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**THE EVALUATION OF RISK CONCERNING TYPE 2  
DIABETES (AS A LONG-TERM HEALTH PROBLEM)  
AMONG THE STUDENTS OF THE FACULTY OF  
HEALTH SCIENCE OF THE MAZOVIAN STATE  
UNIVERSITY IN PŁOCK**

**Ocena ryzyka wystąpienia cukrzycy typu II (jako długoterminowego problemu  
zdrowotnego) wśród studentów Wydziału Nauk o Zdrowiu Mazowieckiej Uczelni  
Publicznej w Płocku**

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A - Koncepcja i projekt badania, B - Gromadzenie i/lub zestawianie danych, C - Analiza i interpretacja danych, D - Napisanie artykułu, E - Krytyczne zrecenzowanie artykułu, F - Zatwierdzenie ostatecznej wersji artykułu

**Abstract (in Polish):**

**Cel pracy**

W ciągu ostatnich lat obserwuje się systematyczny wzrost częstości występowania cukrzycy. Terminem tym określa się grupę zaburzeń metabolicznych, które charakteryzuje występowanie hiperglikemii będącej skutkiem nieprawidłowego wydzielania lub działania insuliny, bądź też kombinacji obu tych stanów. Przewlekłe podwyższenie poziomu glukozy we krwi może stać się przyczyną zaburzeń funkcjonowania i niewydolności niektórych narządów. Do czynników ryzyka rozwoju cukrzycy typu 2 zalicza się: styl życia, czynniki genetyczne, wiek, płeć oraz występowanie innych problemów zdrowotnych, takich jak m.

in. otyłość czy nadciśnienie tętnicze. Celem badania było określenie oceny ryzyka wystąpienia cukrzycy typu 2 wśród studentów Wydziału Nauk o Zdrowiu Mazowieckiej Uczelni Publicznej w Płocku.

### **Materiał i metody**

W badaniu wzięło udział 130 studentów Wydziału Nauk o Zdrowiu Mazowieckiej Uczelni Publicznej w Płocku. Posłużono się metodą sondażu diagnostycznego z wykorzystaniem ankiety, która składała się z kwestionariusza konstrukcji własnej oraz kwestionariusza oceny ryzyka wystąpienia cukrzycy FINDRISK. Kwestionariusz konstrukcji własnej składał się z metryczki oraz zapisu wyników dokonanych pomiarów, takich jak: waga, wzrost, ciśnienie tętnicze krwi i tętno. Na podstawie odpowiednich danych określono indywidualnie przedział BMI dla każdego studenta oraz sklasyfikowano jego wartość ciśnienia tętniczego krwi według najnowszego podziału.

### **Wyniki**

Dokonując analizy wyników uzyskanych przez studentów poszczególnych kierunków, zauważono, że grupa osób posiadających niskie ryzyko wystąpienia cukrzycy typu 2 w ciągu najbliższych 10 lat jest najliczniejsza wśród studentów kosmetologii (82,5%; N-33), natomiast najmniej liczna – wśród studentów pielęgniarstwa (63%; N-44).

### **Wnioski**

Studenci Wydziału Nauk o Zdrowiu PWSZ w Płocku uczący się na poszczególnych kierunkach studiów odznaczają się różnym stopniem ryzyka rozwoju cukrzycy typu 2.

### **Abstract (in English):**

#### **Aim**

In recent years the systematic increase in the diabetes prevalence has been observed. The term defines the group of metabolic disorders characterized by hyperglycaemia presence being the result of abnormal insulin secretion or action, or combination of those conditions. The chronic increase of glucose level in blood may become the cause of functioning disorder and failure of selected organs. Purpose Establishing of risk assessment for type 2 diabetes among the students of the Faculty of Health sciences of the Mazovian State University in Płock.

#### **Material and methods**

The research has been conducted within the group of 130 students of the Faculty of Health Sciences of the Mazovian State University in Płock. The self-made questionnaire and Finnish Diabetes Risk Score (FINDRISC) have been used. Self-made questionnaire contained of metrics and result record of done survey, such as: weight, height, arterial pressure and pulse. Using the relevant data, the BMI range for each student was determined individually and their blood pressure values were classified according to the latest classification.

#### **Results**

When analysing the student results of selected faculties, it has been noted that the largest group of people having low risk of type 2 diabetes in the next 10 years includes the students of cosmetology (82,5%; N-33), whereas the smallest group includes nursing students (63%; N-44).

## Conclusions

Students of the Faculty of Health Sciences of the Mazovian State University in Płock studying on particular field of study are characterized by different degree of risk of developing type 2 diabetes.

**Keywords (in Polish):** diabetes, FINDRISC, type 2 diabetes, Finnish Diabetes Risk Score.

**Keywords (in English):** FINDRISC, cukrzyca typu 2, cukrzyca, Skala Oceny Ryzyka Wystąpienia Cukrzycy typu II.

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## Short title

Ocena ryzyka wystąpienia cukrzycy typu II

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## Authors (short)

A. Frydrysiak - Brzozowska et al.

## Introduction

In recent years the systematic increase in the diabetes prevalence has been observed. It is a disease known to people since ancient times, but it was not until discoveries made in the 19th and 20th centuries that the cause of its occurrence could be identified. The current prognosis concerning the number of the ill in the future indicates diabetes burden, particularly in the developing countries [8,9]. According to the report of Expert Committee of the World Health Organisation (WHO) publicised in 1998 on the definition, diagnosis, classification and diabetes complications, the term defines the group of metabolic disorders characterized by hyperglycaemia presence being the result of abnormal insulin secretion or action, or combination of those conditions. The chronic increase of glucose level in blood may become the cause of functioning disorder and failure of selected organs [4].

The classification recommended in a given report is still used. It covers the following disorder categories:

1. Type 1 diabetes
2. Type 2 diabetes
3. Other specific types of diabetes
4. Gestational diabetes mellitus

Type 2 diabetes mentioned in the classification is the most common type of diabetes in the population. It is also called insulin-independent diabetes or adult-onset diabetes. Pathogenetically, it is a disorder associated not only with dysfunction of the  $\beta$ -cells of the pancreatic islets where insulin

secretion takes place, but also with simultaneously occurring reduced tissue reactivity to this hormone. This disorder is accompanied with persistent hyperglycaemia and glycosuria [9]. Symptoms that may indicate diabetes development include polyuria, polydipsia (increased thirst) and mass loss. Moreover, weakness, increased insomnia, purulent skin lesions and inflammation of genitourinary organs could also occur [11]. The risk development factors concerning type 2 diabetes include lifestyle, genetic factors, age, sex, and other health problems such as obesity or arterial hypertension. The risk development of this type of diabetes increases with age, increased BMI, waist and hip circumference, duration of obesity and decreased physical activity. The disorder is more common among women, especially those diagnosed with gestational diabetes mellitus (GDM), but also among those with hypertension or dyslipidaemia and in certain racial and ethnic groups [1,2,3,4,7]. In relation to type I diabetes, type 2 diabetes significantly more frequently occurs among family members because of its genetic liability. Conducted molecular research allowed to discover few genes (including insulin receptor genes, genes for proteins that transport glucose into cells, genes for mitochondrial enzymes), which structure and function in case of evaluation is abnormal, which allows to state that this diabetes is a multi-gene condition [9].

Purpose Establishing of risk assessment for type 2 diabetes among the students of the Faculty of Health sciences of the Mazovian State University in Płock.

### Materials and methods

The research has been conducted in January and February of 2019 within the group of 130 students of the Faculty of Health Sciences of the Mazovian State University in Płock. The self-made questionnaire and Finnish Diabetes Risk Score (FINDRISC) have been used. Self-made questionnaire contained of metrics and result record of done survey, such as: weight, height, arterial pressure and pulse. Using the relevant data, the BMI range for each student was determined individually and their blood pressure values were classified according to the latest classification.

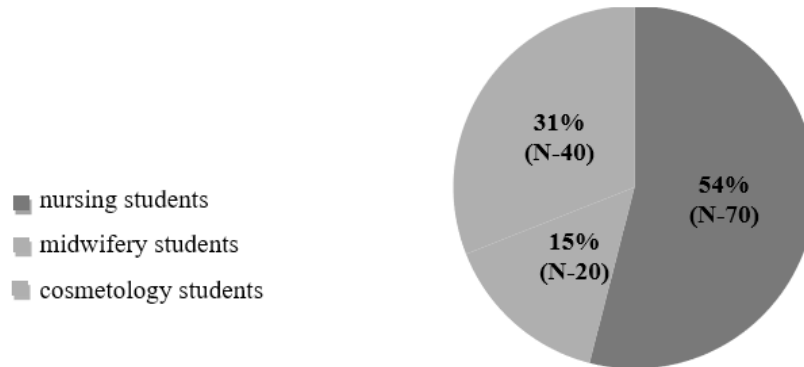
Finnish Diabetes Risk score used in the research was designed by Professor Jakko Tuomilehto and Professor Jaana Lindström from Finnish Institute for Health and Welfare. It is a questionnaire containing of 8 closed questions concerning age, BMI, waist circumference physical activity, consumption of fruits and vegetables, taking medication to lower blood pressure, detection of elevated blood glucose levels and family history of diabetes. It is a tool which helps identify those at risk of developing type 2 diabetes in the next 10 years with 85% accuracy [7] (Tab.1)

**Tab.1. Risk assessment scale for type 2 diabetes in the next 10 years according to the FINDRISC questionnaire.**

Number of points	Risk of diabetes	Morbidity rate
< 7	low	1/100
7-11	Slightly increased	1/25
12-14	Moderate	1/6
15-20	High	1/3
20	Very high	1/2

## Results

Among the students surveyed, three groups were distinguished based on the criteria of the chosen field of study. The first, representing 54% (N-70) of the respondents, consisted of nursing students, the second, representing 15% (N-20) - midwifery students, while the third, representing 31% (N-40) - cosmetology students. (Fig.1)



**Fig. 1.** Structure of respondents according to their chosen field of study.

The majority of respondents were under the age of 25 - 82% (N-107). Those aged 26-30 years accounted for 5% (N-6) of the respondents, those aged 31-40 years accounted for 8% (N-10), those over 40 years accounted for 5% (N-7). The largest number of people over 25 years old was in the group of nursing students.

Of the subjects, 92% (N-119) were woman and 8% (N-11) were men, with no men among the midwifery students.

The group of students surveyed included both unmarried people, who made up 84% (N-109) of the respondents, and married people - 15% (N-19), while 1% (N-2) were divorced

Most of the respondents had secondary education - 87% (N-113). People with higher education constituted 11% (N-14) of the respondents, while three respondents had vocational education.

Students who are simultaneously studying and working accounted for 24% (N-31) of the respondents, while the remaining 76% (N-99) were non-employed.

Respondents are both city dwellers - 51% (N-66) and rural residents - 49% (N-64).

The collected data on the result of measurements taken on the respondents made it possible to determine the average weight and height of the students of the various faculties, as well as to analyse the size of the groups of people classified into different ranges according to the size of the BMI. (Tab.2)

**Tab. 2.** Mean values of weight and height of the surveyed students.

Attribute under analysis	Sex	Nursing	Midwifery	Cosmetology
Weight	Woman	62,7 kg	63,5 kg	61 kg
	Man	83,6 kg	-	75 kg
Height	Woman	165 cm	168 cm	167 cm
	Man	179 cm	-	170 cm

In each group, the majority were those with normal BMI values [midwifery – 55% (N-11), nursing – 60% (N-42), cosmetology – 62,5% (N-25)]. Analysing the results obtained, however, it is possible to notice differences in the structure of the surveyed groups regarding the presence of obese people in them. There

are more of them among nursing students (11%; N-8) compared to midwifer (5%; N-1) and cosmetology students (5%; N-2). In each group there are also people classified in the lowest ranges, indicating that they are underweight, and in the group of nursing students 3% (N-2) were, according to the classification, in an emaciated state. These people represent 15% (N-20) of all respondents, while those classified as overweight or obese represent 25% (N-32) of respondents. (Tab.3)

**Tab. 3. Results of the classification of the surveyed students according to the classification of BMI values.**

<b>BMI</b>	<b>Nursing</b>	<b>Midwifery</b>	<b>Cosmetology</b>
<b>&lt;16,0</b>	-	-	-
<b>16,0-16,99</b>	3% (N-2)	-	-
<b>17,0-18,49</b>	9% (N-6)	20% (N-4)	20% (N-8)
<b>18,5-24,99</b>	60% (N-42)	55% (N-11)	62,5% (N-25)
<b>25,0-29,99</b>	17% (N-12)	20% (N-4)	12,5% (N-5)
<b>30,0-34,99</b>	7% (N-5)	5% (N-1)	2,5% (N-1)
<b>35,0-39,99</b>	4% (N-3)	-	-
<b>≥40</b>	-	-	2,5% (N-1)

The blood pressure and heart rate values of the students were further measured. The results showed that nursing students include the highest number of people with optimal blood pressure values. They represent 80% (N-56) of the group, which is significantly more than those with similar measurement results from the other surveyed groups [(cosmetology – 52,5% (N-21), midwifery – 35% (N-7)], among whom a significant proportion of the students surveyed had elevated blood pressure or hypertension. (Tab.4)

**Tab. 4. Heart rate measurement results.**

<b>Pulse</b>	<b>Nursing</b>	<b>Midwifery</b>	<b>Cosmetology</b>
<b>Bradycardia</b>	-	-	-
<b>Normal</b>	94% (N-66)	90% (N-18)	87,5% (N-35)
<b>Tachycardia</b>	6% (N-4)	10% (N-2)	12,5% (N-5)

There was no one with bradycardia in the surveyed group, but there was a small group of people with tachycardia. Their percentage share among cosmetology students was slightly higher than among students of other fields of study [nursing – 6% (N-4), midwifery – 10% (N-2), cosmetology – 12,5% (N-5)]. However, the vast majority of respondents had heart rate values that were within the normal range of 60-100 beats/minute. Among cosmetology students, their percentage was correspondingly slightly lower (87,5%; N-35) compared to the group of nursing students (94%; N-66) and midwifery students (90%; N-18) students. (Tab.5)

**Tab. 5. Blood pressure measurement results.**

<b>Blood pressure</b>	<b>Nursery</b>	<b>Midwifery</b>	<b>Cosmetology</b>
<b>Optimal</b>	80% (N-56)	35% (N-7)	52,5% (N-21)
<b>Increased</b>	13% (N-9)	20% (N-4)	15% (N-6)
<b>Stage I hypertension</b>	6% (N-4)	35% (N-7)	22,5% (N-9)
<b>Stage II hypertension</b>	1% (N-1)	10% (N-2)	10% (N-4)

The second part of the study was to assess the occurrence of type 2 diabetes among the surveyed students in the next 10 years using the FINDRISC questionnaire.

The first two questions, on age and BMI, overlapped with the areas already studied, with different classification ranges adopted in the respective standardised questionnaire.

In the next part of the research, the waist circumference of the students was measured. The results were considered according to sex. More than 60% (N-81) of the female respondents had a waist circumference of less than 80 cm. In the male group, the most frequently indicated range was as follows: 94-102 cm. Analysis of the results indicated that the greatest number of people with waist circumferences falling within the lowest ranges were cosmetology students (75%; N-30), while those falling within the highest ranges were nursing students (19%; N-13) and midwifery students (20%; N-4) (Fig. 2,3,4)

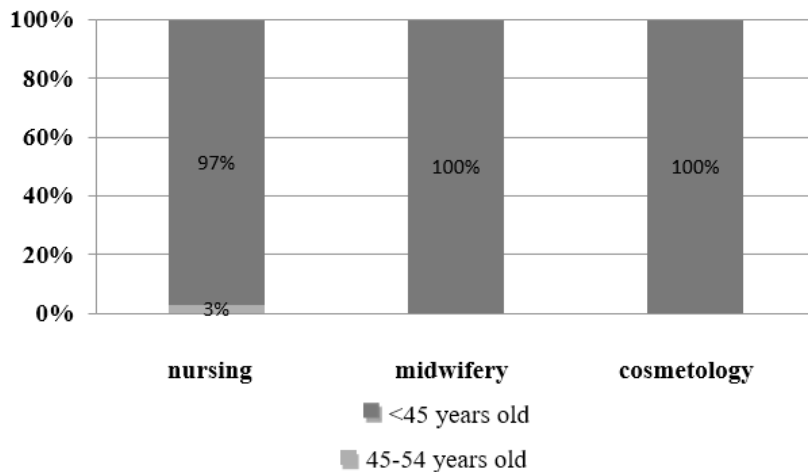


Fig. 2. The student answers to the FINDRISC questionnaire – age

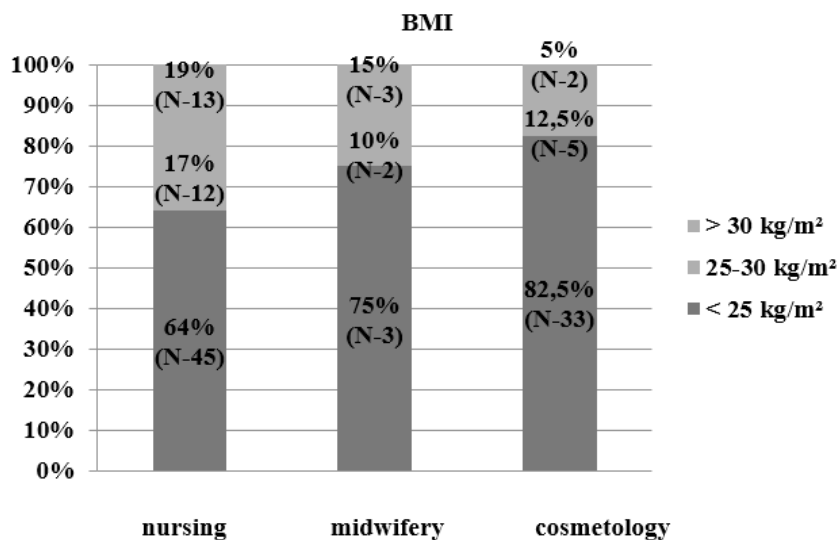


Fig. 3. The student answers to the FINDRISC questionnaire – BMI

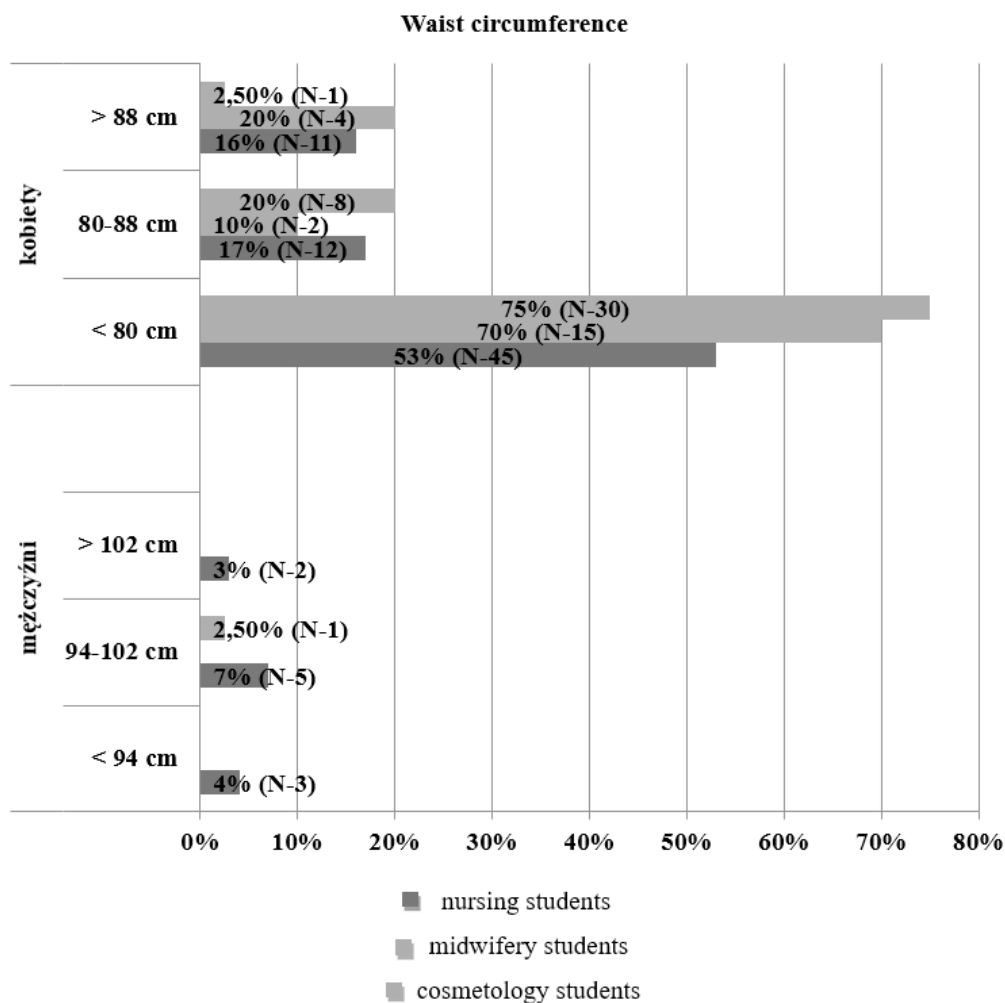
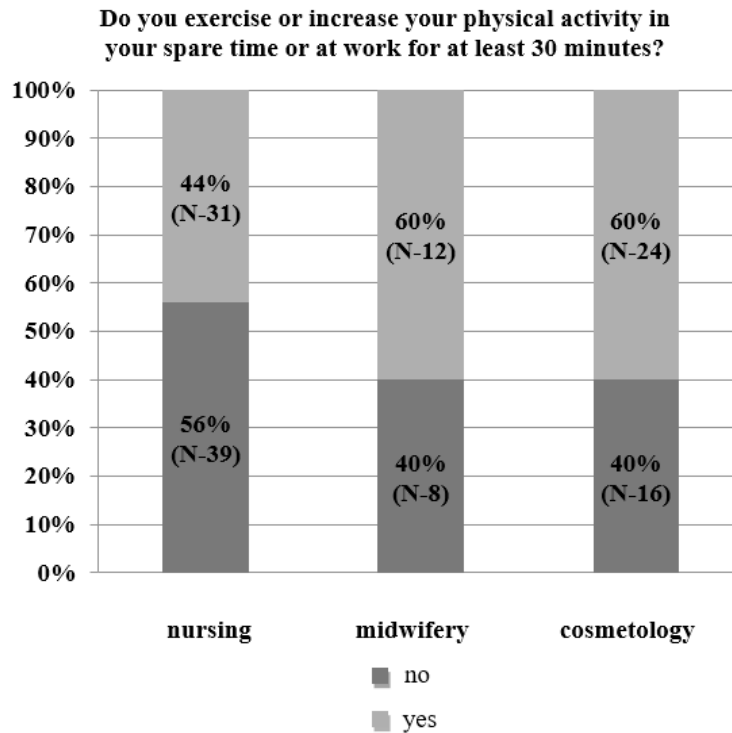


Fig. 4. The student answers to the FINDRISC questionnaire – waist circumference

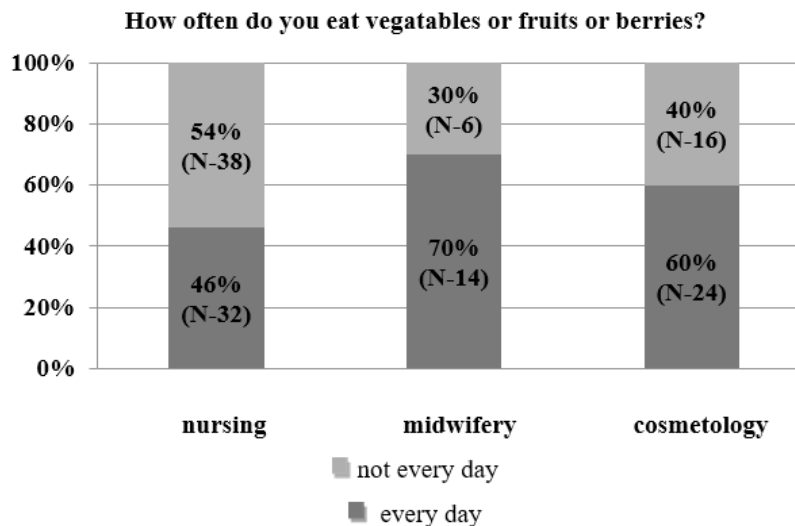
Another element of the research was to determine the frequency of exercise or increasing physical activity. Among nursing students, 56% (N-39) of respondents do this daily, while among midwifery and cosmetology students, 60% (midwifery: N-12, cosmetology: N-24) of respondents do not do that. (Fig.5)





**Fig. 5.** The student answers to the FINDRISC questionnaire – physical activity

According to the results obtained, the vast majority of midwifery students (70%; N-14) and cosmetology students (60%; N-24) consume vegetables or fruits or berries every day, while the percentage is lower among nursing students (46%; N-32). (Fig.6)



**Fig. 6.** The student answers to the FINDRISC questionnaire – diet.

Nearly 100% of the surveyed students in each field of study did not take medication to lower their blood pressure, but there were a few in each group who did. (Fig. 7)

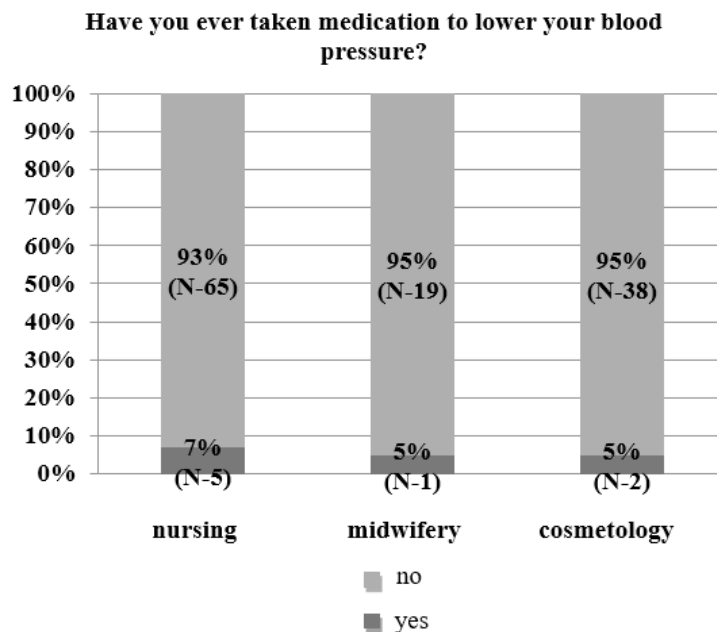


Fig. 7. The student answers to the FINDRISC questionnaire – antihypertensives.

Similarly, nearly 100% of the surveyed students in each field of study had not been diagnosed with elevated blood glucose levels, but there were a few in each group who had experienced that. (Fig. 8)

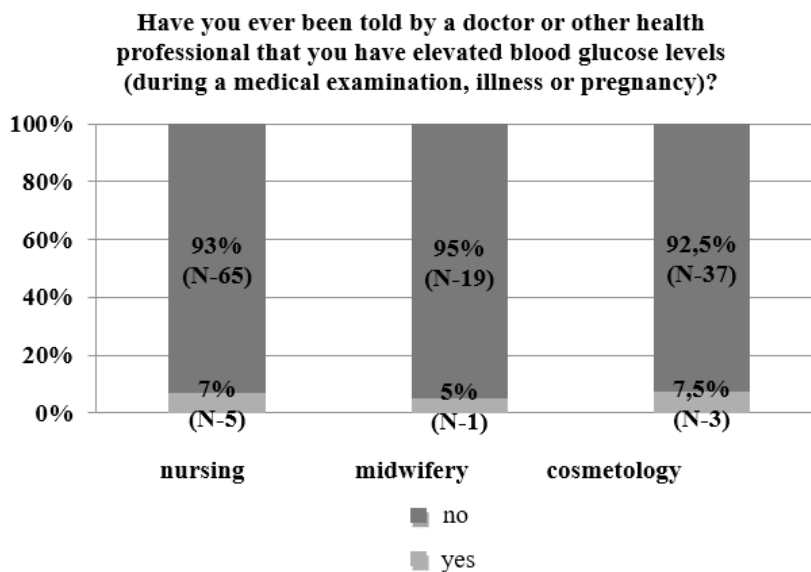


Fig.8. The student answers to the FINDRISC questionnaire – hyperglycaemia.

In each group of surveyed students, about 50% indicated that their family members did not have diabetes. The highest proportion of those with this metabolic disorder in their family was among midwifery students (55%; N-11), while the highest proportion of those with this disease in their closest relatives, for instance parents, siblings, children, was among nursing students (16%; N-11). (Fig. 9)

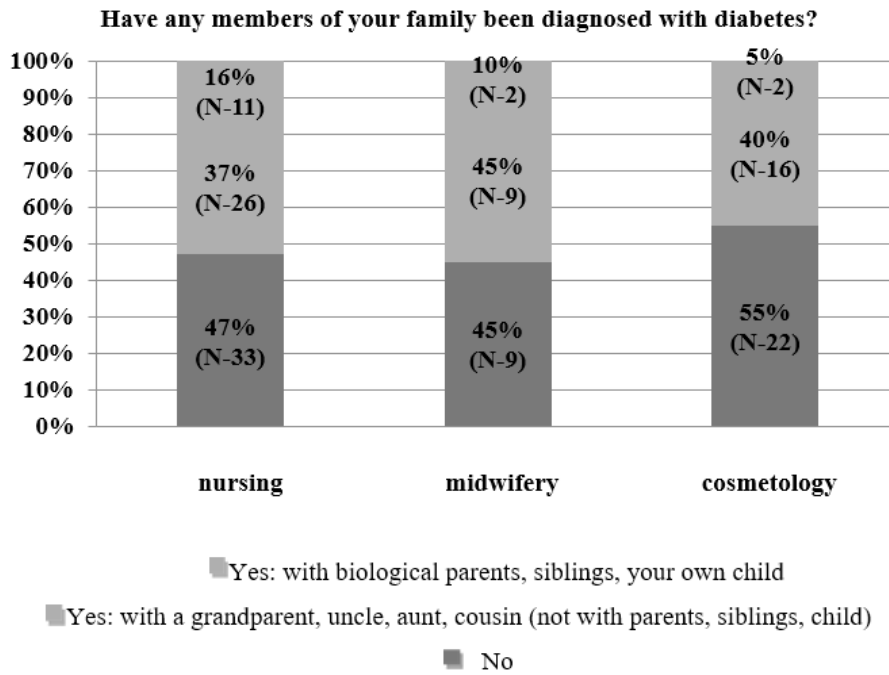


Fig. 9. The student answers to the FINDRISC questionnaire – family history of diabetes

When analysing the results, the average number of points obtained by a student in a given field of study was calculated, In the case of midwifery and cosmetology students, the score was the same at 5 points, while for nursing students the value was slightly higher at 6 points.

When performing a detailed analysis of the results obtained by the students of the different fields of study, it was noted that the group of people having a low risk of developing type 2 diabetes in the next 10 years is the most numerous among cosmetology students (82,5%; N-33), while the least numerous is among nursing students (63%; N-44). (Fig.10)

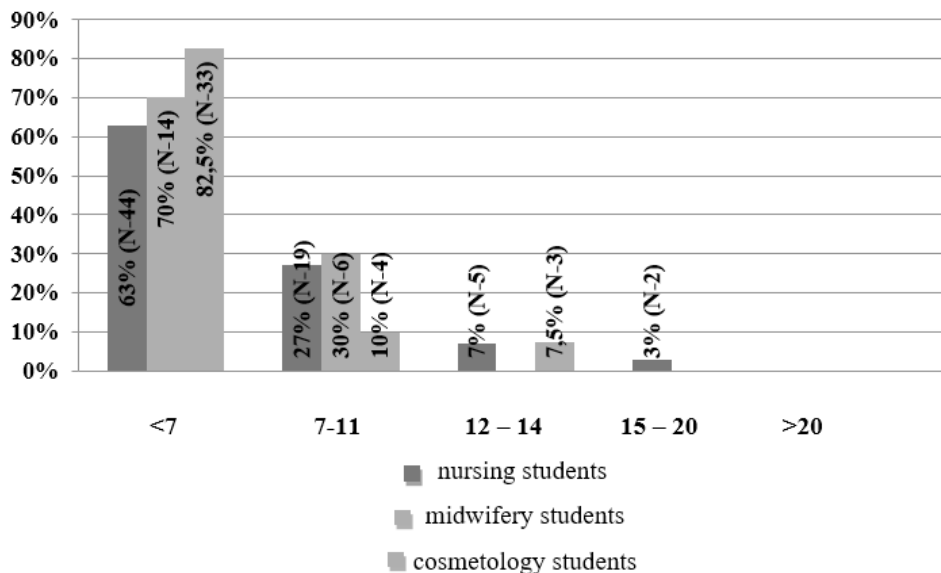


Fig.10. Results of the FINDRISC survey used in the research

## **Discussion**

The applicability of the FINDRISC questionnaire was demonstrated in research conducted by G. J. M. Vandersmissen and L. Godderis, in which 275 health workers were subjected to e.g., electrocardiography, pulmonary function testing, urine test and standard fasting blood analysis, including glycaemia determination. They were also surveyed using the FINDRISC questionnaire. It has proven to be a reliable, valuable and easy-to-use tool for health monitoring [10].

Sheikh Mohammed Saleem conducted research on patients using primary care. The results allowed the FINDRISC questionnaire to be considered a useful screening tool for identifying previously undiagnosed diabetes and estimating the odds of the disease in healthy individuals [6].

According to Timo Saaristo et al. this questionnaire can be used not only in the clinical population, but also in the general population [5].

In the research, the FINDRISC questionnaire was used to assess the risk of developing type 2 diabetes in the next 10 years among students, the vast majority (82% of respondents) being under 25 years old and not in a clinical setting at the time of the research. The questionnaire proved to be an easy-to-use tool for assessing the risk in a short period of time.

However, young people are not the only group surveyed using the questionnaire. According to the results of a research conducted by Zanna Fyoderenko-Dumas et al. on a group of people aged between 18 and 88 years, the risk of developing type 2 diabetes increases with age. In addition, it was observed that this risk increases with increasing BMI and waist circumference values. The risk is also higher in people who are not very physically active, who take medication for hypertension, or who have a family member with diagnosed diabetes [1]. A similar relationship between individual factors examined by means of the FINDRISC questionnaire, in particular overweight or obesity in members of given population, was noted in the research by Joanna Pekar et al [3]. During the analysis of the results of research conducted on students of the PWSZ in Płock, it was noted that the highest risk of type 2 diabetes occurred among nursing students, who at the same time constituted a group with the highest percentage of people over 25 years old, as well as overweight or obese people.

Hypertension is considered to be another of the risk factors for the development of diabetes. However, the results of this research do not indicate a correlation between elevated blood pressure values and a higher probability of developing the metabolic disorder under research due to the fact that the group of nursing students with the highest risk of developing diabetes had the highest number of people with normal blood pressure and heart rate values. Another conclusion was drawn from the results of a study on a group of hypertensive patients aged between 65 and 102 years conducted by Bartosz J. Sapilak et al. using the FINDRISC questionnaire, they assessed the risk of developing diabetes in the studied population. The results indicated a 30-50% probability of developing this metabolic disorder among the researched subjects due to a high or very high risk of developing type 2 diabetes in the next 10 years in more than 40% of them [7].

## **Conclusions**

Students of the Faculty of Health Sciences of the Mazovian State University in Płock studying on particular field of study are characterized by different degree of risk of developing type 2 diabetes. It is the highest in the group of nursing students, while the lowest among cosmetology students.

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