

# Changes in secondary prevention of coronary artery disease in the post-discharge period over the decade 1997-2007. Results of the Cracovian Program for Secondary Prevention of Ischaemic Heart Disease and Polish parts of the EUROASPIRE II and III surveys

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## Abstract

**Background:** Both in the European and Polish guidelines, the highest priority for preventive cardiology was given to patients with established coronary artery disease (CAD). The Cracovian Program for Secondary Prevention of Ischaemic Heart Disease was introduced in 1996 to assess and improve the quality of clinical care in secondary prevention. Departments of cardiology of five participating hospitals serving the area of the city of Kraków and surrounding districts (former Kraków Voivodship) inhabited by a population of 1 200 000 took part in the surveys. In 1999/2000 and 2006/2007 the same hospitals joined the EUROASPIRE (European Action on Secondary Prevention through Intervention to Reduce Events) II and III surveys. The goal of the EUROASPIRE surveys was to assess to what extent the recommendations of the Joint Task Force of International Scientific Societies were implemented into clinical practice.

**Aim:** To compare the quality of secondary prevention in the post-discharge period in Kraków in 1997/1998, 1999/2000 and 2006/2007.

**Methods:** Consecutive patients hospitalised from 1 July 1996 to 31 September 1997 (first survey), from 1 March 1998 to 30 March 1999 (second survey), and from 1 April 2005 to 31 July 2006 (third survey) due to acute myocardial infarction, unstable angina or for myocardial revascularisation procedures, below the age of 71 years were identified and then followed up, interviewed and examined 6-18 months after discharge.

**Results:** The number of patients who participated in the follow-up examinations was 418 (78.0%) in the first survey, 427 (82.9%) in the second and 427 (79.1%) in the third survey. The use of cardioprotective medication increased significantly: antiplatelets from 76.1% (1997/1998) to 86.9% (1999/2000) and 90.1% (2006/2007), beta-blockers from 59.1% (1997/1998) to 63.9% (1999/2000) and 87.5% (2006/2007), and ACE inhibitors/sartans from 45.9% (1997/1998) to 79.0% (2006/2007). The proportion of patients taking lipid lowering agents increased from 34.0% (1997/1998) to 41.9% (1999/2000) and 86.8% (2006/2007). Simultaneously, a significant improvement in the control of hyperlipidemia could be noted. In 2006/07, over 60% had a serum LDL cholesterol < 2.5 mmol/l. No significant change was found in the proportion of subjects with well-controlled hypertension or diabetes. In 2006/2007, elevated blood pressure was found in 46.6% of participants and glucose > 7 mmol/l in 13.4%. There was no significant change in smoking rates (16.3 vs. 15.9 vs. 19.2%). The proportion of obese patients increased reaching 33.9% in 2006/2007.

**Conclusions:** The implementation of CAD prevention guidelines into clinical practice over the decade from 1997/1998 to 2006/2007 changed significantly. The use of cardioprotective drugs increased largely but among risk factors a significant improvement could be found only in the case of hypercholesterolemia. No improvement in the control of hypertension and diabetes, no change in smoking rates and increasing prevalence of obesity suggest insufficient lifestyle modifications in CAD patients.

**Key words:** coronary artery disease, risk factors, secondary prevention

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## Introduction

Coronary artery disease (CAD) is the most common single cause of death in the developed countries. The CAD prevention has contributed largely to the decrease in the incidence of CAD as well as in mortality rates [1, 2]. It has been estimated that in the US secondary prevention contributed to 11% of the fall of the number of CAD deaths over the period from 1980 to 2000, which is nearly two fold more than revascularisation for chronic angina [2]. In 1994, five European scientific societies including the European Society of Cardiology published joint recommendations on prevention of ischaemic heart disease in clinical practice [3]. The document was updated in 1998, 2003 and 2007 [4-6]. In Poland a series of recommendations was issued by experts of the Polish Cardiac Society in 1997 and 2000 [7-10]. In 2004, the third European recommendations were translated to Polish and endorsed by the Polish Cardiac Society [11]. Both in the European and Polish guidelines, the highest priority for preventive cardiology was given to patients with established ischaemic heart disease.

The Cracovian Program for Secondary Prevention of Ischaemic Heart Disease was introduced in 1996. The main goal of the program was to assess and improve the quality of clinical care in secondary prevention of CAD in Kraków. First results showed that implementation of CAD prevention guidelines into clinical practice was inadequate and that there was a considerable potential for further reduction of the cardiovascular risk in CAD patients [12, 13]. The same centres took part in the EUROASPIRE (European Action on Secondary Prevention through Intervention to Reduce Events) II and III surveys. These initiatives allowed for the assessment of temporal changes in the implementation of recommendations as well as for international comparisons [14, 15]. In the recent paper we reported significant improvements in the quality of secondary prevention of CAD among patients hospitalised in cardiac departments in Kraków [16]. The aim of the present study was to compare the quality of secondary prevention in post-discharge patients in Kraków in 1997/1998, 1999/2000 and 2006/2007.

## Methods

Groups studied and methods used in the Cracovian Program for Secondary Prevention of Ischaemic Heart Disease and in the EUROASPIRE II and III surveys have been described in earlier reports [12-16]. A brief description is given below.

Five hospitals with departments of cardiology serving the area of the city of Kraków and surrounding districts (former Kraków voivodship) participated in the study. The total population of this area was 1 200 000 inhabitants. In each department, medical records of consecutive patients hospitalised from 1 July 1996 to 31 September 1997 (first survey), from 1 March 1998 to 30 March 1999 (second survey), and from 1 April 2005 to 31 July 2006

(third survey) with the following discharge diagnosis or procedures performed were reviewed:

- acute myocardial infarction [first or recurrent, no prior percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG)],
- unstable angina (first or recurrent, no prior PCI or CABG),
- percutaneous coronary intervention (first, no prior CABG),
- isolated coronary artery bypass surgery (first).

Patients were identified retrospectively excluding those who died during their in-hospital stay. If the patient was hospitalised more than once during the study period, only the first hospitalisation was regarded as an index event. The first survey was conducted as the Cracovian Program for Secondary Prevention of Ischaemic Heart Disease [12, 13], the second as a part of the EUROASPIRE II survey [14] and the third one as a part of the EUROASPIRE III survey [15]. The methods of the first survey were carefully reviewed. Only data with assured comparability with later data collected in EUROASPIRE surveys were included into the present analysis. There was a difference in the age span between the first two and the third survey. To ensure comparability between findings of all three surveys, only participants at the age below 71 years were included in the present analysis.

Participants were invited to take part in the follow-up examination 6 to 18 months after discharge. Data on demographic characteristics, personal history of ischaemic heart disease, smoking status, blood pressure, fasting glucose, plasma lipids, and prescribed medications were obtained using a standard questionnaire. Height and weight were measured in the standing position without shoes and heavy outer garments using standard scales with a vertical ruler. Body mass index (BMI) was calculated according to the following formula:  $BMI = \text{weight [kg]} / (\text{height [m]})^2$ . Blood pressure was measured twice, on the right upper arm in the sitting position after at least five minutes of rest. For plasma lipid and glucose measurements a fasting venous blood sample was taken between 7.30 and 8.30 in the morning. For the present report, results of the analyses which were done no later than 4 h after blood collection were used. Analyses were carried out using enzymatic automated methods in the Department of Biochemical Diagnostics of the Jagiellonian University Medical College, Kraków, Poland that participated in the external quality control programme of the Center of Disease Control, Atlanta, USA. LDL-cholesterol (LDL-C) was calculated according to Friedewald's formula [17]. Diabetes mellitus was defined as fasting glucose level  $\geq 7.0$  mmol/l or taking antidiabetic treatment. The study protocol was approved by the Bioethics Committee of the Jagiellonian University (KBET/115/B/2005).

## Statistical analysis

Categorical variables are reported as percentages and continuous variables as mean  $\pm$  SD. The Pearson  $\chi^2$  test was applied to all categorical variables. Normally distributed continuous variables were compared using Student's t test.

Variables without normal distributions were evaluated using the Mann-Whitney U test. A two-tailed p value of less than 0.05 was considered to indicate significance. A general linear model was used to assess the independent differences between the three surveys and their 95% confidence intervals.

## Results

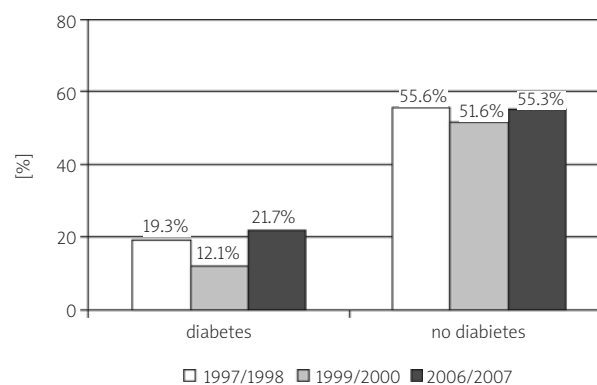
The number of CAD patients selected for the study after the review of hospital records was 536 in 1996-1997, 515 in 1998-1999, and 540 in 2005-2006. The number of patients who participated in the follow-up examinations 6-18 months after discharge was: 418 (78.0%), 427 (82.9%) and 427 (79.1%), respectively. There was no significant difference in the age and sex distribution between subjects who participated in the follow-up examination and those who did not. Also, no significant differences were found in the exposure to risk factors recorded during hospitalisation.

The characteristics of the studied groups by survey are shown in Table I. There was no significant difference in the gender distribution between the samples. The mean age was higher and duration of education was longer in the sample examined in the third survey (2006/2007) when compared with the first sample (1997/1998).

Proportions of patients who did not reach the treatment goals are presented in Table II. The proportion of patients having blood pressure  $\geq 140/90$  mmHg was 46.3% in 1997/98 and did not change significantly over the decade (46.6% in 2006/07). There was no significant change in the proportion of participants with blood pressure below 130/80 mmHg in diabetics (Figure 1). Similarly, there was no significant difference in proportions of non-diabetics with blood pressure below 140/90 mmHg (Figure 1). The effectiveness of hypercholesterolemia management improved significantly in 2006/07 when compared with the two previous surveys (Table II). The change was even more pronounced after replacing the old treatment goal (3.5 mmol/l) with the recently introduced one of 2.5 mmol/l [6]. Proportion of patients who reached

target LDL cholesterol level according to values recommended as treatment goals at the time of survey is presented in Figure 2. Although the treatment goal was lowered by 1 mmol/l over the decade, the proportion of patients reaching the goal was the highest in the last survey (2006/2007). Also the proportion of patients with a total cholesterol level at goal in 2006/2007 (54.3% with total cholesterol  $\leq 4.5$  mmol/l) was higher when compared with 1997/1998 (25.5% with total cholesterol  $\leq 5.0$  mmol/l) and with 1999/2000 (25.8% with total cholesterol  $\leq 5.0$  mmol/l).

There was no significant change in the proportion of patients with high fasting glucose in the whole group (Table II). In persons with known diabetes, no significant difference was found in the proportions of controlled diabetes. In diabetics, the proportion of patients with fasting glucose  $< 7.0$  mmol/l was 32.1% in 1997/98, 32.9% in 1999/2000 and 42.9% in 2006/2007. The proportion of patients with obesity (BMI  $\geq 30$  kg/m<sup>2</sup>) increased over the decade by almost 10%.



**Figure 1.** Proportion of patients with required blood pressure values in diabetic and non-diabetic patients (treatment goal for diabetics: blood pressure  $< 130/80$  mmHg, goal for non-diabetics: blood pressure  $< 140/90$  mmHg)

**Table I.** Mean age, gender distribution, mean duration of education, and mean time between index hospitalisation and the follow-up examination by survey

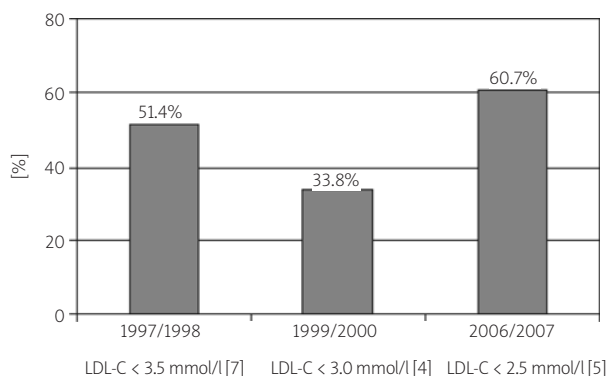
Survey	Mean age [years $\pm$ SD]	Men/women [%]	Mean duration of education [years $\pm$ SD]	Mean time between index hospitalisation and the follow-up examination [years $\pm$ SD]
1997/1998	57.8 $\pm$ 8.3	73.2/26.8	11.4 $\pm$ 3.6	1.22 $\pm$ 0.43
1999/2000	58.6 $\pm$ 8.1	69.8/30.2	11.6 $\pm$ 3.5	1.09 $\pm$ 0.33
2006/2007	59.9 $\pm$ 7.7	71.2/28.8	11.9 $\pm$ 3.4	1.11 $\pm$ 0.38
<b>Difference (95% confidence interval)</b>				
1999/2000 vs. 1997/1998	0.8 (-0.3-1.9)	-3.4% (-9.5-2.7%)	0.3 (-0.2-0.8)	-0.14 (-0.19-0.09)
2006/2007 vs. 1999/2000	1.2 (-0.1-2.3)	-2.0% (-8.1-4.1%)	0.3 (-0.2-0.7)	0.03 (-0.03-0.08)
2006/2007 vs. 1997/1998	2.0 (0.9-3.1)	1.4% (-4.7-7.5%)	0.6 (0.1-1.0)	-0.11 (-0.16-0.06)

**Table II.** Temporal changes in proportions of patients who did not reach treatment goals

Survey	Smoking [%]	Blood pressure $\geq 140/90$ mmHg [%]	LDL cholesterol $\geq 3.5$ mmol/l [%]	LDL cholesterol $\geq 2.5$ mmol/l [%]	Fasting glucose $\geq 7.0$ mmol/l [%]	Body mass index $\geq 30$ kg/m <sup>2</sup> [%]
1997/1998	16.3	46.3	48.6	87.4	9.6	24.5
1999/2000	15.9	50.4	47.0	86.9	13.1	27.2
2006/2007	19.2	46.6	13.1	39.3	13.4	33.9
<b>Differences adjusted for age, sex, duration of education and time between index hospitalisation and the examination (95% confidence intervals)</b>						
1999/2000 vs. 1997/1998	-0.3% (-5.3-4.7%)	4.1% (-2.6-10.8%)	-1.6% (-7.9-4.6%)	-0.5% (-6.0-4.9%)	3.5% (-1.0-8.0%)	2.8% (-3.3-9.0%)
2006/2007 vs. 1999/2000	3.6% (-1.4-8.6%)	-4.2% (-10.9-2.5%)	-33.5% (-39.7- -27.3%)	-47.7% (-53.1- -42.9%)	0.5% (-3.9-5.0%)	7.0% (0.9-13.0%)
2006/2007 vs. 1997/1998	3.3% (-1.7-8.3%)	0.1% (-6.6-6.9%)	-35.2% (-41.4- -28.9%)	-48.3% (-53.7- -42.9%)	4.1% (-0.4-8.6%)	9.9% (3.7-16.1%)

**Table III.** Temporal differences in proportions of patients taking cardioprotective drugs

Survey	Antiplatelets [%]	Beta-blockers [%]	ACE inhibitors /sartans [%]	Calcium antagonists [%]	Diuretics [%]	Lipid lowering drugs [%]	Antidiabetic agents [%]
1997/1998	76.1	59.1	45.9	28.7	17.0	34.0	10.3
1999/2000	86.9	63.9	47.5	33.3	20.1	41.9	13.4
2006/2007	90.1	87.5	79.0	20.9	31.8	86.8	19.6
<b>Differences adjusted for age, gender, duration of education and time between index hospitalisation and the examination (95% confidence intervals)</b>							
1999/2000 vs. 1997/1998	10.8% (6.0-15.6%)	4.8% (-1.1-10.7%)	1.6% (-4.7-8.0%)	4.5% (-1.4-10.5%)	3.1% (-2.4- 8.7%)	7.9% (2.1- 13.8%)	3.1% (-1.6- 7.8%)
2006/2007 vs. 1999/2000	3.2% (-1.6-8.1%)	23.8% (17.9-29.7%)	31.1% (24.7-37.4%)	-12.4% (-18.4- -6.4%)	11.8% (6.3- 17.4%)	45.1% (39.2- 51.0%)	6.6% (1.9- 11.3%)
2006/2007 vs. 1997/1998	14.0% (9.2-18.9%)	28.7% (22.7-34.6%)	32.7% (26.3-39.1%)	-7.8% (-13.9- -1.8%)	15.0% (9.4- 20.5%)	53.0% (47.1- 59.0%)	9.7% (4.9- 14.4%)

**Figure 2.** Proportion of patients who reached recommended LDL cholesterol level according to guidelines valid at the time of each survey

Proportion of patients taking antiplatelet agents, beta-blockers, ACE inhibitors, calcium antagonists, diuretics, lipid-lowering drugs and antidiabetic agents is presented in Table III. The increase in the use of lipid lowering treatment was the most pronounced. The proportion of patients taking statins was 28.7% in the first survey, 34.2% in the second and 85.4% in the third survey ( $p < 0.001$ ). The proportion of patients taking fibrates was 5.3% in 1997/1998, 7.7% in 1999/2000 and 3.5% in 2006/2007 ( $p < 0.05$  vs. 1999/2000).

Changes in the risk factor control and the use of drugs in the subgroups (index diagnosis of acute myocardial infarction, unstable angina, PCI or CABG) were similar (data not shown).

## Discussion

In this study we present the results of the longitudinal observation of changes in secondary prevention of CAD. The 10-year period during observations were collected at three time points followed directly the first publication of

European guidelines for CAD prevention and covered the time of intensive work on improvement of international guidelines and endorsing them at the national level. In general, our results showed improvement in the management of patients after hospitalisation due to CAD. However, although the use of medications had increased considerably, the effectiveness of risk factor management improved only in the case of hypercholesterolemia. Still, almost 40% of patients had an LDL cholesterol level above the recommended goal. Proportions of active smokers and those with high blood pressure or high fasting glucose remained unchanged and the proportion of obese patients even increased. Blood pressure remained the least controlled risk factor in 2006/07, especially in CAD patients with diabetes, among whom almost 80% had blood pressure above the recommended goal. The increasing prevalence of obesity could influence our findings concerning hypertension and diabetes control. Indeed, no significant change in the hypertension control could be detected despite a considerable increase in the use of blood pressure drugs. Our results may suggest that the main attention of physicians was focused on prescribing more drugs, especially more statins. Less attention was paid to the lifestyle modification, which might have weakened the final effect. Our data showed that although changes over the last ten years were favourable, there is still a considerable potential to raise the chance of survival in CAD patients.

In all three EUROASPIRE surveys there was a large variation between countries in the use of cardioprotective medications and the control of risk factors [14, 15, 18]. The use of these agents in the Kraków sample remained close to the EUROASPIRE average. Similarly, the risk factor control in Kraków was similar to the European average. However, among CAD patients with diabetes the proportion of those who reached the target of  $HbA_{1c} < 6.5\%$  was the highest in the Polish centres [15]. Temporal changes in Kraków were similar to changes described for 8 EUROASPIRE centres that participated in all three EUROASPIRE surveys [19].

The evidence of the quality of secondary prevention in Poland is rather scarce. In a separate paper we reported significant improvements in the quality of secondary prevention in CAD patients during hospitalisation in cardiac departments in Kraków [16]. In 2002, an analysis from Białystok was published showing a considerable gap between guidelines and clinical practice [20]. Similar conclusions come from registries of CAD patients [21-23]. The estimates on temporal changes in secondary prevention of CAD from the Cracovian Program for Secondary Prevention of Ischaemic Heart Disease and Polish parts of EUROASPIRE II and III surveys remain unique in Poland. First, because they were delivered by independent assessment of the quality of the physicians' work and second, because we were able to make estimates on the quality of care a long time after discharge in patients from four diagnostic groups.

The impact of guidelines and recommendations issued by national and international scientific societies on changes in secondary prevention seems to be unquestionable. In the decade of 1997-2007 it was enforced by an increasing number of secondary publications and promotion actions. Changes in the organisation of the health care system could also have some influence on our results. Early data from the Cracovian Program for Secondary Prevention of Ischaemic Heart Disease suggested a large difference in the quality of medical care between general practitioners and cardiologists [24]. Although such disparity might have decreased until now, future actions to improve the effectiveness of secondary prevention should seek less privileged groups of patients as well as focus more on the lifestyle modification.

The study does have some important limitations. The first is that we were unable to assess the impact of changes in the implementation of secondary prevention on the risk of cardiovascular complications. However, beneficial effects of changes in the quality of medical care, which decrease the exposure to risk factors, on survival of CAD patients can be anticipated. There might have been some unrecognised differences in the subgroups served by particular hospitals or across diagnostic groups, which could have influenced the approach to secondary prevention. Studied groups were not representative for all CAD patients but were limited to patients who were hospitalised for acute CAD events or for revascularisation procedures. However, changes in the compliance with the preventive guidelines in other CAD patients probably have the same direction. We did not analyse doses of cardioprotective drugs. It is possible therefore that the weak effect of changes in medication use could be explained by the use of lower doses than tested in clinical trials.

## Conclusions

Changes in the implementation of CAD prevention guidelines into clinical practice in patients after hospitalisation in the Kraków cardiac departments over the decade from 1997/1998 to 2006/2007 were important. The use of cardioprotective medications increased. However, among risk factors, a significant improvement was found only in hypercholesterolemia management. Still, almost 40% patients studied in 2006/07 had a high LDL cholesterol level. No significant changes were found in a significant proportion of patients with high blood pressure and hyperglycaemia. Lower than expected effectiveness of treatment of hypertension and diabetes, unchanged smoking rates and increasing prevalence of obesity suggest insufficient lifestyle modifications in CAD patients.

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## Zmiany we wtórnej prewencji choroby niedokrwiennej serca po wypisaniu ze szpitala w latach 1997–2007. Wyniki Krakowskiego Programu Wtórnej Prewencji Choroby Niedokrwiennej Serca oraz polskiej części badań EUROASPIRE II i EUROASPIRE III

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### Streszczenie

**Wstęp:** W zaleceniach europejskich i polskich towarzystw naukowych dotyczących profilaktyki chorób układu krążenia za najważniejszą grupę docelową działań profilaktycznych uważa się osoby z objawami chorób powstających na podłożu miażdżycy. W roku 1996 rozpoczęto realizację Krakowskiego Programu Wtórnej Prewencji Choroby Niedokrwiennej Serca, którego głównym celem było określenie skuteczności i poprawa jakości opieki w zakresie kardiologii prewencyjnej. W programie uczestniczyły kliniki i oddziały kardiologiczne krakowskich szpitali, zapewniające opiekę kardiologiczną dla populacji ok. 1 200 tys. osób mieszkających na terenie miasta Krakowa i otaczających gmin (byłe województwo krakowskie). W latach 1999/2000 i 2006/2007 te same kliniki i oddziały wzięły udział w badaniach Europejskiego Towarzystwa Kardiologicznego EUROASPIRE II i EUROASPIRE III. Celem badań EUROASPIRE była ocena, w jakim stopniu zalecenia międzynarodowych towarzystw naukowych były wdrażane do praktyki klinicznej. Zastosowanie we wszystkich trzech projektach wystandaryzowanych metod badawczych pozwoliło na uzyskanie porównywalnych wyników, co umożliwiło określenie zmian postępowania w zakresie prewencji wtórnej.

**Cel:** Porównanie jakości i skuteczności prewencji wtórnej u pacjentów po hospitalizacji z powodu choroby niedokrwiennej serca (ChNS) w Krakowie w latach 1997/1998, 1999/2000 i 2006/2007.

**Metody:** Do pierwszego badania zakwalifikowano 536, do drugiego 515, a do trzeciego 540 pacjentów hospitalizowanych z powodu zawału serca, niestabilnej dusznicy bolesnej lub w celu wykonania angioplastyki wieńcowej albo operacji pomostowania aortalno-wieńcowego. Osoby te zostały zaproszone do badania w okresie 6–18 miesięcy po wypisaniu ze szpitala. Do pierwszego badania zgłosiło się 418 (78,0%) osób, do drugiego 427 (82,9%), a do trzeciego 427 (79,1%) osób.

**Wyniki:** Stwierdzono znaczne zwiększenie częstości stosowania leków kardioprotekcyjnych, przy czym najbardziej wzrosła częstość stosowania leków hipolipemizujących. Odsetek pacjentów przyjmujących statyny wynosił 28,7% w latach 1996/1997, 34,2% w latach 1999/2000 i 85,4% w latach 2006/2007. Fibraty przyjmowało odpowiednio 5,3, 7,7 i 3,5% pacjentów. W badaniu przeprowadzonym w latach 2006/2007 ponad 60% pacjentów miało zalecane stężenie cholesterolu LDL (< 2,5 mmol/l), podczas gdy w latach 1996/1997 i 1999/2000 odpowiednio 48,6 i 47,0% nie osiągało nawet stężenia < 3,5 mmol/l. Odsetek pacjentów, którzy mieli ciśnienie tętnicze  $\geq 140/90$  mmHg, wynosił 46,7% w latach 1997/1998 i nie zmienił się istotnie w okresie 10 lat (47,5% w latach 2006/2007). Wśród osób z cukrzycą odsetek chorych ze stężeniem glukozy < 7,0 mmol/l wynosił 32,1% w latach 1997/1998, 32,9% w latach 1999/2000 oraz 42,9% w latach 2006/2007. W całej badanej grupie odsetek osób ze stężeniem glukozy > 7 mmol/l nie zmienił się istotnie i w latach 2006/2007 wynosił 13,4%. Odsetek osób otyłych (wskaźnik masy ciała  $\geq 30$  kg/m<sup>2</sup>) wzrósł w ciągu 10 lat z 24,5 do 33,9%. Odsetek palących tytoń nie zmienił się istotnie i w latach 2006/2007 wynosił 19,2%.

**Wnioski:** Zmiany we wdrożeniu zaleceń dotyczących profilaktyki ChNS do praktyki klinicznej, które stwierdzono u pacjentów po hospitalizacji w krakowskich szpitalach z powodu ChNS, były znaczące, przede wszystkim w zakresie częstości stosowania farmakoterapii. Pod względem kontroli czynników ryzyka istotną poprawę osiągnięto tylko w zwalczaniu hipercholesterolemii. Brak istotnej poprawy skuteczności leczenia nadciśnienia tętniczego i cukrzycy, utrzymanie się częstości palenia na tym samym poziomie oraz wzrost częstości występowania otyłości sugerują niską skuteczność działań zmierzających do modyfikacji stylu życia u osób z rozpoznaną ChNS.

**Słowa kluczowe:** choroba niedokrwienność serca, czynniki ryzyka, prewencja wtórna

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