

Screening for risk factors for type 2 diabetes mellitus using the Canadian Diabetes Risk Questionnaire (CANRISK) in the East Java Provincial Health Service, Indonesia

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Abstract

Diabetes Mellitus remains a serious and growing global challenge for public health. Early identification of cases prevents delays in treating diabetes mellitus, which often causes various complications in the body. Diabetes Mellitus screening includes anamnesis for family and personal history of the disease, measurement of height, weight, abdominal circumference, blood pressure examination, and examination of sugar levels. One instrument that can be used to assess the risk of developing type 2 diabetes mellitus is the Canadian Diabetes Risk Questionnaire (CANRISK). The aim of this research is to find out the characteristics of respondents and the risk categories of respondents suffering from type 2 diabetes mellitus in the next 10 years using CANRISK. This research uses quantitative methods. Based on the type of research, this research uses descriptive observational research. The research design used was cross sectional. The results showed that 78% of respondents had a low-moderate risk of developing type 2 DM, 6% had a high risk of developing type 2 DM, and 16% had a very high risk of developing type 2 DM. The conclusion of this study was that the risk factors for developing Type 2 DM 2 are age, BMI, waist circumference, physical activity habits, vegetable and fruit consumption habits, history of high blood pressure and high blood sugar, history of giving birth to a baby more than 4.1 kg, family history of diabetes, parents' ethnic group, and level of education.

Keywords: Screening; Type 2 Diabetes Mellitus; Risk Factors; CANRISK

1. Introduction

In general, Diabetes Mellitus (DM) is grouped into 4 groups, namely type 1 DM, type 2 DM, Gestational and other specific diabetes. (1). Type 2 diabetes mellitus is caused by a progressive loss of adequate cellular insulin secretion along with a background of insulin resistance. Insulin resistance is characterized by a reduced ability of insulin to balance blood glucose levels due to reduced tissue sensitivity thereby increasing insulin production by pancreatic beta cells (2). Common symptoms of type 2 Diabetes Mellitus are increased thirst due to reduced electrolytes in the body, increased hunger due to reduced glucose levels in the tissues, urine containing glucose when blood glucose levels reach 180 mg/dL, urination more frequently than usual (polyuria), dehydration due to increased glucose levels which causes extracellular fluid in cells to come out, easy fatigue due to impaired CHO utilization, drastic weight loss due to lack of body fluids and use of muscle tissue and fat which is converted into energy, other symptoms such as energy reduced vision, cramps, constipation, and candidiasis infection (3).

Diabetes remains a serious and growing global challenge to public health. This places a huge burden not only on individuals, but also has an impact on the quality of a country's human resources. The International Diabetes Federation reports that in 2021 around 537 million adults aged 20-79 years live with diabetes and this is expected to increase to 643 million in 2030 and 783 million in 2045 (4). In developing countries like Indonesia, Type 2 Diabetes Mellitus is one of the non-communicable diseases that has claimed the lives of more than 73% of the population aged 30-69 years. (5).

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Early identification of cases prevents delays in treating diabetes mellitus, which often causes a series of complications in the body.

Diabetes Mellitus screening includes anamnesis on family and self-history of the disease, measurement of height, weight, abdominal circumference, blood pressure check, and blood sugar level check (6). Several assessment tools that use a combination of clinical and epidemiological characteristics can accurately identify increased risk for diabetes. Examples of instruments that can be used include: *the Australian Diabetes Risk Assessment Tool (AusDrisk)*, *the Cambridge Risk Score*, *the FINDRISC*, and *the Canadian Diabetes Risk Questionnaire (CANRISK)*.

In this study, the Canadian Diabetes Risk Questionnaire (CANRISK) instrument was used. The CANRISK instrument is used to see how big a person's risk of developing type 2 Diabetes Mellitus is in the next 10 years. This questionnaire contains questions about age, gender, body mass index (BMI), waist circumference, frequency of daily physical activity, daily consumption of vegetables and fruit, and history of giving birth to a baby over 4 kg (for women only). (7)

CANRISK is a diabetes assessment tool that is cheap and able to increase the efficiency and effectiveness of diabetes prevention targeted at groups at moderate or high risk so that they do not develop Type 2 DM. In addition, CANRISK is equipped with a table of the relationship between weight and height from which the BMI value can be calculated. . CANRISK is a tool that has been shown to be valid in assessing diabetes risk in a multi-ethnic population in Canada. Several studies in Indonesia have also used the CANRISK instrument to assess diabetes risk (8)

2. Material and methods

This research was carried out to coincide with National Health Day activities at the East Java Provincial Health Service on November 3 2023. This research used quantitative methods. Based on the type of research, this research uses descriptive observational research. The research design used was cross sectional. The population in this study were National Health Day screening participants aged 15 years and over. This research uses total sampling to determine respondents. The research results are described in a frequency distribution table.

3. Results and discussion

3.1 Respondent Characteristics

Table 1 Respondent Characteristics

Variable		n	%
Age	18-44	32	64
	45-54	8	16
	55-64	10	20
	65-74	0	0
Gender	Man	20	40
	Woman	30	60
Education	High school/equivalent (not graduated)	1	2
	High school/equivalent (until graduation)	17	34
	College (not graduated)	2	4
	College (until graduation)	30	60
Total		50	100

From Table 1 it is known that the majority of respondents were aged 18-44 years (64%). There are more female respondents than male respondents, namely 30 respondents (60%) of the total population. Then the highest level of education of respondents was college to graduation, namely 30 respondents (60%).

Table 2 Physical Characteristics of the Respondent

Characteristics	Mean±SD
Body Mass Index (BMI)	
Man	26±3.3
Woman	29.1±18.9
Weight (Kg)	
Man	72.9±10.5
Woman	67.8±22.3
Height (cm)	
Man	167.3±7.6
Woman	156.5±10
Abdominal Circumference (cm)	
Man	88.5±9
Woman	83.8±15.4

From Table 2 it can be seen that the average BMI for men is 26.4 ± 3.2 while the average BMI for women is 29.1 ± 18 . The average weight of men is 72.9 ± 10.5 and the average weight of women is 67.8 ± 22.3 . The mean TB for men was 167.3 ± 7.6 and the mean TB for women was 156.5 ± 10 . Then the average abdominal circumference in men is 88.5 ± 9 and the average abdominal circumference in women is 83.8 ± 15.4 .

3.1. CANRISK Questionnaire Items

Table 3 CANRISK Questionnaire Items

Variable	Category	n	%
Age	18-44 years	32	64
	45-54 years	8	16
	55-64 years	10	20
	65-74 years	0	0
Gender	Man	20	40
	Woman	30	60
BMI	<25	20	40
	25-29	19	38
	30-34	8	16
	>=35	3	6
Abdominal Circumference	Man		
	<94 cm / <37 inches	14	70
	94-102 cm / 37-40 inches	5	25
	>102 cm / >40 inches	1	5
	Woman		

	<80 cm / <31.5 inches	16	53,3
	80-88 cm / 31.5-35 inches	6	20
	>88 cm / >35 inches	8	26,6
Physical activity \geq 30 minutes	Yes	29	58
	No	21	42
Consume fruit and vegetables	Every day	28	56
	Not everyday	22	44
History of high blood pressure	Yes	43	86
	No/don't know	7	14
History of high blood sugar	Yes	42	84
	No/don't know	8	16
History of giving birth to a large baby weighing 9 pounds (4.1 kg) or more	Yes	1	2
	Don't/don't know/can't apply	49	98
Level of education	High school/equivalent (not graduated)	1	2
	High school/equivalent (until graduation)	17	34
	College (not graduated)	2	4
	College (until graduation)	30	60
Total		50	100

From table 3 it is known that the majority of respondents in this study were aged 18-44 years (64%). There were more female respondents than male, namely 30 of the total sampling (60%). Based on the BMI value, most respondents' BMI was in the normal category (>25) (40%) / However, 38% of respondents had an overweight BMI with a BMI value of 25-29. Based on abdominal circumference measurements, 70% of male respondents had the normal abdominal circumference category and 53.3% of female respondents had the normal abdominal circumference category.

Based on physical activity habits, the majority of respondents have the habit of carrying out physical activity for at least 30 minutes every day (58%), but 42% of respondents are still not used to doing physical activity for 30 minutes every day. Judging from their vegetable and fruit consumption habits, 56% of respondents regularly consume vegetables and fruit every day. Then the majority of respondents had a history of high blood pressure (86%). Apart from that, based on blood sugar history, 84% of respondents had a history of high blood sugar. 98% of respondents have never given birth to a baby weighing more than 4.1 kg. Based on their educational history, the majority of respondents had completed their education at university and graduated (60%).

3.2. Risk Categories Based on the CANRIKS Questionnaire

Table 4 Risk Categories Based on the CANRISK Questionnaire

Risk Category	n	%
Low-Medium	39	78
High	3	6
Very High	8	16
Total	50	100

From table 4 it can be seen that the results of the CANRISK questionnaire show that 78% of respondents have a low-moderate risk of developing diabetes, 6% have a high risk, and 16% have a very high risk. Low-moderate risk indicates that a person has a 1-17% chance of being diagnosed with diabetes in the next 10 years. High risk individuals have a 33% chance of being diagnosed with diabetes in the next 10 years. Meanwhile, the risk is very high, there is a 50% chance of being diagnosed with diabetes in the next 10 years.

4. Conclusion

Various risk factors for diabetes mellitus listed in each item of the CANRISK instrument include age, BMI, waist circumference, physical activity habits, vegetable and fruit consumption habits, history of high blood pressure and high blood sugar, history of giving birth to a baby more than 4.1 kg, family history of diabetes, parental ethnic group, and education level. Based on the results of filling out the CANRISK questionnaire, it is known that 78% of respondents have a low-moderate risk of developing diabetes, 6% have a high risk, and 16% have a very high risk.

The CANRISK instrument can be used to predict a person's risk of suffering from Type 2 DM in the next 10 years. This instrument is easy and cheap to use. Respondents will also receive a category classification according to the results of filling out the questionnaire. These results can be followed up by carrying out routine annual HbA1C screening if the risk category is very high, taking HbA1C screening every 3-5 years if the risk category is high, and continuing to carry out non-routine screening for diabetes for the low-medium risk category.

Compliance with ethical standards

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Disclosure of Conflict of Interests

The authors have no conflict of interest in this study.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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