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Does cigarette smoking increase a risk of type 2 diabetes mellitus development?
Czy palenie papierosów zwiększa ryzyko zachorowania na cukrzycę typu 2?

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Summary

Introduction. The Finnish Diabetes Risk Score (FINDRISC) questionnaire is a screening tool used to estimate the 10-year risk of type 2 diabetes in adults by identifying individuals with overweight or obesity, inadequate physical activity, poor nutrition, or a family or personal history of hyperglycemia.

Aim. The objective of the study was to analyze the incidence of cigarette smoking in randomly selected individuals screened with FINDRISC scale, and the effect of nicotinism on body weight, waist circumference, the magnitude of arterial pressure, and the total FINDRISC scores.

Material and methods. The study was conducted in 2016 in Lublin on 99 individuals – 51 women and 48 men. We determined FINDRISC score and measured blood pressure twice. The results were analyzed in STATISTICA 10 at $p < 0.05$.

Results. Only 12 individuals (12.12% of total 99 subjects; 7 females and 5 males) declared heavy smoking. Surprisingly, body mass index (BMI), waist circumference, systolic and diastolic arterial pressure values, and total FINDRISC values did not significantly differ between heavy smokers and non-smokers.
Conclusions. A low incidence of nicotinism in the examined population proves an effectiveness of a public program encouraging to non-smoking. In opposition to common beliefs, nicotinism is not an efficient tool for weight reduction. The diabetes risk seems to be not increased by cigarette smoking; however this result should be confirmed in a study on the larger group of patients.

Key words: smoking, FINDRISC, diabetes mellitus.

Streszczenie
Wstęp. Fiński wskaźnik ryzyka cukrzycy (The Finnish Diabetes Risk Score - FINDRISC) ocenia 10-letnie ryzyko zachorowania na cukrzycę typu 2 u dorosłych poprzez identyfikację osób z nadwagą lub otyłością, zbyt małą aktywnością fizyczną, niewłaściwą dietą lub z obecnym wywiadem rodzinnym lub własnym w kierunku hiperglikemii.
Cel pracy. Celem pracy była analiza częstości palenia papierosów wśród losowo wybranych osób przebadanych za pomocą skali FINDRISC oraz ocena wpływu nikotynizmu na masę ciała, obwód talii, wielkość ciśnienia tętniczego oraz całkowity wynik w skali FINDRISC.
Materiał i metody. Badanie zostało przeprowadzone w 2016 roku w Lublinie na 99 uczestnikach – 51 kobietach oraz 48 mężczyznach. Każdemu z nich określono wynik w skali FINDRISC oraz dwukrotnie zmierzono ciśnienie tętnicze. Wyniki analizowani za pomocą programu STATISTICA 10, wartości $p<0,05$ uznano za istotne statystycznie.
Wyniki. Jedynie 12 badanych osób (12,12% z 99 zakwalifikowanych; 7 kobiet i 5 mężczyzn) zadeklarowało intensywne palenie papierosów. Zaskakująco, różnice w wartościach wskaźnika masy ciała (body mass index - BMI), obwodu talii, w średnich wartościach ciśnienia tętniczego zarówno skurczowego jak i rozkurczowego oraz w całkowitym wyniku w skali FINDRISC nie były istotne statystycznie dla intensywnie palących i niepalących.
Wnioski. Niskie występowanie nikotynizmu w badanej populacji dowodzi efektywności publicznego programu zachęcającego do niepalenia. W przeciwieństwie do powszechnego przekonania, nikotynizm nie jest skutecznym sposobem redukcji masy ciała. Ryzyko zachorowania na cukrzycę typu 2 wydaje się nie wzrastać u palaczy papierosów, jednakże te wyniki powinny zostać potwierdzone w badaniach na większej grupie pacjentów.

Słowa kluczowe: palenie papierosów, FINDRISC, cukrzyca.

Introduction

The natives of America have known the *Nicotiana tabacum* for centuries. The plant was brought to Europe after the discovery of America by Christopher Columbus. The alkaloid nicotine present in this plant is a highly addictive substance. Cigarettes, cigars, cigarillos and snuff are made of tobacco. Systemic effects of tobacco have been noticed by the people of

the Old Continent in the XVth century and its' first use in Europe was for medical purposes [1]. Nicotine stimulates nicotinic receptors located in neuromuscular junctions, autonomic ganglia and in the central nervous system. Their activation triggers contraction of skeletal muscles and neurostimulation. Poisoning with nicotine can cause nausea, vomiting, headache, salivation, diarrhea, tremors, tachycardia and limb weakness. Researches have shown, that smoking predisposes to cancer development, disorders of the cardiovascular and respiratory system, infertility and interferes with pregnancy [2]. Smoking is frequently thought of as a good way to control appetite and weight, and smokers are commonly believed to be thinner than non-smokers.

The Finnish Diabetes Risk Score (FINDRISC) assesses the 10-year type 2 diabetes risk in adults by identifying individuals with poor nutrition, inadequate physical activity, overweight or obesity, or a family or personal history of hyperglycemia, or use of anti-hypertensive medication. FINDRISC scale consists of 8 questions about these risk factors. Every question gives a score in relation to how much it predicts the risk of type 2 diabetes mellitus. The maximum score possible to get is 26 [3]. High-risk individuals can be followed by educational intervention, which has been shown to prevent the development of complications of type 2 diabetes mellitus and reduce the incidence of diabetes [4,5].

The number of patients with type 2 diabetes mellitus is continuously rising. 415 million people suffered from diabetes worldwide in 2015. Over 3 million people suffer from diabetes in Poland, whereas 800 000 people are still undiagnosed [6].

An interesting question arises as to does cigarette smoking increase a risk of diabetes mellitus development.

Objectives

The objective of the study was to analyze the incidence of cigarette smoking in randomly selected individuals screened with FINDRISC scale, and the effect of nicotinism on body weight, waist circumference, the magnitude of arterial pressure, and the total FINDRISC scores.

Materials and methods

The study was conducted in 2016 in Lublin on 99 individuals – 51 women and 48 men. We determined FINDRISC score and measured blood pressure twice. When the score exceeds 20, the risk is considered to be very high (an estimated 1 of every 2 people in this group will develop type 2 diabetes within 10 years). A risk score from 15 to 20 indicates a high risk of type 2 diabetes (an estimated 1 in 3 individuals will develop diabetes within 10 years); 12-14 indicates a moderate risk (about 1 in 6 will develop diabetes within 10 years); 7-11 a slightly increased risk (1 in 25 individuals), and 0–7 a low risk (1 in 100) [7]. Participation in the study was voluntary and anonymous. The participants were selected randomly. The values for the parameters analyzed were presented as arithmetic mean, standard deviation, minimum and maximum values, lower and upper quartiles, and median. The Mann-Whitney U Test was used to compare the differences between smokers and non-smokers. The results were

analyzed in STATISTICA 10 at $p < 0.05$.All procedures involving participants were approved by the local Research Ethics Committee (KE-0254/71/2011).

Results

Only 12 individuals (12.12% of total 99 subjects; 7 females and 5 males) declared heavy smoking. The mean of age in smokers group was 37.67±13.30 years (min. 21, max. 59 years), while in non-smokers 39.83±18.96 years (min. 18, max. 75 years). Body weight did not significantly differ between heavy smokers and non-smokers: mean 71.67±12.79 kg and 71.21±15.96kg, respectively. Surprisingly, no significant differences were found between BMI (24.54±3.69 kg/m2 *vs.* 24.25±4.58 kg/m2) and waist circumference of smokers (86.58±10.89 cm) and of non-smokers (85.49±14.46 cm). The same in systolic blood pressure: 116.92±14.64 mmHg for smokers and 123.87±13.58 mmHg for non-smokers and diastole blood pressure: 75.33±6.97 mmHg and 78.07±7.96 mmHg, respectively. The risk of diabetes on the FINDRISC scale in both groups was comparable. The mean FINDRISC score was 6.83±6.71 for smokers and 6.49±4.58 for non-smokers (Table 1 and Table 2).

	Smokers Descriptive Statistics					
Variable	Valid N	Mean	Median	Minimum	Maximum	Std. Dev.
Age (years)	12	37.67	35.50	21.00	59.00	13.30
Body weight (kg)	12	71.67	72.50	57.00	93.00	12.79
Waist circumference (cm)	12	86.58	87.50	70.00	108.00	10.89
Systolic pressure (mmHg)	12	116.92	113.50	95.00	140.00	14.64
Diastolic pressure (mmHg)	12	75.33	75.00	65.00	87.00	6.97
FINDRISC scale total score	12	6.83	5.00	2.00	23.00	6.71
BMI (kg/m2)	12	24.54	23.92	22.53	28.08	3.69

Table 1: Results in smokers group.

	Non-smokers Descriptive Statistics					
Variable	Valid N	Mean	Median	Minimum	Maximum	Std. Dev.
Age (years)	87	39.82	36.00	18.00	75.00	18.96
Body weight (kg)	87	71.21	71.00	36.00	110.00	15.96
Waist circumference (cm)	87	85.49	85.00	58.00	125.00	14.46
Systolic pressure (mmHg)	87	123.87	122.00	100.00	167.00	13.58
Diastolic pressure (mmHg)	87	78.07	78.00	64.00	98.00	7.96
FINDRISC scale total score	87	6.49	5.00	0.00	25.00	5.74
BMI (kg/m2)	87	24.25	23.77	15.37	36.80	4.58

Table 2: Results in non-smokers group.

Discussion

Addiction to nicotine is certainly harmful to the human body [8]. It has been shown that cigarette smokers are more likely to develop coronary artery disease, and smoking accelerates the onset of atherosclerotic lesions [2]. This addiction also leads to the formation or aggravation of other vascular diseases such as *thrombangitis obliterans*, stimulates the secretion of gastric juice, facilitates the formation of gastroesophageal reflux (conducive to gastric and duodenal ulcers) [2]. Smoking increases metabolism, promotes cancer and chronic obstructive pulmonary disease - COPD [8], damages male and female sex cells (which induces malformations of the fetus) and causes premature birth [2]. Awareness about the harmfulness of smoking is growing among the residents of Lublin [9]. Our study on the residents of Lublin showed that smokers were definitely less than non-smokers. Our research shows that smoking does not increase the risk of developing of type 2 diabetes. FINDRISC is similar in smokers and non-smokers. Similar results were obtained by Cos et al. There was no difference in the prevalence of smoking between the FINDRISC categories [10]. However, other authors point smoking as a significant risk factor for diabetes mellitus [11]. These discrepancies suggest the need for further research in this direction.

Conclusions

A low incidence of nicotinism in the examined population proves an effectiveness of a public program encouraging to non-smoking. In opposition to common beliefs, nicotinism is not an efficient tool for weight reduction. The diabetes risk seems to be not increased by cigarette smoking; however this result should be confirmed in a study on the larger group of patients.

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