2 Diabetes Mellitus Patients in Hospital PKU Muhammadiyah in Yogyakarta on January-July 2008", the result of this study indicate as many as 54.3 % of patients with type 2 diabetes have bad control of blood glucose for 3 months (Kurniawati, 2012).

The high random blood glucose test levels that is more than 200 mg / dl in diabetes, will weakened the power of the white blood cells to kill germs so that infections are difficult to heal (Kariadi, 2009).

The research of relationship between glycemic control and amputations were carried out in the West, it found the risk of doubling the increase in foot lesions, including gangrene and ulcer. Analytic studies showed the risk of amputation statistically significant improvement with increased fasting blood glucose (FBS), post prandial glucose test, or HbA1c (Harris, et.al, 1995).

Among the five studies conducted on risk factors for foot ulcer in patients with diabetes mellitus is known that in the analysis of HbA1c or blood glucose positively correlated to foot ulcer. Bad glucose control contributes in increasing the risk of exacerbating the degree of ulcer and it influences the healing. Regular glucose control as

scheduled play a central role in the early treatment, care, and control of diabetes foot problems such as ulcer, as well as an indicator of foot infection. Glucose management should be done to optimize the metabolic disorders and improve leukocyte function. Nutritional and metabolic status of patients must be assessed and managed properly, because of the nutritional and metabolic disorders are relatively common in these patients may affect wound healing and resolution of infection (LeMaster and Reiber in Boulton, et.al, 2006; Frykberg, et.al, 2006).

Based on the results of preliminary studies on 26th and 27th November 2014 at the Diabetic Foot clinic Ulin Hospital Banjarmasin on blood glucose levels and the degree of diabetic ulcer in diabetes mellitus patients with diabetic ulcer in the patient sample as many as 10 people who carried out the examination offasting blood glucose (FBG) and the maintenance of ulcer during the last 3 months,knownthat FBG levels

is 110-125 mg / dl as much as 2 people and a fasting blood glucose levels >126 mg / dl as many as 8 people. The degree of ulcer consist of as much as 8 people in degree II and as much as 2 people in degrees III. It can be concluded on average patients suffering from ulcer with degree II and fasting blood glucose levels > 126 mg / dl. Among the 8 people with degrees ulcer II only 2 people that its FBG levels 110-125 mg / dl and for 2 people with degrees ulcer III, its FBG levels > 126 mg / dl.

Materials and Methods

This is a quantitative research, with the type of correlational research is to do observation on blood glucose control in diabetic ulcer degree. The samples were outpatients routinely control their blood glucose in Diabetic Foot clinic Ulin Hospital Banjarmasin with simple random sampling obtained a sample of 31 people. Data collected by observation and documentation study and were analyzed by Kendall's tau.

Result

1.Univariate Analysis

Researchers have made observations of diabetic foot wounds and blood glucose control to 31 respondent's. As for the observation of blood glucose control is presented in table 4.5 and the observation of the researchers on diabetic ulcer are presented in table 4.6 below:

a. Blood Glucose Control

Table 4.5 Distribution of Frequency Control of Blood Glucose in Patients with Diabetes Mellitus in Diabetic Foot clinic Ulin Hospital Banjarmasin 2015

No.	Fasting Blood Glucose Control Category	f	%
1.	Good: 80-109 mg/dl	5	16,1
2.	Medium: 110-125 mg/dl	7	22,6
3.	Bad: \geq 126 mg/dl	19	61,3
Amount		31	100

Table 4.5 shows that respondent's category fasting blood glucose control during the 2-3 months that the most recent category (> 126 mg / dl) as many as 19 people (61.3%) and least good category (80-109 mg / dl) as many as 5 people (16.1%).

b. The Degree of Diabetic Ulcer

Table 4.6 Distribution of Frequency Degrees of Diabetic Ulcer in Patients with Diabetes Mellitus in Diabetic Foot clinic Ulin Hospital Banjarmasin 2015

No.	The Degree of Diabetic Ulcer Category	f	%
1.	Degree 0	0	0
2.	Degree I	0	0
3.	Degree II	22	71,0
4.	Degree III	9	29,0
5.	Degree IV	0	0
6.	Degree V	0	0
Amount		31	100

Table 4.6 shows that the average respondent category ulcer highest degree in degree II as many as 22 people (71.0%).

2. Bivariate Analysis

Based on the results of the comparison between the control fasting blood glucose with the degree of ulcer in patients with diabetes mellitus in Diabetic Foot clinic Ulin Hospital Banjarmasin researchers obtained results are presented in Table 4.7 below:

Table 4.7 Distribution of Frequency Control of Blood Glucose in Diabetic Ulcer degree in Patients with Diabetes Mellitus in Diabetic Foot clinic Ulin Hospital Banjarmasin 2015

Fasting Blood Glucose Control	The Degree of Diabetic Ulcer				Total	%
	Degree II		Degree III			
	f	%	f	%		
Good	5	16,1	0	0	5	16,1
Medium	6	19,4	1	3,2	7	22,6
Bad	11	35,5	8	25,8	19	61,3
Total	22	71,0	9	29,0	31	100
<i>p: 0,040</i>						

Table 4.7 shows that the highest number of respondent's in the category of bad fasting blood glucose control with degree II ulcer category as many as 11 people (35.5%), and the lowest number in the category of medium fasting blood glucose control with degree III ulcer category by 1 person (3.2%).

Researchers conducted Kendall's tau bivariate analysis using statistical analysis program-based computer applications. Based on Kendall's tau test results obtained value of correlation coefficient Kendall's tau-b = 0.359. Because the

value is closer to 1 it shows that the relationship between fasting blood glucose control and the degree of diabetic ulcer is closely and fairly. Coefficient value is positive, meaning that if the fasting blood glucose control better the smaller the degree of ulcer or if the fasting blood glucose control is bad then the greater the degree of ulcer.

To determine the relationship means or not, the significance testing. The significant value of Kend all's tau-b = 0.040, due to the significant value of less than 0.05, the null hypothesis is rejected, which means that there is a relationship between the degree of glucose control ulcer.

Discussion

a. Blood Glucose Control in Patients with Diabetes Mellitus in Diabetic Foot Polyclinic Ulin Hospital Banjarmasin

These result indicate that 31 respondents are the highest result in 19 people (61.3%) were bad glucose control and the lowest result in 5 people (16.1%) were good glucose control.

Based on the result above it can be stated that most of the respondents, including the category that has not been able to control fasting blood glucose level.

Fasting blood glucose level are affected by several factors such as age are mostly aged between 45-59 years old (middle age / pre elderly) that as many as 20 people (64.52%). Hastuti (2008) stated in his research that the majority of respondent's who experienced a diabetic ulcer in the group of 55-59 years age range, because at this age the body's physiological function decline. According to experts and research results, that one of the risk factors for diabetes are age, especially over the age of 40 years or > 45 years. At this age many vital organs are weakened and the body begins to experience sensitivity to insulin such as pancreatic decreased production and nearly all hormone production decreased as well. The risk of developing glucose intolerance

increases with increasing age (Nugroho, 2008; Rachmawati 2010; Maryunani, 2013).

The most of respondent's who have bad blood glucose control may be associated with gender factor as seen most of the respondent's were female as many as 20 people (64.52%). It is strongly associated with the prevalence of diabetes mellitus is more prevalent in women. In women who had experienced menopause have a tendency to be insensitive to the hormone insulin and hormone balance in women greatly affect the state of their blood glucose (Nugroho, 2008; Rachmawati, 2010; Maryunani, 2013). The hormones estrogen and progesterone may affect the cells to respond to insulin because after menopause women experience changes in hormone levels will trigger the rise and fall of blood sugar levels. This is why the incidence of diabetes is higher in women than men (Mayoclinic, 2010).

Other factors that also affect that patient compliance in maintaining food intake, exercise, and insulin. This is consistent with the theory according to Fox & Kilvert (2010), that there are three main factors that affect blood sugar levels, namely food, insulin and exercise. In addition there are some things that cause blood sugar to rise,

ie lack of exercise, increasing the amount of food consumed, increasing stress and emotional factors, weight gain and age, as well as the effects of drug treatments, such as steroids. But the above factors do not become a variable in this study.

b. The Degree of Diabetic Ulcer in Patients with Diabetes Mellitus in Diabetic Foot Polyclinic Ulin Hospital Banjarmasin

The results showed that out of 31 respondent's mostly average diabetic wound with a degree II wound as many as 22 people (71.0%) and at least 9 people (29.0%) with degrees III diabetic wound.

Based on the above results shows that the majority of respondent's experienced with degree II diabetic wounds. Diabetic ulcer with degree II have characteristics that penetrating ulcer and tendon and bone. II is a picture of the degree of foot ulcer, ulcer on the plantar, callus, ulcer basically muscle (Anik Maryunani, 2013).

It can be influenced by the length of suffering from diabetic foot wounds because the results of the research showed that respondent's who suffer from diabetic foot length of less than 3 months had the same percentage of respondent's who ever suffered between 3-6 months as many as 14 people (43.75%). This condition is considered to be quite good and the prognosis of diabetic wound healing showed a positive direction because the majority of respondent who suffer from diabetic ulcer treated first with degree III as 17 people (54.8%).

Conditions wound prognosis changed better through appropriate treatment degrees and rank. In general, all patients undergoing

treatment at the Diabetic Foot Polyclinic Ulin Hospital Banjarmasin have received optimal medical and nursing care. In the treatment itself has applied the treatment of diabetic foot wounds is modern.

c. Comparative Analysis of Blood Glucose Control and Degree of Diabetic Ulcer in Patients with Diabetes Mellitus in Diabetic Foot Polyclinic Ulin Hospital Banjarmasin

The results show that that there is a positive relationship with the strength of the correlation fairly between blood sugar control and the degree of ulcer of diabetic patients with diabetes mellitus in Diabetic Foot Polyclinic Ulin Hospital Banjarmasin with a value of correlation coefficient Kendall's tau-b = 0.359, meaning that if control of fasting blood glucose better then the smaller the degree of ulcer or if the fasting blood glucose control is bad then the greater the degree of ulcer.

When seen from the above correlation coefficient, the researchers concluded that a 36% degree of diabetic ulcer are influenced by blood glucose control, of 64% influenced by other factors, such as wound care, medical therapy, and others.

According Anik Maryunani (2013), Under the case of diabetic ulcer, leg DM 50% will become infected as a result of the emergence of the emergence of blood sugar fertile environment for the growth of pathogenic bacteria. Due to lack of oxygen supply bacteria will thrive, especially anaerobes. Hyperglycemic state that constantly will have an impact on the ability of blood vessels to contract and relaxation reduced. In addition, the ability of white blood cells 'eat' and kill germs is reduced

(this ability to recover when blood sugar levels into normal and well controlled). Many types of ways to determine blood glucose levels especially someone fasting blood glucose values, one that is effective and efficient inspection using gauges blood glucose levels that are generally dry reagent how simple and easy to use.

Results of research with correlation analysis in research Isworo (2008) associated with blood sugar levels and diabetes complications. He found that 75% of patients with DM who had a bad experience complications that bad blood sugar levels and only 25% of respondent's who have bad blood sugar levels but suffered complications sedang. Hasil statistical tests showed no significant association between complications with blood sugar levels ($p = 0.0005$) and Odd Ratio (OR) = 8.62 means DM patients with bad blood sugar levels 8.62 times the chance of a bad experience complications.

This is consistent with the theory that hyperglycemia may affect wound healing. Uncontrolled hyperglycemia can make thickening of the capillary membrane, causing stiffness (rigidity) and can prevent vasodilation of blood vessels that normally occurs at the time of injury (Renwick, et al., 2008 in Dealey, 2007). Albert & Press (1992 in Dealey, 2007) said that the increase in blood sugar levels also caused erythrocytes, platelets and leukocytes are more adhesive so it tends to stick to the vascular lumen. Besides a decline in the number of immune response required in the wound healing process are neutrophils and macrophages, but the mechanism is still unknown (Chbinou & Frenette,

2004 in Dealey, 2007). Not only is the decline in the number of neutrophils, the research conducted Kong (2001 in Dealey, 2007) mentions the ability of phagocytosis and chemotactic response of neutrophils was also decreased (King, 2001 in Dealey, 2007).

Several studies indicate that blood sugar levels is one of the factors that affect the diabetic ulcer healing, but when viewed from the relationship that is created only relationship that is or sufficient. So not only do wound care and routine foot control, but control of blood glucose has also an important role in the process of therapy in the treatment and health recovery in patients with diabetes mellitus who developed complications of diabetic ulcer. Although there are many other factors that affect the degree of diabetic ulcer, still blood glucose condition now become one of the main reference for health personnel in carrying out their duties to provide better health services in the form of care or any other medical therapy.

Conclusion

1. Most of the respondent fasting blood glucose control is worse (>126 mg / dl) as many as 19 people (61.3%).
2. Most of the degree of the average diabetic ulcer patient were in degree II as many as 22 people (71.0%).
3. There is a correlation with the degree of glycemic control in patients with diabetic ulcer in Diabetic Foot Polyclinic Ulin Hospital Banjarmasin with sufficient strength of the correlation. Which means blood glucose control is not the only factor that causes changes in the degree of diabetic ulcer. But, there

are other variables that can contribute to the degree of diabetic ulcer that are not investigated by researchers.

Recommendation

Carry out regular check-up (health control and laboratory regularly) every 3 months under normal conditions or community and doctors plan to determine when to check up back. It is recommended primarily controlling blood glucose fasting blood glucose regularly. Because fasting blood glucose tests is one of the effective and efficient to detect early changes in the body's blood glucose conditions, so as to reduce the risk of diabetic ulcer or diabetic ulcer aggravate wounds.

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