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Diagnostic Description of Ischemic Stroke Patients with Type 2 Diabetes Mellitus in Royal Prima Medan General Hospital

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Abstract
Stroke is a focal cerebral dysfunction that occurs for 24 hours or more, which can cause disability or death due to spontaneous bleeding or inadequate blood supply. The stroke itself can be divided into ischemic and hemorrhagic. Ischemic stroke is a sudden loss of blood circulation in the brain area. Diabetes mellitus is a metabolic disease characterized by hyperglycemia that occurs due to abnormalities in insulin, insulin action, or both. Diabetes mellitus is divided into type 1, type 2, and gestational. Type 2 diabetes mellitus is a metabolic disorder usually characterized by increased blood sugar due to a decrease in insulin by pancreatic beta cells and insulin resistance. The purpose of this study was to determine the diagnostic picture of ischemic stroke patients with type 2 diabetes mellitus and to determine the distribution of proportions based on sociodemographic characters, procedures for diagnosis, management, and complications of the disease. This research is descriptive, retrospective with a case study design and a sample of 30 medical records at Royal Prima Hospital, which will then be analyzed using the SPSS application. The results showed the distribution of the proportion of ischemic stroke patients with T2DM in the elderly, male gender, blood sugar levels 200-300 mg/d, cholesterol above 200, and previous disease history. Based on the research results that have been done, it is concluded that people who have had an ischemic stroke almost always have a history of diabetes mellitus, both type 2 and vice versa, and have congenital supporting diseases such as hypertension.

Keywords: Stroke, ischemic stroke, type 2 diabetes mellitus

Abstrak
Stroke merupakan disfungsi serebral fokal yang terjadi selama 24 jam, bahkan lebih. Sehingga dapat menyebabkan disabilitas atau kematian karena terjadi pendarahan spontan atau pasokan darah yang tidak memenuhi. Stroke sendiri dapat dibagi menjadi iskemik dan hemoragik. Stroke iskemik merupakan hilangnya sirkulasi darah didaerah otak secara tiba-tiba. Diabetes mellitus merupakan penyakit metabolik dengan karakteristik hiperglikemia yang terjadi karena kelainan insulin, kerja insulin atau keduanya. Diabetes mellitus dibagi menjadi DM tipe 1, DM tipe 2, gestasional. Pengertian dari diabetes mellitus tipe 2, yaitu merupakan gangguan metabolik yang biasanya ditandai dengan kenaikkan gula darah akibat penurunan insulin oleh sel beta pankreas dan resistensi insulin. Tujuan penelitian ini adalah untuk mengetahui gambaran diagnostik pasien stroke iskemik terhadap diabetes mellitus tipe 2, serta untuk mengetahui distubusi proporsi berdasarkan karakter sosiodemografis, tata cara diagnosis, penatalaksanaan dan komplikasi penyakit. Penelitian ini bersifat deskriptif, retrospektif dengan desain studi kasus dan jumlah sampel sebanyak 30 data rekam medis di RSU Royal Prima yang selanjutnya akan dianalisa menggunakan aplikasi SPSS. Hasil penelitian didapatkan distribusi proporsi pasien stroke iskemik dengan DMT2 pada usia lansia, jenis kelamin laki-laki, kadar gula darah 200-300mg/d, kolestrol diatas 200 dan memiliki riwayat penyakit sebelumnya. Berdasarkan hasil penelitian, dapat disimpulkan hasil: orang yang pernah terkena stroke iskemik hampir selalu memiliki riwayat penyakit diabetes mellitus baik tipe 2 dan sebaliknya, serta memiliki penyakit bawaan pendukung seperti hipertensi.

***Kata kunci**: Stroke, stroke iskemik, diabetes mellitus tipe 2*

INTRODUCTION

Stroke is a disease most often characterized by sudden weakness or numbness of the face, arm, or leg, most often on one side of the body. It can occur due to an inadequate supply of oxygen and nutrients due to impaired blood supply and damage to brain tissue. Stroke is also the second most common cause of death globally and the third leading cause of death in low-income countries.[1]

According to data from the World Health Organization (WHO), it shows that 7.9% of all deaths in Indonesia are caused by stroke. And according to Basic Health Research data (*Rikesdas,* 2013) that the prevalence of stroke in Indonesia, based on the diagnosis of health workers, is 7 per 1000 population, and those diagnosed by health workers or symptoms, are 12.1 per1000 population. The prevalence of stroke in the United States is about 7 million (3.0%), while in China, the prevalence of stroke ranges between 1.8% (rural) and 9.4% (urban).[2]

Stroke is defined as a sudden neurological outburst caused by impaired perfusion through blood vessels to the brain. Blood flow to the brain is managed by the two internal carotid arteries anteriorly and the two vertebral arteries posteriorly. Ischemic occlusion accounts for about 85% of victims in stroke patients-ischemic occlusion results in thrombotic and embolic conditions in the brain. In thrombosis, blood flow is affected by constriction of blood vessels due to atherosclerosis and in embolic stroke, decreased blood flow to areas of the brain causes embolism; reduced blood flow to the brain, leading to severe stress and untimely cell death (necrosis).[3]

Diabetes mellitus is a disease that is usually characterized by hyperglycemia caused by the inability of the pancreas to produce insulin, or a lack of insulin sensitivity in the target cells and diabetes mellitus is categorized into three types, namely type-1 diabetes mellitus, type-2 diabetes mellitus, and gestational diabetes mellitus. Type 2 diabetes mellitus (DMT2) is a metabolic disorder disease characterized by increased blood sugar due to insulin resistance.[4],[5]

The pathophysiology of type 2 DM is a complex process and involves many factors. Pancreatic beta-cell failure and insulin resistance in muscle, liver are primary defects that occur. Subsequently, incretin deficiency occurs, increased lipolysis, hyperglucagonemia, insulin resistance in the brain, and increased renal glucose absorption can also result from disease progression.[6]

Education to promote healthy living should always be carried out as part of prevention efforts and is important for holistic DM management. Medical nutrition therapy is an important part of comprehensive DM management. Medical nutrition therapy should be given according to the needs of

each person with diabetes to achieve the target. Pharmacological therapy consisting of oral drugs and injections is given along with diet and physical exercise (healthy lifestyle).[7]

Patients with high blood glucose levels can increase the risk of stroke twofold compared to patients with reasonable blood glucose control. The hyperglycemia will harm the clinical outcome of patients because it can cause impaired immune function, more susceptibility to infection, worsening of the cardiovascular system, thrombosis, increased inflammation, endothelial dysfunction, oxidative stress, and brain damage.[7]

The prevalence of stroke in people with diabetes in low-middle income countries is 2.7% (1.7%-3.6%). The prevalence of stroke with diabetes mellitus (both types 1 and 2) in Indonesia ranges from 1.0-11.3 % in the clinical population and 2.8-12.5% in the study in the general population. The prevalence of stroke was significantly higher in patients with type 2 diabetes mellitus than in patients with type 1 diabetes mellitus.[8]

Patients with diabetes experience a higher proportion of ischemic strokes than hemorrhagic strokes. This could be due to the higher prevalence of microvascular disease and co-occurrence of hypertension in this group of patients. The prognostic picture also differed from that of the other stroke groups because diabetes was associated with an increased risk of subsequent stroke events, more significant disability, more extended hospital stay, and an increased risk of death. There are also reports of strokes causing dementia.[1]

METHODS

Participants / Subject / Population and Sample

This research is a descriptive, retrospective study with a case study design. The population in this study was all medical record data of ischemic stroke patients with type 2 diabetes mellitus in inpatient rooms and polyclinics taken from the medical record room and outpatient room at RSU Royal Prima Medan in 2018 - 2020. In this study, to find the proportions, the minimum required sample is 30 medical records of Ischemic Stroke patients with Type 2 DM at Royal Prima public hospital from April to May 2021. This research was conducted in the medical and outpatient records room at Royal Prima Medan public hospital.

Procedure and Data Analysis

After all, data is obtained, data management will be carried out using a computer program, SPSS version 26.0. The descriptive statistical distribution of proportions will analyze the data. Furthermore, the data will be presented in narratives, distribution tables, and bar and circle diagrams.

Result

Distribution of patient proportion by age

Table 1 shows that the age most affected by Ischemic Stroke with Type 2 DM with the highest proportion aged 60 years with the highest percentage is 66.7%, while the lowest is at the age of 30-40 years with a percentage the lowest is 3.3%.

Table 1: Distribution of patient proportion by age

Age	F	%
30 – 40	1	3.3
41 – 60	9	30
> 60	20	66.7
Total	30	100

Distribution of patient proportion by gender

Table 2 shows that gender is most affected by Ischemic Stroke with Type 2 DM. The highest proportion is male with the highest percentage (66.7%), while the lowest is female with the lowest percentage (33. 3%).

Table 2: Distribution of patient proportion by gender

Gender	F	%
Man	20	66.7
Woman	10	33.3
Total	30	100

Distribution of patient proportions based on blood sugar levels

Table 3 shows that blood sugar levels are most affected by Ischemic Stroke with Type 2 DM with the highest proportion of 200-300mg/dL with the highest percentage at 50.0%, while the lowest at <100 mg/dL with the lowest percentage of 6.7%.

Table 3: Distribution of patient proportion based on blood sugar levels

Blood sugar levels	F	%
< 100 mg/dL	2	6.7
100 – 200 mg/dL	3	10.0
200 – 300 mg/dL	15	50.0
> 300 mg/dL	10	33.3
Total	30	100

Distribution of patient proportions based on total cholesterol

Table 4 shows that total cholesterol levels are the most affected by Ischemic Stroke with Type 2 DM with the highest proportion > 250mg/dL with the highest percentage at 56.7%, while the lowest at <200 mg/dL with the lowest percentage of 6.7%.

Table 4: Distribution of patient proportions based on total cholesterol

Total cholesterol	F	%
< 200 mg/dL	2	6.7
200-250 mg/dL	11	36.7
> 250 mg/dL	17	56.7
Total	30	100

Distribution of patient proportions by LDL

Table 5 shows that LDL levels are the most affected by Ischemic Stroke with Type 2 DM with the highest proportion of 130-159mg/dL with the highest percentage at 40.0%, while the lowest at <100 mg/dL with the lowest percentage of 6.7%.

Table 5: Distribution of patient proportion by LDL

LDL	F	%
< 100 mg/dL	2	6.7
100 – 129 mg/dL	4	13.3
130 – 159 mg/dL	12	40.0
160 – 189 mg/dL	10	33.3
> 190 mg/dL	2	6.7
Total	30	100

Distribution of patient proportions based on HDL

Table 6 shows that HDL levels are the most affected by Ischemic Stroke with Type 2 DM. The highest proportion is 40-59 mg/dL with the highest percentage being 66.7%, while the lowest is >60 and <40mg/dL with the lowest percentage of 6.7%.

Table 6: Distribution of patient proportions based on HDL

HDL	F	%
> 60 mg/dL	5	16.7
40-59 mg/dL	20	66.7
< 40 mg/dL	5	16.7
Total	30	100

Distribution of patient proportions based on previous medical history

Table 7 shows that the most previous disease history is Ischemic Stroke with Type 2 DM, the highest proportion is with the highest percentage of 90.0%, while the lowest is none with the lowest percentage of 10%.

Table 7: Distribution of patient proportions based on previous medical history

Previous medical history	F	%
It doesn't have	3	10
Have	27	90
Total	30	100

Distribution of patient proportion based on length of stay

Table 8 shows that the previous length of treatment was most affected by Ischemic Stroke with Type 2 DM with the highest proportion <5 days with the highest percentage being 33.3%, while the lowest at >21 days with the lowest percentage being 3.3%.

Table 8 : Distribution of patient proportion based on length of stay

Length of stay	F	%
< 5 days	10	33.33
5-10 days	13	43.3
11-16 days	4	13.3
17-21 days	2	6.7
> 21 days	1	3.3
Total	30	100

Distribution of patient proportion based on the condition at discharge

Table 9 shows that the situation at home is most affected by an ischemic stroke with type 2 diabetes. The highest proportion of outpatients with the highest percentage is 93.3%. In comparison, the lowest is death, with the lowest percentage being 6.7%.

Table 9: Distribution of patient proportion based on the condition at discharge

The condition at discharge	F	%
Outpatient	28	93.3
Die	2	6.7
Total	30	100

DISCUSSION

Ischemic stroke patients are more than 60 years old (66.7%) and male (66.7%), taken from medical record data. Research from Santrianti Totting et al. (2018) also found that people over 60 years of age and male gender were more likely to suffer from ischemic stroke.[(9)]

Ismalia Husna's research (2017), conducted a study on the distribution of blood sugar levels in ischemic stroke patients where the average blood sugar level of ischemic stroke patients was 241.76 mg/dL. This is similar to the results of this study, with the highest number of patients (15 patients) who had blood sugar values between 200-300 mg/dL.[(10)]

This study mostly found patients with cholesterol levels > 250 mg/dL (56.7%), LDL levels 130 - 159 mg/ dL (40%) and HDL levels 40 - 59 mg/ dL. But these results are not following the research of Muhammad Fadlan Adam et al. (2020) that most cholesterol levels < 200 mg/dL (49.3%), LDL levels 70-129 mg/dL (42.2%). This difference can occur because atherosclerosis can be initiated by high K-LDL, which can accumulate in the tunica intima of arteries. Furthermore, LDL will be oxidized and phagocytized by macrophages to form foam cells so that a layer of fat will be formed. In addition, some patients with a history of ischemic stroke may have controlled LDL-K levels.[(11)]

This study found that most patients with ischemic stroke with T2DM have a history of the previous disease (90%), as well as the length of hospitalization for 5-10 days (43.3%) and the condition of the patient while having outpatient therapy (93.3%).

CONCLUSION AND SUGGESTION

1. The age group of 30-40 years is the age group that rarely suffers from ischemic stroke accompanied by DMT2 with a percentage of 3.3%, while the age group > 60 years is most susceptible to ischemic stroke accompanied by DMT2 has a percentage of 66.7%.
2. Ischemic stroke accompanied by T2DM is more common in men than women, with a ratio of 66.7%: 33.3%.
3. Patients with diabetes who have blood sugar values around 200-300 mg/dL are most susceptible to ischemic stroke with a percentage of 50%, while those with values <100 mg/dL are the least likely to occur with a percentage of only 6.7%.
4. Patients who have had DMT2 and have cholesterol values > 250 mg/dL experienced the most ischemic stroke with a percentage of 56.7%, for LDL values the most experienced ischemic stroke were 130 - 159 mg/dL with a percentage of 40%, and for HDL values, the highest was 130-159 mg/dL most affected by ischemic stroke by 40 - 59 mg/dL with a percentage of 66.7%.
5. DMT2 patients with a history of previous diseases such as hypertension have the most ischemic stroke compared to those who do not have a previous history of disease with a percentage of 90%: 10%.
6. 93.9% of patients hospitalized due to ischemic stroke with DMT2 were able to go home by doing outpatient treatment, while 6.7% of patients died.

Suggestion from this research :

Researchers suggest that further research is needed on the diagnostic picture of ischemic stroke patients with type 2 diabetes mellitus.

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