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DIETARY HABITS OF POLES WITH DIABETES: A CROSS-SECTIONAL STUDY

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Authors' contribution:

A. Study design/planning
B. Data collection/entry
C. Data analysis/statistics
D. Data interpretation
E. Preparation of manuscript
F. Literature analysis/search
G. Funds collection

Summary

Background. In developing countries, an increase in the incidence of diabetes has been observed in recent years, which is probably related to unhealthy lifestyles as well as a successively ageing population.

Material and methods. The study was conducted between March 2019 and February 2020 among people aged 18-65 years, being treated for diabetes in inpatient and outpatient facilities in southern Poland. A diagnostic survey with use of the Dietary Habits and Nutrition Beliefs Questionnaire (KomPAN) and a self-designed questionnaire was applied.

Results. A total of 203 subjects with diabetes took part in the study: 102 outpatients (A) and 103 who were hospitalized at the time of the study (H). The average age of the participants was 46.6±13.6 years old (18-65 years old). The majority of the diabetes patients surveyed confirmed they used a low carbohydrate diet in connection with their illness (87.7%). The dietary behaviors described by the respondents were largely unhealthy. The mean pHDI-10 score for the respondents was: 22.55±8.67 points and for nHDI-14: 15.00±9.88 points. The place of the study, education and the general financial situation of the subjects had a statistically significant effect on the results (p<0.05).

Conclusions. When educating patients with diabetes, health professionals should be proactive in providing them adequate counselling on dietary recommendations from the onset of the disease. This will lead to better nutritional knowledge and the motivation to put the recommendations into practice.

Keywords: KomPAN, diet-index, diet quality, dietary patterns, diabetes

Introduction

In developing countries, including Poland, an increase in the incidence of diabetes has been observed in recent years, which is probably related to modern, unhealthy lifestyles resulting in eating disorders, as well as a progressively ageing population [1,2]. According to the latest data from the International Diabetes Federation (IDF), approximately 415 million people worldwide, including 31 million in the European Union, are already living with diabetes, and it is estimated that this number could increase to 642 million by 2040 [1,2]. Polish society is also affected by this problem; epidemiological data from studies conducted by the Department of Analyses and Strategies of the

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National Health Fund (NFZ) indicate that the current number of people with diabetes in Poland is estimated to be as high as 3.5 million [1,3].

Despite the dynamic development of medical science and advances in medical care, diabetes remains a multifaceted problem. The treatment and prevention of the severity of the disease is a system where the elements, such as proper nutrition, physical activity, the use of hypoglycemic drugs and a lifestyle aimed at avoiding harmful factors, should complement each other. However, sometimes these elements are seen as unconnected, especially in relation to diet. Although various scientific societies regularly publish Evidence Based Medicine (EBM)-compliant guidelines for patients which recommend dietary principles that positively influence the health status of people with diabetes and these people themselves largely agree that diet is crucial in the management of their disease, the need to maintain dietary self-discipline is still a major concern for many patients [4-8].

Aim of the work

The aim of the study was to evaluate selected dietary habits and the diet quality of patients with diabetes in Poland.

Material and methods

Design and data collection

The study was descriptive, quantitative and cross-sectional. It was conducted between March 2019 and February 2020 among patients aged 18-65 years in treatment for diabetes in inpatient and outpatient facilities in southern Poland. After applying the exclusion criteria (lack of patient consent to participate in the study, diagnosis of gestational diabetes, not taking anti-diabetic drugs or insulin, and use of therapy for less than 6 months), the initial number of subjects meeting the age criterion (N=231) was reduced to N=208. At the data coding stage, in accordance with the recommendations of the authors of the research tool, an additional verification of the concordance of respondents' answers was carried out by means of follow-up questions. On this basis, a further 5 study participants were rejected. In the end, 203 subjects (100%) remained in the study group, comprising 101 patients (49.7%) being treated in a hospital (H) and 102 patients (50.3%) being treated in a diabetes clinic (A).

Method and research tool

The study was conducted using a survey method. The research tool was the Dietary Habits and Nutrition Beliefs Questionnaire devised in Poland for people aged 16-65 years old (KomPAN) (version v.1.1.) and the author's own questionnaire, which included a metric. KomPAN consists of four parts defining: (A) eating habits; (B) frequency of food intake; (C) views on food and nutrition; (D) lifestyle and personal information. This article details the results of Part A. The Pro-healthy-Diet-Index-10 (pHDI-10) and Non-Healthy-Diet-Index-14 (nHDI-14) are calculated based on the frequency of consumption of selected food for each subject. The interpretation of the indexes is intuitive – the higher the index value, the greater the intensity of features that are beneficial or unfavorable for health. However, the interpretation way proposed by the authors indicates the following ranges: low intensity of nutritional features (0-33 points), moderate intensity of nutritional features (34-66 points), high intensity of nutritional features (67-100 points) [9,10].

KomPAN validation conducted on the Polish population revealed that the internal reliability of the pHDI-10 ranged from 0.66 to 0.71 and for the nHDI-14 from 0.37 to 0.60. Kappa statistics were above 0.40 for all analyzed variables [11].

Data analysis

All statistical calculations were performed using the R programme. Correlation coefficients and statistical modelling techniques were used to analyze the strength, form and direction of the interdependence of the phenomena. Quantitative features were presented with the arithmetic mean (M) and standard deviation (SD). For qualitative features, Chi-squared test was used to assess the heterogeneity of answers in the groups defined by socio-demographic variables. Differences between independent variables were compared using the Mann-Whitney U test (2 groups). *P*-values below 0.05 were considered significant.

Results

Patient characteristics

A total of 203 people with diabetes took part in the study: 102 outpatients (A) and 103 who were in hospital at the time of the study (H). The average age of the participants was 46.6±13.6 years old (1865 years old). Analysis showed no statistically significant differences in socio-demographic data between the groups. Table 1 gives an overview of the participants' socio-demographic features.

Table 1. Socio-demographic characteristic of the study population

Variables	Total (N=203)
	n (%)
Sex	
Women	104 (51.2)
Men	99 (48.8)
Education	
Basic level	9 (4.4)
Vocational level	38 (18.7)
Higher basic level	101 (49.8)
University level	55 (27.1)
Marital status	
Married/with a partner	145 (71.4)
Single	58 (28.6)
Place of residence	
Country	103 (50.7)
Town	100 (49.3)
Professional activity	
Currently working	127 (62.6)
Not currently working	76 (37.4)
Overall financial situation	
< Average income	10(4.9)
Average income	148(72.9)
> Average income	45(22.2)

Notes: N – number of respondents; n – group size.

Regarding the health status of the participants, 62.6% had type 2 mellitus diabetes, 29.5% had type 1 mellitus diabetes, and 6.4% did not know what type of disease they had. The mean duration of the disease

was 10.1±9.5 years (0.6-58 years). 61.2% of the subjects were taking oral anti-diabetic medication and 45.3% were being treated with insulin (of which 3.9% were using a personal insulin pump).

Characteristics of dietary habits and assessment of diet quality of the study population

The majority of the people with diabetes who were interviewed confirmed the use of a low carbohydrate diet in relation to their disease (87.7%). The dietary habits of the subjects with regard to meals eaten, snacking between meals and drinks consumed are shown in Table 2, and with regard to meat, fats, adding sugar to drinks and salt to food consumed in Table 3.

Table 2. Respondents' eating habits in terms of meals eaten, snacking between meals and drinks consumed

Eating habits of respondents	Total n (%)	Statistically significant variables ($p<0.05$)
How many meals per day?		
1-2 meals	7 (3.5)	**Sex:** χ^2=11.25; p=0.024
3-4 meals	126 (62.0)	**Age:** χ^2=17.27; p=0.027
5 meals or more	70 (34.5)	**Currently working:** χ^2=19.53; p=0.001
Are meals eaten at regular times?		
Never	38 (18.7)	**Hospital/Clinic:** χ^2=7.34; p=0.025
Some meals	103 (50.7)	**Age:** χ^2=13.37; p=0.010
All meals	62 (30.5)	**Marital status:** χ^2=9.88; p=0.007
		Currently working: χ^2=14.42; p=0.001
How often do you snack between meals?		
Never	33 (16.3)	
1-3 times a month	10 (4.9)	
Once a week	14 (6.9)	n/s
Several times a week	52 (25.6)	
Once a day	24 (11.8)	
Several times a day	70 (34.5)	
Which foods do you usually eat between meals? (N=170)		
Fruit	129 (75.9)	
Vegetables	165 (97.1)	**Hospital/Clinic:** χ^2=19.24; p=0.007
Unsweetened drinks and dairy desserts	110 (64.7)	**Sex:** χ^2=15.03; p=0.036
Sweetened drinks and dairy desserts	145 (85.3)	**Level of education:** χ^2=26.51; p=0.022
Sweet snacks	133 (78.2)	
Salty snacks	99 (58.2)	
Nuts, almonds, seeds	83 (48.8)	
Which types of milk and dairy drinks do you drink most often?		
Full fat	75(36.9)	n/s
Reduced fat	99(48.8)	
Fat-free	29(14.3)	
What type of water do you usually drink?		
I don't drink water	8(3.9)	**Sex:** χ^2=17.50; p=0.002
Still	131(64.5)	**Age:** χ^2=43.34; p=0.001
Sparkling	72(35.5)	**Currently working:** χ^2=40.11; p=0.001
Flavored	11(5.4)	

Notes: p – significant statistical level.

Table 3. Eating habits in terms of respondents' consumption of meat, fats, and the sweetening of drinks and addition of salt to food

Eating habits of respondents	Total n (%)	Statistically significant variables ($p<0.05$)
How are the meat dishes you eat usually prepared?		**Hospital/Clinic:** $\chi^2=40.19$; $p=0.001$
Boiled	96 (47.3)	**Sex:** $\chi^2=26.67$; $p=0.001$
Stewed	68 (33.5)	**Age:** $\chi^2=54.35$; $p=0.001$
Grilled	109 (53.7)	**Level of education:** $\chi^2=33.81$; $p=0.001$
Roasted	79 (38.9)	**Currently working:** $\chi^2=30.73$; $p=0.001$
Fried	121 (59.6)	**Place of residence:** $\chi^2=12.78$; $p=0.047$
I don't eat meat	75 (36.9)	**Financial situation:** $\chi^2=14.81$; $p=0.022$
What type of fat do you usually spread on bread?		n/s
None	24 (11.8)	
Various	25 (12.3)	
Mayonnaise	3 (1.5)	
Margarine	29 (14.3)	
Butter	90 (44.3)	
Mix of butter and margarine	31 (15.3)	
Lard	1 (0.5)	
What kind of fat do you usually use to fry food?		**Marital status:** $\chi^2=11.43$; $p=0.044$ **Financial situation:** $\chi^2=11.71$; $p=0.039$
None	22 (10.8)	
Various	56 (27.6)	
Vegetable oil	113 (55.7)	
Margarine	6 (3.0)	
Butter	2 (1.0)	
Lard	4 (2.0)	
Do you sweeten hot drinks, e.g., tea, cocoa, coffee?		**Age:** $\chi^2=14.38$; $p=0.026$
No	151 (74.4)	
One teaspoon	16 (7.9)	
Two or more teaspoons	10 (4.9)	
I use a sweetener	26 (12.8)	
Do you add salt to cooked meals and sandwiches at the table?		**Hospital/Clinic:** $\chi^2=8.07$; $p=0.018$ **Age:** $\chi^2=13.86$; $p=0.008$
No	125 (61.6)	
Sometimes	63 (31.0)	
Most meals	15 (7.4)	

Notes: p – significant statistical level.

Selected socio-demographic characteristics significantly influenced the results. The respondents in Group A statistically significantly more often declared regular consumption of all meals, less often ate fruit between meals on weekdays, less often chose unsweetened drinks and dairy desserts and salty snacks, less often consumed boiled meat dishes and were more likely to eat grilled and roasted meat dishes, and less often declared adding salt at the table to cooked meals and sandwiches. Female respondents significantly more often declared eating the recommended number of meals, drank still water more often, snacked more often on unsweetened drinks and dairy desserts and salty snacks between meals, and consumed fruit and

boiled and stewed meat dishes less often in favor of grilled, roasted and fried dishes. Those aged 41-55 years were significantly associated with less often eating the recommended number of meals and less often eating regularly and drinking still water. The less-educated respondents more often reported snacking on nuts, almonds or seeds between meals and to report less often snacking on fruit; they were also less likely to consume boiled meat and more likely to consume grilled and roasted meat. Those in a relationship statistically significantly more often reported irregular consumption of all meals and more frequent use of vegetable oil for frying. Living in a rural area was associated with a significantly lower consumption of boiled and fried meat dishes and higher consumption of grilled dishes. People in employment statistically less often reported eating the recommended number of meals, eating all meals regularly, drinking still water and consuming boiled meat dishes, and more often reported consuming grilled and roasted meat dishes. Those with an above-average overall financial situation, when compared to those with an average or below-average financial situation, significantly more often ate cooked foods and less often grilled foods or reported not eating meat, and more often did not use any fat for frying.

The results of the pHDI-10 and nHDI-14 indices by the place of the study are shown in Table 4.

Table 4. Analysis of the results of pHDI-10 and nHDI-14 by the place of the study

Indices	Group A (N=102)	Group H (N=101)	All respondents (N=203)
pHDI-10			
M±SD	23.70±8.22	21.39±9.00	22.55±8.67
Min–Max	5-46	4-41	4-46
Me	25.00	21.00	22.00
p*	0.047		
nHDI-14			
M±SD	11.10±8.56	18.93±9.60	15.00±9.88
Min–Max	0-45	1-44	0-45
Me	9.00	18.00	14.00
p*	<0.001		

Notes: N – number of respondents; M – arithmetic mean; SD – standard deviation; Min – minimum; Max – maximum; Me – median; *p* – significant statistical level; * Mann-Whitney U test.

In addition to this, the results of both indices were statistically significantly influenced by the education of the subjects. The higher the level of education, the statistically significantly higher the pHDI-10 (p=0.011) and the lower the nHDI-14 (p=0.044). The higher pHDI-10 score was also significantly influenced by the average overall financial situation of the respondents (p=0.018).

Discussion

For several years now, experts have been emphasizing that the diabetes diet, as an eating plan for people with diabetes, does not differ in principle from the general guidelines of a healthy diet recommended for all people, and that it should be tailored to the energy and nutritional needs of each individual patient. It also emphasizes the importance of positive health behaviors, such as regular mealtimes and the avoidance of

snacks and of stimulants, in reducing the risk of diabetes complications and achieving optimal treatment goals [5,12,13]. In our study, as in the studies by Kołpa et al. [14] and Brońkowska et al. [15], the vast majority of subjects confirmed adherence to a low carbohydrate diet, but it should be remembered that, carbohydrate intake is a primary, though not the only, driver of optimal glycemic control. Our own research has shown that only around one in three say they regularly eat all their recommended 5 or more meals per day. Others admit that they only occasionally follow these recommendations or even admit to being completely irregular in this respect, especially those aged 41-55 and who are working and are in relationships. In our own study, similar to the results reported by Kołpa et al. [14], only a small percentage of respondents reported that they did not snack between meals (16.3%). The rest of the respondents reported eating a variety of snacks between meals, including, alas, sweetened dairy drinks and desserts, as well as sweet and salty snacks. People with diabetes should follow recommendations to limit the consumption of products that are sources of saturated fats, such as animal fats, butter, lard, high-fat dairy drinks or so-called "red meat" [5,16]. The findings of this study revealed that the highest percentage of respondents chose butter (44.3%) or a mixture of butter and margarine (15.3%) as a spread, about a third of the respondents drank full-fat milk and half of the respondents confirmed the most frequent consumption of fried (59.6%) and/or grilled (53.7%) meat dishes. This profile of fat intake can easily lead to faster development or aggravation of atherosclerosis and related diseases, especially as diabetes itself is a predisposing factor. Diabetes is a disease that often co-exists with hypertension. Therefore, the Polish Diabetes Association (PTD) recommendations state that dietary salt intake, the main source of sodium, should be reduced [5,15]. In the present study, as in the work of Górska-Ciebiada et al. [17], the majority of people denied adding salt to their food at the table (61.6%), but one third of the respondents confirmed that they sometimes did it (31.0%) and 7.4% always did it. People with diabetes should also avoid sweetening hot drinks such as tea, cocoa or coffee. In the study by Bronkowska et al. [15], 94.4% of men and 76.5% of women denied sweetening their drinks, whereas in our study 74.4% of subjects confirmed that they did not sweeten their drinks, but others sweetened their drinks with artificial sweeteners (12.8%) or sugar (12.9%). When analyzing the quality of the diet of the subjects in the present study, we found that it was characterized by a low pHDI-10, especially in patients in Group H. A better financial situation and a higher level of education were also found to be important factors in the more frequent use of a diet with health-promoting characteristics. These study findings are consistent with the literature [6,17,18]. The poor financial situation of people with diabetes is an important barrier to healthy eating, as it forces them to buy cheaper and often less healthy products. Moreover, a higher education may contribute to better health literacy skills, meaning a better decision-making ability for adhering to dietary rules and other self-care behaviors [17,19].

Study limitations

As in other retrospective studies, obtained data may be biased (over- or underestimated). Although recall biases cannot be avoided, we followed the recommendations of the KomPAN authors regarding the verification of the compliance in the answers given by the respondents. Lack of compliance resulted in the respondent being removed from the data set. Thus we minimized recall bias. Another limitation of the study is related to the fact that other parts of the questionnaire (A, B, and D), which could provide a comprehensive view of the research problem, have not been discussed in this article. However, due to the extensiveness of the survey it was decided to present only a part of the data, with the remainder of the data being presented in subsequent articles.

Conclusions

Although the majority of people with diabetes said they were on a diet, closer analysis revealed that their eating habits were largely unhealthy. The only positive dietary behaviors were quenching thirst with still water, not sweetening hot drinks and not adding salt to food. The pHDI-10 and nHDI-14 values were of moderate severity. Adherence to treatment recommendations, including dietary recommendations, helps to prevent adverse and often dangerous complications of the disease. Therefore, health professionals should be proactive in educating patients from the very beginning of their disease and provide them with adequate counselling about dietary recommendations.

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The study procedure followed the principles of the Declaration of Helsinki (The World Medical Association, 2018), and the approval was obtained from the Bioethics Committee in Bielsko-Biała, Poland (No. 2018/11/15/3 dated 15.11.2018).

Artificial intelligence (AI) was not used in the creation of the manuscript.

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