ABSTRACT

Objective: Diabetes Mellitus (DM) is a metabolic disease characterized by hyperglycemia due to insufficiency of insulin function. One of the complications caused by DM is Diabetic Nephropathy. This study aims to determine the profile of diabetic nephropathy patients at Waled General Hospital, Cirebon Regency, Indonesia.

Methods: A descriptive observational study was conducted at Waled General Hospital, Cirebon Regency, Indonesia. All patients diagnosed with diabetic nephropathy at Internal Medicine Polyclinic from January 2018 to December 2021 were recruited. The inclusion criteria were adult diabetic nephropathy patients (aged >17 years).

Results: There were 58 patients recruited into the sample, consisting of 37.9% male and 62.1% female. The majority of the sample were aged 55-64 years (44.8%) and housewives (60.3%). We also found that 87.9% of sample were productive age group (<65 years). A total of 79.4% sample had hypertension stage 1 and 2. Based on body mass index (BMI), it was found that 15.5% of the sample were overweight and 10.3% were obese. More than half (51.7%) had Random Blood Glucose (RBG) 200-300 mg/dL and about 32.8% had RBG >300 mg/dL.

Conclusion: It can be concluded that diabetic nephropathy is mostly suffered productive age group <65 years, female, housewives, uncontrolled hypertension, lipid and blood glucose. Efforts to prevent DM and diabetic nephropathy need to be carried out in productive age groups, female and housewives by avoiding sedentary lifestyle, maintaining ideal body weight, preventing hypertension, dyslipidemia and optimal blood glucose control.

Keywords: Diabetes Mellitus, Kidney, Hypertension, Diabetic Nephropathy, Obesity.
PRATIWI, W., SURGANA, M., B. (2024). PROFILE OF DIABETIC NEPHROPATHY PATIENTS AT WALED GENERAL HOSPITAL, CIREBON DISTRICT, INDONESIA: HIGH PREVALENCE IN PRODUCTIVE AGE GROUP, FEMALE AND HOUSEWIVES

RESUMO

Objetivo: O Diabetes Mellitus (DM) é uma doença metabólica caracterizada por hiperglicemia devida à insuficiência da função da insulina. Uma das complicações causadas pelo DM é a Nefropatia Diabética. Este estudo tem como objetivo determinar o perfil dos pacientes com nefropatia diabética no Waled General Hospital, Cirebon Regency, Indonésia.

Métodos: Um estudo observacional descritivo foi realizado no Waled General Hospital, Cirebon Regency, Indonésia. Foram recrutados todos os pacientes com diagnóstico de nefropatia diabética na Policlínica de Medicina Interna de janeiro de 2018 a dezembro de 2021. Os critérios de inclusão foram pacientes adultos com nefropatia diabética (idade >17 anos).

Resultados: Foram recrutados 58 pacientes para a amostra, sendo 37,9% do sexo masculino e 62,1% do sexo feminino. A maioria da amostra tinha entre 55 e 64 anos (44,8%) e era dona de casa (60,3%). Verificamos também que 87,9% da amostra pertenciam à faixa etária produtiva (<65 anos). Um total de 79,4% da amostra apresentava hipertensão estágio 1 e 2. Com base no índice de massa corporal (IMC), constatou-se que 15,5% da amostra apresentavam sobrepeso e 10,3% eram obesos. Mais da metade (51,7%) tinha glicemia aleatória (RBG) 200-300 mg/dL e cerca de 32,8% tinha RBG >300 mg/dL.

Conclusão: Pode-se concluir que a nefropatia diabética é mais sofrida na faixa etária produtiva <65 anos, sexo feminino, donas de casa, hipertensão não controlada, lipídios e glicemia. Esforços para prevenção do DM e da nefropatia diabética precisam ser realizados em faixas etárias produtivas, mulheres e donas de casa, evitando o sedentarismo, mantendo o peso corporal ideal, prevenindo hipertensão, dislipidemia e controle ideal da glicemia.

Palavras-chave: Diabetes Mellitus, Rim, Hipertensão, Nefropatia Diabética, Obesidade.

RESUMEN

Objetivo: La Diabetes Mellitus (DM) es una enfermedad metabólica caracterizada por hiperglucemia debido a insuficiencia de la función de la insulina. Una de las complicaciones provocadas por la DM es la Nefropatía Diabética. Este estudio tiene como objetivo determinar el perfil de los pacientes con nefropatía diabética en el Hospital General Waled, Cirebon Regency, Indonesia.

Métodos: Se realizó un estudio observacional descriptivo en el Hospital General Waled, Cirebon Regency, Indonesia. Se reclutaron todos los pacientes diagnosticados con nefropatía diabética en el Policlínico de Medicina Interna desde enero de 2018 hasta diciembre de 2021. Los criterios de inclusión fueron pacientes adultos con nefropatía diabética (>17 años).

Resultados: Se reclutaron 58 pacientes en la muestra, siendo el 37,9% hombres y el 62,1% mujeres. La mayoría de la muestra tenía entre 55 y 64 años (44,8%) y amas de casa (60,3%). También encontramos que el 87,9% de la muestra pertenecía al grupo de edad productiva (<65 años) con hipertensión, glicemia y sobrepeso.
Un total del 79,4% de la muestra tenía hipertensión estadio 1 y 2. Con base en el índice de masa corporal (IMC), se encontró que el 15,5% de la muestra tenía sobrepeso y el 10,3% obesidad. Más de la mitad (51,7%) tenía glucosa en sangre aleatoria (RBG) de 200 a 300 mg/dL y alrededor del 32,8% tenía RBG >300 mg/dL.

Conclusión: Se puede concluir que la nefropatía diabética la padecen mayoritariamente el grupo de edad productiva <65 años, sexo femenino, amas de casa, hipertensión no controlada, lípidos y glucemia. Los esfuerzos para prevenir la DM y la nefropatía diabética deben realizarse en grupos de edad productiva, mujeres y amas de casa, evitando el sedentarismo, manteniendo el peso corporal ideal, previniendo la hipertensión, la dislipidemia y el control óptimo de la glucemia.

Palabras clave: Diabetes Mellitus, Riñón, Hipertensión, Nefropatía Diabética, Obesidad.

1 INTRODUCTION

Diabetes Mellitus is a chronic metabolic disease that causes disturbances in carbohydrate, fat and protein metabolism, causing insulin function insufficiency. Diabetes mellitus is divided into several subclassifications, including Type 1 DM, Type 2, Maturity-onset diabetes of the young (MODY), Gestational diabetes, Neonatal diabetes and Steroid-induced diabetes. (1) Type 2 DM is the most common type of DM. The cause of type 2 DM is a combination of 2 factors, namely impaired insulin secretion by pancreatic β cells and inability of body tissues to respond to insulin appropriately. (2)

Diabetes mellitus is one of health problems faced by the global population. Based on data from World Health Organization (WHO), the number of DM patients has increased 4-fold since 1980. Its prevalence continues to increase throughout the world, especially in low-middle income countries. Currently, it is estimated that around 422 million people worldwide suffer from DM. (3) Based on 2018 Indonesian Basic Health Research data, the prevalence of DM at all ages in Indonesia is about 1.5%. In the age group ≥15 years, there was an increase in DM prevalence from 6.9% in 2013 to 8.5% in 2018. (3)

Diabetes mellitus can cause several complications if blood sugar is not controlled for a long time. Diabetes mellitus even increases the risk of premature death. The WHO also reported that DM was the direct cause of death for 1.5 million people worldwide in 2012. (4) Complications in DM patients are due to disorders of the blood vessels, both microvascular and macrovascular, as well as disorders of the nervous system. (1,5) One of the chronic complications of DM is kidney damage due to microvascular disorders called diabetic nephropathy. In patients with diabetic nephropathy there is a persistent
albuminuria and progressive decrease in Glomerular Filtration Rate (GFR). This situation can cause end-stage renal disease (ESRD) that require hemodialysis. Data in developing countries, including Indonesia, showed that diabetic nephropathy was the main cause of ESRD.(6)

Data regarding the profile of diabetic nephropathy patients in Indonesia, including Cirebon Regency, is still limited. By knowing the characteristics of diabetic nephropathy patients in hospitals, we can provide suggestions for prevention and management efforts. Therefore, this study aims to determine the profile of diabetic nephropathy patients at Waled General Hospital, Cirebon Regency, Indonesia.

2 METHODS

2.1 STUDY DESIGN, SAMPLE AND DATA COLLECTION

This is a descriptive observational study conducted at Waled General Hospital, Cirebon Regency, Indonesia. The sample in this study were patients diagnosed with diabetic nephropathy at Waled General Hospital, Cirebon Regency, Indonesia during January 2018 to December 2021. The sampling technique used was total sampling. The inclusion criteria in this study were diabetic nephropathy patients aged >17 years and recorded in the medical records of the Internal Medicine Polyclinic at Waled General Hospital. Secondary data regarding patient characteristics was obtained from medical records, including age, gender, occupation, marital status, payment for services, blood pressure and BMI. Dyslipidemia, hypoalbuminemia and RBG were obtained from laboratory test results.

2.2 DEFINITION OF VARIABLES

The hypertension referred to the blood pressure when sample were first diagnosed with diabetic nephropathy by internist at Waled General Hospital. It was categorized based on the 2020 International Society of Hypertension (ISH) Guidelines, namely [1] Normal, if the systolic was <130 mmHg and diastolic <85 mmHg; [2] High-normal, if the systolic was 130-139 mmHg and/or diastolic 85-89 mmHg; [3] Hypertension Stage
1, if the systolic was 140-159 mmHg and/or diastolic 90-99 mmHg; [4] Hypertension Stage 2, if systolic ≥160 mmHg and/or diastolic 90-99 mmHg. (7)

Body mass index is the BMI when diabetic nephropathy was first diagnosed by internist, which is calculated from body weight and height. It was categorized according to the Republic Indonesia Ministry of Health BMI Categorization, namely [1] Underweight, if BMI <18.5 kg/m2; [2] Normal, if BMI is 18.5-25 kg/m2; [3] Overweight, if BMI >25-27 kg/m2; [4] Obese, if BMI >27 kg/m2. (8) Data was categorized as dyslipidemia if one of lipid profile test was abnormal (Total cholesterol ≥240 mg/dL or Triglycerides ≥ 200 mg/dL or LDL ≥160 mg/dL or HDL<40 mg/dL). Hypoalbuminemia was blood albumin level ≤3.4 gr/dL.

The numerical data were described through mean±SD, minimum and maximum values. Categorical data were described through frequency and percentage. This study has received ethical approval from the Ethics Commission of the Faculty of Medicine, Universitas Swadaya Gunung Jati Cirebon, Indonesia No. 2/EC/FKUGJ/III/2022.

3 RESULTS

In this study, 58 diabetic nephropathy patients were recruited from January 2018 to December 2021. The characteristics of the research sample are shown in Table 1 below.

### Table 1

**Characteristic profile of diabetic nephropathy patients (n=58)**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean±SD; Min-Max</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>Mean ± SD</td>
<td>55.81±7.24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Min.</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Max.</td>
<td>74</td>
<td></td>
</tr>
<tr>
<td></td>
<td>36-44 years</td>
<td>3</td>
<td>5.2</td>
</tr>
<tr>
<td></td>
<td>45-54 years</td>
<td>22</td>
<td>37.9</td>
</tr>
<tr>
<td></td>
<td>55-64 years</td>
<td>26</td>
<td>44.8</td>
</tr>
<tr>
<td></td>
<td>≥65 years</td>
<td>7</td>
<td>12.1</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>22</td>
<td>37.9</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>36</td>
<td>62.1</td>
</tr>
<tr>
<td>Occupation</td>
<td>Self-employed</td>
<td>9</td>
<td>15.5</td>
</tr>
<tr>
<td></td>
<td>Housewife</td>
<td>35</td>
<td>60.3</td>
</tr>
<tr>
<td></td>
<td>Government employees</td>
<td>5</td>
<td>8.6</td>
</tr>
<tr>
<td></td>
<td>Laborer</td>
<td>4</td>
<td>6.9</td>
</tr>
<tr>
<td></td>
<td>Farmer</td>
<td>3</td>
<td>5.2</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>2</td>
<td>3.4</td>
</tr>
<tr>
<td>Marital status</td>
<td>Not married</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Married</td>
<td>58</td>
<td>100</td>
</tr>
</tbody>
</table>
The age of the sample in this study had mean±SD of 55.81±SD7.24. The youngest was 37 years old and the oldest was 74 years old. Diabetic nephropathy mostly affects age group 55-64 years (44.8%). About 87.9% of sample were productive age group (<65 years). Most of the samples were female (62.1%) and housewives (60.3%). All samples were married. The majority of the sample used national health insurance to pay for services (93.1%) and only 6.9% paid out of pocket.

We also found that the majority of the sample experienced hypertension stage 1 and 2 when they were first diagnosed with diabetic nephropathy (79.4%). There were 39.7% of sample with hypertension stage 2. The results showed that 15.5% of the sample was overweight and 10.3% obese. About 1.7% of the sample were underweight. However, in this study there were 50% missing data because weight and/or height were not written in medical record. Based on lipid profile test, more than half of the samples had dyslipidemia (54.2%), although there were 39% missing data. It was found that 30.5% of samples had hypoalbuminemia and 5.2% of data were not available.

The results showed that mean±SD of RBG was 272.41±79.40. The RBG levels range from 100 mg/dL to 460 mg/dL. The majority of samples had an initial RBG of 200-300 mg/dL (51.7%). Meanwhile, those with RBG >300 mg/dL were 32.8%. The proportion of RBG levels based on age is shown in Figure 1. It appears that majority of
samples, both male and female, have RBG 200-300 mg/dL. However, in female, the proportion who have RBG >300 mg/dL was greater than male (36.1% vs 27.35).

**Figure 1**

*The proportion of RBG levels based on gender (n;%)*

<table>
<thead>
<tr>
<th>Gender</th>
<th>RBG 200-300 mg/dL</th>
<th>RBG &gt;300 mg/dL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>13; 59.1%</td>
<td>6; 27.3%</td>
</tr>
<tr>
<td>Female</td>
<td>17; 47.2%</td>
<td>6; 16.7%</td>
</tr>
</tbody>
</table>

Source: Medical records of Waled General Hospital, Cirebon Regency, Indonesia (2018-2021)

The proportion of RBG levels by age group is shown in Figure 2 below. At the age of 36-45 years, 20% of samples had RBG levels of 200-300 mg/dL and 40% had random blood glucose >300 mg/dL at initial diagnosis. Meanwhile, in the 46-55 years age group, more than half had RBG >300 mg/dl. In the 56-65 years age group, there were 54.5% sample with RBG 200-300 mg/dL and 27.3% with RBG >300 mg/dL. Meanwhile, at age >65 years, all had RBG ≥200 mg/dL.

**Figure 2**

*The proportion of RBG levels based on age group*

<table>
<thead>
<tr>
<th>Age Group</th>
<th>&lt;200 mg/dL</th>
<th>200-300 mg/dL</th>
<th>&gt;300 mg/dL</th>
</tr>
</thead>
<tbody>
<tr>
<td>36-45</td>
<td>48; 40%</td>
<td>54.5; 40%</td>
<td>18.2; 12%</td>
</tr>
<tr>
<td>46-55</td>
<td>12; 20%</td>
<td>54.5; 48%</td>
<td>0; 0%</td>
</tr>
<tr>
<td>56-65</td>
<td>18.2; 12%</td>
<td>54.5; 48%</td>
<td>0; 0%</td>
</tr>
<tr>
<td>&gt;65</td>
<td>0; 0%</td>
<td>83.3; 16.7%</td>
<td>0; 0%</td>
</tr>
</tbody>
</table>

Source: Medical records of Waled General Hospital, Cirebon Regency, Indonesia (2018-2021)
4 DISCUSSION

This study showed that 44.8% of diabetic nephropathy patients at Waled General Hospital were aged 55-64 years and followed by the age group 45-54 years (37.9%). Previous research conducted at DR. M. Soewandhie General Hospital Surabaya, Indonesia obtained almost the same results that the majority of diabetic nephropathy patients were aged 50-59 years.(9) Other study at the Raden Mattaher General Hospital Jambi, Indonesia showed that the majority of diabetic nephropathy patients were 60-64 years old (23.1%), which was older than our finding.(10)

We also found that 87.9% of diabetic nephropathy patients were productive age <65 years. Previous study that collected data from Basic Health Research 2013 showed that the prevalence of DM in productive age group: 20-54 years in Indonesia was 6.5% (95%CI 6.1-7.0) and the prevalence of diabetic nephropathy was 0.3% (95% CI 0.2-0.4).(11)

Productive age is a period when a person can make major contribution to life and actively earn a living. Morbidity due to disease in productive age greatly influences the quality of life.(12,12) Moreover, WHO data showed that diabetic nephropathy increases the risk of premature death.(4) Therefore, based on our findings, the government needs to make comprehensive efforts to prevent the occurrence of DM and diabetic nephropathy, especially at productive age group.

Most of diabetic nephropathy patients at Waled General Hospital were female (62.1%) and housewives (60.3%). It was in line with several previous studies that diabetic nephropathy was more common in women compared to men and those who were housewives. The large number of women who experience diabetic nephropathy may be because the prevalence of DM in women is higher than men.(9,13,14) Based on the 2018 Indonesia Basic Health Research, the prevalence of women in Indonesia with impaired fasting glucose was 25.3% and impaired glucose tolerance was 34.7%.(3)

Obesity and lack of physical activity were the risk factors of DM in women.(15) Housewives do less physical activity than those who work, making it easier to become obese and develop DM. Housewives spend more time at home with more rest time. Besides, currently there were many household appliances that help them to carry out activities at home, such as cooking, sweeping, mopping and so on. It will cause a sedentary lifestyle among housewives. (14) Another factor that causes more women to
experience diabetic nephropathy was phenotypic differences (genetics) and hormones between men and women. Estrogen and progesterone have an important role in the pathophysiology of DM and its complications in women. Women with DM also have more rapid progression of worsening kidney function than men, especially at older ages.(16)

Our study found that the majority of diabetic nephropathy patients had hypertension when initially diagnosed as diabetic nephropathy, of which 39.7% had hypertension stage 1 and the same percentage had hypertension stage 2. Hypertension was one of diabetic nephropathy sign. It was caused by increased sodium reabsorption by the kidneys and peripheral vasoconstriction resulting in increased peripheral vascular resistance. Besides, there was also activation of the Renin-Angiotensin-Aldosterone System (RAAS), increase in Endothelin-1 (ET-1), regulation of Reactive Oxygen Species (ROS) and decrease in Nitric Oxide (NO). This study results showed that majority of diabetic nephropathy patients have uncontrolled blood pressure. Very high and uncontrolled blood pressure can cause life-threatening emergencies. Because of it, in diabetic nephropathy patients, controlling blood pressure is very important to prevent the progression of kidney failure.(17)

This study showed that 15.5% of samples were overweight and 10.3% were obese at initial diagnosis of diabetic nephropathy. Overweight and obesity are chronic medical conditions. Many references have stated that overweight and obesity increase the risk of DM and its complications. The prevalence of DM has continued to increase since the last 3 decades, in line with the increasing of overweight and obesity prevalence.(4) Research conducted in Iran involving 111,830 DM patients found that obesity was associated with an increase in the prevalence of diabetic nephropathy. The higher BMI, the higher the risk of suffering from DM and diabetic nephropathy. The influence of overweight and obesity on the occurrence of DM and its complications makes weight loss as one of the management for DM patients besides anti-diabetic drugs.(18)(19)

It was found that more than half of diabetic nephropathy patients experienced dyslipidemia (54.2%) when initially diagnosed with diabetic nephropathy. Even though 39% of the data was missing. Kidney disorders in DM nephropathy patients cause dyslipidemia which can increase the occurrence of plaque on the artery walls (atherosclerosis). As a result, there will be an increased incidence of atherosclerotic cardiovascular disease (ASCVD), such as myocardial infarction, angina and coronary
artery stenosis. (20, 21) Therefore, an optimal strategy for controlling lipid levels is one of management in patients with diabetic nephropathy. (6)

We found that 30.5% of the samples experienced hypoalbuminemia. Based on previous research in China, hypoalbuminemia in patients with DM or diabetic nephropathy was associated with a worse renal prognosis. The risk of progressive kidney damage in the group with mild hypoalbuminemia was HR = 2.09 (95% CI 0.67-6.56), the moderate hypoalbuminemia group HR = 6.2 (95% CI 1.95-19.76) and severe hypoalbuminemia group HR = 7.37 (95% CI 1.24-43.83). (22)

More than half of the diabetic nephropathy patients in this study had RBG of 200-300 mg/dL. As many as 32.8% had RBG > 300 mg/dL. Based on gender, most male and female had RBG 200-300 mg/dL. In the age group >65 years, all sample had uncontrolled RBG (GDS > 200 mg/dL). These results indicate that the majority of diabetic nephropathy patients have uncontrolled blood sugar levels, especially elderly. Hyperglycemia causes a condition called "glucose toxicity" which can damage the body's organs, including the kidneys. Hyperglycemia causes enzymatic and non-enzymatic disorders of several proteins and neurotransmitters. Very high blood sugar levels can cause hyperosmolar hyperglycemia which is an emergency condition and can cause death. (23)

Diabetic nephropathy is one of catastrophic disease, namely a disease that can be life-threatening, requires long-term medical treatment and requires large medical costs. In this study, 93.1% of diabetic nephropathy patients used National Health Insurance (Badan Penyelenggara Jaminan Sosial/BPJS) and 6.9% out of pocket. Of course, this represents a huge economic burden for both personal and national health systems. Throughout 2022, BPJS handled around 23.3 million cases of catastrophic diseases in Indonesia, an increase of 18.6% compared to 2021. The BPJS have spend around IDR 24.1 trillion for the treatment of patients with catastrophic diseases. This amount represents 21% of the total health insurance burden of BPJS. Therefore, it is very important for the government to prioritize preventive and health promotion efforts related to diabetic nephropathy. (24)

4.1 LIMITATION OF THE STUDY

Because the data used in this study was taken from medical records, there are limitations in the variables of characteristic profile that can be obtained. Besides, in this
study there were missing data on BMI, dyslipidemia and hypoalbuminemia due to incomplete filling of the medical records. This research data was taken from patient medical records for the period of January 2018 to December 2021, when the COVID-19 pandemic was still occurring. At that time, community activities were limited and many patients were afraid to leave the house, including going to the hospital. Therefore, the actual prevalence rate of diabetic nephropathy may be higher than the results of this study.

5 CONCLUSION

Diabetic nephropathy patients at Waled General Hospital Cirebon Regency, Indonesia were mostly at productive age group <65 years, female, housewives, overweight and obese. Diabetic nephropathy patients also experience uncontrolled blood pressure, lipid, blood glucose levels and hypoalbuminemia.

Based on the results of our study, it is important to develop comprehensive efforts to prevent the occurrence of DM and diabetic nephropathy, especially in the productive age group. It is also very important to provide education and health promotion to the public to avoid sedentary lifestyle and maintain an ideal body weight, especially for women and housewives. To get optimal control of blood pressure, lipid and blood glucose levels, DM patients are expected to take medication and visit health services regularly.
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Pratiwi, W., Surgana, M., B. (2024). PROFILE OF DIABETIC NEPHROPATHY PATIENTS AT WALED GENERAL HOSPITAL, CIREBON DISTRICT, INDONESIA: HIGH PREVALENCE IN PRODUCTIVE AGE GROUP, FEMALE AND HOUSEWIVES


