Primary Health Care Department of Family Medicine Department
Medical University of Lublin

GRAŻYNA MARDAROWICZ, JERZY ŁOPATYŃSKI,
GRZEGORZ SZCZEŚNIAK

Cardiovascular risk factors in the Lublin Region population with and without type 2 diabetes mellitus

Ischaemic heart disease is still the most important cause of mortality in developed countries. In Poland it is the main cause of earlier death for men and the second most frequent cause of earlier death (after malignant neoplasm) for women. It is responsible for about 40% deaths of middle-aged men and leads to the phenomenon characteristic of our country of over-mortality in this group (11). However, a gradual decrease in ischaemic heart disease related mortality can be observed in recent decades. Improvement has been noted in the United States since the beginning of the 1970's, some time later in Western Europe, and since the early 1990's in Poland (16).

Diabetes is believed to be one of the main risk factors of ischaemic heart disease. As many as 20–30% of subjects with ischaemic heart disease have diabetes and around ¾ of diabetics have ischaemic heart disease (7). Their co-occurence increases the death risk in men by 2–3 times and by as many as 3–5 times in women (2, 8). Haffner et al. proved that the hazard ratio for death of coronary heart disease in diabetic subjects who have not had cardiac infarction is similar to the risk in non-diabetic subjects who have had the cardiac infarction (5). Increased incidence and mortality caused by ischaemic heart disease can also be found in subjects with impaired glucose tolerance (2).

It is presently believed that all risk factors coexisting in patients should be taken into account in coronary disease prophylaxis as in this way more can be achieved than focusing on just one of them. The aim of this study was to asses the prevalence of selected risk factors of ischaemic heart disease: obesity, central obesity, arterial hypertension, lipid disorders and smoking habit of the Lublin Region inhabitants, and to compare this prevalence with the one in the groups of normal and impaired glucose tolerance (IGT), newly diagnosed and known type 2 diabetes mellitus (DM 2).

MATERIAL

The analysis was based on the data collected by Primary Health Care Department personnel in the 1998 – 2001 period during the realization of the scientific project PBZ/018-11 – *Primary and Secondary Prevention and Its Influence on Epidemiological and Economic Factors in Type 1 and Type 2 Diabetes Mellitus in the Polish Population* coordinated by Prof. Zbigniew Szybiński, commissioned by the Ministry of Healthcare and Social Welfare. The survey involved 3,782 persons aged ≥ 35 selected in a two-layer draw from the inhabitants of former Lubelskie Voivodship (province) (9). This analysis concerns 1966 persons from the Lublin Town and 1795 persons from villages of the Lublin Region.

METHODS

The body weight, height and waist and hip circumference were measured. Body mass index (BMI) and waist to hip ratio (WHR) were determined. Obesity was defined as BMI $\geq$ 30 kg/m^2 (12), central obesity was diagnosed when WHR > 0.85 in women and 0.9 in men (13).

Arterial blood pressure of the examined was measured three times in the sitting position after a 10-minute rest. The values of $\geq$ 140 mmHg for systolic and $\geq$ 90 mmHg for diastolic pressure sustaining during at least two measurements were diagnosed as arterial hypertension (15). Fasting blood samples were taken from the basilic vein in order to determine the full blood glucose concentration. We determined concentrations of total cholesterol (TC), high-density lipoprotein cholesterol (HDL) and triglycerides (TG) in blood serum. Glycaemia was also determined 2 hours after a 75 g oral glucose load in these subjects, who had no previous diagnosis of diabetes and whose fasting glycaemia did not exceed 8 mmol/l (144mg/dl). Glucose concentration level was measured with the Roche glucometer – Glucotrend.

Glycaemia was assessed in accordance with the 1985 WHO criteria (13). DM 2 was diagnosed when glycaemic values of full vein blood were $\geq$ 6.7 mmol/l (120 mg/dl) in fasting and/or $\geq$ 10 mmol/l (180 mg/dl) in the 120th minute after the oral glucose load. IGT was diagnosed, when fasting glycaemic values were < 6.7 mmol/l (120 mg/dl) and were $\geq$ 6.7 mmol/l (120 mg/dl) and < 10 mmol/l (180 mg/dl) in the 120th minute after the oral glucose load.

TC, HDL and TG were measured by means of the enzymatic method with Cormay diagnostic tests. Low-density cholesterol lipoprotein (LDL) was calculated on the basis of the Friedewald's formula (3). Concentration levels of TC $\geq$ 5,2 mmol/l (200mg/dl), LDL $\geq$ 3.5 mmol/l (135 mg/dl), HDL < 1 mmol/l (39 mg/dl) for women and < 0.9 mmol/l (35 mg/dl) for men, TG $\geq$ 1.7 mmol/l (150 mg/dl) were regarded to be pathological (1,4,10,13).

The analysis was conducted in the following groups: A) without DM 2 and IGT, B) with IGT, C) with newly diagnosed DM 2 and D) with known DM 2, separately for all the examined, urban and rural populations. The results were statistically processed by means of the Chi-square test.

RESULTS

DM 2 was diagnosed in 17.2% of the examined in the countryside and in 14.1% of the examined from the town. IGT was found in 30.3% and 21.6%, respectively. The prevalence of glucose tolerance disorders is presented in Table 1.

Table 1. The prevalence of glucose tolerance disorders in the examined population

		Without IGT and DM 2		IGT		DM 2 newly diagnosed		DM 2 known	
		X	%	X	%	X	%	X	%
Town (n = 1966)	women (n = 1087)	694	64	259	24	80	7	54	5
	men (n = 879)	563	64	173	20	71	8	72	8
	total (n = 1966)	1257	64	432	22	151	8	126	6
Countryside (n = 1795)	women (n = 1015)	461	46	349	35	141	14	55	5
	men (n = 794)	477	61	199	25	90	11	23	3
	total (n = 1795)	938	52	548	31	231	13	78	4
Total (n = 3761)	women (n = 2106)	1168	55	608	29	221	10	109	5
	men (n = 1676)	1048	63	372	22	161	10	95	6
	total (n = 3782)	2195	58	980	26	382	10	204	5

Statistically more significant prevalence of obesity in the group B compared to the group A and in the groups C and D compared to the groups A and B was found both in the general, urban and rural populations. Prevalence of obesity in the group D of urban population was additionally significantly higher than in the group C. The highest percentage of subjects with BMI ≥ 30 kg/m 2 was found in the group C in the town (61%) and in the group D in the countryside (65%).

Table. 2. Selected ischaemic heart disease factors in the general population

	A) without IGT and DM 2 (n=2195)		B) IGT (n=980)		C) DM 2 newly diagnosed (n=382)		D) DM 2 known (n=204)		
	x	%	x	%	x	%	x	%	p
BMI ≥ 30 kg/m^2	502	23	340 [1]	35	196 [1,2]	51	113 [1,2]	55	< 0.05
WHR ≥ 0.85 (K) and ≥ 0.9 (M)	1619	74	818 [1]	84	327 [1]	86	184 [1,2]	90	< 0.05
Arterial hypertension	1307	60	769 [1]	79	333 [1,2]	87	181 [1,2]	89	< 0.05
TC ≥ 200 mg%	1344	61	634	65	262 [1]	69	128	63	< 0.05
LDL ≥ 135 mg%	1185	53	539	55	214	56	107	53	≈ 0.8
HDL < 40 mg% (K) and < 35 mg% (M)	550	25	262	27	129 [1,2]	34	74 [1,2]	36	< 0.05
TG ≥ 150 mg%	720	33	403 [1]	41	205 [1,2]	54	115 [1,2,3]	56	< 0.05
Smoking – presently	732	33	194 [1]	20	62 [1]	16	30 [1]	15	< 0.05
Smoking – earlier	503	23	208	21	84	22	54	27	≈ 0.4

Table.3. Selected ischaemic heart disease factors in the Lublin Town population

	A) without IGT and DM 2 (n=1257) aver. age: 52.4 yrs		B) IGT (n=432) aver. age: 56.8 yrs		A) DM 2 newly diagnosed (n=151) aver. age: 58.4 yrs		D) known DM 2 (n=126) aver. age: 62 yrs		
	x	%	x	%	x	%	x	%	p
BMI ≥ 30 kg/m^2	296	24	146 [1]	34	92 [1,2]	61	62 [1,2]	49	< 0.05
WHR ≥ 0.85 (K) and ≥ 0.9 (M)	906	72	355 [1]	82	135 [1,2]	89	115 [1,2]	91	< 0.05
Arterial hypertension	753	60	339 [1]	78	130 [1,2]	86	113 [1,2]	90	< 0.05
TC ≥ 200 mg%	734	58	272	63	92	61	75	60	≈ 0.4
LDL ≥ 135 mg%	660	53	231	53	74	49	61	48	≈ 0.65
HDL <40 mg% (K) and < 35 mg% (M)	376	30	149	34	57 [1]	38	49 [1]	39	< 0.05
TG ≥ 150 mg%	457	36	217 [1]	50	98 [1,2]	65	72 [1]	57	< 0.05
Smoking–presently	438	35	99 [1]	23	36 [1]	24	26 [1]	21	< 0.05
Smoking – earlier	339	27	116	27	40	26	45 [1]	36	≈ 0.25

Central obesity was found statistically more frequently in groups B, C, D than in group A. Prevalence of central obesity in group D of the general population was additionally significantly higher than in group B. In the urban population it was found more frequently in C and D groups compared to group B. Central obesity was most frequent in subjects with known DM 2, where its prevalence neared 90% regardless of the domicile. Regardless of the domicile arterial hypertension was statistically more frequent in groups B, C and D compared to group A, and in group C compared to group B. Significantly higher prevalence of arterial hypertension was found in group D of the general and urban populations than in group B. Arterial hypertension was most frequent in subjects with known DM 2, where its prevalence neared 90%.

Elevated total cholesterol level in blood serum was found statistically more frequently in group C compared to group A of the general and rural populations. TC $\geq$ 5.2 mmol/l occurred significantly more frequently in group C compared to group B only in the rural population. Hypercholesterolemia was the most frequent in the rural group C – 74% of the examined. The analyzed groups did not differ significantly in the respect of hyper-LDL-cholesterolemia prevalence. Hypo-HDL-cholesterolemia was found statistically more frequently in groups C and D compared to A. Hypo-HDL-cholesterolemia in the general and rural populations were significantly more frequent in groups C and D compared to B. The highest prevalence of this disorder was observed in the urban population with known DM 2 – 39% of the examined.

Table.4. Selected ischaemic heart disease factors in rural population of the Lublin Region

	A) without IGT and DM 2 (n=938) aver. age: 54.4 yrs		B) IGT (n=548) aver. age: 60.2 yrs		A) DM 2 newly diagnosed (n=231) aver. age: 63.5 yrs		D) DM 2 known (n=78) aver. age: 64.3 yrs		
	x	%	x	%	x	%	x	%	p
BMI $\geq$ 30 kg/m^2	206	22	194 [1]	35	104 [1,2]	45	51 [1,2,3]	65	< 0.05
WHR $\geq$ 0.85 (K) and $\geq$ 0.9 (M)	713	76	463 [1]	84	192 [1]	83	69 [1]	88	< 0.05
Arterial hypertension	554	59	430 [1]	78	203 [1,2]	88	68 [1]	87	< 0.05
TC $\geq$ 200 mg%	610	65	362	66	170 [1,2]	74	53	68	$\approx$ 0.08
LDL $\geq$ 135 mg%	525	56	308	56	140	61	46	59	$\approx$ 0.6
HDL < 40 mg% (K) and < 35 mg% (M)	174	19	113	21	72 [1,2]	31	25 [1,2]	32	< 0.05
TG $\geq$ 150 mg%	263	28	186 [1]	34	107 [1,2]	46	43 [1,2]	55	< 0.05
Smoking – presently	294	31	95 [1]	17	26 [1,2]	11	4 [1,2]	5	< 0.05
Smoking - earlier	164	17	92	17	44	19	9	12	$\approx$ 0.45

The following was the prevalence of hypertriglyceridemia in the groups of the general population: A < B < C < D. This disorder in urban and rural populations was found more frequently in groups B, C and D compared to group A and in C compared to B. Additionally, in the countryside hypertriglyceridemia occurred significantly more frequently in group D than in B. The highest prevalence of hypertriglyceridemia was found in the inhabitants of Lublin with newly diagnosed DM 2 – 65%.

Regardless of the domicile, there were significantly more active tobacco smokers in group A than in groups B, C and D. Their percentage in this group was close to 33%. In the countryside we also found significantly higher prevalence of the smoking habit in group B compared to groups C and D. There were significantly more former smokers in group D then in group A in the Lublin population. Percentage of former smokers did not differ significantly between the other groups. It was highest in the group of town inhabitants with known DM 2.

DISCUSSION

Our analysis shows that the prevalence of ischaemic heart disease risk factors related to metabolic syndrome: obesity, central obesity, arterial hypertension, hypo-HDL-cholesterolemia and hypertriglyceridemia – grows along with the increase in the occurrence of impaired glucose tolerance disorders. It is a particularly dangerous phenomenon for many patients with such accumulation of risk factors as coronary disease develops quickly, latently and may lead to sudden heart death. Reduction of these factors to the greatest possible extent is necessary: body mass reduction due to an appropriate diet and increased physical activity, effective hypoglycaemic, hypotensive and hypolipemic treatment.

Attention should be drawn to diabetes-related lipid disorders. In our survey we found particularly high prevalence of hypertriglyceridemia. Other lipid disorders occurred in DM 2 and IGT comparably as frequently as in the nondiabetic population. It can suggest that fibrates rather than statins should be preferred hypolipemic drugs in the prophylaxis of ischaemic heart disease in the case of such patients (6).

Tobacco smoking, especially active, seems to be less prevalent in persons with DM 2 and IGT. If in the case of persons with known DM 2 this can be explained by a health promoting change in behaviour, which can be proved by a high percentage of former smokers, it is difficult to unambiguously explain why this relationship also concerns persons with newly diagnosed DM 2 and IGT.

It is worth saying that an average age of the examined subjects with DM 2 was in our survey higher than that of the examined without DM 2 in their mid - 60's. Most of these persons are no more subjected to periodical health examinations and controlling and fighting of ischaemic heart diseases risk factors remains in the hands of the family doctor. It is the family doctor who decides whether a patient predisposed to develop arteriosclerosis only by virtue of his age will have obesity, diabetes, arterial hypertension or dislipidemia diagnosed early and treated correctly.

CONCLUSIONS

Ischaemic heart disease risk factors related to the metabolic syndrome – obesity, central obesity, arterial hypertension, hypo-HDL-cholesterolemia and hypertriglyceridemia – occur significantly more frequently in persons with DM 2 and IGT. Diagnosis and treatment of these disorders should be a priority in diabetes care.

REFERENCES

1. Aktualne Stanowisko American Heart Association. Ogólne zalecenia American Heart Association dotyczące prewencji pierwotnej chorób sercowo naczyniowych. Med. Prakt., 3, 87, 1998.
2. Balkau B. et al.: High blood glucose concentration in a risk for mortality in middle-aged non-diabetic men. Diabetes Care, 3,360, 1998.
3. Friedewald W.T. et al.: Estimation of the concentration of low density lipoprotein cholesterol in plasma without use of the preparative ultracentrifuge. Clin. Chem., 18, 449, 1992.
4. Guide to primary prevention of cardiovascular diseases. A statement of health professionals from the Task of Risk Reduction. Circulation, 95, 2329, 1997.
5. Haffner S.M. et al.: Mortality from coronary heart disease in subjects with type 2 diabetes and in nondiabetic subjects with and without prior myocardial infarction. N. Engl. J. Med., 339, 229, 1998.
6. Idzior-Waluś B.: Leczenie zaburzeń lipidowych w cukrzycy. Terapia, 1, 132, 2003
7. Kannel W. B., McGee D. L.: Diabetes and glucose as risk factor for cardiovascular disease: the Framingam Study. Diabetes Care, 2, 120, 1979.
8. Królewski A. S. et al.: Mortality from cardiovascular diseases among diabetics. Diabetologia, 13, 345, 1997.
9. Łopatyński J. et al.: Badania nad występowaniem cukrzycy typu 2 w populacji powyżej 35 roku życia na wsi i w mieście w regionie lubelskim. Pol. Arch. Med. Wew., CVI. 3, 9, 37, 2001.
10. Polskie Towarzystwo Kardiologiczne. Standardy Postępowania w Chorobach Układu Krążenia. Kard. Pol., 46, supl.1, 1997.
11. Rządowa Rada Ludnościowa: Raport 1998–1999. Sytuacja demograficzna Polski. Warszawa 1999.
12. WHO Expert Committee: Physical Status: the Use and Interpretation of Anthropometry. WHO Technical Report Series no. 854, Geneva 1995.
13. World Health Organisation: Definition, Diagnosis and Classification of Diabetes Mellitus and Its Complications. Report of WHO Consultations. Part 1: Diagnosis and Classification of Diabetes Mellitus, Geneva 1999.
14. World Health Organisation: Diabetes Mellitus: Report of WHO Study Group. WHO Technical Report Series no. 727, Geneva 1985.
15. Zasady postępowania w nadciśnieniu tętniczym. Nadciśnienie Tętnicze, 4, supl. B., B1, 2000.
16. Zatoński W. A. et al.: Ecological study of reasons for sharp decline in mortality from ischaemic heart disease in Poland since 1991. BMJ, 316, 7137, 1047, 1998.

SUMMARY

In the 1998–2001 period we carried out a survey on a representative group of the Lublin Region inhabitants aged over 35. During the survey we found particularly high and so far underestimated prevalence of type 2 diabetes mellitus (DM 2) and impaired glucose tolerance (IGT). Ischaemic heart disease and sudden heart death, which is related to it, are the most frequent DM 2 complications. The aim of this study was to assess the prevalence of selected ischaemic heart disease risk factors – obesity, central obesity, arterial hypertension, lipid disorders and the smoking habit – in the Lublin Region inhabitants in groups with correct and impaired glucose tolerance (IGT) as well as newly diagnosed and known type 2 diabetes mellitus 2 (DM 2), and to compare them with each other. We found significantly higher prevalence of obesity, central obesity, arterial hypertension, hypo-HDL-cholesterolemia and

hypertriglyceridemia in the group with IGT and DM 2 compared to the group without IGT and DM 2. We did not find significant differences between the groups in total hypercholesterolemia and hyper-LDL-cholesterolemia prevalence. Smoking percentage was significantly higher in persons without IGT and DM 2. Ischaemic heart disease risk factors related to the metabolic syndrome are significantly more frequent in persons with DM 2 and IGT. Diagnosis and treatment of these disorders should be a priority in diabetes care.

Czynniki ryzyka choroby niedokrwiennej serca u mieszkańców Lubelszczyzny z cukrzycą i bez tej choroby

W latach 1998-2001 przeprowadziliśmy badanie na reprezentatywnej grupie mieszkańców Lubelszczyzny od 35 roku życia. W badaniach tych stwierdziliśmy szczególnie duże, a niedoszacowane dotychczas rozpowszechnienie cukrzycy typu 2 (DM 2) i upośledzonej tolerancji glukozy (IGT). Najczęstszym powikłaniem DM 2 jest choroba niedokrwienna serca i związana z nią nagła śmierć sercowa. Celem tej pracy było oszacowanie częstości występowania wybranych czynników choroby niedokrwiennej serca: otyłości, otyłości brzusznej, nadciśnienia tętniczego, zaburzeń lipidowych i nałogu palenia tytoniu u mieszkańców Lubelszczyzny w grupach z prawidłową i upośledzoną tolerancją glukozy (IGT) oraz nowo wykrytą i znaną cukrzycą typu 2 (DM 2) i porównanie ich ze sobą. W grupie z IKT i DM 2 stwierdziliśmy znamiennie częstsze występowanie otyłości, otyłości brzusznej, nadciśnienia tętniczego, hipo-HDL-cholesterolemii i hipertrójglicerydemii w stosunku do grupy bez IGT i DM 2. Nie stwierdziliśmy wyraźnych różnic w grupach w rozpowszechnieniu hipercholesterolemii całkowitej i hiper-LDL-cholesterolemii. Palenie tytoniu było znamiennie częstsze u osób bez IGT i DM 2. U osób z DM 2 i IGT znamiennie częściej występują czynniki ryzyka choroby niedokrwiennej serca z kręgu zespołu metabolicznego. Wykrywanie i leczenie tych zaburzeń powinno być priorytetem w opiece nad pacjentem z cukrzycą.