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

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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.
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 certain groups derived from a closed population which was selected in a complex, multi-stage, stratified/cluster sampling [40,41]. The study covered all areas.

The study materials, the subsequent analysis covered the data randomly. Since not all the facilities which declared to co-operate one family nurse deployed in 77 PHC facilities in Poland. If one team criteria (Table 1). There were teams consisting of one family doctor and one team.

Table 1:

| Provence       | 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 2: Studied area.

| Provence       | Number of selected facilities in every province | Number of facilities which submitted study materials | Number of facilities which did not submit study materials |
|----------------|-----------------------------------------------|---------------------------------------------------|--------------------------------------------------------|
| 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 |

*) 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.

| Provence       | Study covered | Qualified to next stage analysis | Not qualified to next stage analysis* |
|----------------|---------------|---------------------------------|-------------------------------------|
| 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.
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 α=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 9.0% 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 (79.8%); 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
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<0.005), 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<0.005), while demonstrating less mental symptoms (p<0.005) or other diseases which often accompany diabetes (p<0.0001). The data is shown in Tables 6 and 7.

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The results confirmed the other studies in that the patients with better social status had families with higher knowledge of the disease [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 the disease, unlike in the other studies [47]. In our study, the level of the knowledge did not depend on the duration of the disease, unlike in the other studies [47].

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 the disease, 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]. Our results 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

| 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 | % |
| 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.
| 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%                |
| 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; Chi^2 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: |
|----------------|-----------------------------------------------|
| **Total N=1366** |                                               |
| **BMI:**        |                                               |
| Normal weight BMI: (M<24,9; W<23,9) | ![Chi^2 Pearson test](11,9%) | ![df=6, p<0.0005](76, 40.6%) |
| Overweight BMI: (M=25-29,9; W=24-29,9) | ![Chi^2 Pearson test](21, 4.3%) | ![df=222, 45.3%](247, 50.4%) |
| Obesity, BMI: (30-40) | ![Chi^2 Pearson test](14, 2.4%) | ![df=245, 41.8%](327, 55.8%) |
| Giant obesity, BMI: (>40) | ![Chi^2 Pearson test](1, 1.2%) | ![df=24, 28.2%](60, 70.6%) |
| **WHR:**        |                                               |
| Type AO (M >=1; W >= 0,85) | ![Chi^2 Pearson test](15, 2.3%) | ![df=272, 41.1%](375, 56.6%) |
| Type GO (M<1; W<0,85) | ![Chi^2 Pearson test](18, 4.0%) | ![df=194, 43.4%](235, 52.6%) |
| Does not apply WHR | ![Chi^2 Pearson test](11, 5.9%) | ![df=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):** | ![Chi^2 Pearson test](23,3133, 55.8%) |
| Increased | ![Chi^2 Pearson test](25, 2.4%) | ![df=426, 41.8%](569, 55.8%) |
| Normal | ![Chi^2 Pearson test](19, 6.4%) | ![df=151, 51.2%](125, 42.4%) |
| **Blood pressure [mm/Hg]:** | ![Chi^2 Pearson test](28,4760, 41.8%) |
| (<120-130 and <80-85) | ![Chi^2 Pearson test](15, 7.9%) | ![df=78, 41.0%](97, 51.1%) |
| (130-139 and 85-89) | ![Chi^2 Pearson test](8, 5.2%) | ![df=71, 46.4%](74, 48.4%) |
| (140-159 and 90-99) | ![Chi^2 Pearson test](18, 3.4%) | ![df=257, 47.9%](261, 48.7%) |
| (>160-179/100-109 and >=180/ >100) | ![Chi^2 Pearson test](7, 1.5%) | ![df=187, 39.2%](283, 59.3%) |
| **Triglycerides [mg/dl]:** | ![Chi^2 Pearson test](13,1950, 55.8%) |
| <150 mg/dl | ![Chi^2 Pearson test](16, 7.6%) | ![df=88, 41.7%](107, 50.7%) |
| 150-200mg/dl | ![Chi^2 Pearson test](1, 0.5%) | ![df=82, 44.6%](101, 54.9%) |
| >200 mg/dl | ![Chi^2 Pearson test](4, 3.0%) | ![df=58, 43.6%](71, 53.4%) |
| **Physical fitness:** | ![Chi^2 Pearson test](49,0203, 55.8%) |
| Physically fit (7 points) | ![Chi^2 Pearson test](10, 8.2%) | ![df=70, 57.9%](41, 33.9%) |
| Few limitations of physical ability (8-14 points) | ![Chi^2 Pearson test](24, 3.8%) | ![df=298, 47.2%](310, 49.0%) |
| Many limitations of physical ability (in at least one factor) (15-21 points) | ![Chi^2 Pearson test](13, 2.4%) | ![df=189, 35.3%](334, 62.3%) |
| Lack of physical ability in at least one factor (22-28 points) | ![Chi^2 Pearson test](1, 1.3%) | ![df=42, 54.5%](34, 44.2%) |
| **Independence:** | ![Chi^2 Pearson test](50,7848, 55.8%) |
| Fully independent | ![Chi^2 Pearson test](15, 8.2%) | ![df=104, 56.8%](64, 35.0%) |
| Insignificant limitations of independence | ![Chi^2 Pearson test](21, 4.2%) | ![df=232, 46.7%](244, 49.1%) |
| Marked limitations of independence (partially unable to perform a minimum of 1 activity) | ![Chi^2 Pearson test](12, 1.9%) | ![df=237, 37.9%](376, 60.2%) |
| No independence (totally unable to perform a minimum of 10 activity) | ![Chi^2 Pearson test](0, 0.0%) | ![df=26, 42.6%](35, 57.4%) |
| **Somatic ailments:** | ![Chi^2 Pearson test](17,0339, 55.8%) |
| None | ![Chi^2 Pearson test](34, 4.0%) | ![df=407, 47.7%](413, 48.3%) |
| Single (1-2) | ![Chi^2 Pearson test](12, 2.9%) | ![df=155, 37.2%](249, 59.9%) |
| Many (3 and more) | ![Chi^2 Pearson test](2, 2.1%) | ![df=37, 38.5%](57, 59.4%) |
| **Disturbances and symptoms in the psycho-emotional life** | ![Chi^2 Pearson test](22,7602, 55.8%) |
| No ailments | ![Chi^2 Pearson test](29, 4.5%) | ![df=310, 48.1%](306, 47.4%) |
| 1-2 ailments | ![Chi^2 Pearson test](9, 2.0%) | ![df=170, 37.2%](278, 60.8%) |
| 3-4 ailments | ![Chi^2 Pearson test](4, 2.9%) | ![df=63, 46.0%](70, 51.1%) |
| 5 and more ailments | ![Chi^2 Pearson test](5, 5.7%) | ![df=37, 42.0%](46, 52.3%) |
| **Concomitant diseases:** | ![Chi^2 Pearson test](22,3669, 55.8%) |
| No diagnosis of concomitant diseases | ![Chi^2 Pearson test](10, 6.7%) | ![df=82, 54.6%](58, 38.7%) |
| 1-2 concomitant diseases | ![Chi^2 Pearson test](25, 4.2%) | ![df=250, 41.7%](325, 54.1%) |
| 3-4 concomitant diseases | ![Chi^2 Pearson test](7, 1.7%) | ![df=172, 41.4%](236, 56.9%) |
| 5 and more concomitant diseases | ![Chi^2 Pearson test](6, 3.0%) | ![df=95, 47.2%](100, 49.8%) |

Table 7: The level of family’s knowledge about the disease and selected health indicators in diabetes patients.
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 ketoic 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 are the effects of nutrition in diabetes?
What are the effects using drugs for diabetes?
What are the rules of nutrition in diabetes?
What are the effects of physical activity in diabetes?

Table 9: Questions evaluating the knowledge of the disease.

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