

THE LEVEL OF KNOWLEDGE OF DIABETIC PREVENTION IN POLAND – IS THERE A PHENOMENON OF PLURALISTIC IGNORANCE?

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Abstract

Objectives: The main aim of this work is to assess the level of knowledge about diabetes prevention and the consequences of untreated diabetes in the Polish society, as well as to indicate the variables that have a significant impact on that knowledge. **Material and Methods:** The analysis is based on the results of the *National Multicenter Health Survey – WOBASZ II*. The number of subjects surveyed was 6170, including 2760 men and 3410 women, aged 20–74 years. Data on socio-demographic variables, lifestyle and subjective health assessment were collected using the face-to-face technique. **Results:** The results obtained in the WOBASZ II project showed that >85% of the respondents had an unsatisfactory level of knowledge about

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diabetes prevention methods and approximately to 85% of the respondents – about the consequences of untreated diabetes. Moreover, one-fourth of the respondents were unable to identify a single way of preventing diabetes, and more than one-third could not identify a single disease caused by diabetes. The risk of a lack of knowledge about diabetes prevention and the consequences of untreated diabetes is more common for men, people with a low level of education, not married, non-diabetic, and without diagnosed diabetes in the family. **Conclusions:** The presented results indicate that there is an prevailing lack of knowledge about diabetes prevention and the consequences of untreated diabetes in the Polish society. It is associated with several variables like: sex, level of education, age, marital status, subjective health assessment and diabetes diagnosed in the respondent and/or in the respondent's family. *Int J Occup Med Environ Health.* 2021;34(5)

Key words:

diabetes, level of knowledge, health literacy, WOBASZ II, diabetic prevention, questionnaire interview technique

INTRODUCTION

Diabetes, which is not only a huge health concern but also a major social and economic problem, constitutes one of the most dangerous diseases of modern civilization. Diabetes mellitus is classified as a metabolic disease, with an elevated blood glucose level (hyperglycemia) associated with abnormal secretion and/or insulin effect. Type 1 diabetes (insulin-dependent) affects 5–10% of diabetic patients and type 2 diabetes (non-insulin-dependent) >80% [1]. Diabetes leads to a number of disorders associated with damage to many organs including: diseases of the circulatory system, kidneys, nerves, eyes or peripheral vessels. It can also cause oral and pregnancy complications [2,3]. Moreover, people with diabetes also have a higher risk of developing infections [4]. If left untreated, it may eventually lead to death.

The World Health Organization (WHO) lists diabetes as one of the most common causes of death (rated eighth) [2,5]. The disease caused 1.5 million deaths in 2012 [6], and 1.6 million deaths in 2016 (i.e., deaths caused directly by diabetes). However, the International Diabetes Federation (IDF) estimates that these numbers are in fact much larger. According to data from 2015, 5 million people died because of diabetes (whether as the direct or indirect influence of diabetes) per year [7], so more than those who died because of HIV/AIDS, tuberculosis or malaria [8].

The costs of diabetes are high. In 2013, IDF stated that almost 11% of all healthcare funding accounted for expenditure related to diabetes treatment. This means that over USD 548 billion dollars were spent on it. These costs were

initially projected to increase to USD 627 billion dollars by 2035. However, these predictions have turned out inaccurate. According to IDF, already in 2019 diabetes caused at least USD 760 billion dollars in health expenditure – 10% of the total spending on adults. Due to the increase in the number of patients, it is estimated that these costs will rise to USD 776 billion dollars in 2045 [9]. The economic costs of diabetes are also connected with leaving the labor market by populations of working age.

The number of people with diabetes has increased dramatically in recent years. In 2015, IDF reported 415 million adult patients, which means that 1 in 11 adults suffered from this disease [8]. Four years later, IDF stated that 463 million adults lived with diabetes. Moreover, 232 million people with diabetes were undiagnosed. The IDF prognosis leaves no doubt that the rate of the disease growth will not decrease [9]. By 2030, it is predicted that more than half a billion people around the world will have suffered from diabetes [8], and by 2045 this will have risen to 700 million [9]. It is estimated that there are over 58 million people with diabetes in Europe [10], and 10% of the continent's population is expected to be affected by the disease by 2025. As estimated by IDF, there are more than 3 million adults with diabetes in Poland, which represents 8% of the population of the whole country (data from 2015) [8]. This figure will grow by another million by 2040, and soon about 11% of Poles will struggle with diabetes.

As further noted by IDF, both in the world and Poland, around 25–30% of adults do not have this kind of aware-

ness. Such a state of affairs appears alarming not only because of the serious complications and consequences of diabetes, but also because of how little is necessary to prevent the complications of the disease or simply to avoid it [8].

The main aim of this work is to assess the level of knowledge about diabetes prevention and the consequences of untreated diabetes in the Polish society, as well as to indicate the variables that have a significant impact on that knowledge.

MATERIAL AND METHODS

The analysis is based on the results of the National Multicenter Health Survey – WOBASZ II [11] – which was conducted in Poland in 2013–2014 as part of the National Prevention Program and Treatment of Cardiovascular Diseases POLKARD. The number of subjects surveyed was 6170, including 2760 men and 3410 women, aged 20–74 years. Data on socio-demographic variables, lifestyle and subjective health assessment were collected using the face-to-face technique [12]. The thematic area, presented in the article, refers to the following variables: preventive knowledge, age, sex, level of education, marital status, net income per capita in the family, subjective health assessment, diagnosed diabetes in the respondent, and/or in the respondent's family, and the respondent's excessive body weight.

While completing the questionnaire, the respondents were asked about their knowledge of how to prevent diabetes, as well as about the health consequences that are likely to arise in case the disease is left untreated. The questions were open-ended to the respondents but close-ended to the interviewers. In view of the fact that an unhealthy lifestyle, including a lack of physical activity, an unhealthy diet, overweight or obesity [8], is conducive to diabetes (especially type 2), in the first case, the following 6 preventive measures were highlighted: increased physical activity, decreased weight among overweight people,

a regular lifestyle, as well as reduced fat, carbohydrates and alcohol consumption. It was arbitrarily assumed that, if the respondent had a full prophylactic knowledge, he/she would be able to name all, or almost all, methods, and such a knowledge would represent an essential element of his/her healthy lifestyle. On the other hand, the respondents who were unable to name a single method of diabetes prevention were characterized by preventive ignorance. In addition, 2 other categories of respondents were extracted: listing 1–3 methods was considered having a rather bad, and mentioning 4–5 methods rather good, knowledge of diabetes prevention.

Dealing with diabetes is not only a matter of life comfort. If left untreated, it may lead to a variety of complications and/or premature death. The maximum awareness adopted by the WOBASZ II project in the case of the consequences of untreated diabetes was the respondent's listing 4 options: cardiovascular diseases, kidney, eye and peripheral vascular diseases. Similar as in the case of non-pharmacological methods for the prevention of diabetes, researchers also pointed groups of respondents with a bad (1–2 indications) vs. good (3 indications) knowledge about the consequences of untreated diabetes, and a group of those who had no knowledge of this topic (0 indications). The respondents were also asked to evaluate their health status, and this subjective health assessment constituted an additional criterion for the analysis, alongside socio-demographic characteristics.

The research protocol was approved by the Bioethics Committee of the Institute of Cardiology in Warsaw, Poland. Written informed consent was obtained from each participant, and the rule of full anonymity was in force.

The χ^2 test was implemented to compare the frequency, and to assess the statistical significance of the categories of quantitative characteristics in the analyzed groups. A univariate and multivariate logistic regression analysis was carried out to identify the factors that could contribute to the level of knowledge about diabetes prevention

and about its consequences. The results were shown as odds ratios (ORs) with 95% confidence interval (CI). Statistically significant variables in the univariate analysis for which $p < 0.05$ were included in the multivariate model. Only those factors that had a statistical effect on the dependent variable were included in the final multivariate model. Statistical analyses were conducted using Statistica v. 12.5 of the PL (StatSoft.pl).

RESULTS

Data from the WOBASZ II project show that >85% of the respondents had an unsatisfactory level of knowledge of diabetes prevention methods (they were able to point ≤ 3 out of 6 methods). Moreover, one-fourth of the respondents were unable to identify even 1 way of preventing diabetes. Only 3.6% of the respondents showed a very good level of knowledge indicating all 6 non-pharmacological ways of reducing the risk factors. People with elementary education prevailed among the subjects who were unable to point out a single diabetes prevention method. As the level of education increased, the proportion of the respondents with a lack of knowledge about how to reduce the risk factors for diabetes declined.

Similar as in the case of non-pharmacological ways of preventing diabetes, approx. 85% of the respondents showed an unsatisfactory level of knowledge as regards the consequences of untreated diabetes, listing ≤ 2 such consequences. However, in this case, the proportion of the respondents who had no knowledge of the subject was >37% (more than one-third of the respondents could not identify a single disease caused by diabetes). The education variable was statistically significant again – the higher the declared level of education, the lower the percentage of the respondents with preventive ignorance about the consequences of diabetes (Table 1).

The results obtained in the WOBASZ II project showed that the risk of a lack of knowledge about diabetes prevention and the consequences of untreated diabetes is

associated with several variables. The use of a multifactor reverse logistic regression indicated that the lack of knowledge about how to prevent diabetes was statistically significantly correlated with such variables as sex, level of education, marital status and subjective health assessment. Equally important was the diagnosis of diabetes in the respondent and/or in the respondent's family, as well as the diagnosis of obesity.

The analyses indicated that the risk of a lack of knowledge about how to prevent diabetes was 1.5 times higher in men than in women. The respondents' level of education had a great significance. People with secondary education had a 30% higher, and people with elementary education >2.5 times higher, risk of a lack of knowledge about diabetes prevention than those with university education. Another important variable was the marital status of the respondents. The results of the analysis showed that the risk of a lack of knowledge was 30% higher among those respondents who were single (spinster/bachelor) than in married people. The experience of diabetes diagnosed in the respondent or the respondent's family was another significant variable for the level of knowledge about diabetes prophylaxis. It was revealed that those individuals who were not diagnosed with diabetes had a 3-fold higher risk of a lack of knowledge on how to prevent this disease. A similar observation was made regarding the subjects who had no family member diagnosed with diabetes; this risk was 30% higher than in those who experienced the disease in their immediate vicinity.

Variables related to the respondents' health status were also found to be important. Those subjects who were not diagnosed with obesity had a >40% higher risk of a lack of knowledge on how to prevent diabetes. Moreover, people assessing their health as bad or very bad had a 55% greater risk of a lack of knowledge about preventing diabetes than people with a very good subjective health assessment.

In contrast, a lack of knowledge about the consequences of untreated diabetes was statistically significantly corre-

Table 1. The level of knowledge about diabetes prevention and the consequences of untreated diabetes by level of education, based on the results of the National Multicenter Health Survey – WOBASZ II conducted in Poland in 2013–2014 involving 6170 participants

Level of knowledge	Participants (N = 6162)							
	elementary education (N = 2526)		secondary education (N = 2405)		university (N = 1231)		total	
	n	%	n	%	n	%	n	%
Diabetes prevention^a								
lack of knowledge	860	34.0	506	21.0	207	16.8	1573	25.5
low	1445	57.2	1499	62.3	765	62.1	3709	60.2
good	178	7.0	295	12.3	188	15.3	661	10.7
very good	43	1.7	105	4.4	71	5.8	219	3.6
Untreated diabetes consequences^b								
lack of knowledge	1199	47.5	771	32.1	316	25.7	2286	37.1
low	1031	40.8	1150	47.8	603	49.0	2784	45.2
good	224	8.9	315	13.1	186	15.1	725	11.8
very good	72	2.9	169	7.0	126	10.2	367	6.0

^a $\chi^2 = 240.443$, $p < 0.001$; ^b $\chi^2 = 260.042$, $p < 0.001$.

lated with such variables as sex, age, level of education, marital status, and the diagnosis of diabetes in the respondent and/or in the respondent's family (Table 2).

Compared to women, men had a 36% higher risk of a lack of knowledge about the diseases caused by untreated diabetes. The risk of a lack of knowledge was diminished with the subjects' age. The respondents aged 18–34 years were characterized by a 71% higher risk of a lack of any knowledge of the consequences of untreated diabetes than people aged >55 years. A similar trend was observed in the education variable. The higher the level of education, the lower the risk of a lack of knowledge. The respondents with secondary education had a 45% higher risk of a lack of knowledge about diabetes-induced diseases, and those with elementary education >3 times higher (OR = 3.37), than the respondents with university education.

The marital status of the surveyed was also a non-negligible factor. The risk of a lack of knowledge in single

persons was about 34%, and in those widowed/divorced/in separation about 20%, higher than in married people. Similar as in the case of the knowledge of diabetic prophylaxis, the level of knowledge about the consequences of untreated diabetes was dependent on the experience of the disease by the respondent or his/her family members. The people who were not diagnosed with diabetes had a >2.5 times (OR = 2.71) greater risk of a lack of knowledge. The respondents who did not have any family member suffering from diabetes had a 41% greater risk of having no such knowledge than those who experienced the disease in the immediate vicinity.

It is also worth noting that the people who were unable to indicate even 1 disease caused by untreated diabetes were very frequently (>72%) characterized by ignorance of diabetic prophylaxis, so they were also unable to indicate even a single non-pharmacological disease prevention method.

Table 2. The lack of knowledge concerning non-pharmacological methods of preventing diabetes and untreated diabetes in the WOBASZ II studies: the results of univariate and multivariate logistic regression, based on the results of the National Multicenter Health Survey – WOBASZ II conducted in Poland in 2013–2014 involving 6170 participants

Variable	Non-pharmacological methods of preventing diabetes										Untreated diabetes						
	participants (N = 6170) ^a					participants (N = 6170) ^a					single-factor logistic regression		multi-factor logistic regression				
	with no knowledge		with no knowledge		total [n]	single-factor logistic regression		multi-factor logistic regression		total [n]	single-factor logistic regression		multi-factor logistic regression				
	n	%	n	%		OR	95% CI	OR	95% CI		OR	95% CI	OR	95% CI			
Sex																	
women	3410	737	21.6	1.00	ref.	1.00	ref.	1.00	ref.	3410	1120	32.8	1.00	ref.	1.00	ref.	
men	2760	838	30.4	1.58***	1.41–1.77	1.48***	1.30–1.69	1.30–1.69	2760	1168	42.3	1.50***	1.35–1.66	1.36***	1.21–1.53		
Age																	
18–34 years	1377	359	26.1	1.02	0.88–1.19				1377	583	42.3	1.24***	1.09–1.42	1.71***	1.42–2.05		
35–54 years	2288	573	25.0	0.97	0.85–1.10				2288	776	33.9	0.87*	0.77–0.98	1.03	0.90–1.18		
≥55 years	2504	643	25.7	1.00	ref.				2504	929	37.1	1.00	ref.	1.00	ref.		
Level of education																	
elementary	2526	860	34.1	2.55***	2.15–3.03	2.58***	2.13–3.12	2.13–3.12	2526	1199	47.5	2.62***	2.25–3.04	3.37***	2.83–4.01		
secondary	2405	506	21.0	1.31**	1.10–1.58	1.30**	1.07–1.57	1.07–1.57	2405	771	32.1	1.37***	1.17–1.59	1.45***	1.23–1.71		
university	1231	270	16.8	1.00	ref.	1.00	ref.	ref.	1231	316	25.6	1.00	ref.	1.00	ref.		
Marital status																	
married	4109	1007	24.5	1.00	ref.	1.00	ref.	ref.	4109	1432	34.9	1.00	ref.	1.00	ref.		
spinster/bachelor	1056	302	28.6	1.23**	1.06–1.43	1.30**	1.09–1.54	1.09–1.54	1056	475	45.0	1.53***	1.33–1.75	1.34***	1.13–1.58		
widowed/divorced/in separation	1004	266	26.5	1.11	0.95–1.30	1.15	0.96–1.37	0.96–1.37	1004	381	38.0	1.14	0.99–1.32	1.20*	1.01–1.42		
Income per capita																	
<1000 PLN	2323	667	28.7	1.84***	1.27–2.66				2323	974	41.9	1.68***	1.23–2.28				
1001–2000 PLN	2101	497	23.7	1.42	0.98–2.05				2101	685	32.6	1.12	0.82–1.53				
2001–3000 PLN	527	93	17.6	0.98	0.64–1.49				527	160	30.4	1.01	0.71–1.44				
>3000 PLN	206	37	18.0	1.00	ref.				206	62	30.1	1.00	ref.				

Subjective health assessment												
very good	671	167	24.9	1.00	ref.	671	258	38.5	1.08	0.85–1.37		
good	3401	838	24.6	0.99	0.81–1.19	3401	1256	36.9	1.02	0.84–1.22		
mediocre	1072	437	25.7	1.04	0.85–1.28	1072	622	36.6	1.00	0.84–1.18		
poor	268	91	34.0	1.55**	1.14–2.11	268	98	36.6	1.00	ref.		
Diagnosis												
diabetes												
in the respondent												
yes	488	60	12.3	1.00	ref.	488	97	19.9	1.00	ref.	1.00	ref.
no	5560	1494	26.9	2.62***	1.99–3.46	5560	2158	38.8	2.56***	2.03–3.21	2.71***	2.09–3.53
in the respondent's family												
yes	2296	486	21.2	1.00	ref.	2296	708	30.8	1.00	ref.	1.00	ref.
no	3444	966	28.1	1.45***	1.28–1.64	3444	1386	40.2	1.51***	1.35–1.69	1.41***	1.25–1.59
obesity												
in the respondent												
yes	1484	285	19.2	1.00	ref.	1484	467	31.5	1.00	ref.		
no	4594	1261	27.5	1.59***	1.38–1.84	4594	1778	38.7	1.38***	1.21–1.56		

* p < 0.05, ** p < 0.01, *** p < 0.001.

^a The number of participants may vary for different variables due to data gaps.

DISCUSSION

The results obtained in the WOBASZ II project have shown that the level of knowledge about how to prevent diabetes and its consequences in the Polish society is very low. Generally, over 85% of the respondents had an unsatisfactory level of knowledge of diabetes prevention methods and almost the same percentage of the respondents – about the consequences of untreated diabetes. Moreover, one-fourth of the respondents were unable to identify even 1 way of preventing diabetes, and more than one-third could not identify a single disease caused by diabetes. The people who were unable to indicate even 1 disease caused by untreated diabetes were very frequently (>72%) characterized by ignorance of diabetic prophylaxis, so they were also unable to indicate a single non-pharmacological disease prevention method.

A lack of basic knowledge about diabetes leads to ignoring the first symptoms of the disease, and also to late diagnosis and an increasing number of people suffering from this disease. Comparing the results obtained in the WOBASZ (2003–2005) and WOBASZ II (2013–2014) projects, the prevalence of diabetes in Poland is similar to that observed in other European populations and has increased significantly over the last decade [13]. In 2014, Poland was ranked 13th, out of 44 European countries, in terms of the proportion of adults with diabetes among men and 15th among women [14]. As reported by IDF, the number of diabetic patients in Poland in 2017 was >2.23 million. This means that 7.6% of the Polish population suffered from diabetes [10]. According to the Department of Analysis and Strategy of the National Health Fund in Poland, in 2018 the number of registered patients was 2.86 million. It was estimated that other 1.7 million people were unaware of their disease. The annual increase in morbidity was 3.7%, which is associated with Poles' lifestyle, overweight [15], a low level of physical activity [16], changes in the demographic structure [17], as well as a lack of preventive knowledge or no concern for their own health [18].

The Polish Diabetes Society reports that in 10 years there will be about 5 million diabetic patients in Poland [19].

A substantial number of registered patients with diabetes is not the only problem in Poland. The other one is connected with the fact that many patients are unaware of their disease. Late detection of the disease causes an increase in the number of amputations of the lower extremities due to diabetes. According to the OECD data (2019), Poland was in the 10th place, out of the 31 countries surveyed, with the highest rate of lower limb amputations in people with diabetes per 100 000 people [20]. The value of this indicator increases every year. In 2014–2018, the number of amputations due to diabetes increased by 22.5%. The percentage of amputations performed in diabetic patients among all amputations also increased, to 60.1%. Late complications of diabetes, including diabetic retinopathy, kidney failure, ischemic heart disease and stroke, still pose the main health problem. Among all patients with renal insufficiency, coronary heart disease or stroke, 30–40% were diabetics. As reported by IDF in 2015, about 21 500 people died in Poland per year because of diabetes. However, these data were based on the direct causes stated in death cards, without taking into account the share of complications caused by diabetes.

In Poland, the cost of diabetes treatment is also rising rapidly. The cost of diabetes treatment in 2013 ranged PLN 7–12 billion (depending on the methodology used) [21,22]. As reported by IDF, that cost per person in 2017 amounted to >USD 1.1 thousand dollars. However, the money spent on treatment is not the only economic cost of diabetes. The disease is also linked to labor market productivity.

In Poland, about 10% of patients with type 1 diabetes, and 65–75% of those with type 2 diabetes, quit their jobs or are dismissed. This is related to quite a stereotypical thinking about a working diabetic, the fear of numerous absences of an employee and his/her lower productivity. Due to the fear of losing their job, many people with dia-

betes do not admit their illness, do not use their benefits in the workplace (shorter daily working hours and longer holidays), and accept working conditions that can negatively affect the process of the disease [23]. Meanwhile, both international and Polish recommendations suggest that diabetes cannot be the cause of discrimination or unequal treatment in the workplace, and that occupational restrictions should be considered on a case-by-case basis [24]. Occupational activity of people suffering from diabetes not only guarantees them and their families financial stability, but also affects their mental health, gives a sense of value and independence, as well as helps to maintain social relationships.

Working conditions can not only affect the process of the disease, but also contribute to its development. People working at night, often taking overtime, having sedentary work or exposed to permanent stress in the workplace are at a higher risk of developing diabetes. It, therefore, underlines the need for diabetes screening among people at risk of occupational nuisance, as well as the need for education aimed at modifying the lifestyles of office workers, including greater physical activity and weight reduction, reduction of stressors, improved psychosocial conditions, as well as access to healthy food and opportunities for walking breaks in the workplace [24].

Given the social, economic and health-related costs of diabetes, the low level of knowledge about how to prevent diabetes and its consequences in the Polish society may be a concern. The data from the WOBASZ II project showed that almost every third man, and more than every fifth woman, participating in the study had no knowledge of how to prevent diabetes. However, when the reference point was the knowledge of the diseases and complications that can provoke untreated diabetes, these areas of prophylactic ignorance significantly increased. The Poles' low level of knowledge about diabetes has also been confirmed in other studies [7,25]. According to the European Diabetes Awareness Survey, which took place in 8 EU

countries, the majority of European societies did not have a sufficient knowledge about diabetes and Poland had the lowest level of knowledge about diabetes complications and the availability of treatment [26]. Interestingly, 1 in 10 Polish respondents considered diabetes to be an infectious disease or they were not certain about it, and a significant proportion of Polish respondents never performed a blood sugar test.

A low level of health literacy increases the risk of a sharp increase in diabetes morbidity, as a result of an unhealthy lifestyle. In addition, it often delays the start of the treatment process due to failure to recognize the symptoms of the disease. The *European Health Literacy Survey* [27], which used the *Health Literacy Survey European Questionnaire 47*, indicated that the respondents had a low level of health literacy [28]. In the case of Poland, almost half of the respondents had an insufficient level of health literacy. The area where respondents had the greatest deficiencies concerned the disease prevention. Health literacy is the primary indicator determining health decisions and the consequences of those decisions. Their high level is a key factor in health and well-being, thus reducing health inequalities.

CONCLUSIONS

Data from the WOBASZ II project showed that the level of knowledge about diabetes in the Polish society is very low. About 85% of the respondents had an unsatisfactory level of knowledge of diabetes prevention methods and the consequences of untreated diabetes.

The risk of a lack of knowledge about diabetes prevention and the consequences of untreated diabetes is associated with several variables including sex, level of education, age, marital status, subjective health assessment, and diabetes diagnosed in the respondent and/or in the respondent's family. The analyses indicated that the risk of a lack of knowledge about how to prevent diabetes was higher in men, as well as in people with a low level of education, not married, without obesity, non-diabetic and without diag-

nosed diabetes in the family. The risk of a lack of knowledge about the consequences of untreated diabetes was also higher in men, as well as in people with a low level of education, not married, young, non-diabetic and without diagnosed diabetes in the family.

There can be many reasons for those observations. There are still many myths and stereotypical thinking around diabetes in Poland, which give rise to misunderstanding and fear. It seems that many people do not want to allow themselves to even consider the possibility of being sick and deny the problem for as long as possible. Unfortunately, this leads to late diagnosis, a more severe process of the disease, and an increase in the number of amputations of the lower extremities.

People with a lower level of education often have a low level of health literacy, which is manifested by their inability to find reliable information on the disease prevention, as well as to understand and apply the acquired knowledge in practice. In the case of the Polish society, the problem of ignorance, reluctance and fear of using preventive examinations is also highlighted. This applies primarily to men, young and middle-aged people, and to those with a low level of education.

In Poland, there are regular social campaigns aimed at raising the awareness about diabetes, prevention opportunities and the risks associated with this disease. However, studies indicate that the rate of improvement is too slow and the state of knowledge is still definitely insufficient [7,29]. Taking this into account, according to the Strategies for Prevention and Treatment of Diabetes in Poland, this disease in Poland needs to be redefined. It should be defined as a social disease and must not be considered only in the medical aspect. The main goals are to increase detection, to reduce the incidence of diabetes, and to decrease the incidence of complications [22]. Systemic solutions are needed, and one of the most important aspects is the general education of society regarding the risks posed by this disease and, above all, its preventive methods.

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REFERENCES

1. Opielak G, Piotrkowicz J, Szeszko Ł, Tsyganok M, Dmowski K, Szymanek L. [Hypertension and diabetes – the most common causes of sudden medical interventions]. *Med Rodz.* 2013;2: 41–3. Polish.
2. Drągowski P, Czyżewska U, Cekała E, Lange P, Zadykowicz R, Sójka A, et al. [Diabetes as a social and economic problem]. *Polish Rev Health Sci.* 2014;2(39):163–6. Polish.
3. American Diabetes Association. Standards of medical care in diabetes – 2016: Summary of revisions. *Diabetes Care.* 2016; 39(supplement 1):4–5, <https://doi.org/10.2337/dc16-S003>.
4. International Diabetes Federation [Internet]. Brussels: The Federation; 2020 [cited 2020 Jul 28]. Diabetes complications. Available from: <https://idf.org/aboutdiabetes/complications.html>.
5. GBD 2013 Risk Factors Collaborators, Forouzanfar MH, Alexander L, Anderson HR, Bachman VF, Biryukov S, et al. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or cluster risks in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet.* 2015;386(10010):2287–323, [https://doi.org/10.1016/S0140-6736\(15\)00128-2](https://doi.org/10.1016/S0140-6736(15)00128-2).
6. World Health Organization [Internet]. Geneva: The Organization; 2018 [cited 2020 Jul 21]. The top 10 causes of death. Available from: <http://www.who.int/mediacentre/factsheets/fs310/en/>.
7. Sobierajski T. [Study results: a social picture of diabetes. Report]. Warsaw: Coalition to Fight Diabetes; 2017. Polish
8. International Diabetes Federation [Internet]. Brussels: The Federation; 2015 [cited 2020 Aug 10]. Diabetes Atlas. 7th ed. Available from: <https://idf.org/e-library/epidemiology-research/diabetes-atlas.html>.
9. International Diabetes Federation [Internet]. Brussels: The Federation; 2019 [cited 2020 Aug 11]. Diabetes Atlas.

- 9th ed. Available from: <https://idf.org/e-library/epidemiology-research/diabetes-atlas.html>.
10. International Diabetes Federation [Internet]. Brussels: The Federation; 2017 [cited 2020 Aug 8]. Diabetes Atlas. 8th ed. Available from: <https://idf.org/e-library/epidemiology-research/diabetes-atlas.html>.
 11. Drygas W, Niklas AA, Piwońska A, Piotrowski W, Flotyńska A, Kwaśniewska M, et al. Multi-centre National Population Health Examination Survey (WOBASZ II study): assumptions, methods, and implementation. *Kardiol Pol.* 2016;74(7):681–90, <https://doi.org/10.5603/KP.a2015.0235>.
 12. McDowell I. *Measuring Health: A Guide to Rating Scales and Questionnaires.* 3 ed. New York: Oxford University Press; 2006.
 13. Rutkowski M, Wojciechowska A, Śmigielski W, Drygas W, Piwońska A, Pająk A, et al. Prevalence of diabetes and impaired fasting glucose in Poland in 2005–2014: results of the WOBASZ surveys. *Diabetes Med.* 2020;(2020):1–8, <https://doi.org/10.1111/dme.14333>.
 14. NCD Risk Factor Collaboration. Worldwide trends in diabetes since 1980: a pooled analysis of 751 population-based studies with 4.4 million participants. *Lancet.* 2016; 387(10027):1513–30, [https://doi.org/10.1016/S0140-6736\(16\)00618-8](https://doi.org/10.1016/S0140-6736(16)00618-8).
 15. Stepaniak U, Micek A, Waśkiewicz A, Bielecki W, Drygas W, Janion M, et al. Prevalence of general and abdominal obesity and overweight among adults in Poland Results of the WOBASZ II study (2013–2014) and comparison with the WOBASZ study (2003–2005). *Pol Arch Med Wewn.* 2016;126(9):662–71, <https://doi.org/10.20452/pamw.3499>.
 16. Kwaśniewska M, Pikala M, Bielecki W, Dziańkowska-Zaborszczyk E, Rębowska E, Kozakiewicz K, et al. Ten-Year Changes in the Prevalence and Socio-Demographic Determinants of Physical Activity among Polish Adults Aged 20 to 74 Years. Results of the National Multicenter Health Surveys WOBASZ (2003–2005) and WOBASZ II (2013–2014). *PLOS ONE.* 2016;11(6):e0156766, <https://doi.org/10.1371/journal.pone.0156766>.
 17. Klimek M, Knap J, Tulwin T, Trojnar M, Dzida G. [Evaluation of the relationship between the prevalence of diabetes and selected demographic factors]. *Clin Diabetol.* 2018;7(3):145–50, <https://doi.org/10.5603/DK.2018.0010>.
 18. Piwońska A, Piotrowski W, Kozela M, Pająk A, Nadrowski P, Kozakiewicz K, et al. Cardiovascular diseases prevention in Poland: results of WOBASZ and WOBASZ II studies. *Kardiol Pol.* 2018;76(11):1534–41, <https://doi.org/10.5603/KP.a2018.0154>.
 19. National Health Fund [Internet]. Warsaw: The Fund; 2019 [cited 2020 Aug 04]. [NHF on health. Diabetes]. Available from: https://zdrowedane.nfz.gov.pl/pluginfile.php/205/mod_resource/content/4/nfz_o_zdrowiu_cukrzyca.pdf. Polish.
 20. Organization for Economic Cooperation and Development [Internet]. Paris: The Organization; 2018 [cited 2020 Aug 5]. Health at a Glance: Europe 2018. State of health in the EU Cycle. Available from: https://www.oecd-ilibrary.org/docserver/health_glance_eur-2018-en.
 21. [Diabetes. Hidden pandemic. The situation in Poland. 2014 edition]. Warsaw: Novo Nordisk; 2014. Polish.
 22. Institute of Patient Rights and Health Education [Internet]. Warsaw: The Organization; 2015 [cited 2020 Aug 03]. [Diabetes 2025. Strategy for prevention and treatment of diabetes in Poland]. Available from: <http://ippez.pl/wp-content/uploads/2019/03/Cukrzyca-20251.pdf>. Polish.
 23. Bilski B, Perz S, Kara-Perz H. [Diabetes mellitus – a problem for occupational medicine physicians]. *Med Pr.* 2005; 56(4):329–34. Polish.
 24. Marcinkiewicz A, Radomska A, Hanke W, Walusiak-Skorupa J. [Can diabetes be treated as an indirectly work-related disease?]. *Med Pr.* 2017;68(5):667–75, <https://doi.org/10.13075/mp.5893.00584>. Polish.
 25. Kalinowski P, Bojakowska U, Kowalska ME. [Assessment of patients' knowledge about the complications of diabetes]. *Med Og Nauk Zdr.* 2012;18(4):302–7. Polish.
 26. Kordas A. [The latest results from the European Diabetes Awareness Survey] [Internet]. Poznan: Termedia; 2011 [cited 2020 Aug 02]. Available from: <https://www.termedia.pl/>

- mz/Najnowsze-wyniki-europejskiego-badania-swiadomosci-cukrzycy,5151.html. Polish.
27. Niedostys B, Chrzan-Rodak A, Bartoszek A, Ślusarska B. [Competence of health (Health Literacy) – a review of research using the European Health Competence Questionnaire (HLS-EU-Q47) in 2010–2018]. *Hygeia Public Health*. 2019;54(2):105–13. Polish.
28. Sørensen K, Pelikan JM, Röthlin F, Ganahl K, Slonska Z, Doyle G et al. Health Literacy in Europe: comparative results of the European Health Literacy survey (HLS-EU). *Eur J Public Health*. 2015;25(6):1053–8, <https://doi.org/10.1093/eurpub/ckv043>.
29. Sobierajski T. [Study results: a social picture of diabetes. Report]. Warsaw: Coalition to Fight Diabetes; 2010. Polish.