



Prevalence Of Diseases Complication In Individuals With Type Two Diabetes Mellitus

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Abstract

Introduction : Non-communicable diseases are a special problem, especially in Indonesia, one of the developments of non-communicable diseases is diabetes mellitus. This disease can be characterized by glucose levels in the blood which will have a negative impact on damage to body organs such as blood vessels, heart, eyes, nerves, and kidneys. Type 2 diabetes (T2DM) is the most common case of diabetes, this occurs when the body's resistance occurs or does not produce enough insulin. Diabetes mellitus has contributed to the development of diabetes complications both microvascular and macrovascular. Microvascular complications can include neuropathy, retinopathy, and nephropathy, while macrovascular complications are more likely to lead to coronary artery disease, cerebrovascular disease, and peripheral vascular disease. Based on the above findings, this study was conducted to determine the prevalence of microvascular and macrovascular complications that may occur at Jasmine Clinic 2 Surakarta.

Management and Outcome : A case report conducted in this study by recording the numbers and informations from data based of T2DM patients in Jasmin 2 Clinic, Surakarta. All necessary data such as gender, age, duration of diabetes, recent blood sugar levels (both fasting blood sugar and hemoglobin A1c calculations were entered) as well as recent complaints obtained through phone interviews. Based on the data presented, there were a total of 100 participants, of which 52 were women and 48 were men, aged 40 – 80 years. All participants received oral information regarding the purpose of this research. This study found prevalence of DM in women was higher than men by 52% and 48% respectively. There were 33% people aged less than 60 years. As many as 52% of individuals with diabetes mellitus 1-5 years, 32% for 6-10 years, and more than 10 years by 16%. Current blood sugar levels 14% blood sugar levels <100mg/dl and the remaining 86% with blood sugar levels >100mg/dl. The incidence of microvascular complications reported higher than macrovascular complications, there were 68% and 8% for each, while participants who did not have complaints were 24%.

Conclusion : This study declared higher prevalence of DM among women aged over or 60 years. Hyperglycemia is a tendency as dominant factor developing microvascular and macrovascular complications in individuals with T2DM.

Keyword : T2DM, Macrovascular and Microvascular complications



Introduction :

Non-communicable diseases are a special problem, especially in Indonesia, one of the developments of non-communicable diseases is diabetes mellitus^[16]. According to WHO, diabetes is a chronic metabolic disease. This disease can be characterized by high glucose levels in the blood which will have a negative impact on damage to body organs such as blood vessels, heart, eyes, nerves, and kidneys^[20]. Type 2 diabetes (T2DM) is the most common case of diabetes, this occurs when the body's resistance occurs or does not produce enough insulin^[17].

Classification and Diagnosis of Diabetes, the reference values for blood sugar are as follows^[5]:

- **Hemoglobin A1C (HbA1c):** (normal) less than 5.7%, (prediabetes) 5.7% to 6.4%, (diabetes) 6.5% or higher
- **Fasting Plasma Glucose (FPG):** (normal) less than 100 mg/dl, (prediabetes) 100mg/dl to 125mg/dl, (diabetes) 126 mg/dl or higher
- **Oral Glucose Tolerance Test (OGTT):** (normal) less than 140 mg/dl, (prediabetes) 140 mg/dl to 199 mg/dl, (diabetes) 200mg/dl or higher

So that the results can show diabetes if^[5]:

- **HbA1c** 5.7% - 6.4%
- **Fasting Plasma Glucose (FPG)** 100-125 mg/dl
- **Oral Glucose Tolerance Test (OGTT)** 140 mg/dl–199 mg/dl

Diabetes mellitus has the prevalence in the population aged 20-79 years based on the International Diabetes Federation 2019^[4]. Southeast Asia ranks 3rd with high population of DM, it is about 11.3%^[9]. Where Indonesia with aged 20-79 years itself has a diabetes national prevalence of 6.2%^[4]. Based on the results of data conducted by the Basic Health Research (RISKESDAS) in 2018 the prevalence of diabetes in Indonesia increased by 2% for aged above 15 years, this showed an increase in the prevalence of diabetes from 2013 by 1.5%. However, the prevalence of diabetes mellitus in the population above 15 years increased from 6.9% to 8.5% by 2013 to 2018. While women had high prevalence of DM than men with 1.78% and 1.21 respectively^[9].

Diabetes mellitus has contributed to the development of diabetes complications both microvascular and macrovascular^[14]. Microvascular complications can include neuropathy, retinopathy, and nephropathy, while macrovascular complications are more likely to lead to coronary artery disease, cerebrovascular disease, and peripheral vascular disease^[18]. Based on the above findings, this study was conducted to determine the prevalence of microvascular and macrovascular complications that may occur at Jasmine Clinic 2 Surakarta.

Method :

This study had been approved by Health Sciences Faculty, Universitas Muhammadiyah Surakarta (1299.5/C.8-III/FIK/VIII/2021). A case report study conducted to this study by recording the numbers and informations form data based of T2DM patients in Jasmin clinic 2, Surakarta. The data was collected selectively by enumerators. All necessary data such as gender, age, duration of diabetes, recent blood sugar levels (both fasting blood sugar and hemoglobin A1c calculations were entered) as well as recent complaints obtained through phone interviews due to face-to-face constraints due to the SARS CoV-2 virus pandemic.

All participants were asked to answer all questions correctly, checking the patient's blood sugar level as evidenced by the results of the last lab examination carried out both at the Jasmine's clinic data based and at other health installations for at least the last 3 months and receiving drug therapy from a doctor. Patients with hypertension were confirmed through a doctor's statement, medical recapitulation records, as well as hypertension drug therapy consumed. Based on the data presented, there were a total of 100 participants, of which 52 were women and 48 were men, aged 40 – 80 years. All participants received oral information regarding the purpose of this research.

Result

Table 1. Prevalence of Gender, Age, and Complication Diabetes Mellitus.

Variable		Frequency	Prevalence %
Gender	Women	52	52.0
	Man	48	48.0
	Total	100	100.0
Age	30 – 59 years	33	33.0
	60 – 80 years	67	67.0
	Total	100	100.0
Duration of Diabetes Mellitus	1 – 5 years	52	52.0
	6 – 10 years	32	32.0
	Above 10 years	16	16.0
	Total	100	100.0
blood sugar levels	< 100mg/dl	14	14.0
	>100mg/dl	86	86.0
	Total	100	100.0
Complication	Macrovascular	8	8.0
	Microvascular	68	68.0
	Without Complication	24	24.0
	Total	100	100.0

In table 1, it can be seen that the prevalence of diabetes mellitus in women was higher than men with 52% and 48% respectively. There were 33% people with aged under 60 years, and about 67% people aged 60-80 years. For the duration/how long the participants have had diabetes mellitus, as many as 52% of individuals with diabetes mellitus 1-5 years, 32% for 6-10 years, and more than 10 years by 16%. With the current blood sugar levels 14% with controlled blood sugar levels <100mg/dl and the remaining 86% with blood sugar levels >100mg/dl. The incidence of microvascular complications was higher than macrovascular complications, the ratio of microvascular complications were 68% and 8% severally, and as well 24 % participants who did not have complaints.

Table 2. Prevalence of Macrovascular and Microvascular Complication in people with T2DM

Variable		Frequency	Prevalence (%)	Total prevalence
Macrovascular	Cardiovascular Disease	2	2.0	19%
	Hypertension	15	15.0	
	Stroke	2	2.0	
Microvascular	Retinopathy	4	4.0	65%
	Neuropathy	58	58.0	
	Nephropathy	3	3.0	

In table 2, shows that the complications of macrovascular complications are dominated by hypertension, which is 15%, followed by heart disease as much as 2% and stroke as much as 2%. Then in table 2 also shows microvascular problems that occur in patients with type 2 diabetes mellitus with the highest prevalence of 58% being neuropathy, followed by 4% retinopathy, and 3% kidney disorders.

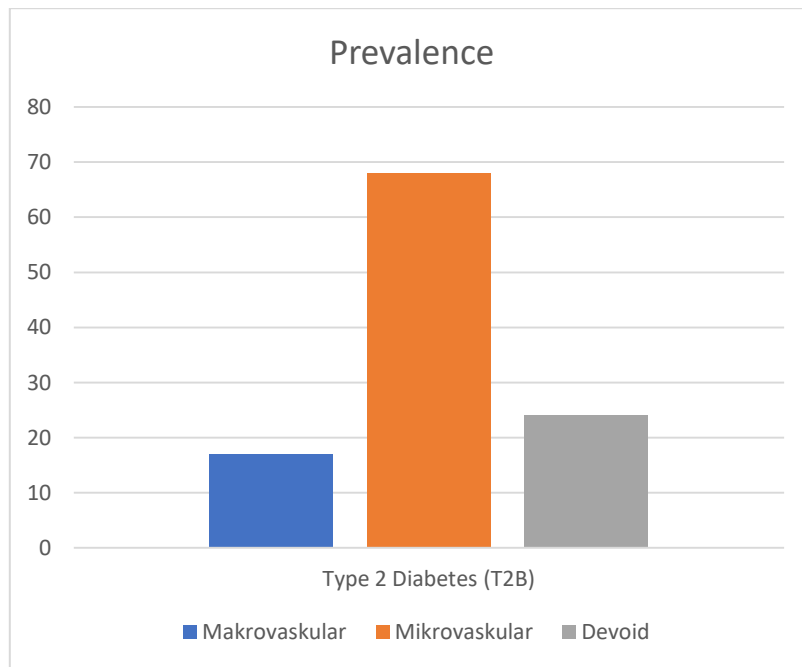


Chart 1. Prevalence of Complication Diabetes Mellitus

The chart 1 shows a prevalence diagram of complicated diabetes cases that occurred at the jasmine 2 clinic where you can see a bar chart showing the highest complication cases were in microvascular complications, with a total of 68% or as many as 68 participants having complaints of microvascular complications, both pure and micro- and mixed-complications. macro complication

Discussion :

Diabetes Mellitus Prevalence

In table 1 shows the highest DM prevalence in aged 60 years above and women induced DM higher than men. Research related to non-communicable diseases in Indonesia is accompanied by an increase in cases according to age and gender. A study by Rukmini showed the highest prevalence of DM in aged 60-69 years, as well women was higher number than men^[17]. Especially in urban areas, women have a tendency in education and work related to government employees. In DM, the higher prevalence tends in elderly people, this is due to a decrease in the function of the body's cells, including the pancreatic cells that works to produce insulin. Older women have a higher chance of increasing their postmenopausal body mass index^[16]. This is supported by the high mortality rate of women with DM due to various complications occurred. As well DM as the highest mortality rate^[8]. Other problems caused by diabetes include microvascular and macrovascular complications that arise along with diabetes^[14]. Problems such as microvascular generally tend appearing at the beginning of DM exposure, which is followed by other developments^[3]. Diabetes mellitus in productive age has higher risk factors and complications as well, and that the common risks include: obesity, dyslipidemia, hypertension and other complications such as stroke or tuberculosis^[12].

Microvascular Complication

- *Retinopathy*

This study reported that T2DM patients in Jasmine 2 Clinic were 4%. It showed retinopathy as the common impact of progressing of DM. The most common microvascular complication in patients with diabetes mellitus is diabetic retinopathy, with a percentage of up to 30%. The endothelial system in vascular injury and chronic damage is closely related to diabetic retinopathy. Common diseases associated with retinopathy caused by diabetes include glaucoma, macular damage, macular edema, and cataracts^[13]. Other common signs caused include micro aneurysm dot and blot bleeding, retinal edema, and cotton spots. Fundoscopic examination and digital photography can be performed as a test for diabetic retinopathy^[10].

- *Neuropathy*

There were 58% performed neuropathy in this study. The neuropathy as the 2nd most common case found in individuals with diabetes mellitus. This is due to the presence of neuropathic damage due to diabetic vasculopathy such as glucosotase, along with the accumulation of basement membrane lipids which is a major problem in neuropathy. This has an effect on microscopic damage causing motor and neuronal peripheral sensitivity disorders, other clinical signs can be found such as loss of sensitivity to pain, vibration, temperature and deep tendon reflexes. This being the most common complaint in cases of diabetes, it is advisable to perform a neurologic and dermatological examination to assess the individual's condition^[13].

- *Nephropathy*

Other complications caused by diabetes mellitus include diabetic nephropathy which is a disorder of the kidneys due to diabetes. Occurs in 40% of this is generally caused by hypertension and hyperglycemia^[10]. Notably, in this study occurred about 3% of nephropathy. The mechanism of nephropathy begins with the release of podocytes from the glomerular basement membrane, this is followed by hyperglycemia in the renin-angiotensin system in individuals with diabetes mellitus^[14].

Macrovascular Complication

- *Hypertension*

The hypertension noted approximately 15% in this study. Compared to individuals without diabetes, cases of hypertension have a 2-fold risk in individuals with diabetes. With increasing age, the prevalence of hypertension and diabetes, especially in industrialized countries, also increases. Hypertension is a pioneer of other diseases, both macrovascular and microvascular. Hypertension contributes as much as 30% mortality rate in patients with diabetes^[2]. The prevalence for hypertension in patients with diabetes mellitus was 85.6% in Benghazi, and 54.2% in Nigeria. Damage that occurs to organs due to hypertension is manifested by increased albumin excretion (proteinuria), hypertrophy and the presence of a left ventricular deformity pattern on the ECG. In a study of hypertension diabetes has a high correlation with heart disease and stroke. Hyperglycemia in diabetes mellitus, followed by insulin resistance and dyslipidemia is one of the highest prevalences of arterial hypertension. The above factors contribute to the development of atherosclerosis which plays a role in vascular inflammation, endothelial cell dysfunction, platelet disorders and blood clotting. Insulin itself has a role in increasing sodium retention and increasing sympathetic nerves, one

of which affects the production of aldosterone, a hormone responsible for salt and water in the kidneys. Another organ that is the target of hypertension is damage to the brain that results in stroke^[7].

- *Cardiovascular Disease*

In cases of diabetes, problems such as heart failure or heart disease are common cases, moreover hyperglycemia can increase blood clotting mechanisms, thereby inducing atherosclerosis and plaque susceptibility in patients with coronary heart disease^[11]. Such as 2% cardiovascular complication detected in this study. Hypertension and heart disease go hand in hand with diabetes mellitus, accounting for 25% of the incidence of cardiovascular disease in patients with diabetes mellitus^[2]. Cardiovascular disease is one of the contributors to the death rate in patients with diabetes mellitus by 60%. In patients with diabetes, atherosclerotic buildup generally affects the systemic vasculature^[13].

- *Stroke*

The risk of stroke in individuals with diabetes mellitus is higher than in those who have controlled blood sugar levels. Metabolic syndrome can be a multiplier factor in the risk of stroke. The findings obtained in stroke patients with diabetes mellitus are almost similar to coronary artery disease where plaque builds up in blood vessels, this causes the incidence of ischemic stroke to be much higher in cases of type 2 diabetes, on the contrary in cases of type 1 diabetes, stroke cases include: ischemic and hemorrhagic stroke^[1]. There were 2% of stroke patients registered in Jasmine 2 Clinic Surakarta.

Pharmacotherapy

The influence of drugs or drug therapy carried out by patients is also one way to control the stability of blood sugar levels and reduce the risk of hypoglycemia in the management of diabetes^[18]. Previous study explained an intensive group with an HbA1c level of 6.5% had unchanged macrovascular or various causes of death, but this finding was accompanied by a decrease in the incidence of microvascular complications, especially in T2DM with nephropaty^[19]. However, other studies also found chronic liver disease problems experienced by patients with type 2 diabetes mellitus, these findings still needed development of researches to determine the effect of drugs in DM patients with liver damage and other liver disorders. And also needs involving some factors as body mass index, lifestyle, and genetic risk. So that the use of diabetes drugs must still be adjusted to clinical conditions and consider to the dose according to the problems suffered by T2DM patients^[15]. Several other researchers have found a potential link to fluid resistance caused by glucose-lowering drugs (Thiazolidinediones)^[11].

Conclusion :

The results of this study obtained a higher prevalence in women aged over 60 years. Hyperglycemia is a the tendency factor to develop various microvascular and macrovascular complications in individuals with T2DM. For further, the microvascular has higher complications than macrovascular in patients with T2DM at the Jasmin 2 Clinic, Surakarta.

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