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SURVIVAL ANALYSIS OF DIABETES MELLITUS PATIENTS WITH DIABETIC ULCERS

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Abstract

Diabetes Mellitus (DM) is a chronic disease that occurs because the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. The general effects of uncontrolled diabetes can lead to serious complications over time. This study aims to determine the factors that influence the survival of diabetes mellitus sufferers with diabetic ulcers at RSUP Dr. Wahidin Sudirohusodo and Ibnu Sina Hospital, Makassar City. This research is an analytical observational study with a retrospective cohort design. The study population was all patients suffering from DM with diabetic ulcers and recorded in medical records. The research was carried out by tracing the medical records of 100 samples of DM sufferers with diabetic ulcers. Data were analyzed using Kaplan-Meier (p, 0.05) and Cox regression (p<0.25). Results: The results of research with Kaplan Meier show that the factors that influence the survival of diabetes mellitus sufferers with diabetic ulcers are total cholesterol levels (p=0.000), HDL levels (p=0.004), triglyceride levels (p=0.011), and duration of DM (p=0.000). From multivariate analysis using Cox Regression, the Hazard Ratio (HR) for total cholesterol levels = 11.441 and HR for long DM = 11.829. Avoiding risk factors can influence the survival probability of diabetes mellitus sufferers with diabetic ulcers at RSUP Dr. Wahidin Sudirohusodo and Ibnu Sina Hospital, Makassar City.

Keywords*: Survival, Diabetes Mellitus, Diabetic Ulcer*

Introduction

The structure of society changes over time. Apart from unhealthy eating patterns, there is also a decrease in physical activity which can trigger an increase in non-communicable and degenerative diseases. One example is diabetes mellitus (Ramadhani et al., 2022). Diabetes mellitus is a chronic disease characterized by hyperglycemia or increased blood glucose levels (Pourkazemi A, 2020). Uncontrolled hyperglycemia in the body can cause complications, therefore diabetes mellitus is a serious threat to public health (Suryati I et al., 2019). One of the complications of diabetes mellitus is diabetic ulcers. Diabetic foot ulcers are non-traumatic lesions on the skin (some or all layers) of the feet of people with diabetes mellitus (Trisnawati et al., 2017).

The World Health Organization (WHO) shows that the number one cause of death in the world is non-communicable diseases, reaching 71%. Apart from that, WHO also stated that there is an increase in diabetic ulcer sufferers in the adult population, namely 122 million people suffer from diabetic ulcers in the world. It is estimated that in those aged less than 70 years there are 2.2 million deaths caused by diabetic ulcers. In fact, there will continue to be an increase of 600 million people in 2035 (WHO, 2018). Diabetes mellitus in the world has the highest prevalence, at the age of more than 30 years the risk of amputation is 10.8, 15-46 times higher than non-diabetes mellitus sufferers, the post-amputation mortality rate is 15.89% and for diabetic ulcer sufferers it is 9.4 % (WHO, 2020).

The prevalence of diabetic ulcer sufferers in Indonesia is around 15%, the amputation rate is 30%, the mortality rate is 32% and diabetic ulcers are the largest cause of hospital admission at 80% (Trisnawati et al., 2017). The increasing prevalence of diabetes mellitus sufferers with diabetic ulcers certainly affects patient survival and makes diabetes mellitus with diabetic ulcers a public health problem. Therefore, researchers are interested in carrying out survival analysis by looking at the probability of survival and the factors that influence the survival of diabetes mellitus sufferers with diabetic ulcers.

Methods

The type of research is an analytical observational study using a retrospective cohort design. This study uses secondary data from medical records of diabetes mellitus patients diagnosed at the Makassar City Hospital, RSUP Dr. Wahidin Sudirohusodo and Ibnu Sina Hospital. Data collection was carried out retrospectively by following subjects to determine events that had occurred since the patient was first diagnosed. The total sample was 100 cases of diabetes mellitus complicated by diabetic ulcers. Data were analyzed using Kaplan Meier survival analysis to determine the survival of Diabetes Mellitus patients with Diabetic Ulcers based on the factors age, total cholesterol levels, HDL levels, Triglyceride levels, and duration of DM.

Results

Analysis was carried out to determine the probability and survival graph as well as the difference in survival probability for the independent variable versus the dependent/status variable. Analysis was carried out with Kaplan Meier. To see whether the statistical curves are the same or different, a log rank test is carried out.

Survival of Diabetes Mellitus Patients with Diabetic Ulcers Based on Age Groups

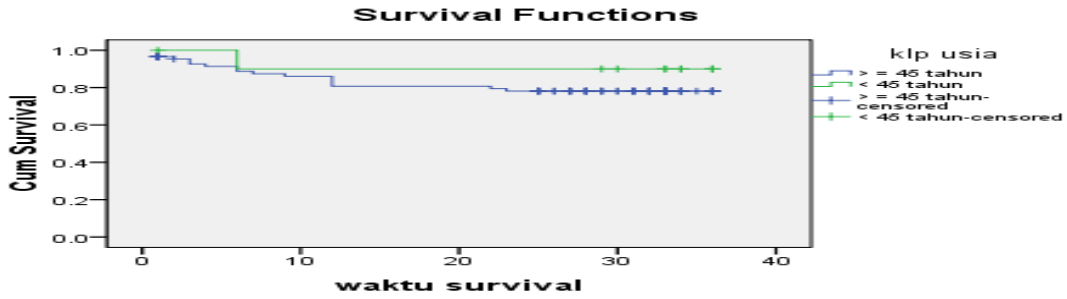

Figure 1. Survival curve of diabetes mellitus sufferers with diabetic ulcers at Dr.Wahidin Sudirohusodo Hospital and Ibnu Sina Hospital Makassar

The image above shows that the survival curves of DM patients with diabetic ulcers intersect each other. This means that the difference in survival probability based on the respondent's age group (≥ 45 years and < 45 years) is not significant or does not meet the Proportional Hazard assumption (p value = 0.389), log rank test value = 0.239.

Survivial of Diabetes Mellitus Patients with Diabetic Ulcers Based on Total Cholesterol Levels

The survival curve for DM patients with diabetic ulcers based on the respondents' total cholesterol levels is expressed in the following Kaplan Meier curve

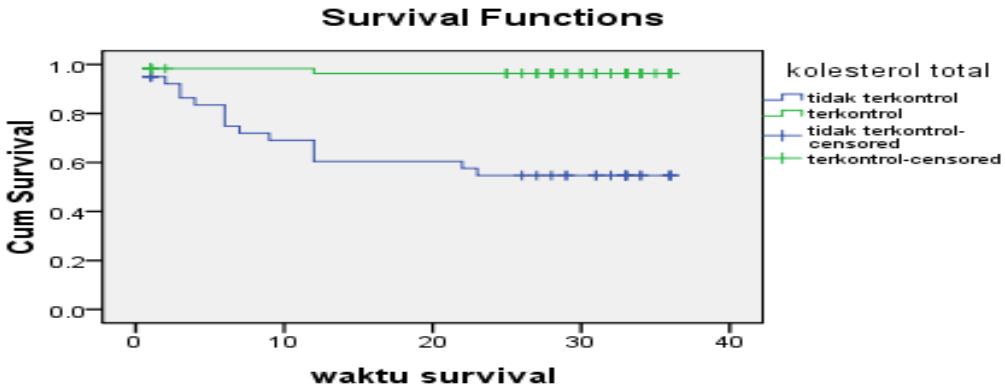

Figure 2. Survival curve of diabetes mellitus sufferers with diabetic ulcers at Dr.Wahidin Sudirohusodo Hospital and Ibnu Sina Hospital Makassar

Figure 2 shows that the survival curves for DM sufferers with diabetic ulcers based on the respondents' total cholesterol levels do not intersect with each other. This means that the difference in survival probability based on cholesterol levels is significant or meets the Proportional Hazard assumption (p value = 0.000), log rank test value = 22.804.

Survival of Diabetes Mellitus Patients Based on HDL

The survival curve for DM patients complicated by diabetic ulcers based on the HDL cholesterol levels of the respondents is expressed in the following Kaplan Meier curve:

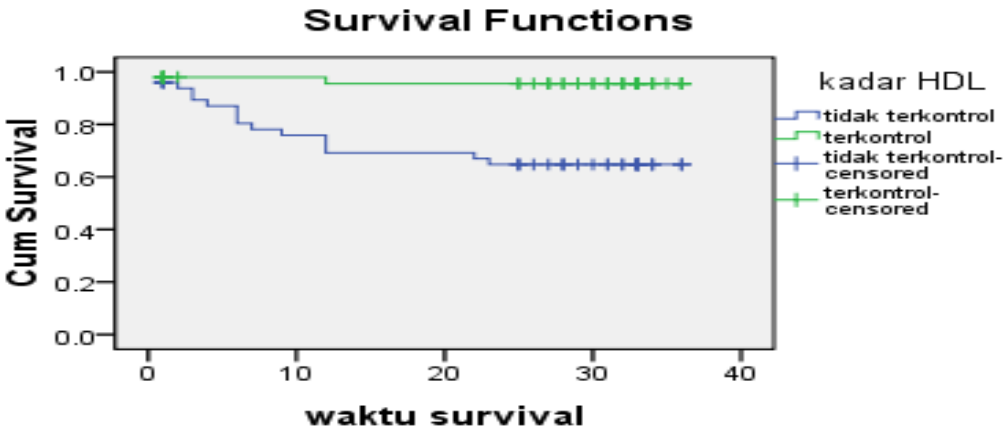

Figure 3. Survival curve of diabetes mellitus sufferers with diabetic ulcers at Dr.Wahidin Sudirohusodo Hospital and Ibnu Sina Hospital Makassar

Survvial of Diabetes Mellitus Patients with Diabetic Ulcers Based on Cholesterol Triglyceride Levels

The survival curve for DM patients with diabetic ulcers based on the respondent's cholesterol and triglyceride levels is expressed in the following Kaplan-Meier curve:

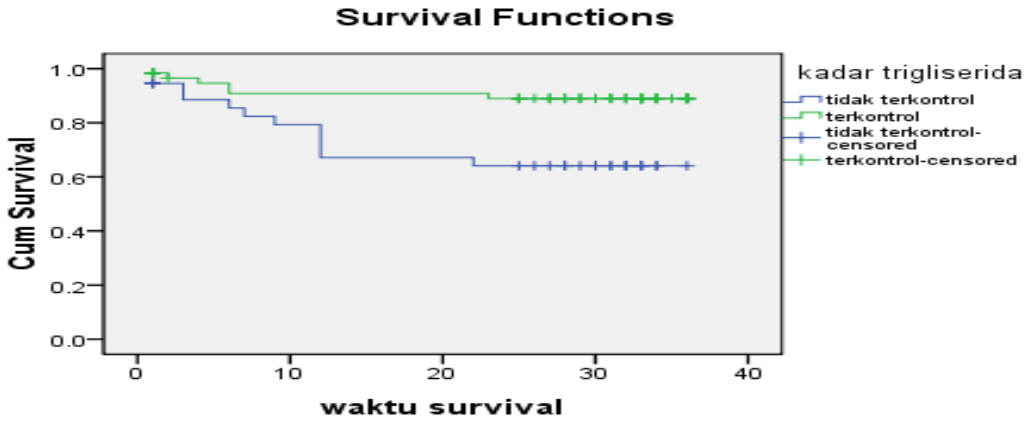

Figure 4. Survival curve of diabetes mellitus sufferers with diabetic ulcers at Dr.Wahidin Sudirohusodo Hospital and Ibnu Sina Hospital Makassar

Figure 4 shows that the survival curves for DM sufferers with diabetic ulcers based on the respondents' triglyceride levels do not intersect with each other. This means that the difference in survival probability based on cholesterol and triglyceride levels is significant or meets the Proportional Hazard assumption (p value = 0.006), log rank test value = 7.588.

Survival of Diabetes Mellitus Sufferers with Diabetic Ulcers Based on Length of Suffering from DM

The survival curve for DM patients with diabetic ulcers based on the respondent's duration of suffering from DM is expressed in the following Kaplan Meier curve:

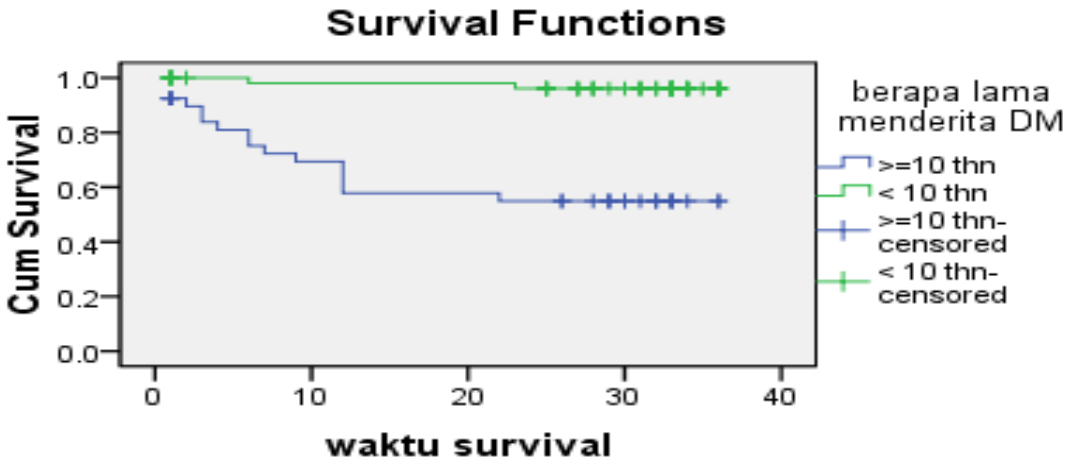

Figure 5. Survival curve for diabetes mellitus sufferers with diabetic ulcers at Dr.Wahidin Sudirohusodo Hospital and Ibnu Sina Hospital Makassar

Figure 5 shows that the survival curves for DM sufferers with diabetic ulcers based on the respondent's duration of suffering from DM do not intersect with each other. This means that the difference in survival probability based on the length of time suffering from DM is significant or meets the Proportional Hazard assumption (p value = 0.000), log rank test value = 23.556.

In the survival data analysis, the Cox Regression (Proportional Hazard Model) approach was used. The table of results of multivariate analysis using Cox Regression (Proportional Hazard Model) is as follows:

Table 1. Cox Regression Analysis for Each Independent Variable with Survival of Diabetes Mellitus Patients with Diabetic Ulcers at Dr.Wahidin Sudirohusodo Hospital and Ibnu Sina Hospital Makassar

Step	Variabel	Beta	SEB	Wald	P	HR	95 % CI
Step 1	Kolesterol	2,,018	0,898	5,047	0,025	7,525	1,294-43,770
	HDL	0,644	0,915	0,495	0,482	1,903	0,317-11,432
	Trigliserida	0,135	0,065	0,047	0,799	1,144	0,406-3,222
	Lama DM	2,500	0,763	10,752	0,001	12,187	2,734-54,321
Step 2	Kolesterol	2,037	0,885	5,303	0,021	7,668	1,354-43,422
	HDL	0,692	0,883	0,614	0,433	1,998	0,354-11,284
	Lama DM	2,458	0,755	10,590	0,001	11,686	2,658-51,368
Step 3	Kolesterol	2,437	0,755	10,425	0,001	11,441	2,606-50,235
	Lama DM	2,471	0,755	10,708	0,001	11,829	2,693-51,952

Source: Medical Record Data from Dr. Wahidin Sudirohusodo Hospital and Ibnu Sina Hospital Makassar

Discussion

Diabetes melitus sufferers who have been around for >15 years have a 6.5x higher risk of developing diabetic foot ulcers (Assaad-Khalil et al., 2015; Fawzy et al., 2019). This is in line with previous research conducted in North India stating that long duration of DM is an important risk factor for diabetic complications (Shahi et al., 2012). Suffering from DM for a long period of time will result in blood glucose levels continuing to increase and become uncontrolled. This will cause macroangiopathy which will result in decreased blood circulation and loss of pain sensation in the wound.

The longer a person suffers from diabetes mellitus causes the patient to experience a prolonged state of hyperglycemia and the greater the chance of suffering from chronic hyperglycemia. A continuous state of hyperglycemia causes hyperglycolia, which is a condition where cells are flooded with glucose. Chronic hyperglycolia will change the biochemical homeostasis of the cells, which then has the potential to cause changes in the basis for the formation of chronic complications of diabetes mellitus (Roza et al., 2018).

Diabetic foot wounds can increase morbidity, cause lifelong disability and substantially reduce the quality of life for patients. Specifically, patients with diabetic foot ulcers have limited mobility, poor psychosocial adjustment, and lower self-perception of health compared to patients without ulcers, with the survival rate of patients with diabetic foot ulcers decreasing (Bekele et al., 2020). .

Diabetic ulcers are the main reason why diabetes mellitus patients are hospitalized and can cause amputation, decreased quality of life, and even death (Shahbazian et al, 2013). Diabetic Ulcer Mortality in Dr. Kariadi Regional Hospital, Semarang City Tertiary Health Service reached 10.9% (Pemayun and Naibaho, 2017). The main cause of diabetes sufferers being hospitalized is diabetic foot ulcers and amputation is a serious consequence of diabetic foot ulcers and occurrence of death (Ahmad, 2016).

Conclusion

There is no effect of age on the survival of DM sufferers with diabetic ulcers. There is an influence of total cholesterol levels, HDL cholesterol levels, triglyceride cholesterol levels, duration of DM on the survival of DM sufferers with diabetic ulcers at Dr. Wahidin Sudirohusodo Hospital and Ibnu Sina Hospital, Makassar City.

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