

RELATION OF WAGNER CLASSIFICATIONS AND THE MORTALITY OF DIABETIC FOOT ULCER PATIENTS HOSPITALIZED IN CENGKARENG HOSPITAL

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Abstract- One of chronic complication forms in diabetes mellitus is emergence of foot diabetic disease that can be appeared based on vascular, neuropathy and ischaemia abnormalities. Wagner classification can be used as a guideline of diabetic foot ulcer patients which is helpful in determining the prognosis of diabetic foot ulcer patients. This study was conducted to find out the relation of Wagner classification towards mortality of diabetic foot ulcer patients. Design of this study was analytic design with retrospective approach based on a cross sectional test with consecutive sampling. Results of the study showed that the number of diabetic foot ulcer patients with males 42.4%, females 57.6% in age of 46-65 years (76.3%) with the most level of education were senior high school (30.5%), 42.4% of them were housewives. Clinical data of ulcer patients showed that 58% of normal blood pressure with normal Body Mass Index (BMI) were 64.4%, 88% anaemia, 49.2% A1C value > 7%, 23.7% single lesion with 62.7% patients in Wagner Classification II, 39% ulcer located on foot with osteolytic lesion were 11.9%, 23% positive culture test and the most done treatment were surgical (74.6%). The mortality rate was 1.7%. By using Chi Square statistical analysis test, it is known that Wagner classification could not give relation towards of mortality of diabetic foot ulcer patients who were hospitalized (p value > 0.05).

INTRODUCTION

Diabetes is a collection of various metabolic abnormality conditions, characterized by hyperglycaemia and caused by a complex interaction between genetic and environmental factors. Abnormalities in metabolic regulation of diabetes mellitus (DM) patients can lead to chronic complications which are neuropathy, retinopathy and vascular abnormality and can even lead to death due to acute complications.

According to WHO report, globally, an estimated 422 million adults were living with diabetes in 2014, compared to 108 million in 1980. The global prevalence (age-standardized) of diabetes has nearly doubled since 1980, rising from 4.7% to 8.5% in the adult population. This number is expected will

continue to grow in coming years up to two times in 2025. In Indonesia, as reported by PERKENI (2011) and WHO (2016), predicts there will be an increment of diabetes patients from 8.4 million in 2000 to 21.3 million in 2030, therefore International Diabetes Federation (IDF) estimates that there will be an increment of diabetes patients from 7 million in 2009 to 12 million in 2030. Although WHO and IDF have a predication of different prevalence rates, but both of them are similar in predicting an increment the incidence of DM in Indonesia.

As top referral hospital in Indonesia, Cipto Mangunkusumo Hospital, the diabetes foot diseases are still a big problem. Diabetes mellitus patients' treatment almost always related to diabetic foot. The mortality rate and amputation rate still high, which are 16% and 25%. Sarwono (2006) reported that the

prognosis of post amputation diabetes mellitus patients were still bad, with 14.3% died in a year after post amputation, and 37% died in 3 years post amputation. One of important things in handling diabetic foot ulcer is by determining whether the patient is infected or not, or just only manifests as ulcer wounds due to diabetes. The method that can be used to help the assessment is by using a scoring system, among them is the use of Wagner classification. This classification determines besides having an impact on treatment but the most important is also impact to prognosis of the patients. Especially in Department of internal medicine at Syarif Hidayatullah state Islamic university, data that are related to diabetic ulcer patients have not complete yet until now, therefore based on the things described above, so researcher interested and think that need to do a study about the relation of Wagner classification toward mortality of diabetes foot ulcer patients that hospitalized in Cengkareng hospital, Jakarta.

METHODOLOGY

Design of this study was analytic design with retrospective approach based on a cross sectional test. This Design was used to identify the relation of Wagner classification and the mortality of diabetic ulcer patients that are hospitalized in Cengkareng hospital. Data in the form of medical records of diabetic patients with diabetic ulcers were taken from medical record unit according to the inclusion criteria that were fulfilled by using consecutive sampling method. Data was analysed by conducting univariate and bivariate analysis to determine the relation with the dependent variable using the *Chi Square* statistical analysis test, if it did not accord to the *Chi Square* test requirements then Kolmogorov-Smirnov test was conducted. A significant P-value was < 0.05 .

RESULTS AND DISCUSSION

The number of patients that recorded was 59 patients according to the inclusion criteria. While the other 41 data were excluded because they did not accord to the inclusion criteria

From Table 1, it can be seen the distribution of diabetic ulcer patients are based on gender. From 59 diabetic ulcer patients that recorded, 42.4% (25 patients) were males, while 57.6% (34 patients) were females so that the ratio of diabetic ulcer patients

Table 1. Characteristics demographic of diabetic ulcer patients

Variable		Total (n=59)	Percentage (%)
Gender	Male	25	42.4
	Female	34	57.6
Age	26-45	10	16.9
	46-65	45	76.3
	> 65	4	6.8
Occupation	Unemployment	4	6.8
	Housewives	25	42.4
	Laborer	5	8.5
	Entrepreneur	4	6.8
	Employee	4	6.8
	Officer	2	3.4

between males and females was 1: 1.36. Results of this study are differed by Decroli *et al.* (2008) which found the gender distribution with 71% were males and 29% were females in Dr. M. Djamil Hospital at Padang. This difference was supported by Llanes *et al.* (2001) which found the ratio between males: females 1 : 0.64, Chomiand Nuneza (2014) with ratio 1,4 : 1, along with Raymundo and Mendoza (2002) with ratio 1.1 : 1.

According Chomi and Nuneza (2014), the high distribution of diabetic ulcer in male was likely due to males rarely come to consult with a doctor compared to females and even if they come to consult with a doctor, there is a very little information they tell about their condition. This difference of the result is possible because of the number of subject is insufficient that caused by gathering data in short time, so that it does not describe the distribution of the gender like in general as said by Demayo *et al.* (2011) and Hjelm and Atwine (2011). Based on age, 10 patients or 16.9% were adults (26-45 years), 45 patients or 76.3% were elderly (46-65 years) and 4 patients or 6.8% were seniors (> 65 years).

From the data above also obtained the highest rate of disease which is 46 – 65 years with an average age of 53.9 years. This number matched with Madanchi *et al.* (2013) and Llanes *et al.* (2001) which stated that the peach of diabetic ulcer patients was in the fifth and sixth decades of life. Madanchi *et al.* (2013) in their research also found the average age of patients ranged from 55-60 years. Chomiand Nuneza (2014); Raymundo and Mendoza (2002) and Decroli *et al.* (2008) in their research found that the most diabetic ulcer patients were in age of 50-59 years (average age of each was 53 years), age of 40-

59 years (average age 55.2 ± 9.5 years) and age of 51-60 years with average patients age 56 ± 28.2 years. This was caused by decreased immune response of elderly patients, decreased ability of cell proliferation, slowing of angiogenesis and has a lower rate of collagen synthesis compared to its degradation (Minimas, 2007).

Based on the table 2, it was found that the BMI of 55 patients, 8 patients (13.6%) were underweight, 38 patients normal (64.4%), 8 patients pre obesity (13.6%) and 1 patient was obesity grade 1, furthermore it also showed that normal and overweight BMI is the largest number with each percentage of 20.3% and 13.6%. A similarity result also found by Chomi and Nuneza (2014) where 48% of diabetic ulcer patients have normal BMI while 42% were overweight.

Deribe *et al.* (2014) in their study found that patient with overweight BMI would have 4 times greater risk of having ulcer compared to patients who has a normal BMI. In other study, Chomi and Nuneza (2014) found that risk factor for overweight and obesity which are important risk factors in aggravating insulin resistance and type 2 diabetes. Kahn *et al.* (2006) and Unachukwu *et al.* (2007) reported that body weight and BMI are also factors that can increase the severity of diabetic ulcer.

As seen in Table 2, it was found that the profile of ulcer patients if it were categorized by using the lowest threshold of 7%, only 5 patients had A1c values below 7% and 29 patients had A1c values

above 7%. The results of the A1c in diabetic ulcer patients showed that the dominance of patients were those who have poorly controlled sugar levels, which is 29 patients or 49.2% have A1c value above 7% while only 5 patients or 49.2% have A1c value under 7%. This similarity also obtained by Madanchi *et al.* (2013) where 85.6% patients of diabetes mellitus control was still low. Janmohammadi *et al.* (2011) also found that there were 86% diabetic ulcer patients domain with A1c > 7%.

Uncontrolled sugar conditions can cause a prolonged hyperglycaemia. As a result, there were changes in cells which led to the process of worsening wound healing and the emergence of ulcer that caused by tissue neuropathy and ischemia.

Table 2 also showed the blood pressure of diabetic ulcer patients that 34 patients (58%) had normal blood pressure, 6 patients (10%) pre hypertension, 13 patients (22%) hypertension grade 1 and 5 patients (8%) had hypertension. When it viewed as a whole, only 18 diabetic ulcer patients (30%) who had grade 2 hypertension. Similar result were obtained by Viswanathan and Thomas (2005), they found 34% of hypertensive patients. Chomi and Nuneza (2014) reported 52% of diabetic ulcer patients with hypertension. The differences in result is likely due to the variation in exposure to risk factors that differ between patients in one study with patients in another study, and as explained in

Table 2. Clinical data of Diabetic Ulcer Patients

Variable	Total (n = 59)	Percentage (%)
A1c	< 7%	5
	> 7%	29
	No data	25
Blood pressure	Normal	34
	Prehypertension	22
	Hypertension Grade 1	13
	Hypertension Grade 2	5
	No data	1
Hemoglobin Count	Normal	6
	Anemia	52
	No data	1
Culture test	Positive	14
	Negative	3
	No data	42
Body Mass Index (BMI)	Underweight	8
	Normal	38
	Pre obesity	8
	Obesity 1	1
	No data	4

the literature that diabetes mellitus patients who have hypertension have greater risk factors for diabetic ulcer compared with patients diabetes mellitus who do not have hypertension as reported by Raymundo and Menoza (2002) and Riaz and Miyan (2012).

From Table 3, it was seen that severity of diabetic ulcer patients was based on Wagner criteria from 59 patients, 5 patients (8.5%) were stage I, 34 patients (57.6%) stage II, 12 patients (20.3%) stage III, 6 patients (10.2%) stage IV, and 2 patients (3.4%) were stage V. The most Wagner classification of ulcer were in stage II and III. This result was similarly with result of Naeem *et al.* (2011), they found 74% patients were in stage II and III. Amogne *et al.* (2011) also showed the same thing in their research that the dominance of ulcer severity based on Wagner classification was diabetic ulcer patients with stage III and IV which was 36.6%. In another study, Decroli *et al.* (2008) found most patients with Wagner classification third degree (55%), i.e. the infection had affected the subcutaneous tissue, muscles and could be deeper into the bone, with signs of clear local infection and erythema with a size greater than 2 cm. Chomiand Nuneza (2014) through their research publications also showed different results, which was 48% diabetic ulcer patients with Wagner 0 degree. As well as Lawrence

and Constantin (2008) who found I degree Wagner as the most ulcer patient (63.9%). This difference can be caused the patient's understanding and knowledge is quite good for the disease so that severity of diabetic ulcer in generally does not reach the stage of tissue necrosis or Wagner IV and V degree which needed expand treatment like internal screw fixation and amputations.

Based on the Table 3, it was also found that out of 59 diabetic ulcer patients, 44 patients (74.6%) received surgical therapy, while 15 patients (25.4%) received non-surgical therapy. This distribution was similar with Decroli *et al.* (2008) where all of their diabetic ulcer patients underwent surgical therapy. Janmohammadi *et al.* (2011) also obtained the same results, where out of all diabetic ulcer patients that undergoing therapy, 85% underwent surgical therapy. In another result, Singh *et al.* (2013) obtained that the higher the grade, the higher the risk of amputation with a longer healing time. But this was different from the result of Jeffcoate and Game (2008), they obtained that patients (77%) were treated by non-surgical procedure. This difference is possible because in Cengkareng hospital, many patients are included in the Wagner classification III degree. In addition, the National Health Insurance system or other health insurance such as health insurance can be implemented, making the cost

Table 3. Characteristics of Ulcer

Variable		Total (n = 59)	Percentage (%)
Stages of Ulcer	Stage I	5	8.5
	Stage II	34	57.6
	Stage III	12	20.3
	Stage IV	6	10.2
	Stage V	2	3.4
Number of Ulcer	Single	37	62.7
	Multiple	22	37.3
Location of Ulcer	Toes	16	27.1
	Back foot	16	27.1
	Sole	8	13.6
	Foot	23	39
	Hands	2	3.4
	Decubitus	3	5.1
Type of therapy	Non-surgical	15	25.4
	Surgical	44	74.6
Culture test	Positive	14	23.7
	Negative	3	5.1
	No data	42	71.2
Radiology description	Osteolytic	7	11.9
	Fracture	2	3.4
	Erosion	1	1.7
	No data	49	83.1

factor no longer an obstacle in fulfilling the administration to carry out the action.

As seen in Table 3, it was found that the location distribution of 59 diabetic ulcer patients, 16 patients (27.1%) were at the toes, 16 patients were at back feet, 8 patients were at the sole, 23 patients (39%) were at feet, 2 patients (3.4%) were at hand, and 3 patients (5.1%) were on decubitus. The division of this percentage seems not entirely clear and looks overlapping, such as the use of the terms feet, soles and back feet. This is because the data obtained in the field almost 39% did not mention the specific location of the ulcer such as the use of the term sole, back and toes but only presented large regional terms like feet. But even so, we can conclude that the distribution of ulcer's locations is generally found in the legs. This result is consistent with the majority of studies to the foot as the most ulcers' location even with different variations of specific locations. Syadzwina *et al.* (2013) found that the most distribution of ulcer's location were at toes (47.9%). Madanchi *et al.* (2013) and Janmohammadi *et al.* (2011) also found that the most location of patients' ulcer in their study were the toes. And different variations were obtained by Naeem *et al* (2011) in their research the most distribution (50.43%) of ulcer's location was on dorsum foot. Janmohammadi *et al* (2011) and Tchakonte *et al* (2005) said that the differences and variation of ulcer's location in each patient is related and depends on the cause or etiology, whether due to neuropathy, neuroischaemic or ischemic. Madanchi *et al.* (2013) also explained the incidence of ulcer's location in the majority study tend to be in the legs with the most were on the toes because risk factors for diabetic ulcer more in the distal extremity, where the tendency for ischemic, diabetic neuropathy and trauma is greater than the proximal part.

Based on Table 3, it was found that the distribution of diabetic ulcer patients according to the type of ulcer, there were 37 patients (62.7%) had a single type of ulcer and 22 patients (37.3%) had multiple type of ulcers.

The result of X-rays of diabetic ulcer patients showed that 7 patients (11.9%) had osteolytic, 2 patients (3.4%) fracture and 1 patient (1.7%) had erosion, so it can be seen that diabetic ulcer patients who have a suspected diagnosis of osteomyelitis are 11.9% of 59 patients, where the infection has invaded bone tissue and caused an increment in the severity of diabetic ulcer.

From Table 3, it is known that the diabetic ulcer

patients did not all get bacterial culture tests. Of the 59 patients, only 17 patients (28.81%) were tested for culture, and obtained 14 patients (23.7%) tested positive for microorganisms while 3 patients (5.1%) did not find any microorganisms. Culture tests are recommended only to patients who have signs of infection, such as pain, erythema, swelling, a warm sensation and the appearance of pus on the wound. This seems to be less synchronous with the number of patients with infectious cases of diabetic ulcer patients who were recorded, because when viewed from the incidence of infection, it was found that all diabetic ulcer patients had experienced infection. This difference is likely to occur due to the difficulty of sampling to be cultured and have received antibiotic therapy before a culture examination is carried out in each patient who can interfere with the results of the examination, and it is also due to the consideration that the majority of infected patients are still at early infection as explained by Benjamin *et al.* (2012).

Table 4. Characteristics of Ulcer Patients' Final Data

Variable		Total (n = 59)	Percentage (%)
Final data	Dead patients	1	1.7
	Alive patients	58	98.3

It can be seen from the data in the Table 4, the mortality rate for diabetic ulcer patients III with the cause of death was sepsis. By using the Chi Square statistical analysis test, it was found that Wagner's classification in this study did not affect the death of diabetic ulcer patients treated with p value > 0.05 .

CONCLUSION

The results of this study indicated that the number of diabetic ulcer patients males were 42.4%, females 57.6% in the 46-65 years (76.3%) with the highest level of education was the level of high school education (30.5%) and 42.4% of them are housewives.

Clinical data of ulcer patients which studied showed that 58% of patients with normal blood pressure, 64.4% normal Body Mass Index (BMI), 88% anaemia, 49.2% with A1C values $> 7\%$ and 23.7% were successfully cultured. Characteristics of diabetic ulcer which studied showed that 57.6% of patients in Wagner II classification with a single lesion (62.7%), 39% ulcer located in the legs with osteolytic lesions as much as 11.9%, 23% were

culture test positive and the most treatment were surgical procedure (74.6%).

The mortality rate in this study was 1.7%. Finally, it was found that Wagner Classification is not related to the mortality of diabetic ulcer patients that were hospitalized in Cengkareng hospital.

REFERENCES

- Amogne, W., Reja, A. and Amare, A. 2011. Diabetic foot disease in Ethiopian patients: A hospital based study. *Ethiop J Health Dev.* 25 (1) : 17-21.
- Bays, H., Chapman, R. and Grandy, S. 2007. The Relationship of body mass index to diabetes mellitus, hypertension, and dyslipidaemia : comparison of data from two national surveys. *Int J Clin Pract.* 61(5): 737-747.
- Benjamin, A.L. and Anthony, B. 2012. Infectious diseases society of America clinical practice guideline for the diagnosis and treatment of diabetic foot infections. *IDSA Guideline. Clinical Infectious Disease.* 54.
- Chomi, E.I. and Nuneza, O.M. 2014. Clinical profile and prognosis of diabetes mellitus type 2 patients with diabetic foot ulcers in Chomi Medical and Surgical. Philippines: Department of Biological Sciences, College of Science and Mathematics, Mindanao State University-Iligan Institute of Technology.
- Decroli, E., Karimi, J., Asman, M. and Syafril, S. 2008. Profilulкусdiabetikpadapenderitawatinap di bagianpenyakitdalam RSUP Dr M. Djamil Padang. Padang: Fakultas Kedokteran Andalas.
- Demayo, C., Bag-ao, T. and Torres, M. 2011. Heritability of aging male symptoms(AMS) in Filipinomale. *Australian Journal of Basicand Applied Sciences.* 5 (8): 429-437.
- Deribe, B., Kifle, W. and Gugsu, N. 2014. Prevalence and factors Influencing diabetic footulcer among diabetic patients attending Arbaminch hospital, South Ethiopia. *J Diabetes Metab.* 5 :1.
- Norafizah, H.Z., Joshua, B. and Mauro, V. 2014. Characteristics of diabetic foot ulcers in Western Sydney, Australia. *Journal of Foot and Ankle Research.* 7: 39.
- Hjelm, K. and Atwine, F. 2011. Health-care seeking behavior among persons with diabetes in Uganda: an interview study, BMC International Health and Human Rights. 11.
- Janmohammadi, N., Reza, M., Roushan, H., Moazezi, Z., Rouhi, M. and Mokhtar S. 2011. Epidemiological characteristics of diabetic foot ulcer in Babol, north of Iran: a study on 450 cases. *Caspian J Intern Med.* 2 (4) : 321-325.
- Jeffcoate, W.J., Game, F.L. 2008. Primarilynon-surgicalmanagementofosteomyelitis of the foot in diabetes. *Diabetologia.* 51 : 962-967.
- Kahn, S.E., Hull, R.L. and Utzschneider, K.M. 2006. Mechanisms linking obesity to insulin resistance and type 2 diabetes. *NATURE.* 444(14) : 840-846.
- Lawrence and Constantin, I. 2008. Risk factors and clinical characteristics for foot ulcers in patients with diabetes in bucharest. Romania: The "N. Paulescu" National Institute of Diabetes.
- Llanes, L.R., Pena, A. and Cauton-Valera, R. 2001. Clinical, microbiological profile and outcome of diabetic patients with foot ulcers admitted at the Quirino Memorial Medical Center : January 2000-May 2001. *Phil J Microbiol Infect Dis.* 30 (3) : 101-107.
- Madanchi, N., Tabatabaei-Malazy, O., Pajouhi, M., Heshmat, R., Larijani and Mohajeri-Tehrani, M.R. 2013. Who are diabetic foot patients? A descriptive study on 873 patients. *Journal of Diabetes and Metabolic Disorders.* 12 : 36.
- Minimas, D. 2007. Ageing and its Influence in Wound Healing. *Wounds UK.* 3 (1) : 46-48.
- Naeem, Khalil-Ur-rehman, Kamran, 2011. Epidemiology and outcome in patients of diabeticfoot. *J Ayub Med Coll Abbottabad.* 23(1).
- Persatuan Endokrinologi Indonesia (PERKENI). 2011. Konsensus Pengendalian and Pencegahan Diabetes Mellitus tipe 2 di Indonesia," h: 1
- Raymundo, M.F. and Mendoza, M. 2002. The Microbiologic features and clinical outcome of diabetic foot infections among patients admitted at UP-PGH. *Phil J Microbiol Infect Dis.* 31 (2) : 51-63.
- Riaz, M. and Miyan, Z. 2012. Characteristic and outcomes of subjects with diabetic footulcerations. *Diabetes Care.* 35.
- Sarwono Waspadji, 2006. Kaki Diabetes" dalamAru, dkk., ed., Buku AjarIlmu Penyakitdalam Edisi IV Jakarta: Fakultas Kedokteran UI, h.1933.
- Singh, S., Pai, D.R. and Yuhhui, C. 2013. Diabetic foot ulcer-diagnosis and management. *Clin Res Foot Ankle.* 1 (120) : 1-9.
- Syadzwin, S., Jazil, K. and Suyanto, 2013. Profil pasienulкусdiabetikumyang dirawat di RSUD Arifin Ahmad Riau Provinsi Riau periode 1 Januari 2011-31 Desember 2011. Riau: Fakultas Kedokteran Riau.
- Tchakonte, B., Ndip, A., Aubry, P., Malvy, D. and Mbanya, J.C. 2005. The Diabetic foot in Cameroon. *Bull Soc Pathol Exot.* 98 : 94-98.
- Unachukwu, C., Babatunde, S. and Ihekwebi, A.E. 2007. Diabetes, hand and/or footulcers: across-sectional hospital-based study in Port Harcourt, Nigeria. *Diabetes Res Clin Pract.* 75 : 148-152.
- Viswanathan, V. 2005. Profile of diabetic foot complications and its associated complications-a multicentric study from India. *JAPI.* 53.
- World Health Organization, 2016. Global report on diabetes.