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Risk Assessment For Type 2 Diabetes Using The Finnish Diabetes Risk Core Instrument

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ABSTRACT

Indonesia ranks sixth in the world in the number of people with diabetes with an increase in prevalence from 5.7% in 2007 to 8.5% in 2018. This study aims to describe the risk factors for T2DM in the community who visit the Tamansari Health Center, Tasikmalaya City. This study is a descriptive quantitative study with a cross-sectional design. Respondents as many as 100 people were selected using the total accidental sampling method. Data were collected using the Finnish Diabetes Risk Score (FINDRISC) questionnaire which includes various T2DM risk factors, such as age, gender, body mass index (BMI), waist circumference, physical activity, hypertension, and family history. The majority of respondents were female (68%) with an average age of 45.29 years. A total of 39% of respondents had hypertension, and 39% were physically inactive. The mean BMI of the respondents was 24.83 kg/m², close to the overweight category, while the mean waist circumference was 83.21 cm, indicating abdominal obesity in some respondents. A total of 13% of respondents had a family history of T2DM, and the risk level of T2DM showed that 49% were at low risk, while the other 51% were at risk levels varying from slightly elevated to very high. The main risk factors identified were age, abdominal obesity, hypertension, physical inactivity, and family history. Most of the respondents were at low risk, but 51% were at increased to very high risk. Lifestyle-based interventions such as weight management, increased physical activity, and early detection are needed to reduce the prevalence of T2DM in this population.

INTRODUCTION

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia that occurs due to abnormalities in insulin secretion, insulin action or both. A person can be diagnosed with diabetes mellitus if they have classic symptoms of diabetes mellitus such as polyuria, polydipsi and polyphagia accompanied by a blood sugar level during ≥200 mg/dl and fasting blood sugar ≥126 mg/dl. The classification of

diabetes mellitus generally consists of type 1 diabetes mellitus, type 2 diabetes mellitus, gestational diabetes, and diabetes due to other factors (Black, J.M. & Hawks, J.H., 2014).

Globally, the total population of adult diabetes mellitus aged between 20-79 years is about 425 million people worldwide or 8.8% are estimated to have diabetes. The prevalence of diabetes mellitus in 2045 is estimated to reach 9.9% or 629 million people aged 20-79 years will suffer from diabetes. China ranks first as the country with the most people with diabetes mellitus, namely 114.4 million in 2017, then the next prevalence is India, America, Brazil, Mexico, and Indonesia in sixth place (IDF Diabetes Atlas, 2017).

Based on the Basic Health Research (Riskesdas) of the Ministry of Health of the Republic of Indonesia, in 2018 the number of diabetes mellitus in Indonesia was 8.5% or around 14 million people with an estimated population of Indonesia aged 15 years and over 176.6 million people, this number continues to grow, it is predicted that in 2030 it will reach 21.3 million people. Riskesdas data shows that there has been an increase in the prevalence of diabetes in Indonesia from 5.7% in 2007, 6.9% in 2013, and 8.5% in 2018 (Riskesdas, 2018).

Type 2 diabetes mellitus is the more common type of diabetes mellitus, which is about 90-95% of all people with diabetes. In type 2 diabetes, there are two main insulin-related problems: insulin retention and impaired insulin secretion. Normally insulin will be bound to special receptors on the cell surface. As a result of insulin binding to these receptors, a series of reactions occur in glucose metabolism in cells. Insulin retention in type 2 diabetes is accompanied by a decrease in this intracellular reaction (Muhammad, A. A. 2018).

The increase in the number of people with DM, which is mostly type 2 DM, is related to several factors, namely risk factors that cannot be changed, risk factors that can be changed and other factors. According to the American Diabetes Association (ADA), DM is associated with risk factors that cannot be changed including family history of DM (first degree relative), age ≥ know, ethnicity, history of giving birth to a baby with a baby's birth weight >4000 grams or a history of having suffered gestational DM and a history of low birth weight (<2.5 kg). Modifiable risk factors include obesity based on BMI ≥ 25 kg/m2 or abdominal circumference ≥ 80 cm in women and ≥ 90 cm in men, lack of physical activity, hypertension, dyslipidemia and unhealthy diet (Fatimah, R. N, 2015).

METHOD

This research is a type of descriptive Quantitative research. The population in this study were adults who visited the Tamansari Health Center, Tasikmalaya City. The sampling method used total Accidental Sampling for 2 weeks with a total of 100 respondents. The instrument in this study used the Findrisc / Finnish Diabetes Risk Core questionnaire.

RESULTS AND DISCUSSION

Table 1. Gender

Gender	F	%
Male	32	32%
female	68	68%
Total	100	100%

The table shows that the majority of respondents in this sample were female (68%), while only 32% were male. Type 2 diabetes mellitus (T2DM) is a chronic disease with a prevalence that shows variations based on gender. Globally, the International Diabetes Federation (IDF)

Diabetes Atlas 2021 report shows that the prevalence of T2DM is almost equal between men and women. However, in certain age groups, especially after menopause, women tend to have a higher prevalence due to hormonal changes that affect glucose metabolism (IDF, 2021).

Table 2. Age, BMI, Waist Circumference

Variable	N	mean	Median	Std. Deviasi	Min	Max
Age	100	45,29	49,00	13,911	20	81
BMI	100	24,83	24,20	5,78	13,44	55,00
Waist Circumference	100	83,20	81,45	12,67	59,00	115,00

The table above shows descriptive data regarding the age, body mass index (BMI), and waist circumference of 100 respondents, which are important variables in determining the risk of type 2 diabetes mellitus (T2DM). The average age of the respondents was 45.29 years with a range of 20 to 81 years. Older age is a major risk factor for T2DM as insulin resistance and decreased pancreatic function tend to increase with age. According to the International Diabetes Federation (IDF), in 2021, the highest prevalence of T2DM is found in the age group of 75-79 years globally. This indicates that the risk of T2DM increases significantly in old age as the aging process affects glucose metabolism and insulin function (IDF, 2021).

Based on the 2018 Riskesdas data, the prevalence of T2DM in Indonesia also shows an increase in older age groups. The highest prevalence was found in the 55-64 years age group, followed by the 65 years and above age group. This data indicates that the aging population in Indonesia contributes to the increasing number of T2DM cases. As we age, the body tends to experience a decrease in insulin sensitivity and glucose metabolism efficiency. In addition, a less active lifestyle, increased body weight, and accumulation of cardiometabolic risk factors contribute to the risk of T2DM (Murtiningsih et al., 2021). Therefore, old age is one of the main predictors for the development of T2DM, and early prevention is necessary, especially through weight control, a healthy diet, and regular physical activity (Kusnadi et al., 2017).

In addition, the average BMI of respondents was 24.83, which is close to the overweight category (≥25). The highest BMI value reached 55, indicating obesity in some respondents. Overweight and obesity are known to increase the risk of T2DM as they are associated with insulin resistance. Body Mass Index (BMI) has a significant association with the risk of Type 2 Diabetes Mellitus (T2DM), where obesity or overweight is a major risk factor. The accumulation of body fat, especially visceral fat found in individuals with high BMI, leads to increased insulin resistance and impaired glucose metabolism (Eckel et al., 2018)

This condition affects the body's ability to use glucose efficiently, which can eventually lead to T2DM (Enarga et al., 2023). . According to the World Health Organization (WHO), individuals with a BMI ≥25 kg/m² (overweight) or ≥30 kg/m² (obese) have a significantly higher risk of developing T2DM than individuals with a normal BMI (Hu et al., 2018).

Epidemiological studies, including the 2018 Riskesdas data in Indonesia, show that the risk of T2DM is significantly increased in groups with high BMI. Local studies, such as the study at RSUD Dr. Soetomo Surabaya, also found that the average IMT of T2DM patients is higher than healthy

individuals, with IMT above 25 kg/m² contributing significantly to the risk of T2DM (Suryani & Rahayu, 2020).

BMI is a simple indicator that can be used to predict the risk of T2DM. In fact, 5-10% weight loss in individuals with high BMI has been shown to significantly reduce the risk of T2DM (Eckel et al., 2018). Weight management through a balanced diet and regular exercise are effective preventive measures to reduce BMI and T2DM risk. In addition, lifestyle interventions such as increased physical activity, reduced sugar consumption, and healthy food intake can also significantly reduce risk (Hu et al., 2018). Thus, BMI is one of the important parameters in assessing and preventing T2DM risk, especially in populations with a high prevalence of obesity.

The average waist circumference of the respondents was 83.21 cm, with the highest value reaching 115 cm. A waist circumference greater than 80 cm for women and 90 cm for men indicates abdominal obesity, which is a strong predictor of T2DM risk. The maximum value and high variation of waist circumference in this sample suggests that some respondents may have an at-risk body fat distribution. Waist circumference has a significant association with Type 2 Diabetes Mellitus (T2DM) risk as it is an indicator of abdominal obesity, which is directly related to insulin resistance. Visceral fat accumulated around the abdominal organs releases inflammatory mediators such as proinflammatory cytokines and free fatty acids, which can interfere with insulin function and glucose metabolismv(Eckel et al., 2018).

Research shows that waist circumference greater than 80 cm for women and 90 cm for men significantly increases the risk of T2DM, even in individuals with normal BMI (Hu et al., 2018). The 2018 Riskesdas data in Indonesia also shows that abdominal obesity is one of the main risk factors for T2DM across different age groups.

Local studies support this relationship, such as a study at RSUD Karsa Husada, which found that the majority of T2DM patients had waist circumference that exceeded normal limits (Pratiwi, 2021). This suggests that body fat distribution is more relevant than total body weight in predicting T2DM risk. Therefore, interventions targeting waist circumference reduction through regular exercise and healthy diet are important steps in T2DM prevention (Eckel et al., 2018; Hu et al., 2018). Waist circumference, as an easily measurable indicator, provides important insights in early screening and risk management efforts for T2DM.

Table 3. Family Genetic History

Category	F	%
Yes	13	13%
No	87	87%
Total	100	100%

The table illustrates that only 13% of respondents have a family history of T2DM. Although the proportion is small, family genetic history is a major risk factor in the development of T2DM. Individuals who have a family history of T2DM, such as parents or siblings, have a greater chance of developing the disease than individuals without a family history. This is due to genetic influences on insulin resistance and glucose metabolism (Hu et al., 2018).

On the other hand, the majority of respondents (87%) had no family genetic history. Genetic factors play an important role in the development of Type 2 Diabetes Mellitus (T2DM), although the disease is also strongly influenced by environmental factors such as diet, physical activity and

obesity. Individuals with a family history of T2DM, such as parents or siblings, have a two to four times higher risk of developing the disease than individuals without a family history (Grundy et al., 2018). This risk is linked to the inheritance of genes that affect insulin sensitivity, insulin secretion and glucose metabolism. For example, genetic variants such as TCF7L2 (Transcription Factor 7-Like 2) have been found to be consistently associated with an increased risk of T2DM (Hu et al., 2018).

In addition, genes associated with pancreatic beta cell function, such as the HHEX, SLC30A8 and KCNJ11 genes, also contribute to the risk of T2DM. These genetic variations can affect the body's ability to regulate blood glucose levels, especially in situations of insulin resistance that often occur in individuals with obesity or unhealthy lifestyles (McCarthy, 2017). These genetic factors often work in conjunction with environmental factors, meaning the risk of T2DM is higher in individuals who have a genetic predisposition and are exposed to unhealthy lifestyles.

Table 4. Hypertension sufferers

Category	F	%
Yes	39	39%
No	61	61%
Total	100	100%

The table illustrates the distribution of respondents based on hypertension status, with 39% of respondents having hypertension and 61% not having hypertension. Hypertension is known to have a close relationship with the risk of Type 2 Diabetes Mellitus (T2DM), as these two conditions are often associated in the context of metabolic syndrome. Individuals with hypertension have a higher risk of developing T2DM, as the insulin resistance, endothelial dysfunction and chronic inflammation that often accompany hypertension can impair glucose metabolism (Eckel et al., 2018).

According to research, hypertension doubles the risk of T2DM, especially in individuals who also have other risk factors such as obesity or a family history of T2DM (Grundy et al., 2018). In addition, hypertension can worsen vascular complications in patients with T2DM, so good blood pressure management is an important part of preventing the development or complications of T2DM. In the group of respondents without hypertension (61%), the risk of T2DM may be lower, but it cannot be ignored if there are other risk factors such as obesity, unhealthy diet, or lack of physical activity.

Table 6. Daily Physical Activity

Category	F	%
Yes	61	61%
No	39	39%
Total	100	100%

The table shows the distribution of respondents based on physical activity, where 61% of respondents reported doing physical activity, while 39% did not do physical activity. Regular physical activity is one of the main protective factors against the risk of Type 2 Diabetes Mellitus (T2DM). Physical activity can increase insulin sensitivity, aid weight control, and improve glucose metabolism, thus playing an important role in the prevention of T2DM (Colberg et al., 2016).

Physical activity has an important role in reducing the risk of Type 2 Diabetes Mellitus (T2DM). Regular physical activity increases insulin sensitivity, improves glucose metabolism and aids weight control, all of which are key factors in the prevention of T2DM (Colberg et al., 2016).

When the body is physically active, muscles use more glucose as an energy source, so blood glucose levels can be better controlled. In addition, regular exercise can reduce visceral fat that contributes to insulin resistance and chronic inflammation, key mechanisms that influence T2DM risk (Grundy et al., 2018).

In contrast, lack of physical activity or sedentary lifestyle is one of the major risk factors for T2DM. Studies show that inactive individuals have a higher risk of developing T2DM than physically active individuals. In fact, research by Hu et al. (2018) found that physical activity can reduce the risk of T2DM by 30-50%, depending on the intensity and duration of the activity. Physical activities such as brisk walking, cycling, or aerobic exercise of at least 150 minutes per week as recommended by the World Health Organization (WHO) can have a significant protective effect on T2DM risk.

Physical activity is also important for individuals with a genetic predisposition to T2DM. Research suggests that genetic risk can be modified through an active lifestyle, thereby lowering the likelihood of disease progression in high-risk individuals (Colberg et al., 2016).

Table 7. Type 2 Diabetes Risk Level

Category	F	%
Low	49	49%
Slightly increased	32	32%
Medium	10	10%
High	8	8%
Very high	1	1%
Total	100	100%

The table shows the distribution of respondents based on the risk level of Type 2 Diabetes Mellitus (T2DM). Most respondents (49%) were in the low risk category, while 32% were in the slightly increased risk category. A total of 10% of respondents had moderate risk, 8% had high risk, and 1% were in the very high risk category. This distribution reflects that almost half of the respondents had a low risk of T2DM, but there was a significant proportion who already showed an increased risk. The risk distribution shown in this table indicates that while almost half of the respondents had a low risk of T2DM, 51% of the respondents had varying levels of risk from slightly elevated to very elevated. Risk factors such as age, body mass index (BMI), waist circumference, diet, physical activity and family history may influence this distribution. The "slightly elevated" to "very elevated" categories indicate the need for preventive interventions, such as weight management, increased physical activity and dietary control to prevent the risk from becoming more severe.

Respondents in the moderate to very high risk category (19%) require special attention. Factors such as obesity, hypertension, physical inactivity and family history are likely to affect this group. Based on the literature, the risk of T2DM can be significantly reduced by lifestyle modifications, such as regular exercise for 150 minutes per week, a low-calorie diet, and reduction of visceral fat (Colberg et al., 2016). In addition, early detection using blood sugar or HbA1c tests should be done in this group to ensure early diagnosis and initiate treatment if needed.

The low-risk category, although dominating (49%), is not completely free from potential risks, especially if there are changes in lifestyle or ageing. This suggests that health promotion needs to continue to be conducted widely, not only for high-risk groups but also for groups considered to be at low risk, in order to maintain their health condition.

CONCLUSIONS AND RECOMMENDATIONS

From the risk distribution, 49% of the respondents had a low risk of T2DM, but the other 51% were at risk levels varying from slightly elevated to very high. The moderate to very high risk group (19%) requires special attention for further prevention and management. Although most respondents have a low risk of T2DM, various risk factors such as obesity, hypertension, physical inactivity, and genetic history still need attention. Lifestyle-based health interventions, such as physical activity promotion, weight management, and early detection, are essential to reduce the risk and prevalence of T2DM in this population. Comprehensive prevention efforts should focus on groups at increased to high risk to reduce the overall impact of the disease.

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