

## Research Article

## Survival of Diabetic Gangrene Patients in Teaching Hospitals Wahidin Sudirohusodo and University Hospital Hasanuddin Makassar City

Hajar Hasan<sup>\*1</sup>, Ridwan Amiruddin<sup>1</sup> and Muhammad Syfar<sup>1</sup><sup>1</sup>Department of Epidemiology, Faculty of Public Health, Hasanuddin University, Makassar Indonesia

\*Corresponding Author

Hajar Hasan

**Abstract:** Diabetic gangrene is the presence of diabetic neuropathy which accompanies diabetes mellitus which causes numbness in the foot area which will increase the risk of trauma or injury that is not felt by the patient's pain. This study aims to determine the Survival of Diabetes Mellitus Patients Who Have Diabetic Gangren in Wahidin Sudirohusodo Hospital and Hasanuddin University Hospital in 2015-2019. The study design was an observational study with a retrospective cohort design with a sample of 180 people taken by exhaustive sampling. Data obtained from medical records was then carried out by Kaplan Meier Survival Analysis and Log Rank to determine cumulative and significant incidents. The results showed that of 180 patients there were 101 events and 79 sensors. The statistical test results of Kaplan Meier Survival Analysis and Log Rank show that there are significant differences between categories in one independent variable on the survival curve (p value <0.005). The variable comorbidity (0,000) is known to have significant differences between categories, while variables with (p value > 0.05), age variable (0.051), gender (0.496) is known to have a non-significant difference. It was concluded that, comorbidities and factors that influence the survival of patients with diabetes mellitus who have diabetic gangrene are clinical stage variables.

**Keywords:** survival, diabetes mellitus, diabetic gangrene.

### INTRODUCTION

Diabetes mellitus is a degenerative disease and one of the most common metabolic disorders in the world that occurs when the pancreas does not produce enough insulin or if the body cannot effectively use the insulin it produces. Diabetes mellitus is a disease that is a public health problem and is still the main factor globally. This is because diabetes is the main cause of blindness, kidney failure, heart attacks, strokes and serious damage to many body systems, especially nerves and blood vessels (WHO, 2017).

Gangrene wounds are one of the chronic complications of Diabetes Mellitus that are most feared by every person with diabetes mellitus caused by the presence of neuropathy and vascular disorders in the legs (Tjokropawito, 2011). Gangrene sores are lesions on the feet that are blackish red and foul-smelling due to blockages that occur in medium or large blood vessels in the legs. The incidence of gangrene is still high, not only in developed countries but also in developing countries (Perkeni, 2008). Diabetic ulcers or

gangrene have a tremendous impact on sufferers, in addition to amputation, infections that occur often require patients to be hospitalized longer than other complications of diabetes mellitus, so the cost of treatment needed is greater and patients with gangrene have a higher risk of death compared to patients with diabetes mellitus without gangrene. (Erin, 2015)

The case of Diabetes Mellitus in adults has increased in recent years from 108 million cases in 1980 increased to 425 million cases in 2017. The global prevalence of diabetes until 2017 among adults over 18 years is 8.8 per 100 people in 2045. And it is estimated that diabetes cases will increase faster in low and middle income countries (A. Lipsky et al., 2012). The prevalence of gangrenous wound sufferers in Indonesia is around 15%, the amputation rate is 30%, the mortality rate is 30%, and gangrenous injuries are the most common cause of hospital care by 80% for DM. It is estimated that every year the number of one million patients suffering from gangrene wounds undergo amputation of the lower limb (85%) and the mortality

Quick Response Code



Journal homepage:

<http://www.easpublisher.com/easjacc/>

Article History

Received: 14.06.2019

Accepted: 06.07.2019

Published: 18.07.2019

Copyright @ 2019: This is an open-access article distributed under the terms of the Creative Commons Attribution license which permits unrestricted use, distribution, and reproduction in any medium for non commercial use (NonCommercial, or CC-BY-NC) provided the original author and source are credited.

rate is 15-40% annually and 39-89% every 5 years (Zhang *et al.*, 2017).

Data from several studies in Indonesia show amputation rates and diabetic gangrene mortality rates of 15-30% amputation rates and 17-32% mortality rates and around 28-40 days of care. In developed countries like the United States, diabetic foot is still a big problem. The mortality rate and amputation rate are still high when diabetic gangrene has occurred (Wahyuni, 2008)

Based on Riskesdas in 2007 and 2013, the highest number of cases of diabetes mellitus suffered by Indonesians, with age above 15 years (based on diagnosis and clinical symptoms) occurring in Central Sulawesi province which died from 1.7% to 3.8%, North Sulawesi increased from 1.7% to 3.7%, and South Sulawesi increased from 0.8 to 3.4%. However the biggest increase occurred in the province of South Sulawesi, which amounted to 2.6% (Malewa, 2015).

Based on medical record data at Wahidin Sudirohusodo's General Hospital of Education, the number of diabetic gangrene sufferers from 2015-2018 was 437 and TK III Pelamonia Hospital had a number

of diabetic gangrenous patients of 48. Based on these problems the purpose of the study was to determine the relationship of survival in gangrenous patients diabetic at Wahidin Hospital Sudirohusodo and Hasanuddin University (UNHAS) Hospital.

## METHODOLOGY

### Design of Research

This type of research is an observational study with a retrospective cohort design. This research was conducted at Wahidin Sudirohusodo Hospital and Makassar City UNHAS Hospital.

### Population and sample

The population in this study were all patients with diabetes mellitus who experienced diabetic gangrene who were first diagnosed with diabetic gangrene in 2015-2019 at Wahidin Sudirohusodo Hospital and Makassar City UNHAS Hospital. The sample in this study were diabetic patients who had diabetic gangrene in two hospitals in Makassar City and fulfilled the inclusion criteria, namely patients with diabetes mellitus who had diabetic gangrene who had diabetic gangrenous diagnosis in 2015 and there were data on gender, age, mortality, Long suffered, and recorded medical records.

## RESULTS

### Characteristics of Respondents

**Tabel 1. Characteristics of respondents**

Variable	Survival status				Total	
	Event		Sensor		n	%
	n	%	n	%		
General Education Hospital Wahidin Sudirohusodo	86	85,1	68	86,1	154	85,6
Hospital Hasanuddin University	15	14,9	11	13,9	26	14,4
Age						
17-25 Years	0	0,0	1	1,3	1	0,6
36-45 Years	10	9,9	21	26,6	31	17,2
46-55 Years	39	38,6	27	34,2	66	36,7
56-65 Years	26	25,7	27	34,2	53	29,4
>65 Years	26	25,7	3	3,8	29	16,1
Education						
Did not finish elementary school	4	4,0	3	3,8	7	3,9
Primary school	19	18,8	19	24,1	38	21,1
Junior high school	9	8,9	11	13,9	20	11,1
High school	45	44,6	21	26,6	66	36,7
Graduated	24	23,8	25	31,6	49	27,2
Marital status						
Single	8	7,9	6	7,6	14	7,8
Mate	93	92,1	73	92,4	166	92,2

Table 1 shows that the study locations of diabetic patients with diabetes mellitus in 2015-2019 were mostly known to come from RSUP Dr.r Wahidin Sudirohusodo as many as 154 patients (85.6%), compared with UNHAS Hospital, which was 26 (14.4%). Based on the age group of the most patients in the age category 46-55 years as many as 66 patients (36.7%), and the lowest in the age category of 17-25 years as many as 1 person (0.6%). Based on event and sensor events.

Based on the highest level of patient education at the high school education level as many as 66 patients (36.7%), and the lowest did not complete elementary school as many as 7 patients (3.9%). Based on events and censorship events at the level of education and based on marital status, 166 people (92.2%) were married and as many as 14 people (7.8%) were unmarried patients. In both groups, both those who experienced events and censorship were the most married patients.

**Table 2. Distribution of Diabetic Gangrene Patients Based on Research Variables at Wahidin Sudirohusodo Hospital and Hasanuddin University Hospital in 2015-2019**

Variable	Survival status				Total		p
	Event		Sensor		n	%	
	n	%	n	%			
Age							
<55 years old	44	61,8	47	42,3	91	50,6	0,037
> 55 years old	57	40,5	32	40,5	89	49,4	
Gender							
Women	58	57,4	44	55,7	102	56,7	0,880
Man	43	41,3	35	46,1	78	43,3	
Lam Long suffering from Diabetes Mellitus							
<5 years	16	15,8	57	72,2	73	40,6	0,001
> 5 years	85	84,2	22	12,2	107	59,4	
Comorbidity							
Yes	90	89,1	16	20,3	106	58,9	0,001
Not	11	10,9	63	79,7	74	41,1	

Table 2 shows that diabetes mellitus patients who have the highest diabetic gangrene at age > 55 years are equal to 91 (50.6%). The statistical test results show a p value of 0.011 or there is a relationship between age and death of diabetic patients with diabetic gangrene. Based on the highest sex variable, namely the female sex and the highest mortality, namely female sex by 51 people (58.01%). With a value of p = 0.546. That is, there is no relationship between sex and the survival of Diabetes Mellitus patients who experience diabetic gangrene.

Based on the duration of diabetes mellitus showed that diabetes mellitus patients who had diabetic gangrene died the highest duration of suffering from diabetes, namely > 55 years which is 78 (75.0 %) The statistical test results showed a p value of 0.001 or there was a relationship between diabetes mellitus and diabetes patients mellitus that has diabetic gangrene.

**Analysis Kaplan Meier**

**Table 3. Log of Survival Rank of Diabetes Mellitus Patients Experiencing Diabetic Gangrene**

Variable	P (log rank)
Age	0,051
Gender	0,496
Long suffering from diabetes mellitus	0,000
Comorbidity	0,000

Table 3 shows that there is no difference in probability of survival and does not meet the proportional Hazard assumption. The significant difference shown by the logrank value > 0.05, gender does not fulfill the proportional hazard assumption or the speed ratio between sex groups is not fulfilled. (p > 0.05), the duration of suffering from diabetes there is a difference in probability survival and fulfilling the proportional Hazard assumption significant difference indicated by the logistic value p < 0.000, and in comorbidity there is a difference in survival probability

and fulfill proportional Hazard assumptions. Significant difference is indicated by the Logrank value < 0,000.

**DISCUSSION**

Factors related to the survival of diabetic patients with diabetes mellitus in this study consisted of dependent variables namely the survival of patients with diabetes mellitus who had diabetic gangrene and the independent variables namely, age, gender, duration of diabetes mellitus and comorbidity.

In this study age is not a survival risk factor for patients with diabetes mellitus who have diabetic gangrene in Meier analysis with a log rank value obtained p value = 0.051 means that the age variable is not significant with the survival of patients with diabetes mellitus. At old age physiological function decreases because the aging process decreases insulin secretion so that the ability of the body's function to control blood glucose is quite high is not optimal. The aging process causes a decrease in insulin secretion or resistance resulting in a macroangiopathy, which will affect the decrease in blood circulation, one of which is a large or medium blood vessel that is overtaken, which is easier for diabetic gangrene to occur. This is in accordance with research conducted in the United States which was cited by (Merza & Tesfaye, 2003) reported that the highest percentage of diabetic feet at the age of 45-64 years. As we know, the elderly usually have limited mobility, poor vision, and other disease problems.

On gender variables The results of the analysis using the Kaplan Meier method indicate that the curvature of the survival of diabetic patients with diabetic gangrene based on sex intersects. This shows that the assumption of proportional hazard or comparison of speed between sex groups is not fulfilled. The difference was strengthened by the Logrank value = 0.496 (p > 0.05) so that it was concluded that statistically there was no difference in the timing of the event between female patients and gender. The causes of differences in diabetic foot

prevalence among men and women in other studies regarding diabetic gangrene with neuropathic and neuroischemic ulcers can be caused by a number of reasons, namely: hormonal factors (the presence of estrogen in women which can prevent vascular complications that decrease with age), differences in life habits such as smoking habits and alcohol consumption in men.

In this study it is not in line with the research conducted by (Merza & Tesfaye, 2003) which is based on a cross-sectional study in 251 patients with Diabetes Mellitus, reported that as many as 70% of patients affected by diabetic foot are men. The study (Hokkam, 2009) showed that male sex had a high risk factor for diabetic foot ( $p = 0.009$ ).

In the old variable of suffering from diabetes mellitus The results of the analysis based on the Meier Kaplan curve of life of diabetic gangrenous patients based on long suffering did not intersect with each other. This shows that there is a probability of survival and fulfills the proportional Hazard assumption. Significant differences indicated by Logrank values  $<0.001$  can be concluded that patients with diabetes mellitus who have diabetic gangrene related to the duration of suffering from diabetes have different events.

Diabetics who are more than 5 years old if uncontrolled blood sugar levels will cause vascular-related complications so that they experience macroangiopathy that will occur vasculopathy and neuropathy that causes a decrease in blood circulation and the presence of wounds in the patient's legs usually not felt. Research in line done by (Boyko, 2003) and (Hastuti, 2008) reported that patients who had diabetes mellitus for  $> 10$  years were a risk factor for diabetic foot with RR of 3 and OR 21.3 patients who had diabetic foot with long illness  $> 10$  years, determined by high blood glucose levels. If the blood glucose level is high, then there will be complications related to nerves and leg blood flow. This complication of the nerves and blood flow to the legs causes neuropathy and arterial artery disease.

In comorbidities comorbidity variable is the presence of another disease that follows and appears with gangrene diabetic. The results of the analysis are based on Meier Kaplan curves for survival of diabetic gangrenous patients based on comorbidity not intersecting with each other. This shows that there is a probability of survival and fulfills the proportional Hazard assumption. Significant differences indicated by Logrank values  $<0,000$  can be concluded that patients with diabetes mellitus who have diabetic gangrene associated with comorbidities have different events.

The morbidity and mortality rates in DM are increasing in various countries, besides being associated with a very rapid incidence and progression of the disease, it is also caused by ignorance, both sufferers and doctors themselves, or sufferers generally come accompanied by advanced and severe complications. again, it turns out that hyperglycemia is the beginning of a disaster for people with diabetes, this is evident and also occurs in patients with impaired glucose tolerance who have had abnormalities in vascular complications, even though they are not diabetic. Hyperglycemia is associated with abnormalities in endothelial dysfunction, as the origin of micro and macroangiopathy. Thus, if the hyperglycemia is well controlled and controlled, a normal HbA1c can reduce the incidence of complications in DM. (Permana, 2000).

## CONCLUSION

In this study it can be concluded that the variables related to the survival of diabetic gangrenous patients at Wahidin Sudirohusodo hospital are variable comorbidities and long-standing variables suffering from diabetes mellitus. Therefore it is hoped that the community will be more routine to check blood glucose levels even at the age of  $> 55$  years so that they are more quickly treated and there are no complications of diabetic gangrene.

## REFERENCES

1. A.Lipsky, B., Berendt, A. R., B.Cornia, P., C, J., Edgar, & Armstrong, D. G. (2013). Highlights from 2012 infectious diseases society of America clinical practice guidelines for the diagnosis and treatment of diabetic foot infections. *Infectious Diseases in Clinical Practice*, 21(1), 43–45.
2. Boyko, C. B. (2003). A New Species of Albulione ( Crustacea : Isopoda : Bopyridae : Pseudioninae ) from Taiwan, 1–7.
3. Erin, D. (2015). Diabetic Gangrene in Diabetics with Diabetic Gangrene in Diabetes Mellitus Patient.
4. Hastuti, R. T. (2008). Risk Factors for Ulcers in People with Diabetes Mellitus (Case Study in RSUD Dr. Moewardi Surakarta, February 12.
5. Hokkam, E. N. (2009). Assessment Of Risk Factors In Diabetic Foot Ulceration And Their Impact On The Outcome Of The Disease, 3, 219–224.
6. Malewa, lukman waris. (2015) *Diabetes (Diabetes Mellitus) in South Sulawesi*. Jakarta: Indonesian Torch Foundation.
7. Merza, Z., & Tesfaye, S. (2003). The Risk Factors For Diabetic Foot Ulceration. *Foot*, 13(3):125–129.
8. Perkeni. (2008). *Consensus on the Management and Prevention of Type 2 Diabetes Mellitus in Indonesia*. Jakarta: Executive Board of the Indonesian Endocrinology Society.
9. Permana, H. (2000). Komplikasi Kronik dan Penyakit Penyerita pada Diabetes. *Medical Care*, 1–5.

10. Tjokropawito, I. (2011). Complete Guide to Diet for DM Education. Jakarta: PT Gramedia Public Library.
11. World Health Organization (WHO). (2017). *Global Report On Diabetes*. World Health Organization
12. Wahyuni, S. (2008). *Gambaran Asupan Energi, Zat Gizi Makro, Kadar Gula Darah dan Perkembangan Kesembuhan Luka Pada Penderita Diabetes Mellitus Tipe II dengan Komplikasi Gangrene Di bangsal Melati 1 RSUD Dr. Moewardi Surakarta*. Universitas Muhammadiyah Surakarta.
13. Zhang, N., Yang, X., Ji, Q., Huang, T., Zhu, X., & Zhao, B. (2017). Type 2 diabetes mellitus unawareness, prevalence, trends and risk factors: National Health and Nutrition Examination Survey (NHANES) 1999–2010. *Journal of International Medical Research*, 45(2), 594–609.