ORIGINAL ARTICLE

Ten-year risk assessment for type 2 diabetes mellitus using the Finnish Diabetes Risk Score in family medicine

Suzana Savić[1], Saša Stanivuković[2], Biljana Lakić[1]

[1]Department of Family Medicine, School of Medicine, [2]School of Medicine; University of Banja Luka

ABSTRACT

Aim To assess ten-year risk of diabetes mellitus type 2 (T2DM) using the Finnish Diabetes Risk Score (FINDRISC) in respondents over 18, in Primary Health Centre in Banja Luka.

Methods A prospective study was conducted using data from a population with undiagnosed T2DM in Primary Health Centre in Banja Luka. Eligible respondents were those aged 18 to 70 years. Sociodemographic, behavioural and anthropometric variables were those related to the risk models evaluated by FINDRISC.

Results Data were collected from 520 individuals, 58.8% female and 41.2% male (p=0.005). A very high risk of developing T2DM in the next ten years was found in 5.6% females and 3.7% males. A high risk was found in 12.4% females and 15.9% males, 34.2% respondents ≥ 65 years, 28.8% with body mass index >30 kg/m^2, 26.6% who were not practicing physical activity (p=0.000), 24.0% who took antihypertensive drugs, 42.3% who were diagnosed with impaired glycaemia, 30.4% and 22.9% respondents whose parents and distant relatives, respectively, had T2DM. A moderate risk occurred in 31.4% females with waist circumference >88 cm.

Half (50%) males with waist circumference >102 cm and 33.2% respondents who were not eating fruits and vegetables every day had a slightly increased risk of developing T2DM (p<0.05).

Conclusion The FINDRISC may be used as a tool which would help general practitioners in everyday work, to detect patients with T2DM risk factors and to encourage them to change life style towards healthy habits.

Key words: Diabetes Registry, life style changes, primary health centre Banja Luka, prospective study

Corresponding author:
Suzana Savić
Department of Family Medicine,
School of Medicine,
University of Banja Luka
Kordunaška 10 78000 Banja Luka,
Republic of Srpska,
Bosnia and Herzegovina
Phone: +387 65 544 472;
Fax: +387 51 216 813;
E-mail: suzana.savic@med.unibl.org
ORCID ID: https://orcid.org/000-0002-0677-6323

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INTRODUCTION

Diabetes mellitus type 2 (T2DM) is a growing pandemic worldwide (1,2). According to the 2017 International Diabetes Federation, the prevalence of diabetes among people aged 20 to 64 years was 327 million and among people aged 65 to 79 was 98 million. It is estimated that by 2045 this number will increase to 438 million among people aged 20 to 64 years and among people 65 to 79 years it will be 191 million, unless preventive measures are implemented (2,3). Globally, T2DM is responsible for about 2 million deaths per year (4,5), while it is estimated that about 825 billion USD cost to the Health Care system will be linked to this disease (6,7).

According to the Republic of Srpska Population Health and Diabetes Registry, the prevalence of T2DM in Republic of Srpska has increased, ranging from 3.1% (2014), 3.5% (2015), 4% (2016) to 5.2% (2017) in relation to the environment and the trend, and the prevalence of this disease is estimated to be between 4-6%. The incidence rate in the observed period has been increasing and ranged from 79.4 / 100,000 inhabitants in 2014 to 90/100.000 in 2017 (8,9). According to the World Health Organization in Bosnia and Herzegovina, every second person is overweight (54.6%), while one in five is obese (19.2%) and physically inactive (20.6%) (1,10,11).

Identifying individuals with undiagnosed T2DM represents an important approach for preventing or delaying complications of this disease (12). The American Diabetes Association recommends testing for individuals at high risk of T2DM aged 40 and over, with a family history of T2DM, obesity, physical inactivity or dyslipidaemia (2,13). In the first step of T2DM case identification, an objective assessment of the likelihood of the presence or future development of an adverse health condition (14) is performed, while in the second step, an oral glucose tolerance test (OGTT) or measurement of glycosylated haemoglobin (HbA1c) may be performed, but only among those who, in the previous step, were categorized as at high risk (15).

During the Finnish Diabetes Prevention Study, the Finnish Diabetes Risk Score (FINDRISC) was formed to allow early detection of individuals with increased risk for T2DM in the next ten years. The questionnaire consists of eight simple questions, while each answer is scored (2,16). Questions included age, body mass index, waist circumference, physical activity, daily consumption of fruits, berries or vegetables, history of treatment with antihypertensive drugs, and history of high blood glucose (2,17). Although it is widely used to assess the risk of the development of T2DM in the next ten years, FINDRISC was also evaluated as a tool for identifying undiagnosed T2DM, abnormal glucose tolerance, and metabolic syndrome (18-20).

We had decided to carry out this study because of the population with T2DM risk factors is growing. One of duties of family medicine practitioners is to recognize these factors and to educate the patients how to diminish them.

The aim of this study was to assess ten-year risk of diabetes mellitus type 2 using FINDRISC in subjects over the age of 18 in Primary Health Centre in Banja Luka.

PATIENTS AND METHODS

Patients and study design

This was a prospective study conducted in four teams of family medicine in Primary Health Centre in Banja Luka using data from patients with undiagnosed T2DM. The study was conducted as an anonymous from 15 October 2019 to 15 January 2020 with 520 respondents. The researchers conducted the survey on Mondays, Wednesdays and Fridays, from 9 a.m. to 5 p.m. on respondents who came to the family doctor's office for any reason. The nurses measured body mass index (BMI) and waist circumference.

The protocol informed consent and questionnaires were approved by the Ethical Institutional Committees at the Primary Health Centre Banja Luka. This work had been carried out in accordance with the Declaration of Helsinki. Eligible respondents were those aged 18 to 70 years who provided an informed consent. Females who reported being pregnant or individuals having any physical disability preventing anthropometric measurements (weight, height, blood pressure or waist circumference) or those bedridden were excluded from the study

Methods

Sociodemographic, behavioural and anthropometric variables were those related to the risk models evaluated by FINDRISC (18). These variables

were: age (< 45 years 0 points; 45-54 years 2 points; 55-64 years 3 points; ≥65 years 4 points), BMI (<25 kg/m^2 0 points; 25-30kg/m^2 1 point; ≥ 30 kg/m^2 3 points), waist circumference (male: < 94 cm and female: <80 cm 0 points; male: 94–102 cm and female: 80–88 cm 3 points; male: >102 cm and female: >88 cm 4 points), physical activity, at least 30 min/day (yes 0 points; and no 2 points), daily consumption of fruits and vegetables, at least one portion per day (every day 0 points; not every day 1 point), history of antihypertensive drug treatment NO 0 points and YES 2 points), history of high blood glucose (whether the respondent had ever been found to have high blood glucose in a health examination during an illness or during pregnancy; NO 0 points and YES 5 points) and family history of T2DM, score according to relatives with T2DM diagnosis (NO 0 points; YES: grandparent, relative, uncle, aunt 3 points; YES: parents, siblings, son, daughter 5 points).

"Low" ten-year risk assessment for T2DM (one in 100 people will develop diabetes, 1%) had respondents with scoring <7. „Slightly high risk" for ten-year risk assessment for T2DM (one in 25 people will develop diabetes, 4%) had respondents with score 7-11. "Moderate risk" for ten-year risk assessment for T2DM (one in 6 people will develop diabetes, 17%) was found in respondents with score 12-14. "High risk" for ten-year risk assessment for T2DM (one in 3 people will develop diabetes, 33%) was found in respondents with score 15-20. "Very high risk" for ten-year risk assessment for T2DM (one in 2 people will develop diabetes, 50%) occurred in respondents with score >20.

Statistical analysis

Statistical methods included descriptive statistics using measures of central tendency and standard deviation (Pearson's $\chi 2$ test, Fisher´s Extract, Mann-Whitney U), and the differences between individual groups of respondents were tested by the $\chi 2$ test. There was a statistical significance between compared data if the probability was less than 5% ($p<0.05$).

RESULTS

A total of 520 individuals were invited to participate in the study, out of which 306 (58.8%) were female and 214 (41.2%) male (p=0.005). Very high risk of developing T2DM in the next ten years was found in 17 (5.6%) females and eight (3.7%) males (FINDRISC >20), while 38 (12.4%) females and 24 (11.2%) males (FINDRISC 15-20) had a high risk. (p>0.05).

According to the distribution of respondents by BMI and waist circumference, there was a statistically significant difference (p<0.05) between genders of the respondents. There was no significant difference between genders in relation to the exercise of physical activity for at least 30 minutes (p=0.856). Female respondents consumed fruits and vegetables every day more frequently than males (p <0.05). There was no statistically significant difference (p>0.05) between genders in relation to the usage of antihypertensive drugs, the frequency of hyperglycemia and diabetes occurrence in distant or close relatives (Table 1).

Table 1. Prevalence of components of the Finnish Diabetes Risk Score according to gender in 520 respondents

Variable	N (%) of respondents			p
	Total 520 (100.0)	Male 214 (41.2)	Female 306 (58.8)	
Age (years)				
< 45	221 (42.5)	79 (36.9)	142 (46.4)	0.162
45-54	111 (21.3)	53 (24.8)	58 (19.0)	
55-64	115 (22.1)	50 (23.4)	65 (21.2)	
>64	73 (14.0)	32 (15.1)	41 (13.4)	
BMI (kg/m²)				
<25	169 (32.5)	42 (19.6)	127 (41.5)	0.000
25-30	271 (52.1)	129 (60.3)	142 (46.4)	
>30	80 (15.4%)	43 (20.1)	37 (12.1)	
Waist circumference (cm)				
M: <94; W:<80	203 (39.0)	69 (32.2)	134 (43.8)	0.013
M:94-102; W: 80-88	244 (46.9)	107 (50.0)	137 (44.8)	
M:>102; W: >88	73 (14.0)	38 (17.8)	35 (11.4)	
Physical activity (30 min/d)				
Yes	328 (63.1)	134 (62.6)	194 (63.4)	0.856
No	192 (36.9)	80 (37.4)	112 (36.6)	
Vegetables-fruits				
Daily	336 (64.6)	128 (58.4)	211 (69.0)	0.013
No daily	184 (35.4)	89 (41.6)	95 (31.0)	
Hypertension				
Without medication	312 (60.0)	136 (63.6)	176 (57.5)	0.167
With medication	208 (40.0)	78 (36.4)	130 (42.5)	
Hyperglycaemia antecedent				
Yes	111 (21.3)	47 (22.0)	64 (20.9)	0.774
No	409 (78.7)	167 (78.0)	242 (79.1)	
Familiar antecedents DM2				
No	310 (59.6)	127 (59.3)	183 (59.8)	0.713
Grandparent	118 (22.7)	46 (21.5)	72 (23.5)	
Parents	92 (17.7)	41 (19.2)	51 (16.7)	

BMI, Body mass index; M, Male; F, Female; DM2, Type 2 diabetes mellitus

The lowest average risk of developing T2DM in the next ten years was found in 148 (67%) respondents younger than 45 years, and 25 (34.2%) older than 65 years had a high risk (p <0.05). The lowest risk was found in 109 (64.5%) respondents with BMI < 25kg/m^2, 106 (39.1%) with BMI 25-30 kg/m^2 had a slightly increased risk,

while 23 (28.8%) respondents with BMI>30kg/m^2 had a high risk (p<0.05). Slightly increased risk of T2DM was found in 19 (50%) males with waist circumference >102 cm, while 11 (31.4%) females with waist circumference >88 cm had a moderate risk (p <0.05) (Table 2).

Table 2. The risk of developing diabetes mellitus type 2 (T2DM) according to age, body mass index (BMI), waist circumference and gender

Variable	No (%) of respondents at the risk*						p
	Low	Slightly elevated	Moderate	High	Very high	Total	
Age (years)							0.000
≤ 45	148 (67.0)	61 (27.6)	5 (2.3)	6 (2.7)	1 (0.5)	221 (100.0)	
45 do 54	25 (22.5)	47 (42.3)	14 (12.6)	23 (20.7)	2 (1.8)	111 (100.0)	
55 do 64	18 (15.7)	43 (37.4)	28 (24.3)	18 (15.7)	8 (7.0)	115 (100.0)	
> 65	2 (2.7)	15 (20.5)	17 (23.3)	25 (34.2)	14 (19.2)	73 (100.0)	
Total	193 (37.1)	166 (31.9)	64 (12.3)	72 (13.8)	25 (4.8)	520 (100.0)	
BMI (kg/m^2)							0.000
≤ 25	109 (64.5)	40 (23.7)	10 (5.9)	10 (5.9)	0 (0.0)	169 (100.0)	
25.0–30.0	82 (30.3)	106 (39.1)	36 (13.3)	39 (14.4)	8 (3.0)	271 (100.0)	
≥ 30.0	2 (2.5)	20 (25.0)	18 (22.5)	23 (28.8)	17 (21.3)	80 (100.0)	
Total	193 (37.1)	166 (31.9)	64 (12.3)	72 (13.8)	25 (4.8)	520 (100.0)	
Waist circumference (cm)							
Female							0.000
< 80	97 (72.4)	26 (19.4)	8 (6.0)	3 (2.2)	0 (0.0)	134 (100.0)	
80–88	33 (24.1)	50 (36.5)	16 (11.7)	26 (19.0)	12 (8.8)	137 (100.0)	
> 88 cm	1 (42.8)	9 (25.7)	11 (31.4)	9 (25.7)	5 (14.3)	35 (100.0)	
Total	131 (2.9)	85 (27.8)	35 (11.4)	38 (12.4)	17 (5.6)	306 (100.0)	
Male							0.000
< 94	37 (53.6)	21 (30.4)	8 (11.6)	3 (4.3)	0 (0.0)	69 (100.0)	
94–102	23 (21.5)	41 (38.3)	15 (14.0)	23 (21.5)	5 (4.7)	107 (100.0)	
> 102 cm	2 (5.3)	19 (50.0)	6 (15.8)	8 (21.1)	3 (7.9)	38 (100.0)	
Total	62 (29.0)	81 (37.9)	29 (13.6)	34 (15.9)	8 (3.7)	214 (100.0)	

*Finnish Diabetes Risk Score (FINDRISC);

Over a quarter, 51 (26.6%) patients who were not practicing daily physical activity had a high risk of developing T2DM (p=0.000); 61 (33.2%) who had not consumed fruits and vegetables every day had a slightly increased risk (p <0.05), 38 (20.7%) had a high risk, and 18 (9.8%) had a very high risk. A high risk of developing T2DM was found in 50 (24.0%) respondents who had used antihypertensive drug, and 47 (42.3%) who had hyperglycemia measured during routine screening (p <0.05). A high risk of developing T2DM in the next 10 years was found in 28 (30.4%) respondents whose close relatives had diabetes and in 27 (22.9%) respondents whose distant relatives had diabetes (p<0.05) (Table 3).

Table 3. The risk of developing diabetes mellitus type 2 (T2DM) according to physical activity, intake of fruits and vegetables, taking antihypertensive drugs, impaired blood sugar and family burden diabetes

Question	No (%) of patients at the risk*						p
	Low	Slightly elevated	Moderate	High	Very high	Total	
Do you normally have at least 30 minutes of physical activity at work and / or in your free time during the day including normal daily activity?							
Yes	168 (51.2)	110 (33.5)	26 (7.9)	21 (6.4)	3 (0.9)	328 (100.0)	
No	25 (13.0)	56 (29.2)	38 (19.8)	51 (26.6)	22 (11.5)	192 (100.0)	0.000
Total	193 (37.1)	166 (31.9)	64 (12.3)	72 (13.8)	25 (4.8)	520 (100.0)	
How often do you eat fruits and vegetables?							
Every day	152 (45.2)	105 (31.3)	38 (11.3)	34 (10.1)	7 (2.1)	336 (100.0)	
Not every day	41 (22.3)	61 (33.2)	26 (14.1)	38 (20.7)	18 (9.8)	184 (100.0)	0.000
Total	193 (37.1)	166 (31.9)	64 (12.3)	72 (13.8)	25 (4.8)	520 (100.0)	
Have you ever taken antihypertensive drugs?							
No	165 (52.9)	105 (33.7)	18 (5.8)	22 (7.1)	2 (0.6)	312 (100.0)	
Yes	28 (13.5)	61 (29.3)	46 (22.1)	50 (24.0)	23 (11.1)	208 (100.0)	0.000
Total	193 (37.1)	166 (31.9)	64 (12.3)	72 (13.8)	25 (4.8)	520 (100.0)	
Have you ever been measured for an impaired blood sugar level during a routine check-up during illness or pregnancy?							
No	190 (46.5)	146 (35.7)	48 (11.7)	25 (6.1)	0 (0.0)	409 (100.0)	
Yes	3 (2.7)	20 (18.0)	16 (14.4)	47 (42.3)	25 (22.5)	111 (100.0)	0.000
Total	193 (37.1)	166 (31.9)	64 (12.3)	72 (13.8)	25 (4.8)	520 (100.0)	
Has anyone in your family had or now has diabetes?							
No	162 (52.3)	100 (32.3)	31 (10.0)	17 (5.5)	0 (0.0)	310 (100.0)	
Yes†	24 (20.3)	42 (35.6)	19 (16.1)	27 (22.9)	6 (5.1)	118 (100.0)	
Yes‡	7 (7.6)	24 (26.1)	14 (15.2)	28 (30.4)	19 (20.7)	92 (100.0)	0.000
Total	193 (37.1)	166 (31.9)	64 (12.3)	72 (13.8)	25 (4.8)	520 (100.0)	

*Finnish Diabetes Risk Score (FINDRISC); †grandparent, aunt, uncle or first relative, but not parents, brothers and sisters; ‡parents, brothers, sisters or child

DISCUSSION

The FINDRISC is a well-known risk score created initially for incidental T2DM cases, but can currently be used for T2DM screening (21). Using this questionnaire of 520 respondents in our study,

in 12.4% of women and 11.2% of men a high risk (FINDRISC 15-20), and in 5.6% of women and 3.7% of men a very high risk (FINDRISC over 20) to develop T2DM in the next ten years was determined. The study by Atayoglu et al. conducted in Turkey to 1500 adults aged ≥18 years using the FINDRISC as Diabetes Risk Questionnaire found 13.5% respondents were in the high-risk group (15.2% of females vs. 12.4% of male) (22). A study-conducted-on Peruvian population (using The FINDRISC questionnaire) indicated that 37.1% of respondents had a high risk of T2DM (23). A cross-sectional analysis of Vandersmissen at al. indicated a prevalence of unknown dysglycemia of 1.8% among 275 healthy employees: 12% had a moderate risk and 5.5% had a high - very high risk (24). The study by Bergmann et al. conducted on over 500 German subjects at increased risk of developing T2DM indicated FINDRISC as a simple, high-performance tool to predict the risk of developing this disease. It has also been pointed out that subjects with lower FINDRISC will soon benefit more from implementing preventive interventions to reduce the risk factor of developing T2DM (25).

In our study, a significant prevalence in respondents aged 45-54 was at high and very high risk for a development of T2DM, while in respondents >65 years old, this prevalence was higher. Our results have shown higher risk of diabetes was in correlation with higher BMI and with larger waist circumference.

The study Meijnikman et al. showed that FINDRISC can serve as a good questionnaire for predicting visceral obesity (50.4% had pre-diabetes and 11.1% were diagnosed T2DM) (26). In our study, over half of respondents who practiced physical activity had a low risk, while among those who were not practicing physical activity, 26.6% and 11.5% had a high and very high risk, respectively. A study conducted in Banja Luka in the population 25-75 age of years indicated that physical activity promotes health and reduces the risk of impaired glucose tolerance and others (27). In our study, almost half of respondents who used fruits and vegetables in their daily diet had a low risk, while a quarter who did not use antihypertensive drugs had a high risk of developing T2DM. A Colombian study (28) using FINDRISC found 46.95% respondents had a daily physical activity, which is lower than in our study (63%). An intake of fruits in the diet was more frequent than in the Columbian study (28), while taking antihypertensive therapy was similarly represented.

A prospective cohort study conducted on the Spanish population in Primary Health Care for people who have had FINDRISC 15 and higher showed that intensive lifestyle changes significantly reduced the risk of developing diabetes (29). Kolb et al. have also shown that reducing the prevalence of diabetes is directly related to lifestyle changes (30). In our study, in a group of respondents who had an elevated glycaemia, most of them had a positive family history for T2DM, and at same time, according to FINDRISC, they had a high risk of developing T2DM.

In conclusion, this study confirmed a high risk of developing T2DM in a larger number of female respondents, respondents over 65, respondents with BMI over 30 kg/m^2, respondents who did not exercise and did not eat fruits and vegetables daily, as well as those whose parents had T2DM. The FINDRISC may be used as a tool which would help general practitioners, in everyday work, to detect patients with T2DM risk factors and to encourage them to change life style towards healthy habits.

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TRANSPARENCY DECLARATION

Conflicts of interest: None to declare.

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