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The Survival Rate of Patients with Diabetes Mellitus in Indonesia Between 2019 and 2022

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Abstract Diabetes Mellitus is a rapidly growing health concern that affects almost every country in the world. Currently, there are 537 million cases of diabetes worldwide, and this number is projected to increase to 643 million by 2030. Indonesia is the only Southeast Asian country included among the top 10 nations globally, with the highest number of people diagnosed with diabetes mellitus. Therefore, this study aims to assess the survival rate of patients with diabetes in Indonesia. This study utilized data from the "BPJS Kesehatan," the Indonesian National Health Insurance. The data pertained to a contextual diabetes participant sample. The data was analyzed using survival analysis, which involved univariable analysis, a proportional hazards assumption test, and bivariable analysis using the Cox Regression test. According to the research findings, out of the total sample of 143,496 diabetes patients observed from 2019-2022, the survival rate for diabetes patients in Indonesia was 0.7945. If analyzed by province, the survival rate ranged from 0.7496 to 0.8565. Moreover, this study found that children aged 0-5 had the highest mortality rate with a hazard ratio of 1.9 when compared to those aged 18-40. Additionally, men were found to be at a higher risk than women, with a hazard ratio of 1.5. According to the treatment class, patients in class II had the highest mortality rate, with a hazard ratio of 1.1 when compared to class I patients. On the other hand, based on participant segmentation, independent participants (PBPU) had the highest mortality rate, with a hazard ratio of 2.8 times higher than premium assistance beneficiaries (PBI) participants from the annual national budget (APBN). Finally, patients with diabetes had a higher mortality rate at General Practitioner health facilities than at Primary Clinics, with a hazard ratio of 1.1. In conclusion, the survival rate of patients with diabetes in Indonesia has witnessed a decline from 2019 to 2022, which indicates an increase in the annual mortality rate. It is imperative to address other risk factors that contribute to the decline in the survival rate of patients with diabetes.

Keywords Diabetes, Mortality, Survival Rate, BPJS, Indonesia

1. Introduction

Diabetes Mellitus (DM) is recognized worldwide as an emerging epidemic. It has a cumulative impact across age groups and economic status in almost every country [1]. The World Health Organization (WHO) has declared diabetes mellitus a global health emergency of the 21st century. Diabetes mellitus cases are on the rise worldwide. In 2015, 415 million people were living with diabetes. As of 2021, this number has increased to 537 million people and is projected to reach 643 million people in 2030 [2], [3]. Indonesia is currently among the top 10 countries in the world with the highest number of people living with diabetes. In the Southeast Asia region, Indonesia is ranked third for the number of people with diabetes, with a prevalence rate of 11.3%. Indonesia is ranked third in

Southeast Asia for the highest prevalence of people living with diabetes. However, if the calculation is based on population, approximately 10.7 million Indonesians have diabetes. This puts Indonesia as the only Southeast Asian country in the top 10 countries worldwide with the highest number of people affected by diabetes [4].

Diabetes mellitus is a chronic metabolic disorder characterized by blood sugar levels that exceed normal limits due to decreased insulin secretion and/or action. Meanwhile, according to experts at the Indonesian Endrokinology Association (Perkeni), diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia that occurs due to abnormalities in insulin secretion, insulin action, or both [4]–[6]. Insulin resistance is a common medical condition that can lead to various complications for individuals living with diabetes. These complications include an elevated risk of nerve damage, hypertension, vision loss, cardiovascular disease, foot infections, and other related illnesses. The presence of these complications has a detrimental effect on the overall survival rate of individuals living with diabetes, making it imperative to closely monitor and manage insulin resistance to prevent the onset of further complications [7].

Type 2 Diabetes Mellitus (T2DM) involves defective insulin secretion by pancreatic β cells and insulin resistance in tissues [8]. Genetic factors such as IRS-1, PI-3 K, and environmental factors such as android obesity contribute to T2DM [9]. Type 1 Diabetes Mellitus (T1DM) occurs due to autoimmune destruction of pancreatic β cells, aided by autoreactive T cells and autoantibodies [10]. Epigenetic changes are closely related to the pathogenesis of T1DM, thus enabling the process of adaptation to environmental factors [11]. Gestational Diabetes Mellitus (GDM) is influenced by genetic factors such as TCF7L2, MTNR1B, and environmental triggers such as diet and pollutants, leading to insulin resistance and beta cell dysfunction [12].

Various studies have been conducted worldwide on the survival rate of people with diabetes mellitus. Studies of pregnant women with diabetes found much higher perinatal mortality rates [13]. Studies have shown a link between low socioeconomic status and increased mortality, morbidity, and challenges with disease management [14]. Individuals with diabetes who also have cancer are 30% more likely to die than those with cancer but without diabetes, according to a study conducted in the USA. The study also found that although the death rate for individuals with cancer and diabetes has decreased, certain subgroups of the population, such as those with low education and obesity and the black people community, have experienced an increase in death rates [15]. Furthermore, a study conducted in six countries—Denmark, Latvia, Scotland, Spain, Australia, and the USA—found that Latvia had the highest mortality rate while Spain had the lowest. The death rate for type 1 diabetes patients in these countries has shown a decline. However, the death rate due to diabetes in women in these countries has increased, even though the overall trend in the death rate is declining [16].

In Indonesia, several studies have been conducted on diabetes mellitus. However, these studies have mainly focused on the factors contributing to the disease and its complications, and no statistical data has been found on survival or mortality rates. This information is critical because survival analysis can be used to interpret the survival of two or more groups, and death rates can help measure risk in a disaster emergency. This information can also be used to create plans and policies that align with the intended target groups [17].

2. Materials and Methods

2.1. Data Source

This study was based on contextual sample data for Diabetes Mellitus (DM) obtained from the "Badan Penyelenggara Jaminan Kesehatan" (BPJS Kesehatan, lit. ‘Social security agency on health’), which includes all participants sampled in the BPJS Kesehatan information system across all provinces in Indonesia. The sample was representative of the National Health Insurance (JKN-KIS) participants who were diagnosed with diabetes between 2015 to 2022, based on the International Classification of Diseases (ICD), at First Level Healthcare Facilities (FKTP) and Advanced Referral Healthcare Facilities (FKRTL). The study analyzed data on participants' age, gender, treatment class, and segmentation, which provided insights into their socio-economic status and the type of health facility they received treatment from.

2.2. Population and Sample

The study population consisted of JKN-KIS participants who had been diagnosed with diabetes mellitus while accessing services through BPJS Kesehatan. The diagnosis of diabetes mellitus was based on the diagnosis code according to the International Classification of Diseases (ICD), namely E10 Type 1 diabetes mellitus and E11 Type 2 diabetes mellitus without complications. Sample selection was carried out using a stratified sampling design. The formation of strata is through a combination of three (3) things, namely (1) district/city; (2) type of Diabetes Mellitus (type 1 DM or type 2 DM); (3) type of health facility where participants receive DM services (consisting of FKTP only, FKRTL only or FKTP and FKRTL). Furthermore, the sampling unit is individuals as JKN-KIS participants. A stratified sampling design was used to select the sample. A semi-proportional sampling method was used to collect samples from each stratum. This method considered that the population size in each stratum varies greatly and ensured that the diversity in each stratum was represented. Strata with a large population size were sampled more often than strata with a small population. This approach required weighting before starting analysis

on each data. By using sampling and weighting techniques, the sample data was representative of all the provinces in Indonesia, and as such, the results could be generalized to the population.

2.3. Statistical Analysis

The first step in statistical analysis is data management, which involves the following activities: (1) Data filtering to remove data that is irrelevant or unnecessary for the research; (2) Data cleaning, which involves re-checking the entered data for any errors; (3) Recoding, which is the process of reclassifying data with codes that are relevant to the research; and (4) Computing, which involves creating new variables by combining several variables already present in the main data set [18].

The next step is to analyze the data using survival analysis, with the time units in years. The analysis will consist of two parts: (1) Univariable analysis, which aims to examine the characteristics of each variable by creating a frequency distribution. The data will be presented in tables and figures. (2) Proportional Hazard (PH) assumption, which aims to determine the appropriate analysis to be carried out based on the research variables. The PH assumption can be tested through three methods: the Goodness of Fit (GOF) test, graphic techniques, and time-dependent covariate. If the GOF test was used to check the proportional hazards (PH) assumption, then it was considered to have met the requirement if the value obtained was not significant (>0.05). On the other hand, if the graph method was employed, the PH assumption was met if the line graphs were parallel and did not intersect. However, if the graph showed an intersection and the GOF value was not significant, then a time-dependent covariate (T-COV) was used to indicate that the covariate variable depends on time, which was considered significant if the value obtained was >0.05. (3) The bivariate analysis involving a simple Cox Regression test was used to evaluate the relationship between the independent and dependent variables, i.e., the mortality of patients with DM [19] [20].

3. Results

The survival rate of patients with diabetes mellitus was depicted by the variables of final status and the time (in years) until the end of the study. Additionally, if the patient had passed away, it was referred to as an "event," and if not, it was considered "censored." The following table represents the probability of mortality in diabetes mellitus patients.

According to the survival rate presented in Table 1, the cumulative probability of mortality in diabetic patients in Indonesia was 79.45%. This indicates that out of 100 diabetic patients, approximately 80 patients were likely to survive or not die until the end of the study. However, it was impossible to calculate the median resistance to mortality as the mortality rate did not reach 50% until the end of the observation period. The research results indicate that the mortality rate for patients with diabetes in Indonesia during the year of observation was 5.4 per 100 individuals. When analyzed by province, the highest survival rate was observed in West Nusa Tenggara at 0.8565, which translates to 86 people out of 100 surviving during the observation period. In contrast, the lowest survival rate was observed in North Sulawesi at 0.7496, meaning that 25% of patients with diabetes in North Sulawesi died during the 4-year observation period (Table 2).

Moreover, each variable, including age, gender, treatment class, participant segmentation, province of residence, and type of healthcare facility, was analyzed separately to determine the frequency distribution of results. The analysis was presented in Table 3, which showed that the highest survival rate was observed in the age group of 18-40 years, while the lowest survival rate was observed in children under five years of age, at 0.6250. This means that 35% of patients with DM under the age of five did not survive the fourth year of observation. According to the gender variable, the survival rate among female DM patients was higher than that of male patients, at 0.8248. On the other hand, male patients had a survival rate of 0.7497, which indicates that more than 25% of male DM patients did not survive during the 4th year of the observation period. Additionally, the study analyzed various socio-economic factors based on treatment categories and participant segments. The results showed that the survival rates of diabetic patients did not differ significantly across different treatment categories. However, the lowest survival rate of 0.7769 was observed in the treatment class II. Furthermore, the study found that independent participants had the lowest survival rate of 0.7172 among the participant segments. This implies that in the four years of observation, 25% of independent participants died. Furthermore, patients who received contribution assistance from the central government had a significantly higher survival rate of 0.8854 compared to those who paid for their insurance costs. Finally, the study analyzed the variable type of health facility for diabetic patients. The results indicated that patients who chose the primary clinic as their health facility had the highest survival rate of 0.8023. On the contrary, the survival rate was lower for patients who selected general practitioners as their health facility, with a rate of 0.7884.

Table 1. Cumulative Probability of Mortality Resistance in Patients with Diabetes Mellitus in Indonesia from 2019 to 2022

Time	Beginning Total	Deaths	Lost	Survival	95% CI
1	143.496	4.330	826	0,9698	0,9689 – 0,9707
2	138.340	5.920	1.989	0,9283	0,9270 – 0,9296
3	130.431	7.432	10.322	0,8754	0,8737 – 0,8771
4	112.677	10.414	102.263	0,7945	0,7924 – 0,7967

Table 2. Cumulative Probability of Mortality Resistance in Diabetes Mellitus Patients by Province in Indonesia

No	Province	Deaths (%)	Lost (%)	Survival	No	Province	Deaths (%)	Lost (%)	Survival
1	Aceh	17,96	82,04	0,8106	19	East Nusa Tenggara	15,96	84,04	0,8313
2	North Sumatra	21,16	78,84	0,7790	20	West Kalimantan	18,68	81,32	0,8045
3	West Sumatra	17,29	82,71	0,8187	21	Central Kalimantan	18,04	81,96	0,8109
4	Riau	19,62	80,38	0,7935	22	South Kalimantan	18,46	81,54	0,8049
5	Jambi	21,97	78,03	0,7697	23	East Kalimantan	20,43	79,57	0,7842
6	South Sumatra	19,64	80,36	0,7954	24	North Kalimantan	18,68	81,32	0,8039
7	Bengkulu	19,76	80,24	0,7913	25	North Sulawesi	23,68	76,32	0,7496
8	Lampung	19,08	80,92	0,8008	26	Central Sulawesi	20,36	79,64	0,7853
9	Bangka Belitung Islands	20,01	79,99	0,7892	27	South Sulawesi	17,21	82,79	0,8197
10	Riau Islands	17,47	82,53	0,8171	28	Southeast Sulawesi	17,47	82,53	0,8142
11	DKI Jakarta	21,50	78,50	0,7753	29	Gorontalo	21,27	78,73	0,7740
12	West Java	18,47	81,53	0,8066	30	West Sulawesi	14,94	85,06	0,8424
13	Central Java	20,19	79,81	0,7883	31	Maluku	22,31	77,69	0,7628
14	IN Yogya	17,41	82,59	0,8177	32	North Maluku	19,25	80,75	0,7942
15	East Java	21,40	78,60	0,7756	33	West Papua	15,17	84,83	0,8374
16	Banten	20,11	79,89	0,7887	34	Papua	18,81	81,19	0,8029
17	Bali	15,44	84,56	0,8365	35	Undefined	23,08	76,92	0,7552
18	West Nusa Tenggara	13,69	86,31	0,8565					

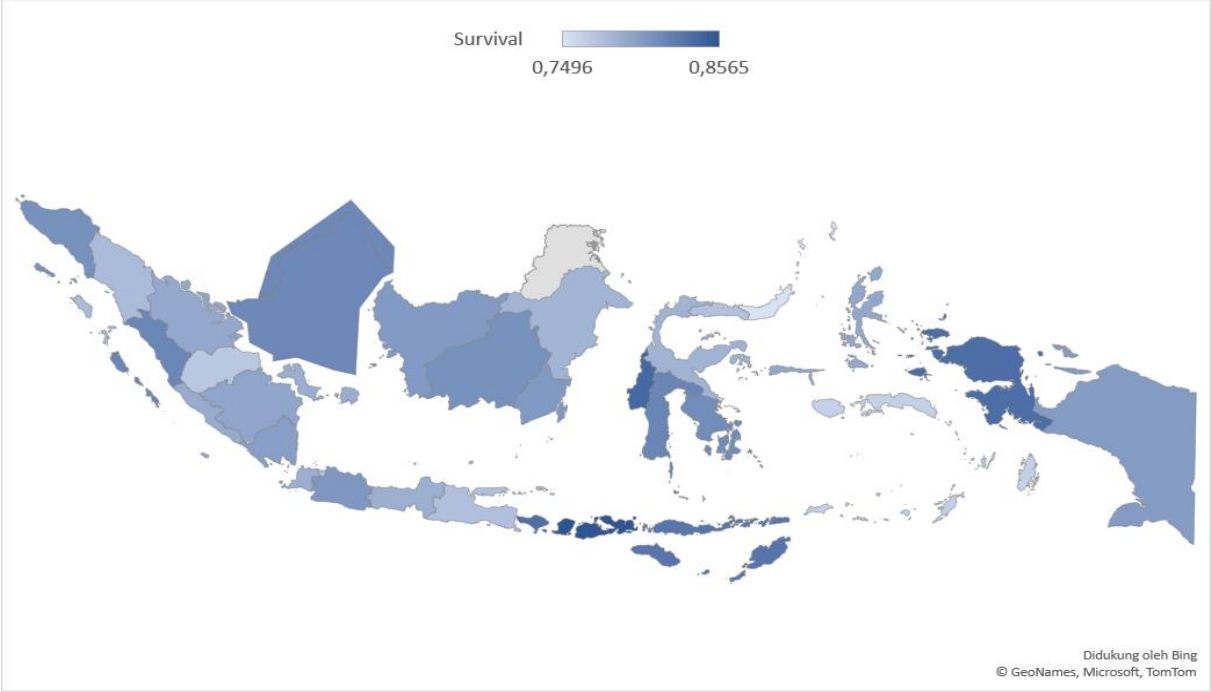

Figure 1. An Overview of the Survival Rate in Each Province of Indonesia

Table 3. Variable Frequency Distribution Based on Respondent's Final Status

No	Variable	Event (Mortalitas)		Cencored		Total		Survival
		n	%	n	%	N	%	
1.	**Age**							
	0-5 years	4	33,33	8	66,67	12	0,01	0,6250
	6-17 years	39	26,00	111	74,00	150	0,10	0,7371
	18-40 years	1.062	18,99	4.530	81,01	5.592	3,90	0,7980
	>40 years	26.991	19,60	110.751	80,40	137,742	95,99	0,7944
2.	**Gender**							
	Male	13.783	23,90	43.884	76,10	57.667	40,19	0,7497
	Female	14.313	16,68	71.516	83,32	85.829	59,81	0,8248
3.	**Treatment Class**							
	Class I	10.395	19,24	43.643	80,76	54.038	37,66	0,7979
	Class II	5.672	21,34	20.909	78,66	26.581	18,52	0,7769
	Class III	12.011	19,14	50.728	80,86	62.739	43,72	0,7991
	Undefined	18	13,04	120	86,96	138	0,10	0,8615
4.	**Participant Segmentation**							
	Self-employed	5.755	19,37	23.962	80,63	29.717	20,17	0,7953
	Government Assistance (PBI APBN)	2.320	10,73	19.294	89,27	21.614	15,06	0,8854
	Government Assistance (PBI APBD)	3.298	20,75	12.595	79,25	15.893	11,08	0,7804
	Independent (PBPU)	10.977	27,30	29.231	72,70	40.208	28,02	0,7172
	Employee (PPU)	5.746	15,93	30.318	84,07	36.064	25,13	0,8323
5.	**Type of Health Facility**							
	Public Health Centers	17.172	19,74	69.810	80,26	86.982	60,62	0,7923
	Primary Clinic	7.250	18,90	31.110	81,10	38.360	26,73	0,8023
	General Practitioners	3.674	20,24	14.480	79,76	18.154	12,65	0,7884

Before proceeding to the next step of analysis, bivariate analysis, a test was performed to check the Proportional Hazard (PH) assumption for the predictor variables. This test aimed to determine the type of modeling appropriate for the research variables. The PH assumption was tested using a graphic technique and the Goodness of Fit (GOF) test. If the results indicate that the PH assumption was not met, then a Time-dependent Covariate (T-COV) test was performed. Tables 4 and 5, as well as Figures 2 to 6, show the results of the PH assumption test.

After analyzing the data using the Kaplan-Meier graphic method, it was observed that the predictor variables showed line intersections, and the age variable satisfied the proportional hazard assumption while the other predictor variables did not. Therefore, the T-COV test was conducted on variables that did not meet this assumption. The results from the T-COV test indicate that all the variables tested were significant, indicating the dependency on time. Thus, the appropriate analysis for this research was the Cox regression test.

Table 4. Proportional Hazard Assumption with the God of Fit (GOF) Method

No	Variable	PH Value
1	Age	0,1315
2	Gender	0,0177
3	Treatment Class	0,0001
4	Participant Segmentation	0,0001
5	Type of Health Facility	0,0005

Table 5. Proportional Hazard Assumption with T-COV

No	Variable	Nilai PH
1	Age	0,0180
2	Gender	0,0001
3	Treatment Class	0,0001
4	Participant Segmentation	0,0030

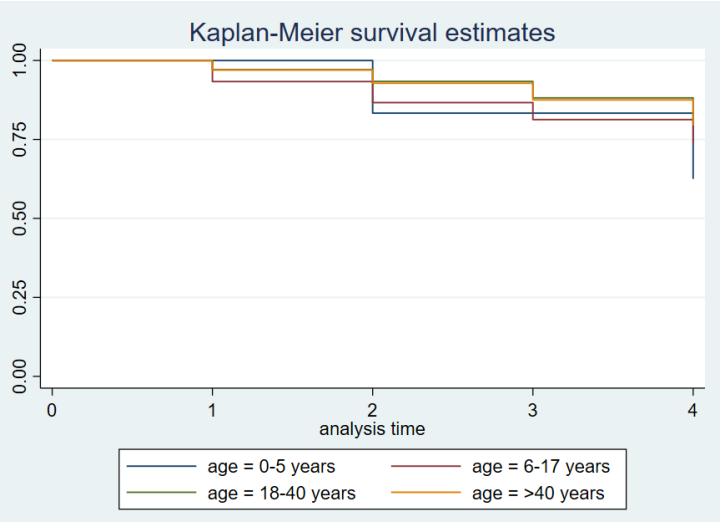

Figure 2. Kaplan Meier Survival Graph on Mortality Based on Age in Indonesia

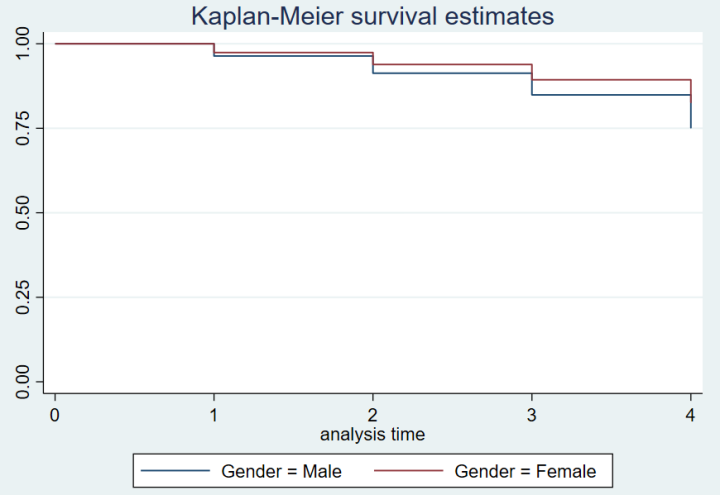

Figure 3. Kaplan Meier Survival Graph on Mortality Based on Gender in Indonesia

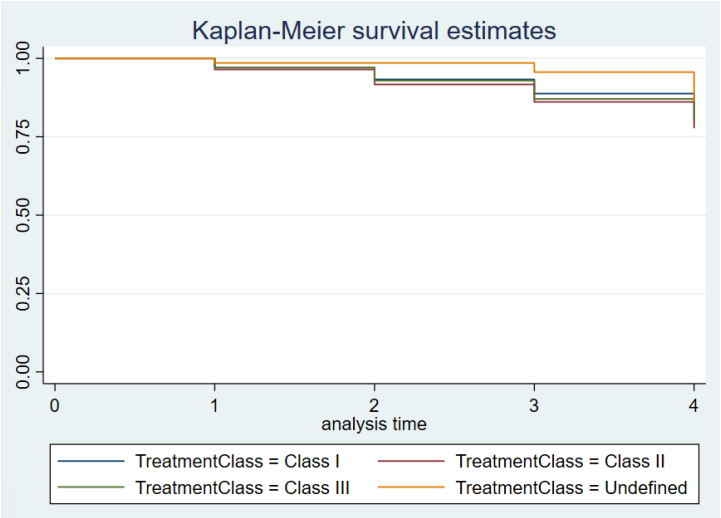

Figure 4. Kaplan Meier Survival Graph on Mortality Based on Treatment Class in Indonesia

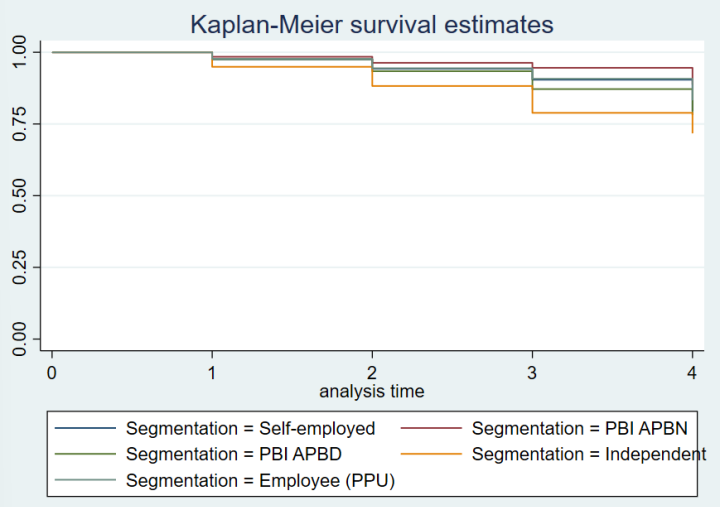

Figure 5. Kaplan Meier Survival Graph on Mortality Based on Participant Segmentation in Indonesia

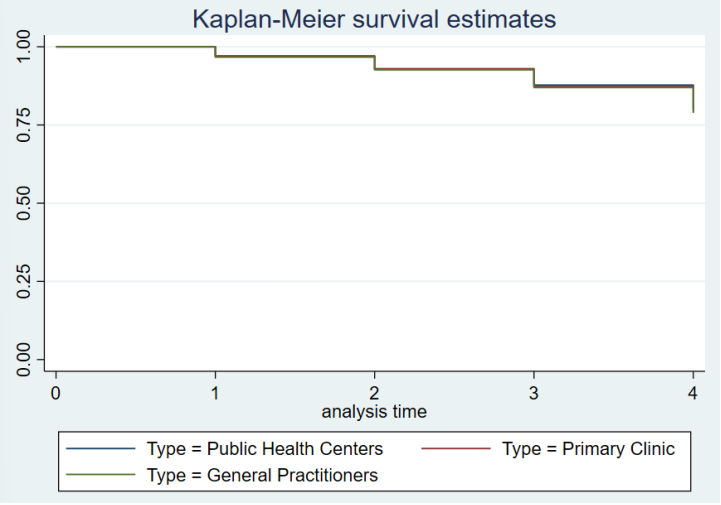

Figure 6. Kaplan Meier Survival Graph on Mortality Based on Type of Health Facility in Indonesia

Next, bivariate analysis was conducted to examine the relationship between various research variables such as age, gender, treatment class, participant segmentation, type of health facility, and mortality incidence in DM patients. The analysis involved calculating the hazard ratio value, which determines the risk of mortality based on independent variables. The findings of the analysis are presented in Table 6.

Table 6 shows how the independent variables relate to the dependent variable. The data suggests that children aged 0-5 years had the highest proportion of mortality, with a hazard ratio of 1.9 times higher than DM patients aged 18-40 years. However, after examining the significance level, it was found that the age group of 6-17 years has the greatest impact on mortality incidence. Additionally, the gender variable indicates that men have a higher proportion of mortality than women, with a hazard ratio of 1.5 times higher than women. Statistical tests also confirmed a significant relationship between gender and the dependent variables.

According to the research results, patients with treatment class II had a 1.1 times higher risk of mortality compared to those with treatment class I. The significance test results also showed that treatment class II had a significant association with the mortality rate among patients with DM. The study found that independent participants had the highest proportion of deaths, with a hazard ratio of 2.8 times higher than those receiving government assistance. All categories of this variable had a significant impact on the incidence of death among DM patients in Indonesia. Additionally, the analysis of health facility types revealed that general practitioner practice health facilities had the highest proportion of deaths, with a hazard ratio of 1.1 times higher than primary clinics.

Table 6. The Effect of Independent Variables on Mortality in Patients with Diabetes Mellitus in Indonesia

No	Variable	Mortality		Hazard Ratio	95% CI	P-Value
		Yes (%)	No (%)			
1	**Age**					
	0-5 years	33,33	66,67	1,876	0,703 – 5,001	0,209
	6-17 years	26,00	74,00	1,389	1,009 – 1,911	0,044
	18-40 years	18,99	81,01	Reff		
	>40 years	19,60	80,40	1,025	0,964 – 1,089	0,428
2	**Gender**					
	Male	16,68	83,32	Reff		
	Female	23,90	76,10	1,469	1,436 – 1,505	0,0001
3	**Treatment Class**					
	Class I	19,24	80,76	Reff		
	Class II	21,34	78,66	1,129	1,094 – 1,167	0,0001
	Class III	19,14	80,86	1,009	0,984 – 1,037	0,465
	Undefined	13,04	86,96	0,642	0,404 – 1,019	0,060
4	**Participant Segmentation**					
	Self-employed	19,37	80,63	1,834	1,747 – 1,924	0,0001
	Government Assistance (PBI APBN)	10,73	89,27	Reff		
	Government Assistance (PBI APBD)	20,75	79,25	2,017	1,912 – 2,127	0,0001
	Independent (PBPU)	27,30	72,70	2,798	2,675 – 2,926	0,0001
	Employee (PPU)	15,93	84,07	1,509	1,438 – 1,584	0,0001
5	**Type of Health Facility**					
	Public Health Centers	19,74	80,26	1,044	1,016 – 1,073	0,002
	Primary Clinic	18,90	81,10	Reff		
	General Practitioners	20,24	79,76	1,071	1,029 – 1,115	0,001

4. Discussion

This research aimed to investigate the survival rate of patients living with diabetes in Indonesia between 2019 and 2022. The study also explored the correlation between patients' characteristics and survival rates. The results indicated that during the observation period, 79.45% of patients with diabetes survived. However, the mortality rate for diabetes patients increased every year, which was consistent with the rise in diabetes prevalence. This finding is in line with the results of basic health research that revealed the prevalence of diabetes has increased from 8.5% in the previous survey. It is important to note that diabetes can lead to an increased risk of mortality due to various complications. For instance, in South Africa, diabetes patients have experienced a higher mortality rate due to complications related to the heart, respiratory system, and cancer. Similarly, research conducted in 108 countries worldwide has indicated that diabetes-related deaths are on the rise due to vascular complications, including issues with the kidneys, blood vessels, and nerves [21]–[24].

It has been observed that there is an annual increase in mortality rate across all 34 provinces of Indonesia, with varying survival rates among the provinces. North Sulawesi Province has the lowest survival rate, with 25% of patients dying within four years of observation. The research also predicts a significant increase in the mortality rate for this province in 2022, reaching up to 156.4% from the previous year. Meanwhile, West Nusa Tenggara (NTB) has the highest survival rate, but has seen a 50.6% increase in death rate. According to the Ministry of Health's basic health research data, North Sulawesi is the fourth province in Indonesia with the highest prevalence of diabetes. Additionally, North Sulawesi holds the highest obesity rate at 30.2%, which is much higher than the national average of 21.8%. Obesity is a significant factor that increases the incidence of diabetes, as an increase in fat tissue leads to higher cell resistance to insulin. A study indicates that an obese person is 7.37 times more likely to develop diabetes than someone with a normal weight. Furthermore, males with a body mass index exceeding 40 kg/m^2 have a significant impact on mortality rates due to diabetes [21], [25]–[27].

The study indicated that several factors were associated with the survival rate of patients living with diabetes. These factors included age, gender, treatment class, participant segmentation, and the type of health facility. The mortality risk for the 6-17 year age group was 1.4 times higher than for adults. Similarly, children aged 0-5 years had a 1.9 times greater mortality risk than adults. Studies have shown that patients with diabetes who die prematurely often have comorbidities or complications. Younger patients with diabetes are more likely to suffer from End Stage Renal Disease (ESRD) compared to adult or elderly patients. Non-albuminuric renal impairment is a strong predictor of mortality, highlighting the prognostic impact of renal dysfunction in diabetic patients with renal impairment [28], [29].

Gender is a significant factor in determining health outcomes. Studies suggest that males were at a higher risk of death, with a 1.5 times greater likelihood of dying than women. These gender differences in health outcomes have been observed in several studies across different countries. For instance, a study in Denmark found that male patients with diabetes had a higher mortality rate (81.3%) compared to their female counterparts (66.4%) throughout 13 years of observation. It is widely believed that males have more predisposing factors than females, mainly due to their higher tendency to smoke. In Indonesia, data on the prevalence of smoking for males is much higher than for females (10:1). Another crucial factor to consider is the existence of complications or comorbidities, such as kidney problems. In Indonesia, the number of males with kidney disorders is higher than that of females (4:3). However, other studies indicate that the number of deaths in female patients with diabetes is higher than in male patients due to vascular disorders, cancer, and obesity [21], [30], [31].

Specific risk factors that cause the death rate for men with diabetes in Indonesia are higher than for women due to various factors. A study shows that gender influences DM treatment compliance [32]. Additionally, behavioral factors such as irregular blood glucose monitoring and not having regular medical check-ups are associated with lower awareness of diabetes treatment, potentially contributing to higher mortality rates among men with diabetes [8]. These factors collectively contribute to the higher male diabetes mortality rate in Indonesia compared to women.

It has been found that socio-economic factors have a significant impact on the survival rate of diabetes patients. The treatment class and participant segmentation variables have been used to describe these factors. Treatment class II has been identified as a factor that increases the mortality risk of diabetes patients by 1.1 times as compared to treatment class I. Additionally, participant segmentation has also been found to influence the survival rate, with independent insurance participants having the highest risk of death. The risk of death for independent participants was 2.8 times greater than for participants who received government assistance. Studies have shown that socio-economic conditions such as long-term unemployment and living alone were strong predictors of mortality in males with diabetes. One such study conducted in Finland supports these findings.

A study conducted in 72 countries aimed to identify the impact of socioeconomic, environmental, and health behavior on the prevalence of cardiovascular diseases and diabetes. The results indicated that these diseases were more concentrated in middle—and low-income countries. Additionally, the study found that treatment class II participants paid lower fees than treatment class I participants. This suggests that the socioeconomic status of patients significantly influences their survival rate in cases

of diabetes. Based on the segmentation of participants, it was discovered that those who paid for insurance independently had a higher risk of death than those who received government assistance. This is consistent with previous research that indicates the number of independent participants in Indonesia is increasing every year, but their compliance in paying contributions is not keeping pace. In fact, 26.4% of independent participants currently have arrears in their insurance contributions, which is preventing them from receiving the health services they need [33]–[35].

Economic status or social status influences a person's healthy living behavior. As research results show, good knowledge is significantly related to a healthy lifestyle in diabetes mellitus patients [36]. Good knowledge will increase a person's awareness of healthy behavior, such as early detection as an initial action in diagnosing diabetes, so that complications/illness can be immediately prevented [37]. In Indonesia, research regarding knowledge of diabetes mellitus states that only 28.6% have good knowledge; 27% have sufficient knowledge, and 44.4% have poor knowledge [38]. The International Diabetes Federation (FDI) states that it is estimated that half of diabetes sufferers are unaware of their disease, making them more susceptible to experiencing diabetes complications [39].

The study focused on the first-level health facility (FKTP) as a factor that affects the survival of diabetes patients. The findings indicate that different types of health facilities have varying degrees of impact on patient survival rates. Primary clinics were found to be less risky compared to community health centers and general practitioners. As per the Regulation of the Minister of Health of the Republic of Indonesia, Number 34 of 2022 on Accreditation of Community Health Centers and the Regulation of the Minister of Health of the Republic of Indonesia Number 28 of 2011 on Clinics, a Community Health Center (Puskesmas) is a healthcare facility that provides public health services or first-level individual services that focus on preventive and promotive efforts. On the other hand, a primary clinic is a healthcare facility that provides comprehensive basic and specialist medical services that are promotive, preventive, curative, and rehabilitative with a staff of at least two doctors, other health workers, and non-health staff. Improved survival rates may depend on the availability of comprehensive health services and a complete staff at the chosen health facility [40], [41].

5. Conclusions

In Indonesia, the survival rate of patients living with diabetes has declined progressively from 2019 to 2022, indicating a rise in mortality every year. Further analysis of sample data suggests that the risk of death is higher among children and elderly patients than adults. Moreover, males are more susceptible to this disease than females. Socioeconomic factors, along with the treatment class, participant segmentation, and selection of health facilities variables, also impact the survival of diabetes patients. This study emphasizes the importance of reducing other risk factors that contribute to premature death in patients with diabetes, such as comorbidities, year of diagnosis, type of diabetes, and other factors that can worsen the condition of diabetic patients. Furthermore, this study also presents a graphical representation of the survival rate in each province, enabling a more accurate assessment of each region.

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