Chronic Complication Profiles of T2DM in Endocrine

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Chronic Complication Profiles of T2DM in Endocrine Outpatient Clinic, Dr Soetomo General Hospital, Surabaya

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Abstract

Background: Nowdays, the number of diabetic complications is still increasing each year. There are some factors that affect the early appearance of diabetic complications. By knowing these factors, doctors and patients will pay attention and prevent the early appearance. Therefore, diabetic patients will reduce the risk of death. **Objectives:** The study aimed todeterminethemost frequently occuringprofileofdiabeticmacroangiopathyandmicroangiopathy in peoplewithtype 2 diabetes mellitus. **Method:** Descriptive qualitativewith a cross-sectionaldesign. **Results:** Patients who are most commonly diagnosed type 2 diabetes mellituswithdiabeticcomplicationsare in theagegroup 46 – 55 year (32%), male (50.6%), highschool educated (59.9%), privateemployees (36.6%), averageof HbA1c level is 8.68%, controlled HbA1c (54.5%),and durationoftype 2 diabetes mellituswithno data on duration (56.9%). The showncomplications are singlemicroangiopathy (30.6%), singlemacroangiopathy (22%), microangiopathyandmacroangiopathycombination (9.4%), multiplemicroangiopathies (2.7%) andmultiplemacroangiopathies (2.7%). The microangiopathycomplications are retinopathy (22.6%), nephropathy (22.1%), andneuropathicdiabetic (10.3%) whilethe mostmacroangiopathycomplications are coronaryheartdisease (19.2%), peripheralcirculatorycomplication (14.8%), andstroke (11%).

Keywords: *Macroangiopathy and microangiopathy, common diabetic complication's profile, Diabetes Mellitus Type 2*

Introduction

The number of people with diabetes in the world is 463 million, with 10,681,400 of them from Indonesia. This places Indonesia is the 7thposition of

countries with the most diabetic people in the world.[2]Hyperglycemia is associated with abnormalities in endothelial dysfunction and also becomes an indication of microangiopathiesand microangiopathies.

If hyperglycemia is properly controlled by maintaining a normal HbA1c level, the incidence of diabetes mellitus complications can be reduced.[3]

Diabetic chronic complications can be grouped as either macroangiopathy or microangiopathy. In macroangiopathy,coronary heart disease, peripheral artery disease, and ischemic stroke. Meanwhile, in microangiopathy, there are 3 kinds of complications: diabetic retinopathy,diabetic nephropathy, and diabetic neuropathy.

There are 4 pillars in treating diabetes mellitus type 2: education, nutritional therapy, physical activity, and pharmacology using HbA1c level for blood glucose control.[5]These numbers are still rising. This studyaims

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to identify the most common macroangiopathy and microangiopathy cases at Dr. Soetomo Hospital. This study aims to analyzing diabetic factors such as age, sex, last education, occupation, duration of type 2 diabetes mellitus (T2DM), and the most types of chronic complications that occur. This is the first research that analyzing diabetic factors in Dr. Soetomo Hospital to improve the diabetes treatment.

Materials and methods

Thisdescriptive, qualitative, and cross-sectional design has a population of all patientsdiagnosed with T2DM with or without chronic diabetic complications. A non-probability sampling method with a consecutive sampling technique is used by taking several quota samples from the population until the quota is met.[6]

The minimum sample size that suggested for the descriptive study is equal to or more than 100 samples.[7]Samples were taken at the Endocrine outpatient clinic in Dr. Soetomofrom 255 patients who received treatments from July 2018 until July 2019, selected based on the inclusion and exclusion criteria.

The variables studied are age, gender, last education, occupation, average HbA1c level, duration of T2DM, and chronic diabetic complications such as coronary heart disease, stroke, diabetic foot, retinopathy, neuropathy, and nephropathy diabetic. The research used medical records as instruments. The data was subsequently analysedusing the 23 version of SPSS and Microsoft excel. The collected data will be presented descriptively in the form of frequencies and percentages.

Results & Discussion

Table 1. Additional Data of Age and Gender

Variables	Category	Total of People with Complications		
		Macroangiopathy	Microangiopathy	Macroangiopathy and Microangiopathy
Age	17–25 Years	-	1	-
	26 – 35 Years	1	4	-
	36 – 45 Years	9	15	3
	46 – 55 Years	18	32	5
	56 – 65 Years	21	20	12
	≥66 Years	11	13	7
Gender	Male	36	39	12
	Female	24	46	15

Table 2. Data frequency of research variable

Variables	Category		Total	%
Age	17-25 years		1	0.6
	26-35 years		5	2.9
	36-45 years		27	15.7
	46-55 years		55	32.0
	56-65 years		53	30.8
	≥ 66 years		31	18.0
Sex	Man		87	50.6
	Woman		85	49.4
Last Education	Primary School		24	14.0
	Junior High School		16	9.3
	High School		103	59.9
	Higher Education		20	11.6
	Uneducated		5	2.9
	Others		4	2.3
Profession	Housewife		56	32.6
	Others		2	1.2
	Civil Servant		19	11.0
	Private Employees		63	36.6
	Unemployed		11	6.4
	Entrepreneur		21	12.2
HbA1c level	Controlled	HbA1c level <7% at <60 years	43	16.9
		HbA1c level <8% at ≥60 years	96	37.6
	Uncontrolled	HbA1c level >7% at <60 years	81	31.8
		HbA1c level >8% at ≥60 years	29	11.4
Duration of T2DM	≤5 years		48	18.8
	≥6 years		62	24.3
	No data		145	56.9
Type of complications	Complications profile	Single Macroangiopathy	56	22.0
		Single Microangiopathy	78	30.7
		Macroangiopathy and Microangiopathy	24	9.4
		Multiple Macroangiopathy	7	2.7
		Multiple Microangiopathy	7	2.7
		Without Complications	83	32.5
	Microangiopathy	Retinopathy diabetic	46	22.6
		Nephropathy diabetic	45	22.1
		Neuropathy diabetic	21	10.3
	Macroangiopathy	Coronary heart disease	39	19.2
		Peripheral circulatory complication	30	14.8
		Stroke	22	11.0

Based on Table 1, it was found that there are 55 people of mostly around 46 to 55 years old who had been diagnosed with chronic complications. Age is an important factor that affect the prevalence of diabetes and impaired glucose tolerance. According to WHO, if someone's age has reached 30 years old, the fasting blood glucose concentrations will be increase by 1-2mg%/ year, and the blood sugar level 2 hours after eating will increase to 5-6-13 mg%[8]. This shows that age is related to diabetes prevalence. Furthermore, it's easier for this age group to become obese because their physical activity is decreasing. The number of insulin receptors that are ready to bind with insulin decrease, therefore affecting the decrease of GLUT-4 translocation rate.[9]According to previous research, patients with macroangiopathy and microangiopathy mostly occur in patients aged 46-65 years old.[10] The decrease of body functions, especially the pancreas, also occurs in this age group.[11]

In terms of gender, there are almost the same numbers of man and womanrespondents with chronic complications, 26 and 24 respectively. A previous research by Lathifa,also foundsuch similarity while a research by Yuhelma found that diabetes mellitus mostly occured in women. The later is due to women having a higher level of LDL or bad cholesterol and triglyceride than men. In women, the increasing higher lipid levels can be increase the risk of diabetes mellitus 3-7 times higher.[13]In this research, men have slightly higher number of complications of diabetes than women. These conditions can be caused by several factors such as lifestyle, culture, smoking habits, exercise, stressors, and socio-economic conditions, much like those found in Dr. Soetomo's patients.

Our recent education data in patients who experience chronic complications showed that most respondents were educated up to Senior High School level while a research by Yuhelma showed that patient's last education was dominated by Junior High School level.[13]Another research showed that respondents with higher education might be more knowledgeable about health, giving them higher awareness on how to maintaining their health.[14]Therefore, it's concluded that recent educations is related to the appearance of chronic complications due to how patients pay attention to their health and how they maintain necessary treatment.

The collected data shows that chronic complications mostly occur in respondents who work as a private employees. Busy work life can affect people's dietary needs and reduce their physical exercise time, giving them a higher risk for diabetes. According to a previous study by Sitohang, people with chronic complications are mostly found in working groups[16], This shows that physical activity is one of the most important pillars in the management of T2DM as it's related to improving insulin sensitivity for glucose to enter cells without insulin.[18]

HbA1c levels is a long-term glycemic control index for 2-3 months. In this study, there are 139 respondents (54%) with a controlled HbA1c level. At Dr. Soetomo Hospital, there are several conditions correlating to respondents with high HbA1c levels. The first is patients with severe conditions or patients after first hospitalization and later died. The second is patients with tumor and cancer at the time of their high HbA1c level but then after surgerythe next HbA1c examination was done in the other health facilities. Lastly, other conditions such as patients who only did 1-time HbA1c examination because they didn't routinely come for the follow-ups. Diabetes treatment is a long-term treatment that requires patients to be obedient in coming for the next follow-ups. Patients' disobedience in following the course of the treatment and lack of lifestyle changes are some of the reasons why the HbA1c control target wasn't achieved.[19]

In this research, the collected data shows that the duration of type 2 diabetes mellitus was challenging to assess as shown by patient's inability to present this data. It's very difficult to detect when T2DM can occur due to the progressive nature of the disease meaning that new symptomsappear when the condition starts to worsen.

The next dominant data is 39 patients (15.3%) who were diagnosed with T2DM for 1 to 5 years. With the lack of public attention and the habit of underestimating this disease, most people are unaware of the typical symptoms of diabetes and they will start to treat it when the condition is already mild. In addition, when people are diagnosed with T2DM, the function of their pancreas willdecrease ±±50%. A few years before being diagnosed with T2DM or while in prediabetes condition, there might abnormalities in laboratory and

clinical findings that can contribute to a cardiovascular risk factor.[18]People who had been suffering for 1 to 5 years from T2DM are susceptible to the quickening of this disease because some are not compliant with the treatment. Meanwhile, research by Lathifashowed that the level of pathogenicity of the disease can be seen from the disease's duration, especially diabetes mellitus.[12] However, if the long-suffering condition is balanced with a healthy lifestyle and compliance to the treatment, the early appearance of chronic complications can be prevent and delayed.[21]

The collected data of complications profile is mostly dominatedwithsinglemicroangiopathy,Similarly,another previous researchfound the most common microangiopathy complication that occur in patients is diabetic nephropathy.[22]

The dominating type of complications in this research is diabetic retinopathy as found in 46 respondents (22.6%). Similar to a research by Suryathi, among 123 respondents, 74 patients (60.16%) were diagnosed with diabetic retinopathy.[23] This complication occurs due to a long hyperglycemic condition that can cause the increase of aldose reductase enzyme activities so that the production of polyols like sugar and alcoholin eye tissues, lens, blood vessels, and optic nerve increase. The characteristic of polyol is that it cannot pass through the basal membrane,making it accumulate in large quantities in the cell. In this condition, the accumulation of polyol can increase the osmotic pressure, which can cause several disorders such as morphological and functional disorders of cells. Several patients are unaware realizeof this complication and only assume that this is a common eye disease symptomsso that the onset of the complications process is often detected.[24,25]

Inadditiontoretinopathy,thenextmostcomplications isdiabetic nephropathy with 45 respondents.

Similarly, a research by Edwina, it was found that the most dominant complications was diabetic nephropathy found in 42.6% of respondents.[22]Nephropathy can be seen in microalbuminuria examination accompanied by glomerular filtration rate examination to assess patient's kidney function. Patients with a fast decreasing glomerular filtration rate may experience glomerulopathy and poor metabolic control. Retinopathy is also a clue to diagnosing nephropathy diabetic. Some people with chronic complications are diagnosed with more than 1 complications.[26,27]

According to table 1, there are 39 respondentsdiagnosed with coronary heart disease. The epidemiology of coronary heart disease shows that hyperinsulinemia or excessive insulin contributes to a higher cardiovascular risk.Based on Permana, 50 to 70 percent of people with diabetes mellitus have coronary atherosclerosis.[3]People with diabetes have 4-8 times higher risk of congestive heart disease.[28]

Another microangiopathy found is diabetic foot. According to previous research at Haji Adam Malik General Hospital in Medan,diabetic foot was common as it was found in 38% of respondents.[29]

Table 1 shows that 22 respondents (11%) were diagnosed with stroke. According to the American Diabetic Association, patients with diabetes mellitus have a 1.5 times higher chance of having a stroke.[31]The pathophysiology of this disease includes several conditions such as hypertension, dyslipidemia, heart disease, and hyperlipidemic conditions.[32]

Based on the research data, the last complication is diabetic neuropathy with a total of 21 respondents. According to a previous study in Ciptomangunkusumo Hospital, diabetic neuropathy is the most commonly occurring in 54% of respondents.[4] Similarly according to the International Diabetes Federation, the most commonly occurring complication in Indonesia is diabetic neuropathy with 17.6%respondents.[2] This is due to persistent hyperglycemia that can stimulate the production of oxidative free radicals which will damagethe vascular endothelium and Nitrite Oxide and block the vasodilation process so that the blood flow to the nerves will decrease. Along with low myoinositol conditions in cells, this condition will lead to neuropathy. If the metabolic damage continues, the disease will trigger worse conditions such as irreparable ischemic and axons structural damage.[35,36]

Conclusion & Acknowledgment

This research concluded that T2DM with diabetic complications is most commonly diagnosed in patients within

1. The age group of 46-55 year (55 respondents or 32%)
2. Similar prevelance of chronic complications in man and woman respondents, 87 (50.6%) and 85 (49.4%) respectively
3. Most common level of recent education is Senior High school with 103 respondents (59,9%)
4. Controlled HbA1c level is found in 139 respondents (54.5%) with the compositions of HbA1c levels <7% in 43 respondents aged < 60 years (16.9%) and HbA1c level <8% in 96 respondents (37.6%) aged >60 years with severe conditions. While the average of HbA1c level is 8.68%.
5. Most T2DM patients were unable to present data on illness duration (145 respondents or 56.9%).
6. With regards to complications, there are 78 respondents with single microangiopathy (30.6%), 56 respondents with single macroangiopathy (22%), 24 respondents with microangiopathy and macroangiopathy (9.4%), 7 respondents with multiple microangiopathies (2.7%) and 7 respondents with multiple macroangiopathies (2.7%).
7. The Most commonly occurring complications are retinopathy with 46 respondents (22.6%), nephropathy with 45 respondents (22.1%), and neuropathic diabetic (21 respondents or 10.3%). The occurrence of macroangiopathy complications are dominated by coronary heart disease with 39 respondents (19.2%), the peripheral circulatory complication with 30 respondents (14.8%), and stroke with 22 respondents (11%).

Conflict of Interest: There was no conflict of interest in this study

Ethical Clearance: The Ethical Clearance is taken from health research ethics committee at Dr. Soetomo General Hospital Surabaya, Indonesia

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