

The Family Knowledge about the Disease and Complications Risk among Diabetic Patients-in Poland

Anna Abramczyk*

Department of Nursing, Faculty of Medicine, University of Warmia and Mazury in Olsztyn, Poland

Abstract

Taking care of diabetic patients involves a family which is perceived as an environment, whose support is a factor that best forecasts implementation of required recommendations for diabetes care. The ability of family to support patients' effort can improve diabetes care results. The aim of this work is to indicate how family knowledge about the disease diversifies a medical condition and complications risk among diabetic patients. Research has been carried out within the scope of NCSR grant no. 6P05D02320, under the leadership of the work's author, among 1366 families/caregivers of diabetic patients randomly chosen from 61 primary healthcare centres in Poland. For the purpose of this work, the research has been carried out based on: anonymous questionnaires among patients' families/caregivers, analysis of medical records.

Results: The majority of families supporting the patient have no knowledge about the disease (56.2%). Among families with higher (moderate) knowledge level a statistical analysis demonstrated that the patient takes more care about oral hygiene ($p < 0.00001$), participates in self-control ($p < 0.00001$) and self-monitoring ($p < 0.05$), is more efficient and independent ($p < 0.00001$), have no somatic ($p < 0.005$) or psycho-emotional health complains ($p < 0.005$) or additional medical conditions ($p < 0.005$) and his/her weight ($p < 0.0005$) blood pressure ($p < 0.005$) and triglycerides level ($p < 0.05$) are in the normal range.

Conclusions: 1. Family knowledge about the disease is a significant factor that diversifies a medical condition of diabetic patients. 2. Higher knowledge level of the family about the disease improves patients' medical condition and reduces the risk of diabetes complications.

Keywords: Results of family knowledge; Diabetes; Risk of complications

Introduction

Diabetes is an issue of people around the globe [1]. Research shows that 8.3% of adults (over 170 million people) suffer from diabetes around the world [2,3], and every 4 out of 5 patients live in the countries of low or average level of salary [4]. According to estimates, there are 8.4% adults (over 55 million people) [4] suffering from diabetes in the region of Europe, including over 3 millions in Poland (10.64% of the adult population). Diabetes that lasts for years can lead to many complications in the cardiovascular system [5], retinopathy [6], neuropathy [6,7], renal insufficiency and even death [7,8]. Ischemic heart disease is the most frequent case of macroangiopathy and cause of death among people suffering from diabetes [9,10]. The risk of death due to heart diseases is 2-4 times higher in diabetes patients than in non-diabetes adults [10], with heart diseases causing around 65% of all deaths of people who suffer from diabetes [9,11]. Diabetes increases the risk of stroke by 2-8 times [12,13], and even 12 times if a patient suffers from arterial hypertension and diabetes at the same time [14]. On top of that, in Poland the mortality related to stroke is higher than in the USA and some countries of Western Europe [15]. Patients with a long history of diabetes make 8-10% of the group of people with poor vision or blind people [16]. Also, nephropathy is more frequent in diabetes patients than in the overall population [17]. Diabetes is the main cause of end-stage renal insufficiency in the USA, Japan and Europe [18-20]. The diabetes foot is another serious issue for the diabetics and leads to a greater risk of recurring ulcers, amputations and even death [21,22]. The rising mortality rate is also caused by diabetic neuropathy [23] which co-exists with other complications and is one of their preceding symptoms [24]. Studies show that over 80% of deaths related to diabetes occur in countries where salaries are low or average [25], with the risk of death being two or more times higher among people with diabetes

[26]. According to WHO, in 2030 diabetes will become the seventh most frequent cause of death worldwide [7]. The serious complications which increase the costs of health care, incidence of disabilities and early death among people suffering from diabetes make this disease one of the greatest challenges for the public health of the 21st century [3,4,27].

The relationship between the treatment of a chronic disease and the family situation requires that the provisioning of patient care is combined with involvement of the patient's family [28]. Patients and their families are the main parties burdened with and rendering care for chronic disease patients [28]. The care is more effective when the social environment of a patient (i.e. the family) supports his/her treatment [28,29].

By rendering care the family provides emotional support, ensures the appropriate conditions of treatment, motivates the patient to stay healthy, performs nursing activities for the patient and helps him/her in the everyday duties [29,30]. In the case of diabetes patients, the family is a crucial factor impacting the regular implementation of medical recommendations for treatment of diabetes [29,31].

*Corresponding author: Anna Abramczyk, Department of Nursing, Faculty of Medicine, University of Warmia and Mazury in Olsztyn, Poland, Tel: +48 89 524 61 01; Fax: +48 89 524 61 14; E-mail: wesola2000@2com.pl

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If prepared and trained properly, the patients, their families and friends could provide the right environment for administration of hypoglycaemic drugs and ensure the right time of administration (drugs vs. meals) in order to avoid errors in patient care [32].

If the family is not prepared appropriately to support the chronically ill patient, many adverse implications, including health risks for the patient could occur. Negative consequences of errors in drug administration, such as intensified risk of complications, increased incidence of diseases, physical disability and even death [33-36], put special focus on education and collaboration of health care professionals with respect to patients and their caregivers alike, because it will improve the competences in the area of chronic disease management [33,37,38].

The aim of this work is to indicate how family knowledge about the disease diversifies a medical condition and complications risk among diabetic patients.

Materials and Methods

The 2001-2004 research project was aimed at identifying the condition of the primary health care in Poland related to diabetes patients.

One of the objectives was to verify the connection between the knowledge of diabetes among families and the risk of complications among people suffering from diabetes.

The study method, population sampling and the study toolkit (original questionnaires tested in prior pilot runs) were approved by the Committee for Scientific Research (KBN) in Warsaw and the Commission of Bioethics of Medical University (UM) in Wrocław.

The study uses a random sample to ensure that conclusions apply to the overall population of diabetics in terms of the primary health care [39]. As the population is very diversified in terms of the studies variables, such as the place of residence (cities, villages), and because there is no reliable sampling frame, the sample was selected using the stratified sampling method. The stratified sampling was chosen also because of the financial cost of the study [40]. The population of diabetics was divided into certain groups from which a certain number of elements were sampled. Every subject in the population belonged to one group only [39]. Based on the register of diabetes-related PHC and outpatient service providers and the administrative structure of Poland (16 provinces), the following were sampled in every province:

- 1 district with a diabetes clinic;
- 1 district with no diabetes clinic;

Next, the following was sampled

- 1 PHC facility in the capital of every province (16 facilities in total);
- 1 PHC facility in the district-level town in a district with a diabetes clinic, and 1 PHC facility in a rural area of that district (Tables 1 and 2).

Because of certain choice of services contracted by diabetes outpatient clinics and due to the nature of the administrative structure of Poland, in the provinces of Pomorskie, Śląskie there were less than 5 PHC facilities that qualified to the sample in line with the sampling criteria (Table 1). There were teams consisting of one family doctor and one family nurse deployed in 77 PHC facilities in Poland. If one team resigned, another team was prepared in the next PHC facility selected randomly. Since not all the facilities which declared to co-operate submitted study materials, the subsequent analysis covered the data

Province	Number of selected facilities in every province	Number of facilities which submitted study materials	Number of facilities which did not submit study materials
Dolnośląskie	5	3	2
Kujawsko-pomorskie	5	4	1
Lubelskie	5	4	1
Lubuskie	5	3	2
Łódzkie	5	4	1
Małopolskie	5	4	1
Mazowieckie	5	4	1
Opolskie	5	5	0
Podkarpackie	5	3	2
Podlaskie	5	5	0
Pomorskie **)	3	2	1
Śląskie *)	4	4	0
Świętokrzyskie	5	4	1
Warmińsko-mazurskie	5	4	1
Wielkopolskie	5	4	1
Zachodniopomorskie	5	4	1
Total	77	61	16

*) no rural area in the district with no diabetes clinic
 **) no district without a diabetes clinic

Table 1: Primary health care facilities selected for the study (province level).

Studied area	PHC facilities		Study materials submitted		Study materials not submitted	
	N	%	N	%	N	%
Capital of a province	16	100	13	81.2	3	18.8
District-level town in a district with a diabetes clinic	16	100	14	87.5	2	12.5
Village in a district with a diabetes clinic	16	100	13	81.2	3	18.8
District-level town in a district with no diabetes clinic	15	100	10	66.6	5	33.4
Village in a district with no diabetes clinic	14	100	11	78.6	3	21.4
Total	77	100	61	79.2	16	20.8

Table 2: Studied area.

Studied area	Study covered		Qualified to next stage analysis		Not qualified to next stage analysis*)	
	N	%	N	%	N	%
Capital of a province	498	22.6	438	22.0	60	27.6
District-level town in a district with a diabetes clinic	526	23.9	484	24.4	42	19.4
Village in a district with a diabetes clinic	419	19.0	351	17.7	68	31.3
District-level town in a district with no diabetes clinic	343	15.6	317	16.0	26	12.0
Village in a district with no diabetes clinic	417	18.9	396	19.9	21	9.7
Total	2203	100	1986	90.2	217	9.8

*) As many pieces of data were missing, study materials from 217 patients have not been qualified for the next stage analysis.

Table 3: Study material classification for next stage analysis based on the studied areas.

from 61 facilities (Tables 1 and 2). The patient sample is mixed and derived from a closed population which was selected in a complex, multi-stage, stratified/cluster sampling [40,41]. The study covered all the patients who were registered with a given family doctor and a given family nurse in the respective PHC facility. The doctors, nurses, patients and their families participated in the study on a voluntary basis. For the

purpose of this study, research was carried out among 1,366 families and care providers and among 1,986 patients with diabetes from 61 randomly chosen national primary health care service units, within the scope of NCSR grant no 6P05D02320, managed by the author of this work.

In the respective facilities, the study took up to 6 months but not less than 3 months. For the purpose of this work, the research was carried out on the basis of [37,42-44]:

1. Nurse anamnesis (carried in the diabetes patient environment) including the following: patients knowledge on (questionnaire in Table 3): selected indices concerned with diabetes treatment (body mass, blood pressure, glycaemia, glucosuria, total blood cholesterol, hypoglycaemia), basic issues of diabetes treatment (causes of the disease, prevention of acute and chronic diabetes complications, diet, physical activity, feet hygiene, self-control, and diabetes pharmacotherapy) patients behavior, including: physical activity, alcohol, cigarettes, diet, feet care, whole body hygiene, mouth and teeth hygiene, treatment modifications within limits stated by the physician, taking drugs, contacting the GP, participation in laboratory examinations, feet and mouth observations, somatic complaints, and psycho-emotional disorders lasting over 2 weeks, factors that hinder fulfillment of the recommendations of diabetes treatment, care and nursing possibilities of the whole family of the patient, patient's social functioning (participation in family, marital, professional, and social life, as well as in social organizations), supply in agents and devices, that help in participation in the treatment and health care social situation of diabetes patients, social care, (family, neighbors), data based on the information concerning: ability of conversation, difficulties to gain help, sufficiency of help received, conformity of achieved help to the expectations, satisfaction of care level, living place, living conditions, marital status, education, sources of income, use of counselling and help: general practitioner, family, neighbors, social worker, specialist in outpatient diabetes clinic, patient's expectations as far as education and care: by general physician, health nurse, family, and social worker.

2. Nurse's assessment of diabetes patients abilities and self-dependence (relative assessment of fitness and independence of the patients);

3. Anonymous questionnaire, focused on obtaining patients' opinions on: access to medical services, satisfaction from health care, life, care;

4. Anonymous questionnaire among families giving support in the process of taking care of the patient, by which information upon knowledge about the disease, expectations and satisfaction from the care was obtained;

5. Analysis of the medical documentation. This included information provided by the GP (family doctor) as to: age, sex, type of diabetes, duration of illness, treatment methods, self-control, results from tests carried out within the previous 12 months (total cholesterol, cholesterol HDL, fasting glycaemia, glycosuria, microalbuminuria or proteinuria, creatinine, glycated haemoglobin, body mass, height, BP, waist circumference, trochanters), accompanying diseases which require treatment.

The knowledge among families/caregivers of diabetes patients was assessed based on an anonymous questionnaire which contained a patient code (the questionnaires were submitted in envelopes by family nurses in charge of the patients) as well as open questions for longer answers and closed questions graded on a scale of 0 to 1 points.

The open question answers were evaluated based on several criteria graded as follows: full answer (1 point), incomplete answer (0.5 point), wrong answer (0 points), I don't know (0 points).

The total score for the knowledge was graded as follows:

- 1) optimal (20.5-23.0 points)
- 2) moderate (13.5-20.0 points)–some gaps in the knowledge
- 3) minimal (6.5-13.0 points)–many gaps in the knowledge
- 4) none (0-6 points)–lack of knowledge or numerous gaps

The answers were evaluated by the project manager and the author of this document. Characteristics of interest were described as frequencies and percentages and compared using the chi-square test [41]. All the tested hypotheses were verified at the level of significance of $\alpha=0.05$. Precise values of the significance level p were calculated.

Results

Research materials were obtained from patients aged above 16 years, living in the area of work of a social and family nurse, and registered on the list of a local GP. The youngest patient was 17 and the oldest was 96. The majority of the tested population consisted of women (63.4%), persons aged above 65 (59%) and patients living in urban areas (57.7%). The most numerous group of tested patients consisted of pensioners (49.5%). Slightly more than one in three patients indicated disability pension as their source of income (37.2%) and 9.3% of patients indicated a job on a farm as their source of income. The majority of persons interviewed were married (61.3%). Almost every third patient was a widow or widower (30.3%). Most of the patients took only oral drugs (56.8%), every fifth patient took only insulin (20%), and almost every fifth patient took insulin and oral drugs (18.5%); only 4.7% of the patients were on a diet. Analysis of the medical documentation shows that diabetes type 1 was found in 11.6% of the patients and diabetes type 2 was found in 51.4%, while 32.9% of the patients were treated without defining the type of diabetes. No information about diabetes type was found in the case of 4.1% of the patients. A pronounced majority of the patients were characterised by elementary or incomplete elementary education (56.2%). Vocational education was found in 15.1% of the patients, secondary school education was found in 2.8%, and higher education was found in 4% of the patients. No information about education was found in 0.9% of the patients.

Families supporting diabetics were surveyed for their knowledge on diabetes. The results show that the families usually do not know what the symptoms of ketotic coma are (86.2%). More than every second person does not know: when to perform urine tests for acetone (84%); what reduces the risk of complications in diabetes (79.9%); what does glucagon cause (77.8%); how to prevent hypoglycaemia (69.6%) and hyperglycaemia (68.7%); what promotes hypoglycaemia (66.5%); what are the symptoms of hyperglycaemia (64.3%); how to proceed in the case of hyperglycaemia (63.8%); what are the potential complications in diabetes (57.1%); what are the symptoms of hypoglycaemia (54.1%); how to perform foot care in diabetes (52.3%); what are the physical activity recommendations in diabetes (51.8%); what the diabetes patient should control himself/herself (51.4%). The families were most familiar with the drug indications in diabetes (17.3%). The data is shown in Table 4. The overall analysis of the knowledge about diabetes proves that it is below the optimal level (23-20.5 pts). 3.5% of families demonstrated a moderate level of knowledge about diabetes (20.0-13.5 pts), and 43.9% had minimum knowledge only (13-6.5 pts). Every second caregiver (52.6%) had no knowledge at all (6-0 pts). The analysis

Provence	The level of family's knowledge about the disease:								Total	
	Normal (23-20< points)		Moderate (20,0-13,5 points)		Minimal (13,0-6,5 points)		None (6-0 points)			
	N	%	N	%	N	%	N	%	N	%
Lower Silesian (dolnośląskie)	0	0.0%	1	1.8%	16	28.6%	39	69.6%	56	4.1%
Kuyavian-Pomeranian (kujawsko-pomorskie)	0	0.0%	5	3.9%	82	64.1%	41	32.0%	128	9.4%
Lublin (lubelskie)	0	0.0%	5	5.1%	38	38.4%	56	56.6%	99	7.2%
Lubusz (lubuskie)	0	0.0%	1	3.2%	8	25.8%	22	71.0%	31	2.3%
Łódź (łódzkie) Lesser	0	0.0%	11	6.7%	81	49.4%	72	43.9%	164	12.0%
Poland (małopolskie)	0	0.0%	0	0.0%	30	41.7%	42	58.3%	72	5.3%
Masovian (mazowieckie)	0	0.0%	2	1.9%	32	31.1%	69	67.0%	103	7.5%
Opole (opolskie)	0	0.0%	6	5.1%	62	53.0%	49	41.9%	117	8.6%
Subcarpathian (podkarpackie)	0	0.0%	3	6.4%	27	57.4%	17	36.2%	47	3.4%
Podlaskie (podlaskie)	0	0.0%	3	3.4%	26	29.2%	60	67.4%	89	6.5%
Pomeranian (pomorskie)	0	0.0%	2	3.2%	23	36.5%	38	60.3%	63	4.6%
Silesian (śląskie)	0	0.0%	2	3.8%	14	26.9%	36	69.2%	52	3.8%
Świętokrzyskie (świętokrzyskie)	0	0.0%	1	1.1%	54	58.7%	37	40.2%	92	6.7%
Warmian-Masurian (warmińsko-mazurskie)	0	0.0%	3	3.1%	42	43.3%	52	53.6%	97	7.1%
Greater Poland (wielkopolskie)	0	0.0%	2	2.4%	31	37.8%	49	59.8%	82	6.0%
West Pomeranian (zachodniopomorskie)	0	0.0%	1	1.4%	33	44.6%	40	54.1%	74	5.4%
Total in Poland	0	0.0%	48	3.5%	599	43.9%	719	52.6%	1366	100.0%

Table 4: Knowledge of the disease among diabetes patient families in specific provinces.

The families do not know:	N	%
What are the symptoms of ketoacidosis coma?	1177	86.2%
When to perform urine tests for acetone?	1148	84.0%
What reduces the risk of complications in diabetes?	1092	79.9%
What does glucagon cause?	1063	77.8%
How to prevent hypoglycemia?	951	69.6%
How to prevent hyperglycaemia?	938	68.7%
What promotes hypoglycemia?	908	66.5%
What are the symptoms of hyperglycemia?	879	64.3%
How to proceed in the case of hyperglycemia?	871	63.8%
What are the potential complications in diabetes?	780	57.1%
What is hypoglycemia?	777	56.9%
What are the symptoms of hypoglycemia?	739	54.1%
How to perform foot care in diabetes?	714	52.3%
What are the physical activity recommendations in diabetes?	707	51.8%
What the diabetes patient should control himself/herself?	702	51.4%
What favours hyperglycemia?	651	47.7%
What promotes normal glucose level in blood?	645	47.2%
What is the relationship between diabetes and the level of insulin?	637	46.6%
What is the aim of the diet (nourishment) in diabetes ?	609	44.6%
What the physical activity causes in diabetes?	546	40%
How to proceed in the case of hypoglycemia?	541	39.6%
How to perform nutrition in diabetes?	467	34.2%
What is the activity of the drugs in diabetes?	237	17.3%

Table 5: The insufficient level of knowledge about the fundamentals of diabetes treatment among the studied families which supported diabetes patients.

shows that a great majority of the families (96.1%) which support diabetes patients does not have the sufficient knowledge about diabetes in order to support the patients effectively. The data is shown in Table 5.

According to statistics, the patients whose care giving families show moderate or minimum level of knowledge about the disease: have a higher (moderate) level of knowledge about the disease ($p < 0.00001$), are familiar with indicators of one's health ($p < 0.00001$), care for one's body ($p < 0.00001$), mouth and teeth more ($p < 0.00001$), exercise the expected measures of self-control ($p < 0.00001$), monitor one's feet and

mouth ($p < 0.05$), physical activity ($p < 0.05$), diet ($p < 0.00001$) and foot care ($p < 0.00001$). The data is shown in Tables 6 and 7.

According to statistics, the patients whose care giving families show moderate or minimum level of knowledge about the disease more often have: the right body mass ($p < 0.0005$), acceptable blood pressure ($p < 0.005$), level of triglycerides ($p < 0.05$), are physically fit ($p < 0.00001$) and independent ($p < 0.00001$), and lack other somatic ($p < 0.005$) and mental symptoms ($p < 0.005$) or other diseases which often accompany diabetes ($p < 0.005$). The data is shown in Table 8.

Furthermore, the patients who have families with good level of knowledge about the disease experience less problems with following the medical recommendations for treatment of diabetes ($p < 0.005$). Also, they are more often have better social and living situation ($p < 0.00001$), and better access to medical services ($p < 0.05$), while demonstrating less (moderate) demand for professional health care ($p < 0.00001$) unlike patients who have families lacking the knowledge about diabetes. The data is shown in Table 9.

Discussion

A comprehensive summary is prevented due to the variety of tests, methods of assessing the knowledge, the type of the population and its size, and the studied areas [45,46]. Our results are hardly comparable with other studies which covered small populations of families of hospitalised patients, diabetic caregivers of children or patients suffering from a specific disease only [45-47]. Unlike results of other studies which show better knowledge among patients than their caregivers, in our study both patients and their caregivers had a similar level of knowledge about diabetes, however insufficient to ensure effective care. In our study, the level of the knowledge did not depend on the duration of the disease, unlike in the other studies [47].

The results confirmed the other studies in that the patients with better social status had families with higher knowledge of the disease [46]. Own studies revealed that families which have better knowledge of the disease promote various patient behaviours which are recommended for treatment of diabetes and help to keep the required indicators of health, such as: body mass, blood pressure, triglycerides, full physical

Tested feature	The level of family's knowledge about the disease:					
	Moderate (20,0-13,5 points) N=48 3,5%		Minimal (13,0-6,5 points) N=599 43,9%		None (6-0 points) N=719 52,6%	
Total N=1366	N	%	N	%	N	%
Knowledge (level) patients:	Chi ² Pearsona: 338,307, df=4, p<0,00001					
Moderate (20,0-13,5 points)	18	29.5%	35	57.4%	8	13.1%
Minimal (13,0-6,5 points)	27	3.3%	468	57.0%	326	39.7%
None (6-0 points)	3	0.6%	96	19.8%	385	79.6%
Knowledge of health indicators (total cholesterol, fasting glycaemia, glycosuria, body mass, blood pressure, hypoglycaemia):	Chi ² Pearsona: 86,6325, df=6, p<0,00001					
Knows all 6 indicators	27	6.42%	246	58.43%	148	35.15%
Knows 3-5 indicators	19	2.29%	322	38.89%	487	58.82%
Knows 1-2 indicators	2	2.13%	25	26.60%	67	71.28%
Does not know indicators	0	0.00%	6	26.09%	17	73.91%
Behavioral patterns within the scope of body hygiene:	Chi ² Pearsona: 76,6258, df=6, p<0,00001					
Washes the whole body every day	32	6.8%	249	53.0%	189	40.2%
Washes the whole body several times a week	9	2.1%	197	46.8%	215	51.1%
Washes the whole body once a week	7	1.6%	142	32.9%	283	65.5%
Washes the whole body less often than once a week	0	0.0%	9	26.5%	25	73.5%
Behavioral patterns within the scope of oral hygiene:	Chi ² Pearsona: 72,2590, df=6, p<0,00001					
Cleans the teeth at least twice a day	31	5.2%	318	53.4%	247	41.4%
Cleans the teeth once a day	14	2.6%	218	41.1%	299	56.3%
Performs oral hygienic behaviours several times a week	0	0.0%	30	31.9%	64	68.1%
Never performs any oral hygienic behaviours	2	1.6%	29	22.8%	96	75.6%
Behavioral patterns within the scope of self-control and treatment modification:	Chi ² Pearsona: 103,721, df=6, p<0,00001					
checks blood glucose level	26	10.9%	144	60.2%	69	28.9%
Does not modify treatment but regularly checks blood glucose level	7	3.1%	99	44.4%	117	52.5%
Does not modify treatment and does not check blood glucose level	9	1.2%	277	37.9%	445	60.9%
Does not check blood glucose level but modifies treatment	6	3.5%	79	45.6%	88	50.9%
Behavioral patterns within the scope of self-observation:	Chi ² Pearsona: 18,2269, df=6, (p<0,05)					
Performs regular observations of feet and oral cavity	34	4.6%	356	47.6%	357	47.8%
Performs regular observations of feet and irregular observations of oral cavity	4	2.3%	69	39.0%	104	58.7%
Performs irregular observations of feet and oral cavity	7	2.2%	120	38.5%	185	59.3%
Does not perform self-observation of feet and oral cavity	3	2.3%	54	41.5%	73	56.2%
Patients' physical activity:	Chi ² Pearsona: 18,2440, df=6,(p<0,05)					
Regular activity, active recreation	16	4.19%	198	51.83%	168	43.98%
Regular activity, passive recreation	5	3.85%	52	40.00%	73	56.15%
Irregular activity, passive recreation	11	2.63%	182	43.44%	226	53.94%
Lack of activity or excessive effort	16	3.74%	165	38.55%	247	57.71%
Eating behaviours:	Chi ² Pearsona: 39,9864, df=4, p<0,00001					
Single dietetic errors (1-3)	15	8.57%	97	55.43%	63	36.00%
Many dietetic errors (4-7)	30	3.54%	370	43.63%	448	52.83%
Numerous dietetic errors (8 and above)	3	0.88%	132	38.71%	206	60.41%
Patients' care of feet hygiene:	Chi ² Pearsona: 47,9152, df=4, p<0,00001					
Lack or single disturbances	34	5.82%	299	51.20%	251	42.98%
Numerous disturbances	12	1.85%	259	39.85%	379	58.30%
Very numerous disturbances	2	1.56%	41	32.03%	85	66.41%

p — level of significance; df — number of degrees of freedom; Chi² Pearsona — Pearson's chi-squared test

Table 6: The level of family's knowledge about the disease and patient's knowledge and behaviours.

Tested feature	The level of family's knowledge about the disease:					
	Moderate (20,0-13,5 points) N=48 3,5%		Minimal (13,0-6,5 points) N=599 43,9%		None (6-0 points) N=719 52,6%	
Total N=1366						
BMI:	Chi² Pearsona: 28,6596, df=6, p<0,0005					
Normal weight BMI: (M<24,9; W<23,9)	11	5.9%	100	53.5%	76	40.6%
Overweight, BMI: (M=25-29,9; W=24-29,9)	21	4.3%	222	45.3%	247	50.4%
Obesity, BMI: (30-40)	14	2.4%	245	41.8%	327	55.8%
Giant obesity, BMI: (>40)	1	1.2%	24	28.2%	60	70.6%
WHR:	Chi² Pearsona: 18,6279, df=4, p<0,0005					
Type AO (M >=1; W => 0,85)	15	2.3%	272	41.1%	375	56.6%
Type GO (M<1; W<0,85)	18	4.0%	194	43.4%	235	52.6%
Does not apply WHR	11	5.9%	100	53.5%	76	40.6%
Waist circumference and a risk of metabolic complications (waist circumference in men >94 cm and in women >80 cm, with BMI>25):	Chi² Pearsona: 23,3133, df=2, p<0,00005					
Increased	25	2.4%	426	41.8%	569	55.8%
Normal	19	6.4%	151	51.2%	125	42.4%
Blood pressure [mm/Hg]:	Chi² Pearsona: 28,4760, df=6, p<0,0005					
(<120-130 and <80-85)	15	7.9%	78	41.0%	97	51.1%
(130-139 and 85-89)	8	5.2%	71	46.4%	74	48.4%
(140-159 and 90-99)	18	3.4%	257	47.9%	261	48.7%
(>160-179/100-109 and >=180/ >100)	7	1.5%	187	39.2%	283	59.3%
Triglycerides [mg/dl]:	Chi² Pearsona: 13,1950, df=4, p<0,05					
<150 mg/dl	16	7.6%	88	41.7%	107	50.7%
150-200mg/dl	1	0.5%	82	44.6%	101	54.9%
>200 mg/dl	4	3.0%	58	43.6%	71	53.4%
Physical fitness:	Chi² Pearsona: 49,0203, df=6, p<0,00001					
Physically fit (7 points)	10	8.2%	70	57.9%	41	33.9%
Few limitations of physical ability (8-14 points)	24	3.8%	298	47.2%	310	49.0%
Many limitations of physical ability (in at least one factor) (15-21 points)	13	2.4%	189	35.3%	334	62.3%
Lack of physical ability in at least one factor (22-28 points)	1	1.3%	42	54.5%	34	44.2%
Independence:	Chi² Pearsona: 50,7848, df=6, p<0,00001					
Fully independent	15	8.2%	104	56.8%	64	35.0%
Insignificant limitations of independence	21	4.2%	232	46.7%	244	49.1%
Marked limitations of independence (partially unable to perform a minimum of 1 activity)	12	1.9%	237	37.9%	376	60.2%
No independence (totally unable to perform a minimum of 10 activity)	0	0.0%	26	42.6%	35	57.4%
Somatic ailments:	Chi² Pearsona: 17,0339, df=4, p<0,0005					
None	34	4.0%	407	47.7%	413	48.3%
Single (1-2)	12	2.9%	155	37.2%	249	59.9%
Many (3 and more)	2	2.1%	37	38.5%	57	59.4%
Disturbances and symptoms in the psycho-emotional life	Chi² Pearsona: 22,7602, df=6, p<0,0005					
No ailments	29	4.5%	310	48.1%	306	47.4%
1-2 ailments	9	2.0%	170	37.2%	278	60.8%
3-4 ailments	4	2.9%	63	46.0%	70	51.1%
5 and more ailments	5	5.7%	37	42.0%	46	52.3%
Concomitant diseases:	Chi² Pearsona: 22,3669, df=6, p<0,0005					
No diagnosis of concomitant diseases	10	6.7%	82	54.6%	58	38.7%
1-2 concomitant diseases	25	4.2%	250	41.7%	325	54.1%
3-4 concomitant diseases	7	1.7%	172	41.4%	236	56.9%
5 and more concomitant diseases	6	3.0%	95	47.2%	100	49.8%

Table 7: The level of family's knowledge about the disease and selected health indicators in diabetes patients.

Tested feature	The level of family's knowledge about the disease:					
	Moderate (20,0-13,5 points) N=48 3,5%		Minimal (13,0-6,5 points) N=599 43,9%		None (6-0 points) N=719 52,6%	
Patients' difficulty in respecting of recommendations:	Chi ² Pearsona: 18,9759, df=6, (p<0,005)					
No difficulties	35	4.6%	338	44.5%	387	50.9%
1-2 difficulties	10	3.2%	152	48.6%	151	48.2%
3-4 difficulties	2	1.7%	44	37.6%	71	60.7%
5 and more difficulties	1	0.6%	65	36.9%	110	62.5%
Social situation and living conditions:	Chi ² Pearsona: 30,8129, df=2, p<0,00001					
Very good and sufficient	38	5.0%	370	48.4%	356	46.6%
Insufficient and none	10	1.7%	229	38.0%	363	60.3%
Difficulties of patients in access to medical services:	Chi ² Pearsona: 10,6027, df=4, p<0,05					
No difficulties	6	4.0%	81	54.4%	62	41.6%
Problems with access to 1-3 services	33	4.2%	365	46.9%	381	48.9%
Problems with access to 4 or to all the services	6	2.8%	84	39.1%	125	58.1%
Need for professional care:	Chi ² Pearsona: 106,492, df=2, p<0,00001					
Moderate	31	7.3%	253	59.8%	139	32.9%
High and very high	17	1.8%	346	36.7%	580	61.5%

Table 8: The level of family's knowledge about the disease and difficulties in respecting recommendations, difficulties in access to medical services, social situation and need for care in diabetes patients.

fitness and independency, no emotional or somatic problems and no accompanying diseases which require treatment.

The deficit of the recommended behaviours, excessively low indicators of health, incidence of accompanying diseases, higher risk of complications and the high demand for professional health care, as observed in patients whose families lack the knowledge about diabetes, confirm the opinion that the sole fact of having a family is not enough to ensure better care for diabetes patients and that families not always support patients [29]. Such results could be demonstrating that the high deficit of the knowledge about diabetes among both patients and their supporting families could lead to negative clinical effects [33]. Own studies confirmed the correlation of the level of knowledge in the patient's family with the health and the risk of complications [29,45,48].

The studies demonstrated that professional and comprehensive education of families and caregivers who support diabetes patients at home is a measure preventing the risk of errors in patient care [49] and promoting better implementation of medical recommendations [50]. The education of patient families helps to improve their competences, effective care and nursing and involvement in the basic and secondary prevention of diabetes. It also leads to better results in patient care, followed by the reduction of costs of such care [36,47]. In our study, those patients who had families with better knowledge of diabetes more frequently behaved as recommended in the treatment of diabetes and had the indicators of personal health closer to the standard levels, including body mass, blood pressure, triglycerides, full physical fitness and self-reliance, no emotional or somatic problems and no accompanying diseases which require treatment. Such situation could result from more effective procedures which the families with better knowledge apply, and provides grounds for including family training as the permanent component of high-quality health care rather than just a solution dedicated to families of old-age patients or patients with serious deficits (as is the case in the Polish health care system) [27]. The incidence of diabetes is rising and the costs of health care are high but the Polish system still lacks a diabetes-dedicated register or incentives to commit the state to diabetes prevention and related training [27].

The conducted studies are a frontier research. Many positive results of patient care which is rendered by patient families with better knowledge about diabetes, and the great deficit of such knowledge among many families, as demonstrated by the studies, are a crucial but underestimated factor in the care of diabetes patients, while such care provided by supportive families could lead to reduced incidence of complications and lower costs of treatment.

Study reservations

1. Study results cover patients and families from those PHC facilities only where the doctors and nurses agreed to participate in the study.
2. The study cannot be completed, if the doctor, the nurse and the patient do not cooperate.
3. The study does not involve a longer observation.
4. In their medical history, some patients lack results of biomechanical tests (triglycerides), anthropometrics and body mass information.
5. The missing results could explain why there is no connection between the knowledge of diabetes among families and the medical indicators of treatment (such as HbA1c).

Conclusions

1. Family knowledge about the disease is a significant factor that diversifies a medical condition of diabetic patients.
2. Higher knowledge level of the family about the disease improves patients' medical condition and reduces the risk of diabetes complications.
3. The process of preventing diabetes complications in this group of patients should reflect the impact from the level of knowledge about diabetes among supporting families.

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Questions evaluating the knowledge of the disease:
In your opinion, diabetes is a illness where:
1-there is too much insulin
2-there is too little insulin
3-I don't know
What leads to high blood sugar?
What leads to low blood sugar?
What is hypoglycemia?
What are the symptoms of low blood sugar (hypoglycemia)?
What are the symptoms of high blood sugar (hyperglycemia)?
What are the symptoms of ketotic coma?
What are the complications in diabetes?
What supports normal glucose level in blood?
What reduces the risk of complications in diabetes?
How to perform foot care in diabetes?
What the diabetes patient should control himself/herself?
What are the rules of nutrition in diabetes?
What are the physical activity recommendations in diabetes?
What are the effects using drugs for diabetes?
1-lower blood sugar level
2-higher blood sugar level
3-no effect on the blood sugar level
4-I don't know their role or effects
What is the objective of the diet (nutrition) in diabetes?
What are the effects of physical activity in diabetes?
1-lower blood sugar level
2-higher blood sugar level
3-no effect on the blood sugar level
4-I don't know its role or effects
What are the effects of Glucagon?
1-higher blood sugar level
2-lower blood sugar level
3-no effect on the blood sugar level
4-I don't know its role or effects
What is the recommended procedure with low blood sugar (hypoglycemia)?
1-eat an extra meal
2-wait until the condition passes
3-skip one meal
4-take an extra dose of the drug
5-I don't know
What is the recommended procedure with high blood sugar (hyperglycemia)?
When to perform urine tests for acetone?
How to prevent hypoglycaemia? How to prevent hyperglycaemia?

Table 9: Questions evaluating the knowledge of the disease.

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