



## Screening to detect carbohydrate disturbances in welfare home residents in Rzeszów

Badania przesiewowe dotyczące zaburzeń metabolizmu węglowodanów  
u mieszkańców domu pomocy społecznej w Rzeszowie

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### Abstract

**Introduction:** To screen for undiagnosed type 2 diabetes and other disturbances of the glucose metabolism in welfare home residents in Rzeszów.

**Material and methods:** 478 residents of four randomly selected welfare homes in Rzeszów were initially enrolled in the study. Among them were 66 residents with previously diagnosed diabetes. Of the remaining 412 adults, 191 (39 males) aged  $66.0 \pm 17.7$  years were enrolled in the study having completed informed consent. All subjects underwent measurements of fasting glucose levels using a glucose meter (Roche Accu-Chek Active, Mannheim, Germany). In participants whose glucose levels exceeded 99 mg/dL, an oral glucose tolerance test (OGTT) was performed. The results of OGTT were qualified as impaired fasting glucose (IFG), impaired glucose tolerance (IGT), or diabetes mellitus (DM).

**Results:** Among the 191 participants, we found 26 cases of IFG (13.6%), 25 of IGT (13.1%), and ten (5.2%) cases of newly diagnosed T2DM.

**Conclusions:** This study highlights that in Polish welfare homes greater medical vigilance is needed in order to optimise the health of residents. (*Endokrynol Pol* 2012; 63 (6): 483–486)

**Key words:** impaired glucose tolerance, diabetes mellitus, welfare home

### Streszczenie

**Wstęp:** Celem pracy było określenie występowania zaburzeń metabolizmu węglowodanów oraz cukrzycy typu 2 u mieszkańców domów pomocy społecznej (DPS) w Rzeszowie.

**Materiał i metody:** Badaniem objęto 478 mieszkańców z 4 losowo wybranych DPS w Rzeszowie. Wśród nich było 66 mieszkańców z wcześniej rozpoznaną cukrzycą. Spośród pozostałych 412 dorosłych osób do badania, po uzyskaniu świadomej zgody, włączono 191 osób (152 kobiety i 39 mężczyzn) w wieku  $66,0 \pm 17,7$  roku. U wszystkich pacjentów wykonano pomiary stężenia glukozy na czczo przy użyciu glukometru (Roche Accu Chek Active Mannheim, Niemcy). U osób, u których stężenie glukozy przekraczało wartość 99 mg/dl, przeprowadzono doustny test tolerancji glukozy (OGTT). Wyniki OGTT kwalifikowano jako nieprawidłową glikemię na czczo (IFG), upośledzoną tolerancję glukozy (IGT) lub cukrzycę (DM).

**Wyniki:** Wśród 191 uczestników badania stwierdzono 26 przypadków IFG (13,6%), 25 przypadków IGT (13,1%) i 10 (5,2%) przypadków nowo zdiagnozowanej cukrzycy typu 2.

**Wnioski:** Badanie to wskazuje, że w domach opieki medycznej konieczna jest większa czujność diabetologiczna w celu optymalizacji zdrowia mieszkańców. (*Endokrynol Pol* 2012; 63 (6): 483–486)

**Słowa kluczowe:** upośledzona tolerancja glukozy, cukrzyca, dom pomocy społecznej

### Introduction

The incidence of type 2 diabetes has taken on epidemic proportions, and has become one of the most important public health concerns [1]. The incidence of diabetes increases with age [1–3]. The Polish study Screenpol 2 diagnosed type 2 diabetes in 15.6% of persons over 45 years of age [3]. In recent decades, attention has been paid to the importance

of detecting diabetes in a variety of care institutions [4–8] for the treatment and prevention of complications. Diagnosed and undiagnosed diabetes in these populations ranges from 20% [6] to 26.7% [4], while in the general population the incidence is 3.5% [4, 6–8]. Welfare homes in Poland are mainly intended for the elderly or for younger adults who are unable to live independently. For the most part, residents of these institutions require nursing care alone, and



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do not have complex medical needs. To date, no data exists regarding the prevalence of diabetes in Polish care institutions.

The aim of this study was to screen for undiagnosed type 2 diabetes and other disturbances of the glucose metabolism in welfare home residents in south-eastern Poland.

## Material and methods

The study was conducted after obtaining approval from the Commission of Bioethics at the University of Rzeszow and the consent of the Municipal Directorate of Social Welfare Centre in Rzeszów. We enrolled in the study only those who were able to understand its purpose and who gave their informed consent to participate. Initially, 478 people from four randomly selected welfare homes in Rzeszów were eligible for inclusion. All subjects were East Central European Caucasians. The screening tests excluded 66 persons previously diagnosed with diabetes. Of the remaining 412 patients, 191 people aged  $66.0 \pm 17.7$  years (39 males) were eligible for inclusion in the study.

For all those who gave their informed consent to participate in the study, fasting plasma glucose levels were measured using a glucose meter (Roche Accu-Chek Active, Mannheim, Germany) at 7am and 8am. The use of such testing as a screening of glucose intolerance is consistent with other studies [9–11]. Residents who had blood glucose levels equal to or lower than 99 mg/dL were considered to be persons free from disturbances of carbohydrate tolerance. Participants whose fasting glucose level exceeded 99 mg/dL completed an oral glucose tolerance test (OGTT) between seven and 28 days after the initial fingerstick test. The results of OGTT completed by these patients were qualified as impaired fasting glucose (IFG), impaired glucose tolerance (IGT), or diabetes mellitus (DM), based on recommendations from the literature [10, 11]. Statistical analysis was performed using STATISTICA v. 6.0 software and a subsidiary of the Microsoft EXCEL spreadsheet. The results

were statistically analysed using the  $\chi^2$  test [12]. We used the method described by Croxon et al [4] to determine the prevalence of diabetes in the whole population of Polish welfare homes.

## Results

The higher ratio of women to men in the study reflected the greater number of female residents in the care homes. Women were younger ( $65.7 \pm 16.9$  years) than men ( $66.9 \pm 20.8$  years), though this was not statistically significant. No significant differences were seen between the mean BMI for men ( $26.3 \text{ kg/m}^2 \pm 5.6 \text{ kg/m}^2$ ) and for women ( $27.3 \pm 6.0 \text{ kg/m}^2$ ). Similarly, no significant sex differences were seen between mean fasting plasma glucose levels using a glucose meter ( $92.4 \pm 12.6 \text{ mg/dL}$  vs  $96.6 \pm 14.0 \text{ mg/dL}$ ).

Based on the OGTT among the 61 enrolled subjects, we found 26 cases of IFG, 25 of IGT, and ten cases of newly diagnosed DM. Table I shows the characteristics of the observed glucose intolerance. Overall, we found abnormal glucose metabolism in 31.9% of patients in the study group. Table II presents an analysis of subgroups made as a result of OGTT. Analysis of variable values and standard deviations showed that statistically significant differences existed between body weight and blood glucose ( $p < 0.05$ ). Increase of body weight significantly increased the risk of impaired glucose tolerance and type 2 diabetes. Mean values of blood glucose were significantly higher in subjects with IFG, IGT and DM.

Statistical analysis of key indicators in four categories characterising the state of glucose metabolism in residents of extended care facilities in Rzeszów indicated that these subgroups did not differ among themselves in terms of age or growth (Table I).

Participants with IGT and DM had significantly higher body mass than subjects with normal glucose tolerance, but these differences did not occur when comparing BMI. However, participants with impaired glucose tolerance had significantly higher mean fasting glucose levels than those with normal glucose tolerance.

**Table I. Characteristics of carbohydrate metabolism disorders identified in the study group**

**Tabela I. Charakterystyka zaburzeń gospodarki węglowodanowej w badanej grupie**

Category of disorders	Occurrence	95% CI
New diagnosis of diabetes (NDD)	10 (5.2%)	105.0–318.4
IFG	26 (13.6%)	98.7–122.6
IGT	25 (13.1%)	104.1–174.5
Total NDD + IFG + IGT	61 (31.9%)	105.0–180.1

IFG — impaired fasting glucose; IGT — impaired glucose tolerance; DM — type 2 diabetes; CI — confidence interval; NDD — newly diagnosed diabetes

**Table II.** Analysis of disorders of glucose metabolism in the study group**Tabela II.** Analiza zaburzeń metabolizmu glukozy w badanej grupie

	Standard	IFG	IGT	DM
Age (years)	65.3 ± 18.9	68.5 ± 13.7	65.8 ± 17.2	68.9 ± 12.7
Height [cm]	157 ± 11.0	156 ± 8.2	160.4 ± 6.8	157 ± 6.9
Weight [kg]	64.9 ± 16.0	68.4 ± 11.8	73 ± 17.5*	72.7 ± 8.9*
BMI [kg/m <sup>2</sup> ]	26.4 ± 6.0	28.2 ± 4.6	28.4 ± 6.8	29.8 ± 4.4
Blood glucose [mg/dL] (capillary blood)	88.4 ± 7.1	105.9 ± 5.3*	112 ± 7.8*	122.4 ± 18.8*

\*p < 0.05; IFG — impaired fasting glucose; IGT — impaired glucose tolerance; DM — type 2 diabetes

Within our population of 478 residents of extended care facilities, there were 66 cases of previously diagnosed diabetes, and a further 61 cases of abnormal glucose homeostasis. By employing the methods of Croxson et al. [4], we extrapolated our results to determine a prevalence of type 2 diabetes of 26.5% in the general population and 29.4% of residents in welfare homes in Rzeszow.

## Discussion

Assuming that in extended care facilities in Poland there are no programmes intended to detect diabetes, we aimed to determine the actual prevalence of diabetes and glucose intolerance in this environment.

In our study, the incidence of diagnosed and treated diabetes in welfare home residents was 13.8%. This result is similar to that described in the UK by Sinclair et al. [5] in 2001 (12%), by Aspray et al. [6] in 2006 (11.4%) and by Gill et al. [13] in New Zealand in 2006 (11.7%). These patients were diagnosed with DM2 using OGTT. A Polish epidemiological multicentre study conducted between 1998 and 2000 revealed the occurrence of DM2 in the general population of persons over 35 years of age at 5.31% [14]. Hauner et al. [7] described a significantly higher incidence of known diabetes (26.2%) in Germany diagnosed on the basis of elevated levels of HbA<sub>1c</sub>. Based on data from the National Nursing Home Service in 2004, Resnick et al. [8] identified the presence of DM at 22.5% and 35.6% respectively in white and non-white residents in the US. The differences between population prevalence in different countries may be due to the variety of methodologies used for testing (OGTT, HbA<sub>1c</sub>, review of documents), and ethnic factors.

In the present study, we found ten new cases of diabetes, which accounted for 5.2% of the previously examined population. A previous British study found the occurrence of newly diagnosed diabetes in extended care facilities to range between 8.2% and 14.7% [5, 6]; Hauser et al. [7] in Germany found 8.5%. Identifica-

tion of the type of prediabetic states (IFG and IGT) was studied in residents of welfare homes in Rzeszow. In our study, these conditions were present in up to 26.7% of our population (13.1% of them were IGT).

The study by Sinclair identified IGT in as many as 30% of participants, but did not distinguish the category of IFG [5]. The other papers cited above did not provide information on the incidence of IFG. Our results are significantly higher than those published in 1991 by Croxson et al. [4], who employed OGTT in a British Caucasian population of 583 people aged from 65 to 85 years and who were for the most part living in their own homes. The Croxson study reported 19 new cases of DM2, (3.2%) and 44 cases of IGT (7.5%). One reason for these differences may be the interval of almost 20 years between the two surveys and the growth in diabetes prevalence during this period. The results of the study by Zhang et al. [15] confirmed that the crude prevalence of DM in residents of extensive care facilities in the US rose from 16.9% in 1995 to 26.4% in 2004.

It is worth noting that both the German and US data are similar to those obtained by our group after we combined cases of previously known and new cases of diabetes and extrapolated these to the whole population. Then, the incidence of diabetes was 26.5%, and the incidence of all disorders of the glucose metabolism was 29.4%.

## Conclusions

We conducted a pilot study to screen for glucose intolerance in extended care facility residents and observed a lower percentage of newly diagnosed diabetes patients compared to other European countries such as Britain and Germany. In addition, we observed a high prevalence of IGT and IFG, which was found in about every fourth participant in our study.

The results of this study highlight the need for an increase in diabetes awareness among medical staff of extended care facilities. Therefore, in view

of the growing network of extended care facilities in Poland and the likely increase in the number of patients potentially at risk of diabetes, it would be prudent to develop guidelines for the early screening of disorders of the glucose metabolism at the point of admission to the care home, in tandem with periodic monitoring of their blood glucose levels or HbA<sub>1c</sub>.

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