

THE INCIDENCE OF DIABETES COMPLICATIONS IN ELDERLY PATIENTS UNDER THE COMMUNITY NURSING CARE

CZĘSTOTLIWOŚĆ POWIKŁAŃ WYSTĘPUJĄCYCH U OSÓB W PODESZŁYM WIEKU CHORUJĄCYCH NA CUKRZYCĘ, OBJĘTYCH OPIEKĄ PIELEŃNIARKI ŚRODOWISKOWEJ

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Summary

Medical documentation of 4680 patients of an individual nursing practice in Jarosław, Poland, was analyzed statistically. The inclusion criteria of the conducted research were patients age ≥ 60 years with type 2 diabetes diagnosed by a physician. The study patients were selected with the use of a diagnostic survey method, the authors' own questionnaire, and medical documentation analysis. As a result, the study involved 170 patients. The chi-square test of independence and the Mann-Whitney test were applied to verify the differences between the variables. The majority of the studied patients were women (61.1%), in the 71–80 age group (57.6%). Irrespective of gender, diabetes was most often diagnosed in people in early senility, aged 60–70 years (62.9%). Most of the respondents received oral medications (59.4%); had a large waist circumference (92.9%), as well as high body mass index (95.3%). In the majority of the elderly, no hypoglycaemia (83.0%) or hyperglycaemia (77.6%) were recognized. However, numerous complications were diagnosed, namely dyslipidaemia (85.9%), hypertension (81.8%), macroangiopathy (90.0%), microangiopathy (71.2%), and ophthalmological diseases (25.9%). Most diabetics suffer from overweight or obesity, and long-term diabetes complications. Analyzing the incidence of diabetes and its complications should help to outline further actions that need to be taken to diagnose and prevent the disease in order to detect its complications early and prolong the patients' survival as well as raise their quality of life.

Keywords: elderly patients, diabetes, healthcare, nurse

Streszczenie

Analizie statystycznej poddano dokumentację 4680 pacjentów Indywidualnej Praktyki Pielęgniarskiej w Jarosławiu. Kryterium doboru był wiek ≥ 60 r.ż. oraz rozpoznana przez lekarza cukrzyca typu II. Materiał badawczy uzyskano za pomocą metody sondażu diagnostycznego z wykorzystaniem autorskiego kwestionariusza ankiety oraz analizy dokumentacji medycznej. Do badań zakwalifikowano 170 pacjentów. Weryfikacji różnic między zmiennymi dokonano przy użyciu testu niezależności χ^2 oraz testu Manna-Whitneya. Wśród badanych przeważały kobiety (61.1%), w przedziale wiekowym 71-80 lat (57.6%). Niezależnie od płci cukrzyca najczęściej była rozpoznawana u osób we wczesnej starości, w wieku 60-70 lat (62.9%). Największa część ankietowanych była leczona lekami doustnymi (59.4%), u większości obwód tali był zbyt duży (92.9%), podobnie jak wynik BMI (95.3%). U większości seniorów nie występowała hipoglikemia (83.0%) i hiperglikemia (77.6%). Natomiast stwierdzono liczne powikłania w postaci dyslipidemii (85.9%), podwyższonych wartości ciśnienia tętniczego (81.8%), makro- (90.0%) i mikroangiopatii (71.2%) oraz chorób oczu (25.9%). Większość osób chorujących na cukrzycę cierpi na nadwagę i otyłość oraz ma późne powikłania cukrzycy. Analiza częstotliwości zachorowań na cukrzycę i jej powikłań powinna pomóc w wyznaczeniu dalszych działań w kierunku rozpoznawania, zapobiegania i wczesnego wykrywania tego schorzenia, co pozwoli chorym zwiększyć szanse na dłuższe życie i podnieść jego jakość.

Słowa kluczowe: osoby w podeszłym wieku, cukrzyca, opieka, pielęgniarka

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Introduction

Diabetes constitutes a significant healthcare and social problem worldwide. Its complications can result from a long-lasting asymptomatic course of the disease, and they considerably lower the patients' quality of life. Diabetics also remain a substantial burden for the healthcare system, and the total costs of managing the disease include the direct, indirect, and immeasurable ones. These are bound with the diagnosis, treatment, rehabilitation, absence from work, disability, and earlier mortality, and refer to physical and psychological suffering (Fabian, Czech 2011).

The number of diabetics rises each year, which is bound with the more and more frequent obesity, lack of physical activity, as well as the process of ageing in the societies. These phenomena increase the risk of multimorbidity and its outcomes.

The epidemiology of diabetes addresses descriptive indicators, e.g. the characteristics of the disease incidence depending on age, sex, race, geographic and social conditions, and analytical indicators, whose aim is to search for the external environment factors that could play a pathogenic role in the manifestation of diabetes (diet, lifestyle, diseases) (Czech, Tatoń 2011).

Diabetes is the only non-infectious disease that has been recognized by the United Nations as a 21st century epidemic. In 2011, the number of patients with type 2 diabetes was estimated at 366 million, and the prognoses for year 2030 point at 439 million. The collected data suggest that the increase in the number of cases refers considerably to developing countries, characterized by high population growth, especially those in Asia (India, China, Pakistan) (Uchmanowicz, Kubera-Jaroszewicz 2012).

In Poland, there are 3.1 million diabetics. More than 750 thousand do not know about their illness yet. The incidence of the disease grows so fast that soon the healthcare systems will be hardly able to manage the problem. In spite of the promising therapeutic progress, diabetes remains an incurable disease, leading to disability and shortening the life of the patients by 20–30%; treating diabetes and its complications consumes ca. 7% of the total healthcare expenditures.

In Poland, 30 thousand people die each year because of diabetes and its complications, and this refers mainly to elderly people. Diabetes is among the 10 most significant reasons for various disabilities, the first one being blindness. According to the World Health Organization, ca. 15 million of the blind people worldwide have lost sight as a result of diabetes complications (Sieradzki 2006).

A precise diagnosis of problems referring to diabetes can help conduct intensive and efficient education, broaden social consciousness (prophylaxis), and, above all, prevent long-term results of the disease, which considerably lower the patients' quality of life (Fabian, Czech 2011). Because of their specificity, diabetes symptoms

lead to disability and increased mortality, which especially refers to elderly patients and makes them dependent on third party care (Sieradzki 2006, Czech 2013).

A detailed recognition of the issue will allow direct specialist actions to be undertaken aiming at the longest possible seniors' independence and, therefore, better quality of life.

Material and methods

Medical documentation of 4680 patients of an individual nursing practice in Jarosław, Poland, was analysed statistically. The inclusion criteria were age ≥ 60 years and type 2 diabetes diagnosed by a physician. The study patients were selected with the use of a diagnostic survey method, the authors' own questionnaire including 20 questions referring to the analysed problem, and medical documentation analysis. As a result, 170 patients were enrolled (3.6%). The chi-square test of independence and the Mann-Whitney test were applied to verify the differences between the variables. The $p < 0.05$ level of significance was assumed.

The study was approved by the management of the Bioethical Institute and Committee of the Wrocław Medical University, Wrocław, Poland.

Results

The patients who participated in the study were 60–93 years of age; those aged 71–80 years turned out the most numerous group (F: $n = 98$, 57.6%; M: $n = 41$, 24.1%), the next ranges being 60–70 years (F: $n = 29$, 17.0%; M: $n = 13$, 7.6%), 81–90 years (F: $n = 14$, 8.3%; M: $n = 10$, 5.9%), and over 91 years (F: $n = 4$, 2.3%; M: $n = 2$, 1.2%). The mean age of the respondents equalled 71.3 years.

Women constituted 61.2% ($n = 104$), men – 38.8% ($n = 66$) of the studied group. Considering the marital status, widows and widowers were the majority ($n = 127$, 74.7%). All the respondents lived in a city ($n = 170$, 100%). Most of them had vocational education ($n = 85$, 50.0%), then came secondary ($n = 55$, 29.4%) and higher ($n = 30$, 20.6%) education. The total of 26.5% ($n = 45$) were professionally active.

Independently of sex, diabetes was most often diagnosed in people in early senility, aged 60–70 years (F: $n = 66$, 38.8%; M: $n = 41$, 24.1%); the subsequent age ranges were 71–80 years (F: $n = 31$, 18.2%; M: $n = 15$, 8.8%) and 81–90 years (F: $n = 7$, 4.1%; M: $n = 10$, 5.9%). Diabetes was diagnosed in none of the patients aged over 91 years.

Comorbidities were recognized in 81.8% ($n = 139$) of the researched patients; 75.9% ($n = 129$) declared that they continued to take the medication appointed by the physician. Most of the respondents received oral medications ($n = 101$, 59.4%); among them there were 74 women (43.5%) and 27 men (15.9%). The next group included patients treated with combination therapies ($n = 48$, 28.2%; 37 women (21.7%) and

11 men (6.4%)), and those receiving insulin (n = 1, 12.3%; 16 women (9.4%) and 5 men (2.9%)).

The waist circumference was measured in the studied patients. In the majority, it turned out too big (n = 158, 92.9%); in 94 (90.3%) women it equalled over 88 cm, in 64 (96.9%) men – over 102 cm. Also, the body mass index (BMI) was calculated as part of the study (Table 1).

The analysis of the patients' image self-assessment showed that it depended on the respondents' sex (p = 0.01) and on the time the signs of overweight or obesity had maintained (p = 0.00). The problem most often referred to women (n = 118, 69.4%) and people in whom it had persisted for more than 3 years (n = 137, 80.6%).

The incidence of hypoglycaemia signs was also analysed in the studied population. The majority of the seniors (n = 141, 83.0%), including 87 (51.2%)

women and 54 (31.8%) men, had never experienced them. The subsequent groups consisted of patients who occasionally (n = 27, 15.9%; 15 (8.8%) women, 12 (7.1%) men) and often (n = 2, 1.2%; women only) suffered from hypoglycaemia.

Signs of fasting hyperglycaemia (glucose concentrations > 200 mg/dl, 11.1 mmol/l) appeared in the studied patients mainly occasionally (n = 132, 77.6%; n = 83 (48.8%) women and 49 (28.8%) men), then often (n = 27, 15.9%; n = 16, (9.4%) women and 11 (6.5%) men), and never (n = 11, 6.5%; n = 5 (2.9%) women and 4 (2.4%) men).

The respondents also presented with:

- dyslipidaemia (n = 146, 85.9%; F: n = 90, 52.9%; M: n = 56, 32.9%);
- hypertension (n = 139, 81.8%; F: n = 85, 50.0%; M: n = 54, 31.8%);
- macroangiopathies (n = 153, 90.0%) (Table 2);

Table 1. The respondents' body mass index values

Body mass index	Women		Men	
	n	%	n	%
18-25	3	1.8	5	2.9
26-30	48	28.3	27	15.9
31-40	46	27.0	28	16.5
> 40	7	4.1	6	3.5
Total	104	61.2	66	38.8
TOTAL: p = 0.01 phi = 0.25 chi-square = 6.05	n = 170, 100%			

Table 2. Macroangiopathies occurring in the respondents

Macroangiopathies	Women		Men	
	n	%	N	%
Ischaemic heart disease	65	38.3	34	20.0
Stroke	20	11.8	12	7.0
Infarction	13	7.6	9	5.3
None	6	3.5	11	6.5
Total	104	61.2	66	38.8
TOTAL: p = 0.05 phi = 0.20 chi-square = 3.58	n = 170, 100%			

Table 3. Microangiopathies occurring in the respondents

Microangiopathies	Women		Men	
	n	%	N	%
Nephropathy	12	7.0	12	7.0
Polyneuropathy	35	20.7	15	8.8
Retinopathy	24	14.1	14	8.3
Diabetic foot	6	3.5	3	1.8
None	27	15.9	22	12.9
Total	104	61.2	66	38.8
TOTAL: p = 0.04 phi = 0.31 chi-square = 8.20	n = 170, 100%			

- microangiopathies (n = 121, 71.2%) (Table 3);
- ophthalmological diseases (glaucoma, cataract) (n = 44, 25.9%; F: n = 28, 16.5%; M: n = 16, 9.4%).

In the results analysis, the problem of diabetes complications was observed to be significant mainly for patients with higher education ($p = 0.04$). Seniors with lower education levels were more often concerned with the fact that taking care of them could be troublesome for their relatives ($p = 0.00$). Neither the patients' age nor sex had influence on the problem.

Discussion

The research carried out by coalitions for diabetes control shows that most people do not associate the disease with its complications. The lack of understanding the disease on the individual level, as well as insufficient solutions within healthcare systems lead to an increase in the number of diabetics. In Poland, 3.5 million people suffer from diabetes; every fourth of them is over 60 years of age, and every fifth Pole has never had their blood glucose concentration examined (Moczulski 2010).

Diabetics aged over 60 years constituted almost 4% of the studied population of patients from the individual nursing practice. The result is consistent with the data obtained by other authors when defining the incidence of diabetes in Poland. The outcomes concerning the female to male patients ratio are also similar (Strojek 2008).

The performed analyses point out that diabetics are most often elder seniors in whom the disease was diagnosed in early senility. Similar results were obtained by Sieradzki when determining the incidence of diabetes among patients living in city areas (Sieradzki 2015). Type 2 diabetes is a relatively late identified disease. According to Tatoń, the diagnosis usually takes place after the age of 60, which was confirmed by the presented research.

The body mass, height, and waist circumference analyses prove that the majority of senior diabetics are characterized by increased BMI and waist circumference values. This should be interpreted as the presence of overweight and obesity, directly relating to type 2 diabetes, especially if one considers the decreasing insulin production in the elderly.

The impact of ageing on the carbohydrate metabolism is regarded as complex. The most characteristic carbohydrate metabolism disorder in senility is a gradual increase in fasting and postprandial insulin concentration. This suggests ageing to be a process associated with tissue insulin resistance development. Some researchers advocate that the key pathogenic factor responsible for the development of carbohydrate metabolism disorders is not ageing itself but

the associated increase in the visceral adipose tissue, inducing insulin resistance (Imbeault i in 2003). It is emphasized that the most significant factor determining insulin resistance is waist circumference (40% variability), and not age (10–20% variability) (Ziemia 2005).

One of the basic tasks for a diabetic patient is not only to maintain a suitable metabolic control of the disease, but also to reduce excess body weight. As proved in the performed study and confirmed by literature data (Tatoń, Czech 2001), only a small group of elderly people manage to reach this goal.

The researched patients of the analysed individual nursing practice were treated mainly with oral medication, and then with combination therapies and insulin. Together with the increasing age, as well as advancing disease and coexisting complications, insulin intake often becomes an unavoidable necessity.

According to the recommendations of the Polish Diabetological Association, in the treatment of senior diabetics, special consideration is given to the expected length of the patient's life, as preventing complications developing within over a dozen years seems less significant in senility. If the expected survival, then, exceeds 10 years, it is recommended to aim at obtaining the generally accepted goals of diabetes management, consistent with the recommendations for the younger population. Namely, hyperglycaemia signs should be reduced, and episodes of hypoglycaemia prevented. When choosing the hypoglycaemic agents, one should take into account the specificity of the patient's clinical status; the considerable role of education is also emphasized (Małecki 2014).

The recommendations of the American Diabetes Association are comparable. They underscore the heterogeneity of the senior diabetics group and the requirement of differentiated management. The recommendations advocate more intensive treatment of patients with a higher complication risk burden, as well as those who are active and do not present cognitive function disorders, as this influences their longer expected survival. The therapeutic aims in these cases do not differ from those established for the younger population. The recommendations emphasize the significant impact of educating senior diabetics, mainly with reference to appropriate medication intake, self-control, and recognition of complications. Research proves that elderly diabetic patients benefit more from a proper control of all coexisting risk factors for cardiovascular events than from blood glucose concentration control only (the biggest advantage being that with lowering blood pressure and lipid-lowering treatment implementation) (Szewczyk 2013).

In turn, in patients with advanced complications, diseases that create a risk concerning the expected survival, cognitive function disorders, or motor disabilities, the therapeutic aims can be less

intensive. Advantages from lowering the risk factors for cardiovascular events are considered; on the other hand, one should respect the risk of complications, including the exceptionally dangerous hypoglycaemia.

The American recommendations point at applying all groups of hypoglycaemic agents in the treatment of diabetes, emphasizing, however, the need to precisely determine the contraindications and doses, and to specifically monitor the adverse events. Medications should be used in the lowest possible doses, with the possibility to increase them until the therapeutic aims are achieved or adverse events appear (Grzeszczak 2010).

In the studied group, only 1/10 of the elderly patients received insulin. The rules of insulin therapy in seniors are similar to those referring to younger diabetics. Insulin can be applied in combination with oral antidiabetic drugs or as monotherapy. The former model is usually introduced with the recognition of excess fasting blood glucose concentration. One, evening dose of intermediate- or long-acting insulin is then recommended. In monotherapy, pre-mixed preparations of short- and intermediate-acting insulins are most often employed. One should remember not to introduce too frequent changes in insulin dosing. Moreover, seniors may have difficulties with unassisted drug application because of the coexisting physical or mental impairment or lack of sufficient abilities (Moczulski 2010).

One of the most frequent metabolic complications of diabetes is hypoglycaemia. In senior diabetics, it constitutes the basic factor restricting therapy intensification. Among the main risk factors for hypoglycaemia there are advanced age, polypharmacy, hospitalization, sulphonylurea or insulin intake, malnutrition, comorbidities, hormonal disorders, antihypertensive medication usage, and unconsciousness of hypoglycaemia. These issues apply to the majority of elderly patients (Koziańska-Rościszewska 2005).

When diabetes is diagnosed, the patient's caregivers should gain knowledge about regular blood glucose concentration control. Hypoglycaemia is detected in patients with type 2 diabetes significantly less frequently than in those with type 1 diabetes. It occurs in 5–20% of diabetics receiving oral hypoglycaemic medication and insulin (Strojek et al. 2008). This has been proved in the presented survey performed among patients of an individual nursing practice; lowered blood glucose concentrations were present in a small group, and only occasionally. It can reflect the efficient education carried out among the seniors and their relatives, as well as their responsibility for health issues.

In senior diabetics receiving insulin, the most frequent reasons for hypoglycaemia episodes include drug dosing mistakes, too low glucose intake, increased insulin sensitivity, and pharmacokinetic changes.

In the care for elderly people, a phenomenon much more alarming than hypoglycaemia is the significantly more frequent hyperglycaemia and dyslipidaemia. According to Fabian, lipid metabolism disorders occur in ca. 50–60% patients with diabetes (Fabian, Czech 2011). In the presented study, the percentage of these complications is even higher, and can predict vascular events, ischaemic heart disease, strokes, and peripheral artery atherosclerosis.

The obtained results should be analysed by physicians treating diabetic patients and should result in undertaking appropriate actions, such as introducing dietary management combined with pharmacological agents, as well as controlled physical effort, adjusted to the patients' age.

Moderate physical exercise in the elderly has been proved to considerably lower the risk of cardiovascular events, even when not accompanied by a significant weight loss (Barlow i in 1995). Therefore, the recommendations of the Polish Diabetological Association point at the beneficial impact of aerobic exercise, characterized by slow introduction and closing (Małecki 2014).

Late signs of diabetes, including hypertension, were recognized in the respondents. Bearing in mind that most studied seniors were overweight or obese, one could draw a conclusion that the increased blood pressure is a consequence of these conditions, additionally bound with nephropathy and visceral neuropathy. The Polish Diabetological Association reports that hypertension occurs in diabetics almost 3 times more frequently than in non-diabetic patients (Małecki 2014). In turn, Fabian informs that this percentage can even refer to 80% of diabetics. These values are comparable with the ones obtained in the presented study analyses (Fabian, Czech 2011).

Another group of diabetes signs are angiopathic complications, also present among the respondents of the study; these result from long-lasting diabetes, treated with insufficient intensity. Macroangiopathic complications, such as ischaemic heart disease, the resulting cardiac infarction, and ischaemic brain stroke, are bound with a high mortality burden. According to the literature, ischaemic heart disease occurs in more than 75% of diabetics, leading to deaths in 50% of this group. In the population studied in Jarosław, ischaemic heart disease was recognized in 1/3 of the seniors, history of myocardial infarction in 1/7, and history of brain stroke in ca. 1/10 (Sieradzki 2008). These results turn out definitely lower than the epidemiological data, attributing the complications mentioned above to ca. 1/4 of senior diabetics. These diseases develop slowly, and may remain unnoticed even after 10 or 20 years of the presence of diabetes (Moczulski 2010).

In diabetic patients, the course of brain stroke is especially severe. Its incidence turns out 3–4 times higher than in the non-diabetic senior population.

Moreover, brain stroke is characterized by more severe signs and higher mortality in this setting. Considering the incidence and severity of diabetes complications, special emphasis should be put on efficient management of the disease in order to minimize the probability of its complications. In turn, early treatment of complications will allow to reduce mortality among diabetics (Pączek et al. 2009).

Microangiopathic complications are specific to diabetes and do not occur with other diseases. Numerous authors report retinopathy to be present in 50% of diabetics and to constitute one of the most frequent causes of blindness (Pączek et al 2009, Strojek 2008). In the research performed among the surveyed patients, the diagnosis of retinopathy referred to a slightly smaller group, ca. 1/4 of the seniors. Additionally, it coexisted with such ophthalmological diseases as cataract or glaucoma.

Nephropathy and neuropathy were observed in 1/5 of the studies patients, which corresponds with the results obtained by Tatoń (Tatoń, Czech 2001).

The so-called diabetic foot, occurring in diabetics, constitutes a serious, separate diagnostic and therapeutic problem. It belongs to the most challenging issues and generates high social and economic costs. Diabetic foot results from long-lasting diabetes and refers to ca. 20% of patients.

Out of this group, 1/4 undergo foot amputation (Karnafel, Mrozikiewicz-Rakowska 2010). The outcomes of the survey performed among diabetics in an individual nursing practice in Jarosław point at diabetic foot presence in a definitely smaller group of patients, which may reflect early diagnosis and prevention.

Conclusions

1. The most numerous group of the diabetics analysed in the presented study were women in their early or advanced senility.
2. Diabetes is most often diagnosed in patients aged 50–60 years and treated with oral medications.
3. Most diabetics suffer from overweight, obesity, or severe obesity.
4. The majority of seniors experience late complications of diabetes, such as dyslipidaemia, hypertension, microangiopathy, and macroangiopathy.
5. Analysing the incidence of diabetes and its complications should help outline further actions to diagnose and prevent the disease itself, as well as to early detect and effectively manage its complications – in order to prolong the patients' survival and raise their quality of life.

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