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THE OVERVIEW OF DIABETIC FOOT RISK IN PUSKESMAS SERIRIT 1 IN DECEMBER 2021

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***Abstract*: Diabetes Melitus (DM) is a chronic disease which its cases has continued to increase in the last decades. One of the most common complication is Diabetic foot which may cause the amputation. Early detection of Diabetic foot risk becomes very important so that the treatment can be started as early as possible for preserving the limbs. The present study aimed to identify the Diabetic foot risk in Diabetic patients admitting to Puskesmas Seririt 1. We conducted a qualitative study with cross sectional approach. Forty Diabetic patients who admitted to Puskesmas Seririt 1 in December 2021 were enrolled by the consequtive sampling technique. The data collection was based on interviews and physical examination, regarding "The Simplified 60-Second Diabetic Foot Screen" questionnaire. The data analysis was conducted using the frequency distribution tables. From this study, it can be inferred that 45% respondents are at high risk to suffer from The Diabetic Foot. Higher risk is more experienced by the men (61,1%), age between 55-64 years old (44,4%), Overweight (50%), Hypertension (77,8%), less than 5 years being diagnosed with Diabetes (72,2 %), unemployment (33,3%) and elementary school as the former education level (44,4%). The early detection of Diabetic foot risk is the main priority in the prevention approach to reduce the complication. It is very important not only to increase the promotion but also to maintain the general practitioners and nurses competencies.**

***Keywords*: Diabetes Melitus, Diabetic Foot, Diabetic Foot Risk.**

I. INTRODUCTION

Diabetes Melitus (DM) is a chronic progressive disease which the pancreatic cells can not produce the sufficient amount of insulin, or there is any decreasing of insulin sensitivity. The prevalence of Diabetes has continued to increase, especially in the last decades. Its worldwide prevalence has increased about two times after 1980, from 4,7% to 8,5% of the adult population. Meanwhile, the total Diabetes population in Indonesia has reached 8,4 million people in 2000, and has been predicted to reach for about 21,3 million people in 2030. Based on the Socioeconomic Survey in 2018, the prevalence of Diabetes in Bali is 1,7% (1).

The Diabetes is a serious health problem due to its high morbidity and mortality. Many complication which caused by the Diabetes such as the cardiovascular disease, kidney problems, blindness, and neuropathy should be identified meticulously, as soon as possible (1). One of the most common and serious complication is Diabetic Foot which may end to foot amputation. The prevalence of Diabetic Foot was known to be approximately 3,3% of total Diabetes Melitus case (2). It may affect to the high medical cost, and may become the socioeconomic burden. In addition, the Diabetic Foot will increase the mortality rate for about 43-50% (3). For Diabetic patients, either within normal feet condition or in mild neuropathy disorder without ulcer, the main priority for the management is by early detection. The early detection of Diabetic Foot Risk is really important so that if it is can be detected sooner, the intervention can be started earlier, especially the approach to preserve the limbs. It is also beneficial not only for decreasing the socioeconomic burden, but also reducing the morbidity and mortality rate (3)

Puskesmas Seririt 1 is one of the Primary Health Care in Buleleng district, Province of Bali, Indonesia. The Primary Health Care, including Puskesmas (Pusat Kesehatan Masyarakat) as one of limited health care facility that prioritize the promotive and prevention approach, should have an easy, fast, reliable, and applicable tools for identifying the Diabetic foot risk. The method for detecting the risk factor is using scoring system such as "The Simplified 60-seconds Diabetic Foot Screening Tool" which has been validated to use in limited health care facilities, such in the Primary Health Care (3).

Due to the high prevalent of the Diabetes Melitus in Bali, and the rapidly growing of Diabetic Foot population, and the increasing of socioeconomic burden, and also morbidity and mortality rate of it, the researcher interests to identify the Diabetic Foot Risk in Puskesmas Seririt 1, Buleleng, Bali, Indonesia.

II. MATERIALS AND METHOD

This was a qualitative study with cross sectional approach. The population of this study was the patients which suffer from Diabetes Melitus admitting to General Outpatient Clinic of Puskesmas Seririt 1 in December 2021. The sampling technique was carried out by the consecutive sampling, on a total of 40 samples. The inclusion criteria of this study were Diabetes Mellitus patients aged over 18 years, able to communicate well, willing to take part in the study and sign the sheet consent to participate in the research. Exclusion criteria for this study including the patients with unstable clinical conditions, unstable vital signs, the patients who were experiencing by acute complications of diabetes, or those who were not willing to be included in the study.

Data was collected through interviews and physical examination of the foot condition based on a diabetic foot ulcer risk questionnaire, namely "The Simplified 60-seconds Diabetic Screening Tool" which was modified by the researcher. This questionnaire was prepared based on the criteria set by the IWGDF (International Working Group on the Diabetic Foot), which consists of a history of previous ulcers or amputations, as well as a physical examination to look for deformities, ingrowing toe nails, impaired arterial pulsation of dorsalis pedis and/or tibialis posterior artery, presence of active ulcers, callus/thickening of the skin, and monofilament examination to detect sensory function disturbances. If any of these signs were found in one or both feet, the patient was categorized as high risk for developing diabetic foot. In a preliminary study by Woodburry et al, the "The Simplified 60-Second Diabetic Foot Screen" questionnaire was used to detect the risk of diabetic foot in 1,222 patients in 2008-2010 as well as on health services with complete and limited facilities. In addition, the Questionnaire "The Simplified 60-Second Diabetic Foot Screen" is considered very easy, simple, and effective. (3). Another questionnaire that was also developed was the "Inlow 60-second tool" questionnaire. This questionnaire is considered to have good interreliability and validity. However, its use has not been proven to be effective in various types of services, both for complete and limited facility services. In addition, it takes about 7 minutes to apply it to one patient (3).

III. RESULT

A total of 40 research samples were obtained that met the inclusion and exclusion criteria at General Outpatient Clinic of Puskesmas Seririt 1 in December 2021.

Distribution of Respondents based on Characteristic

Table 1: Characteristics of Diabetes Mellitus Respondents

Respondent Characteristic	Total (n)	Percentage (%)
Gender		
Male	21	52,5
Female	19	47,5
Age		
35-44 years old	3	7,5
45-54 years old	10	25
55-64 years old	14	35
> 65 years old	13	32,5
Former Education Level		
Uneducated	9	22,5
Elementary School	19	47,5

Junior High School	8	20
Senior High School	3	7,5
Bachelor degree	1	2,5
Occupation		
Labour	4	10
Merchant	3	7,5
Teacher	2	5
Housewives	9	22,5
Farmers	2	5
Drivers	2	5
Employee	5	12,5
Unemployment	13	32,5
Type of Diabetes		
Diabetes Melitus Type 1	0	0
Diabetes Melitus Type 2	40	100
Duration suffering from Diabetes		
< 5 years	31	77,5
≥ 5 years	9	22,5

The variables were obtained from the primary data based on interview and physical exam for the feet condition and also the secondary data from the medical record to identify the age, type of Diabetes, duration of suffering from Diabetes, comorbidities, Body Mass Index, former education level, and occupation

Based on table 1, it is found that the characteristic of the respondents are mostly male (52.5 %), 55-64 years old (35%), type 2 Diabetes Mellitus (100 %), elementary school as the former education level (47.5%), unemployment (32.5%), and the suffering from Diabetes for less than 5 years (77.5%).

The distribution of respondents' characteristics by gender shows that the number of males is slightly higher than that of females. This finding was also similar to a previous study by Pardede et al where the number of male patients was 52.9% while women were 47.1% of the total number of respondents (4). This is probably due to the theory that in men, fat accumulation is concentrated in the abdomen, thus triggering central obesity, which increases the risk of metabolic disorders (5). On the other hand, on the previous study by Suprihatin et al, which found that women had higher risk of suffering from diabetes more than the men (6). This may be caused by the impaired insulin sensitivity related to hormonal factors, causing the distribution of body fat to accumulate more easily (7).

In addition, most of the respondents are between 55-64 years old. The almost similar results was also found in previous studies where as many as 70% of respondents were aged 45-65 years (4). The risk of diabetes will increase with age, especially over the age of 40 years where the glucose intolerance begins to increase. The aging process will cause a decrease in the function of pancreatic beta cells in producing insulin (8). In addition, in elderly individuals, there is a decrease in muscle cell mitochondrial activity as much as 35%. This will cause an increase in muscle fat levels by 30% and trigger insulin resistance (8). According to WHO, over the age of 30 years, there will be an increase in Fasting Blood Glucose level by 1-2% per year and the level of 2 hours-Post Prandial Blood Glucose by 5.6-13 mg/dL (9).

The distribution of respondent characteristics by type of Diabetes Mellitus shows that all respondents in this study are patients with Type 2 Diabetes Mellitus. This is also related because the respondents who were included in the study were over 18 years old. Type 1 diabetes mellitus is most often experienced by children and adolescents. Based on the International Diabetic Federation in 2019, it was explained that as many as 1.1 million children and adolescents under 20 years were estimated to have Type 1 Diabetes Mellitus, while adults over the age of 20 currently suffer from Type 2 Diabetes Mellitus (10).

Based on the duration of being diagnosed with diabetes, the majority of the respondents were diagnosed with diabetes for less than 5 years. This is different from previous study by Romadhiati that the longer someone being sufferred from diabetes, the risk of complications would also increase (7). Disorders of blood vessels throughout the body will exacerbate the disruption of vital organ function. In addition, in other studies it is stated that diabetics are at risk for macroangiopathy in 5-10 years and microangiopathy complications in 5-15 years (11). The finding of this study may differ from the theory which can indicate the lack of Diabetes screening from the early course of disease so that the patients seek medical attention only after they suffer from long term Diabetes complication such as the Diabetic Foot.

In addition, it is also found that most of the respondents had the last education level up to elementary school level. The level of education is closely related to one's knowledge. Lack of knowledge about health at a low level of education can prevent a person from receiving new information or knowledge thereby increasing the risk of becoming more vulnerable to chronic diseases, such as Diabetes Mellitus (12).

From this study, it is also found that most of the respondents in this study are unemployment. Adiatma and Asriyadi explained that light physical activity will increase a person's risk of developing Diabetes Mellitus by 4.36 times (13).

Overview of Body Mass Index (BMI) of Diabetes Mellitus Patients at the General Outpatient Clinic in Puskesmas Seririt 1

Table 2: Body Mass Index (BMI) Characteristics of the Respondents

BMI Characteristic of the Respondents	Total (n)	Percentage (%)
Underweight	4	10
Normal	13	32,5
Overweight	16	40
Obesity	7	17,5

From this study it was found that the majority of Diabetes patients is Overweight as many as 16 people (40%) and also Obese as many as 7 people (17.5%), while 13 of them (32.5%) have normal BMI.

Overview of Comorbidity of Diabetes Mellitus Patients at the General Outpatient Clinic in Puskesmas Seririt 1

Table 3: Comorbidities Characteristics of the Respondents

Comorbidities Characteristics of the Respondents	Total (n)	Percentage (%)
No Comorbidity	**4**	**10**
Hypertension	**28**	**70**
Hypertension, Gout	**1**	**2,5**
Hypertension,Knee Osteoartritis	**2**	**5**
Heart Disease	**3**	**7,5**
Pulmonary Tuberculosis	**2**	**5**

From the this study, it is also found that most diabetes patients had a history of comorbid hypertension (70%), followed by a history of heart disease (7.5%), Pulmonary Tuberculosis (5%), hypertension and knee osteoarthritis (5%), Hypertension and Gout (2.5%). Meanwhile, in the other 4 people (10%), no comorbidities are found. This finding may be related to the progression of Diabetes due to Hypertension (2)

The Level of Diabetes Foot Risk in Diabetes Mellitus Patients at the General Outpatient Clinic in Puskesmas Seririt 1

Table 4: Risk Level for Diabetic Foot

Diabetic Foot Risk	Total (n)	Percentage (%)
High	18	45
Low	22	55

Based on Table 4, out of a total of 40 diabetes patients, 18 (45%) of them are at high risk of developing diabetic foot, while the remaining 22 people (55%) are in the low risk category. The risk level for the occurrence of Diabetic Foot was measured using a questionnaire “The Simplified 60-Second Diabetic Foot Screen”. Of the 18 patients at high risk of developing diabetic foot, the following clinical findings were obtained: 2 patients with ingrown toe nails, 4 patients with callus/ skin thickening, 7 patients with positive monofilament test, 2 patients with new ulcers, 2 patients with foot deformities, and 1 patient with a foot deformity and history of previous leg amputation.

Diabetes Foot Risk Level based on the Characteristics of Diabetes Mellitus Patients at the General Outpatient Clinic in Puskesmas Seririt 1

Table 5: Cross-tabulation of Diabetes Foot Risk Levels based on the Respondents Characteristic

Respondent Characteristics	Diabetic Foot Risk			
	High Risk		Low Risk	
	Total (n= 18)	Percentage (%)	Total (n = 22)	Percentage (%)
Gender:				
Male	11	61,1	10	45,5
Female	7	38,9	12	54,5
Age				
35-44 years old	1	5,5	2	9,1
45-54 years old	5	27,9	5	22,7
55-64 years old	8	44,4	6	27,3
>65 years old	4	22,2	9	40,9
Body Mass Index (BMI)				
Underweight				
Normal	0	0	4	18,2
Overweight	6	33,3	7	31,8
Obesitas	9	50	7	31,8
	3	16,7	4	18,2
Comorbidities				
No Comorbidity	0	0	4	18,2
Hypertension	14	77,8	14	63,6
Hypertension, Gout	0	0	1	4,5
Hypertension,Knee Osteoartritis	1	5,6	1	4,5
Heart Disease	2	11,1	1	4,5
Pulmonary Tuberculosis	1	5,6	1	4,5
Former Education Level				
Uneducated				
Elementary School	4	22,2	5	22,8
Junior High School	8	44,4	11	50
Senior High School	5	27,8	3	13,6
Bachelor degree	0	0	3	13,6
	1	5,6	0	0
Occupation				
Labour	1	5,6	3	13,6
Merchant	2	11,1	1	4,5
Teacher	1	5,6	0	0
Housewives	3	16,7	6	27,3
Farmers	2	11,1	0	0
Drivers	0	0	1	4,5
Employee	3	16,7	2	9,1
Unemployment	6	33,3	9	40
Duration suffering from Diabetes				
< 5 years	13	72,2	18	81,8
≥ 5 years	5	27,8	4	18,2

Based on the table 5, it is shown that respondents with a high risk level for diabetic foot are more experienced by men (61.1 %), age 55-64 years (44.4%), Overweight (50%), hypertension (77.8%). In addition, 72.2% of them had suffered from Diabetes for less than 5 years, 33,3% of them are unemployment and 44,4 % of them had elementary schools as their last education level.

Diabetes Foot Risk Level based on the Characteristics of Diabetes Mellitus Patients at the Seririt 1 Public Health Center

From the results of the study, it was found that 45% of respondents is at high risk of developing diabetic feet, while the 55% remaining can be considered at low risk. This shows that the number of the two groups are almost equal.

Based on the results of the cross tabulation of the Diabetic Foot risk based on the age, it is found that respondents aged 55-64 years were at higher risk of developing diabetic foot. This was also found similarly to a study by Jia et al which the average age of Diabetic patients with foot ulcers was 62.9 years.(14)

Based on the results of the cross tabulation of the Diabetic Foot risk based on gender, it was found that women have a lower risk, while the risk of diabetic foot in men is higher. This is different from previous studies where women are found to be at a higher risk of developing diabetic foot because of the tendency for women to have a higher Body Mass Index (BMI).(6)

Based on the results of the cross tabulation of the Diabetic Foot risk based on the Body Mass Index (BMI), it is found that the overweight respondents are at high risk of developing diabetic foot. It is supported by the theory that the Diabetic patients which suffer from the Overweight/Obesity will experience insulin resistance. The higher insulin levels (hyperinsulinemia) will aggravate the atherosclerosis process and will cause the circulation disorder and facilitate the formation of foot ulcers.(15).

Based on the tabulation results based on the education level, it is found that respondents with the last education up of elementary school are also at high risk of developing diabetic foot. This is different from previous studies where it was found that respondents with the last education of senior high school were at the highest risk of developing diabetic foot (6).

Based on the tabulation results based on the occupation, it was found that respondents who are unemployment are at high risk of developing diabetic foot. This is different from previous research where it was found that housewives were the most at risk, where the risk would increase by 3.47 times (6,16)

Based on the tabulation results in terms of length of suffering from diabetes, it was found that respondents who had diabetes for less than 5 years are at high risk. However, this is not in accordance with previous studies where it was found that people with diabetes over 5 years had a higher risk of developing foot ulcers (6). In addition, Rosa et al also explained that someone who has had diabetes for more than 5 years has a 4.3 times greater risk of developing diabetic gangrene than people with diabetes under 5 years (17). In addition, there is another possibility that patients with diabetes duration of less than 5 years have just been diagnosed and have had diabetes much longer than that time. Besides that, it is probably due to the severity of complications, patients who have been diagnosed with diabetes for more than 5 years will immediately seek medical attention to the specialist in the hospital.

Based on the tabulation results based on the patient comorbidities, it was found that most patients with comorbid hypertension are at high risk of developing diabetic foot. This was also found in previous studies where 56.78% of patients with diabetic feet also had hypertension (2). In another study, it was found that 75% of diabetic patients also had comorbid hypertension. Both conditions have almost the same risk factors and mutually exacerbate the occurrence of macrovascular and microvascular complications (18). The microvascular complications of diabetes involves the disruption of the polyol, hexosamine and protein kinase C pathways in tissue damage. In addition, hyperglycemia will accelerate the formation of AGEs (Advanced Glycated End Products) which cause glomerular hyperfiltration, release of growth factors, and free radicals from ROS (Reactive Oxygen Species). Complications of this macrovascular disorder are multifactorial in which the most involved factors are dyslipidemia, hypertension, hyperglycemia, insulin resistance, and obesity. The occurrence of the atherosclerosis process can cause coronary, cerebrovascular, and peripheral vascular disorders in diabetic patients, but the presence of hypertension will accelerate the progression of the damage. Comorbid hypertension in diabetic patients will exacerbate the occurrence of macrovascular and microvascular complications that can cause damage to the retinal blood vessels, kidneys, heart, brain, and including peripheral blood vessels.

IV. CONCLUSIONS

It was found that 45% of diabetes mellitus patients at the Puskesmas Seririt 1 in December 2021 are at high risk of developing diabetic foot complications. Higher risk is more experienced by the men (61,1%), age between 55-64 years old (44,4%), Overweight (50%), Hypertension (77,8%), less than 5 years being diagnosed with Diabetes (72,2 %), unemployment (33,3%) and elementary school as the former education level (44,4%).

V. RECOMMENDATION

These high-risk patients should be managed in a special program. The collaboration work between the internist, surgeon, general practitioner, nurses, and nutritionist is really needed to prevent worsening of the condition. The health stakeholders need to pay close attention to the number of diabetic patients at high risk to improve the existing public health programs, for example by improving the quality of the Prolanis (The Management of Chronic Disease Program) by focusing on promotion, education, improving cross-sectoral coordination regarding diabetic foot prevention measures. In addition, the competency of the general practitioners and nurses as the frontliners should also be evaluated and improved periodically through workshop and training. In addition, the "The Simplified 60-Second Diabetic Foot Screen" questionnaire should be used as a reference for colleagues to facilitate screening for diabetic foot risk, especially in limited health care facilities such as Puskesmas, considering that screening or early detection of the Diabetic foot risk is a main priority in preventing Diabetic foot, so that abnormalities can be treated as early as possible to prevent further deterioration, including the approach for preserving the limbs.

The limitation of this study is the limited number of samples and time, so it cannot properly describe conditions in a wider area. Therefore, it is expected that the results of this study can be the cornerstone for further research on a larger scale.

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