Buletin Kedokteran & Kesehatan Prima
Vol.3 No.2 (2024)
DOI: 10.34012/bkkp.v3i2.5765

ORIGINAL ARTICLE

Characteristics and complications of diabetes mellitus patients at Royal Prima General Hospital

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ABSTRACT

Diabetes mellitus (DM) is a chronic endocrine disorder characterized by an imbalance in the immune system, with a growing prevalence both globally and in Indonesia. The predominant risk factors for T2DM are sex, age, obesity, smoking, and physical inactivity. Complications of DM can be categorized into microvascular and macrovascular, with higher prevalence rates observed in women and the elderly. This study aimed to describe the characteristics of patients diagnosed with DM at Royal Prima General Hospital in 2023. A quantitative, cross-sectional design was employed, with data collected between May and July 2024. A total of 68 patients were selected using the Slovin formula. The inclusion criteria were patients diagnosed with DM and complete medical records, while the exclusion criteria included incomplete data, deceased patients, or those without complications. Univariate descriptive statistics were used for data analysis. The majority of the 68 patients were aged > 60 years (55.9%) and female (63.2%). The most common occupation was homemaker/unemployed (47.1%), and a significant proportion of the patients had a normal body mass index (86.8%). Microvascular complications were the most prevalent, affecting 54.4% of the patients. Advanced age, female sex, and low physical activity were the dominant factors influencing DM prevalence at Royal Prima General Hospital. Microvascular complications are a major health concern in DM patients.

Keywords: DM, characteristic, complication

Introduction

Diabetes mellitus (DM), a chronic endocrine disease characterized by a long-term imbalance in the immune system, has emerged as a significant global health concern. As a component of the metabolic syndrome, DM has become a leading cause of mortality among adults worldwide. The WHO Health Organization has reported a substantial increase in all types of DM across various regions over the past few decades.[1,2] The prevalence of DM has increased from 108 million (4.7%) in 1980 to 425 million (8.5%) in 2017, with projections indicating a further increase to 629 million by 2045.[3] According to the International Diabetes Federation (IDF), the global prevalence of DM is 1.9%, ranking it as the seventh leading cause of death globally. In 2012, approximately 371 million deaths occurred worldwide, 95% of which were attributed to type 2 diabetes.[4] Additionally, the WHO estimates that the number of DM patients in Indonesia will soar from 8.4 million in 2013 to 14 million in 2014, reaching approximately 21.3 million by 2030. This represents a threefold increase over a 30-year period, positioning Indonesia as the fourth country with the highest

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number of diabetes patients, followed by the United States, China, and India.[5] Based on medical diagnoses, the prevalence of DM varies across Indonesian provinces: DKI Jakarta (2.5%), Central Java (1.7%), North Sumatra (2.0%), and Central Sulawesi (1.6%). Data from the 2018 Basic Health Research in North Sumatra indicated that 69,517 million people suffer from diabetes globally, with 10,928 million residing in Medan.[6]

Type 2 diabetes mellitus (T2DM) is the most prevalent form of the disease. It is characterized by insulin resistance, in which insulin is unable to effectively regulate glucose levels in tissues, such as muscle, liver, and fat. This is often accompanied by a decline in insulin production by pancreatic β-cells.[7,8] While obesity is a common risk factor for T2DM in Western countries, many individuals in India and China with T2DM have normal or low body weight. However, they frequently exhibit elevated levels of visceral and hepatic fats.[9] T2DM accounts for approximately 90% of all cases of diabetes. In this type of diabetes, the body develops insulin resistance, impairing its ability to function properly. Initially, the body compensates for this resistance by increasing insulin production in order to maintain normal blood glucose levels. However, the body's capacity to produce insulin diminishes over time, leading to the development of T2DM. This condition typically manifests in individuals > 45 years of age. Nevertheless, the incidence of T2DM has been rising among children and young adults owing to increasing rates of obesity, physical inactivity, and energy-dense diets.[10]

Several factors, including sex, contribute to the development of diabetes mellitus. A socioeconomic study conducted in Pakistan revealed that men are more likely to develop diabetes, whereas women are more prone to T2DM. These sex disparities vary across different life stages, with men being more susceptible to diabetes before puberty and women after menopause. Notably, men are at a higher risk of diabetes-related ketoacidosis, whereas women have some degree of protection against this condition, except in prolonged hypoestrogenic or anovulatory states.[11] In China, the prevalence of T1DM is highest among individuals under the age of 40 years.[11,12] Other risk factors of diabetes include high rates of obesity, smoking, and physical inactivity. Certain occupations, such as those involving shift work, prolonged sedentary behavior, or high levels of psychological stress, may also increase the risk of developing diabetes.[13]

T1DM is diagnosed through a staging classification system that assesses an individual's risk factors for developing the disease. This classification includes pre-stage 1 (genetic variations and environmental factors), stage 1 (pre-diabetic), stage 2 (pre-symptomatic type 1 DM), and stage 3 (symptomatic type 1 DM). Additionally, diagnostic evaluation may involve examining a history of blood glucose monitoring. To differentiate between classical and monogenic T1DM, The genomic risk score (GRS) was used to differentiate. GRS is effective in identifying individuals with early onset or pre-clinical T1DM as well as those with associated autoimmune syndromes or monogenic diabetes.[14] The diagnosis of T2DM is based on blood glucose and HbA1c levels. Plasma glucose testing is the most recommended method, and the results are monitored using glucometers. Diagnosis should not be solely based on glycosuria or nonspecific symptoms, such as weakness, numbness, itching, blurred vision, erectile dysfunction, or vulvar itching.[15]

Complications of DM include microvascular (nephropathy, retinopathy, and neuropathy) and macrovascular (cardiovascular, stroke, and peripheral artery 1 disease) disorders. Previous studies reported that microvascular and macrovascular complications are more prevalent in women (75%) and increase with age, disease duration, and glycated hemoglobin (HbA1c) levels.[16,17] This study aimed to characterize the profile of patients with diabetes mellitus (DM) at Royal Prima General Hospital in 2023. Specifically, it analyzes the distribution of patients with DM based on sex, age, occupation, obesity, and microvascular and macrovascular complications. A better understanding of these characteristics will provide valuable insights into the effective prevention and management of DM in the future.

Method

This study adopted a quantitative approach using a cross-sectional observational analytical design. Purposive sampling was used for sample selection. Secondary data obtained from the medical records of patients diagnosed with Diabetes Mellitus and its complications were used. This research was conducted from May 2024 to July 2024 at the Royal Prima General Hospital. The study population consisted of 221 patients, with a sample size of 68 patients confirmed to have Diabetes Mellitus and its complications. Following approval of the research proposal, data were collected from medical records. Subsequently, data were analyzed using Statistical Product and Service Solutions (SPSS), employing frequency distribution tests, and presented in a tabular form.

Results

This study was conducted at the Royal Prima General Hospital Medan, located in Jl. Ayahanda No. 68A, Medan, North Sumatra, with 68 participants. The data collected included the distribution of patients based on age, sex, occupation, body mass index, and type of complications experienced by patients. The majority of patients mellitus (DM) patients in this study were female, accounting for 63.2% of the total sample. This finding suggests a potential sex disparity in DM prevalence, with women being more susceptible to the condition. The elderly age group (60 years and above) constituted the largest proportion of patients with DM, representing 55.9% of the total. This aligns with the well-established association between aging and increased risk of DM. The pre-elderly group (45-59 years) also had substantial representation, accounting for 36.8% of the patients. This indicates that DM can significantly impact middle-aged individuals. The study reported a negligible number of adolescent and young adult patients with DM, suggesting that the condition is less prevalent in younger age groups.

Table 1. Characteristics of DM patients based on gender, age, and occupation

Characteristics	n=68	%
Gender		
Female	43	63,2
Male	25	36,8
Age		
Adolescence (10-19 years)	-	-
Adulthood (19-44 years old)	5	7,4
Pre-elderly (45-59 years)	25	36,8
Elderly (60 years and above)	38	55,9
Occupational		
Civil Servants, military, police	6	8,8
Private	5	7,4
Self-employed	14	20,6
Laborer, farmer	8	11,8
Freelancer	-	-
Fisherman	-	-
Housewife	32	47,1
Other	3	4,4

A notable proportion of patients with DM were housewives, accounting for 47.1% of the total. This might reflect specific lifestyle factors, dietary habits, or sedentary behaviors associated with this occupation that contribute to the risk of DM. The remaining patients were distributed across various occupations, including civil servants, private-sector employees, self-employed individuals, laborers, and others. This finding suggests that DM can affect individuals from different socioeconomic backgrounds and occupational sectors. The findings of this study highlight the importance of considering sex and age factors in understanding the epidemiology of DM. The predominance of DM among elderly individuals underscores the need for targeted preventive and management strategies in this population. Additionally, the significant representation of housewives among patients with DM warrants further investigation into the potential role of lifestyle and socioeconomic factors in the development of the condition.

Table 2. Characteristics of DM patients based on BMI and complication

Characteristics	n=68	%
BMI		
Not obese	59	86,8
Obese	9	13,2
Complications		
Macrovascular	15	22,1
Microvascular	37	54,4
Mixed	8	11,8
Other	8	11,8

Table 2 shows that the majority of patients with DM in this study were not obese and had microvascular complications. 59 (86.8%) patients were not considered to be obese. This means that their BMI was likely below 30 kg/m2. Nine (13.2%) patients were classified as obese, with a BMI of 30 kg/m2 or higher. Fifteen (22.1%) patients had macrovascular complications, which affect large blood vessels. These include heart disease, stroke, and peripheral artery disease. 37 (54.4%) patients had microvascular complications that affected small blood vessels. These include diabetic retinopathy (eye damage), diabetic nephropathy (kidney damage) and diabetic neuropathy (nerve damage). 8 (11.8%) experienced both macrovascular and microvascular complications. Eight (11.8%) patients had other complications that were not specified in the table. However, a significant proportion of patients also had macrovascular complications, or a combination of both. This highlights the importance of managing obesity and diabetes to prevent their complications.

Discussion

The majority of the patients (55.9%) were aged range (>60 years). This finding is in line with previous studies showing that the risk of DM increases with age, especially in the age group–45-65 years and above. Decreased glucose tolerance due to aging and weakening of the body's immune system are considered the main factors causing the high prevalence of DM in the elderly. In addition, the decrease in physical activity that often occurs in old age can also exacerbate this condition.[18] The results of this study are consistent with Masruroh's study[19] which reported that the average age of DM patients was above 60 years. Decreased insulin performance due to physiological aging after the age of 40 years is one of the mechanisms underlying the increased risk of DM in the elderly population.

The majority of DM patients were female (n = 43, 63.2%). This finding supports the initial assumption that women tend to be more susceptible to DM than are men. Komariah & Rahayu[18] suggested that the higher prevalence of DM in women can be attributed to physical factors, such as a possible increase in body mass index. In addition, the menstrual cycle and menopause also play a role in increasing the risk of DM, because hormonal changes can trigger the accumulation of body fat. The results of this study are also consistent with the findings of Rita[20], who showed that most (80.4%) patients with DM in her study were female.

Most individuals with DM are housewives or do not work. As many as 20.6% of the participants were self-employed. This study assumes that housewives have a higher risk of developing DM than other professions. This assumption is in line with Syaftriani's research findings[21], which showed that most (79.4%) of the participants in their study were housewives. Working as a housewife is generally categorized as light work. Lack of sufficient physical activity in this group can disrupt the balance of energy use in the body. When the body is sedentary, blood glucose, which should be used as energy by muscles during activity, is used less. Therefore, blood sugar levels may increase the risk of developing DM. Conversely, physical activity, such as exercise, can help the body use blood glucose more effectively and maintain stable blood sugar levels.[21,22]

The majority of patients (86.8%) had a body mass index (BMI) in the normal or non-obese category (17.0-25.0%). In contrast, only nine patients (13.2%) were categorized as obese. This result contradicts the common understanding that obesity is one of the main risk factors for DM. Previous research by Lee et al.[23] also showed that the most common BMI range found in patients with DM was the normal or non-obese category (18.5-25.0%). The difference between the results of this study and common understanding is likely influenced by several factors, such as diet and medication use, which can affect blood glucose levels in each individual. This finding is also in line with Suryanti's study[24], which showed no direct relationship between nutritional status and fasting blood glucose levels in DM patients.

Most patients had microvascular complications. This finding supports the assumption that microvascular complications are a major risk factor in patients with DM. Previous research by Dal Canto et al.[25] showed that microvascular complications, such as nephropathy, retinopathy, and neuropathy, can significantly reduce the quality of life and increase the risk of morbidity in people with DM. According to the theory proposed by Julianti[26], there is a correlation between blood sugar levels and blood pressure, which is influenced by several factors, including insulin resistance and hyperinsulinemia. These conditions can lead to increased peripheral vascular resistance and smooth muscle contraction, so that the circulatory system becomes more sensitive to hormones such as norepinephrine and angiotensin II. As a result, blood pressure increases through physiological feedback mechanisms and the renin-angiotensin-aldosterone system. Under conditions of hyperglycemia, the body of patients with DM overproduces fibronectin and collagen IV. This

can damage the endothelium and thicken the glomerular basement membrane, thereby triggering the development of kidney disease. This finding is in line with the research of Hanniya et al[27] who reported that microvascular complications in the form of neuropathy and diabetic nephropathy are problems that are often faced by people with DM.

Conclusion

This study, conducted at Royal Prima General Hospital, provides valuable insights into the demographic characteristics, risk factors, and complications associated with diabetes mellitus (DM) among patients. The majority of patients with DM were female, elderly, and housewives. These findings suggest potential disparities in the prevalence and risk factors based to sex, age, and occupation. A significant proportion of patients were not obese, indicating that DM can occur even in individuals with normal weight. Microvascular complications are more prevalent than macrovascular complications, highlighting the importance of early detection and management to prevent long-term consequences. This study underscores the need for targeted preventive and management strategies for elderly individuals and women, particularly housewives. Promoting healthy lifestyle habits, such as regular physical activity and a balanced diet, can help reduce the risk of DM and its complications. Early screening and timely intervention are crucial to prevent and manage DM and its associated complications. Further research is warranted to explore the underlying mechanisms linking lifestyle factors, socioeconomic conditions, and genetic predispositions to the development of DM in this population.

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