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Clinical research

Overweight and obesity in patients with established coronary heart disease: Are we meeting the challenge?

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KEYWORDS
Coronary heart disease;
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Aims Several epidemiological studies have reported increasing obesity rates in the general population during last decades. We studied the prevalence of overweight and obesity in the high priority group of patients with established coronary heart disease (CHD) and the therapeutic control of manageable coronary risk factors in relation to body mass index.

Methods Data from a representative sample of patients having experienced a recent cardiac event before the age of 71 years from 15 European centres participating in the EUROASPIRE II study, were gathered in the period 1999–2000 through standardized methods. In total, 5535 coronary patients with valid height and weight measurements were included.

Results About one in three patients (31%) was diagnosed as obese with additionally half of the patient population being overweight (48%). Obesity was 10% more prevalent among women and significantly less smokers were observed among overweight and obese subjects, twice as many diabetics and more people with low education. Overweight and obese patients had more frequently raised blood pressure and elevated cholesterol after adjustment for age, gender, education, diabetes and centre. In patients using blood pressure lowering agents, 56% of obese and 51% of overweight patients were still having raised blood pressure compared to 42% in normal weight patients. A similar result was observed for the therapeutic control of total cholesterol. Since their hospital discharge, obese and overweight patients did not alter lifestyles regarding fat intake and physical activity. In the period between coronary event and interview, body weight had increased with at least five kilograms in a quarter of all patients.

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Conclusion These results suggest that the growing population of overweight and obese coronary patients is at particularly high risk for further cardiovascular complications due to elevated risk factor levels on the one hand and their insufficient therapeutic control on the other hand. Our results also confirm the considerable weight gain seen in a high proportion of patients following their cardiac event.

Introduction

Despite accumulated evidence that overweight and obesity is significantly associated with elevated risk for cardiovascular conditions such as hypertension, dyslipidemia and glucose intolerance, their prevalence has reached epidemic levels in Western societies at an alarming rate not only in the general population but equally so among patients with established coronary heart disease (CHD).[1–10] In a comparison of the two EUROASPIRE cohorts (EUROpean Action on Secondary Prevention through Intervention to Reduce Events), the prevalence of obesity in a representative sample of European CHD patients was increased from 25% to 33% between the periods 1995–1996 and 1999–2000.[11] The direct and indirect costs associated with treating obesity and its morbid consequences are therefore expected to increase. It has been estimated that 2% to 8% of the total health care costs in Western countries are attributable to this modifiable risk factor.[12] Despite the obesity pandemic, management strategies in a clinical context have been proven sub-optimal and failing to achieve long term success.

The aim of the present analysis was to study the prevalence of obesity and overweight in the patients participating in the EUROASPIRE II survey. More particularly, we look at their coronary risk factor profile and the management of coronary risk factors in relation to the patient's body mass index (BMI) status at the time of interview.

Methods

Study population

Following the Joint European society recommendations published in 1998, the EUROASPIRE II study was conducted in 1999–2000 under the auspices of the EuroHeart Survey programme of the European Society of Cardiology. Its design and principal results are described in detail elsewhere.[13] Fifteen European countries were involved in the study: Belgium, the Czech Republic, Finland, France, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Poland, Slovenia, Sweden, Spain and the United Kingdom. In a defined geographical area in each country, consecutive male or female patients, aged 70 years or less, were identified retrospectively from hospital admission and discharge lists or diagnostic registers over a period of not less than 6 months and up to 48 months prior to the start of the survey, with the following diagnoses ('index event'): (i) first elective or emergency coronary bypass grafting (CABG), (ii) first elective or emergency percutaneous transluminal coronary angioplasty (PTCA) without previous CABG, (iii) first or recurrent acute myocardial infarction without previous CABG or PTCA, (iv) acute myocardial ischaemia without previous CABG or PTCA or acute myocardial infarction. In each country, the object was to obtain information on about 400 living patients attending for interview (100 per category).

Data collection

Data collection was conducted by trained research staff who reviewed patient medical records, interviewed and examined the patients at the hospital or at home using standardized methods and instruments at least 6 months after the hospitalisation for the acute event or procedure that included them in the survey. Personal and demographic details and drug use were recorded and risk factors monitored. Apart from general questions on lifestyle changes, each subject was specifically asked if he/she had been offered any personal advice about weight reduction and, if yes, if he/she had attempted to lose weight and how. Height and weight were measured in light indoor clothes without shoes (SECA scales and measuring stick, model number 707). The scales were calibrated at the start of the survey to ensure comparability of results between centres. Body mass index was calculated as the patients' weight (in kilograms) divided by the squared height (in metres). Overweight and obesity were defined according to WHO definitions;[14] overweight was defined as body mass index between 25 kg/m^2 and 29.9 kg/m^2, and obesity as body mass index $\geqslant$30 kg/m^2. Waist circumference was recorded with the use of a tape measure at the level midway between the lower rib margin and the iliac crest at the end of a normal expiration. Abdominal overweight was defined if the waist circumference was found to be in the 'alerting zone' between 'action level 1' (94 cm in men and 80 cm in women) and 'action level 2' (102 cm in men and 88 cm in women).[15] Such patients should be given a signal to avoid weight gain or lose weight and to increase physical activity. Abdominal obesity was defined as waist circumference reaching 'action level 2'. These patients are strongly advised to seek help for weight reduction from health professionals. Detailed information on how information on other major coronary risk factors was gathered, was published previously.[13] Raised blood pressure was defined as systolic blood pressure $\geqslant$140 mmHg and/or diastolic blood pressure $\geqslant$90 mmHg while raised total cholesterol was defined as total cholesterol level $\geqslant$5 mmol/l. A patient was labelled as smoker if he/she reported to be a current smoker or had a carbon monoxide in breath value exceeding 10 ppm at the time of interview. Low education was defined as primary school only or less while high education was defined as university/college level or equivalent.

Statistical analyses

Reported prevalences are presented as proportions. A statistical evaluation of comparing risk factor prevalence between obese, overweight and normal weight subjects was carried out according to multiple logistic regression analysis. In the logistic models, covariates taken into account were age, sex, centre, smoking, educational level and diabetes. *P*-values were obtained through Wald Chi-square statistics. A level of α=0.05

Table 1 Distribution of body mass index and waist circumference by sex, age and diagnostic category

	Body mass index		Waist circumference	
	Overweight[a]	Obesity[a]	Abdominal overweight[a]	Abdominal obesity[a]
Men				
All men	51.2% (2163/4225)	29.1% (1229/4225)	30.9% (1305/4221)	46.2% (1949/4221)
Age				
<55 years	48.8% (639/1308)	32.0% (104/325)	31.0% (405/1307)	45.1% (589/1307)
55–64 years	51.8% (848/1637)	28.9% (473/1637)	31.3% (512/1634)	45.7% (747/1634)
≥65 years	52.8% (676/1280)	26.0% (333/1280)	30.3% (388/1280)	47.9% (613/1280)
Diagnostic category				
CABG	51.3% (611/1191)	28.3% (337/1191)	29.8% (355/1191)	45.8% (546/1191)
PTCA	54.2% (668/1233)	28.0% (345/1233)	33.4% (412/1232)	45.4% (559/1232)
AMI	48.9% (560/1146)	29.0% (332/1146)	30.0% (343/1145)	45.6% (522/1145)
Ischaemia	49.5% (324/655)	32.8% (215/655)	29.9% (195/653)	49.3% (322/653)
Women				
All women	38.6% (505/1310)	38.5% (504/1310)	19.0% (249/1310)	69.5% (910/1310)
Age				
<55 years	32.0% (104/325)	37.2% (121/325)	22.5% (73/325)	59.1% (192/325)
55–64 years	41.8% (187/447)	40.9% (183/447)	16.8% (75/447)	74.7% (334/447)
≥65 years	39.8% (214/538)	37.2% (200/538)	18.8% (101/538)	71.4% (384/538)
Diagnostic category				
CABG	40.8% (93/228)	36.4% (83/228)	14.5% (33/228)	72.4% (165/228)
PTCA	38.6% (124/321)	36.1% (116/321)	21.5% (69/321)	66.4% (213/321)
AMI	38.9% (121/311)	35.4% (110/311)	19.0% (59/311)	69.4% (216/311)
Ischaemia	37.1% (167/450)	43.3% (195/450)	19.6% (88/450)	70.2% (316/450)
All	48.2% (2668/5535)	31.3% (1733/5535)	28.1% (1554/5531)	51.7% (2853/5531)

[a]For definition see methods section.

was used to indicate statistical significance. All analyses were carried out using SAS software.[16]

Results

In total, 8181 medical records were reviewed. Participation to the interview among those who were contacted and found alive, was 75.6% resulting in a group of 5556 patients examined and interviewed at least 6 months after the hospitalization for their acute event or procedure. The median time between index event and interview was 1.44 years (interquartile range 1.12–1.93 years). At the time of interview, valid height and weight measurements were obtained in 5535 patients; 4225 men and 1310 women.

In this population of patients with established CHD, the average body mass index was 28.2 kg/m^2 for men and 29.2 kg/m^2 for women. Average waist circumferences were 101.1 cm and 94.8 cm for men and women respectively. As given in Table 1 the overall prevalence of overweight and obesity at the time of interview were 48.2% and 31.3% respectively, hence about 80% of the patients had a BMI exceeding the threshold of 25 kg/m^2. The lowest prevalence rate of obesity was seen in the Italian sample while the Czech patients were most often obese. The prevalence of obesity was found to be about 10% higher among women compared to men while overweight was more prevalent among men. Obesity rates were decreasing with age in men but remained fairly age-independent in women. The finding that patients in the ischaemia group were more often obese is confounded by gender as differences between diagnostic categories disappeared when stratifying by gender. The results on waist circumference were in the same line as those for BMI with 28.1% classified in the alerting zone while 51.7% reached 'action level 2'; hence 80% of all patients having an excess amount of abdominal fat. Abdominal obesity was much more common among female patients.

In Table 2, the prevalence of some major coronary risk factors are given according to BMI status for men and women separately. Obesity and overweight are associated with lower smoking rates but a clear gradient with the prevalence of diabetes is observed. In both men and women, history of diabetes is observed twice as often in obese subjects compared to patients with a BMI less than 25 kg/m^2. Obesity seems more prevalent in patients with low educational level. In both gender, prevalence rates of raised blood pressure were 10% higher in overweight and obese patients, and these patients were moreover found to be more often treated with drugs with potential blood pressure lowering effect. Although in the latter group the consumption of lipid-lowering drugs is higher than in subjects with a normal BMI, especially in men, no major differences are seen in the distribution of total cholesterol levels after adjustment for age and centre.

Table 2 Prevalence of cardiovascular risk factors in overweight and obese patients by sex

	Normal weight	Overweight	Obese	*P*-value[a]
Men				
Current smoking	27.4% (228/833)	21.4% (463/2163)	20.3% (249/1229)	<0.0001
Self-reported diabetes	11.8% (98/833)	16.9% (366/2162)	24.3% (299/1229)	<0.0001
Low education	33.7% (279/829)	35.0% (754/2155)	41.3% (504/1221)	<0.0001
High education	33.3% (276/829)	29.5% (635/2155)	25.1% (307/1221)	<0.0001
SBP ≥140 mmHg and/or DBP ≥90 mmHg	40.8% (340/833)	48.6% (1051/2163)	54.4% (667/1227)	<0.0001
SBP ≥160 mmHg and/or DBP ≥95 mmHg	17.4% (145/833)	23.4% (506/2163)	26.6% (326/1227)	<0.0001
Blood pressure lowering drugs intake	81.3% (677/833)	85.8% (1857/2163)	88.4% (1085/1228)	<0.0001
Total cholesterol ≥5 mmol/l	51.0% (396/777)	56.0% (1148/2052)	57.9% (673/1162)	0.03
Total cholesterol ≥6 mmol/l	21.8% (169/777)	23.4% (481/2052)	25.1% (292/1162)	0.45
Lipid lowering drugs intake	54.7% (456/833)	62.8% (1358/2163)	63.9% (785/1228)	<0.0001
Statins intake	50.4% (420/833)	57.5% (1243/2163)	57.9% (711/1228)	0.0002
Women				
Current smoking	23.6% (71/301)	16.8% (85/505)	14.7% (74/504)	0.02
Self-reported diabetes	14.6% (44/301)	22.4% (113/505)	32.3% (163/504)	<0.0001
Low education	42.2% (127/301)	51.5% (257/499)	55.3% (273/494)	0.002
High education	24.6% (74/301)	15.4% (77/499)	12.8% (63/494)	0.002
SBP ≥140 mmHg and/or DBP ≥90 mmHg	43.5% (131/301)	59.8% (302/505)	59.8% (301/503)	<0.0001
SBP ≥160 mmHg and/or DBP ≥95 mmHg	20.6% (62/301)	30.9% (156/505)	31.2% (157/503)	0.008
Blood pressure lowering drugs intake	86.0% (259/301)	90.9% (459/505)	93.4% (471/504)	0.004
Total cholesterol ≥5 mmol/l	63.7% (174/273)	70.4% (335/476)	66.8% (316/473)	0.19
Total cholesterol ≥6 mmol/l	29.7% (81/273)	36.8% (175/476)	31.5% (149/473)	0.10
Lipid lowering drugs intake	55.2% (166/301)	58.6% (296/505)	59.1% (298/504)	0.46
Statins intake	51.5% (155/301)	51.7% (261/505)	53.0% (267/504)	0.69

SBP=systolic blood pressure; DBP=diastolic blood pressure.

[a]Significance of differences between three groups after adjustment for age and centre.

Table 3 Prevalences of raised blood pressure, total cholesterol and fasting glucose in overweight and obese patients

	Normal weight	Overweight	Obese	*P*-value[a]
Not treated with BP lowering drugs				
SBP ≥140 mmHg and/or DBP ≥90 mmHg	37.4% (74/198)	48.3% (170/352)	55.4% (97/175)	0.0008
SBP ≥160 mmHg and/or DBP ≥95 mmHg	12.1% (24/198)	24.7% (87/352)	29.7% (52/175)	<0.0001
Treated with BP lowering drugs				
SBP ≥140 mmHg and/or DBP ≥90 mmHg	42.4% (397/936)	51.1% (1183/2316)	56.0% (871/1554)	<0.0001
SBP ≥160 mmHg and/or DBP ≥95 mmHg	19.6% (183/936)	24.8% (575/2316)	27.7% (431/1554)	0.0003
Not treated with lipid lowering drugs				
Total cholesterol ≥5 mmol/l	68.8% (320/465)	73.3% (709/967)	73.6% (448/609)	0.09
Total cholesterol ≥6 mmol/l	34.6% (161/465)	37.3% (361/967)	38.8% (236/609)	0.38
Treated with lipid lowering drugs				
Total cholesterol ≥5 mmol/l	42.7% (250/585)	49.6% (774/1561)	52.7% (540/1025)	0.002
Total cholesterol ≥6 mmol/l	15.2% (89/585)	18.9% (295/1561)	20.0% (205/1025)	0.15
Not diabetic				
Fasting glucose ≥6 mmol/l	27.3% (220/807)	37.9% (682/1799)	50.2% (511/1017)	<0.0001
Diabetic				
Fasting glucose ≥7 mmol/l	70.4% (69/98)	70.5% (263/373)	74.6% (264/354)	0.52

[a]Significance of differences between groups after adjustment for age, sex, smoking, centre, education, diabetes.

However, in the subgroup of patients under lipid-lowering treatment, a significant 10% difference in the prevalence of raised total cholesterol levels (⩾5 mmol/l) was observed between obese subjects and those with normal weight, signifying that the control of total cholesterol was significantly worse in obese subjects (Table 3). Similarly, after adjustment for age, sex, smoking, centre, education and diabetes, the control of raised blood pressure was significantly worse in obese and overweight patients with more than half of the obese patients treated with blood pressure lowering agents, having blood pressures over 140/90 mmHg. The control

Table 4 Weight loss attempts and reported lifestyle changes before the index event and following hospital discharge in overweight and obese patients

	Normal weight	Overweight	Obese
Ever been advised to lose weight	13.2% (150/1134)	43.2% (1152/2667)	78.3% (1355/1732)
Ever attempted to lose weight	22.4% (254/1132)	54.8% (1463/2668)	80.6% (1396/1732)
Currently following nutritional recommendations	6.7% (76/1133)	18.1% (483/2667)	31.4% (544/1732)
Advised about exercise practice since discharge	67.0% (760/1134)	68.4% (1826/2668)	63.7% (1104/1733)
Self-reported lifestyle changes			
Reducing fat intake, before index event	52.8% (599/1134)	58.4% (1557/2668)	59.2% (1026/1733)
Reducing fat intake, since discharge	31.1% (353/1134)	29.8% (794/2668)	27.2% (472/1733)
Changing fat composition, before index event	49.2% (558/1134)	50.7% (1352/2668)	51.6% (895/1733)
Changing fat composition, since discharge	27.2% (308/1134)	27.0% (721/2668)	25.0% (434/1733)
Reducing calorie intake, before index event	29.7% (337/1134)	41.8% (1116/2668)	46.0% (797/1733)
Reducing calorie intake, since discharge	15.7% (178/1134)	19.3% (515/2668)	18.6% (323/1733)
Eating more vegetables, before index event	43.3% (491/1134)	46.4% (1238/2668)	46.7% (809/1733)
Eating more vegetables, since discharge	22.9% (260/1134)	24.1% (642/2668)	24.2% (420/1733)
Eating more fish, before index event	37.5% (425/1134)	41.6% (1109/2668)	38.4% (665/1733)
Eating more fish, since discharge	19.1% (217/1134)	18.2% (487/2668)	20.6% (357/1733)
Increasing physical activity, before index event	31.0% (352/1134)	32.2% (860/2668)	27.4% (475/1733)
Increasing physical activity, since discharge	10.3% (117/1134)	9.6% (255/2668)	8.9% (154/1733)
Losing weight, before index event	18.2% (207/1134)	24.9% (664/2668)	26.2% (454/1732)
Losing weight, since discharge	7.4% (84/1134)	8.9% (237/2668)	10.4% (181/1732)

of fasting glucose in diabetic patients however seemed unrelated to their BMI status. Half of the obese population with no self-reported diabetes, had a fasting glycaemia exceeding the value of 6 mmol/l.

Based on the results of height and weight measurements found in the medical records, 67.2% (2021/3005) of the patients had a BMI $\geqslant 25\ kg/m^2$ at the time of hospital admission for the index event while 26.4% (794/3005) could be further labelled as obese (BMI $\geqslant 30\ kg/m^2$) at that time. Among patients measured as overweight or obese at the time of hospital admission, 93.8% (1895/2021) are still found to be overweight or obese at the time of interview at least 6 months after the index event. Moreover, 86.2% (794/921) of those measured as obese at hospital admission are still obese at the time of interview.

Almost 80% of the patients measured obese at interview reported having been advised to lose weight; an equal proportion reported to have ever attempted so (Table 4). However, only less than a third of the group of obese patients was currently following nutritional recommendations as part of a prescribed regime, while two-thirds was advised about exercise practice after they have left the hospital. Remarkably, no differences were seen in self-reported lifestyle changes after hospital discharge according to BMI status. According to our data, overweight and obese patients did not report to have reduced their calorie and fat intake, were not eating more vegetables or fish and did not increase their level of physical activity since they were discharged from hospital. Although they did some effort to lose weight, this was merely before the index event that included them in this survey.

Fig. 1 shows the distribution of changes in body weight between the time of hospital admission and the time of interview in all patients. A substantial proportion (24.3%) had an increase in their body weight of at least 5 kg in the period between index event and interview of at least 6 months, while only in 8.1% of the patients a weight loss of at least 5 kg was observed. Within the particular subgroup of patients being overweight or obese at the time of interview, we see from Table 5 that those in whom a body weight increase of at least 5 kg between hospital admission and interview was observed, were in general younger and had more often quitted smoking since the index event.

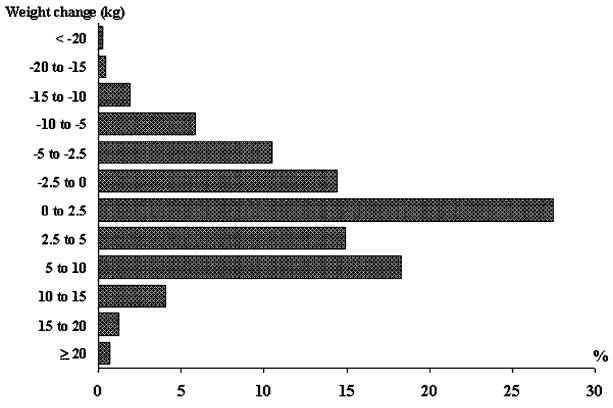

Fig. 1 Distribution of weight changes between time of hospital admission and time of interview in EUROASPIRE II patients.

Discussion

According to the recommendations of the Joint European Societies Task Force on the prevention of coronary heart disease, patients with established CHD or other atherosclerotic disease are at the highest priority for preventive

Table 5 Characteristics of overweight and obese patients according to body weight increase since hospital admission

	Weight change <5 kg	Weight increase ⩾5 kg
Women	21.6% (562/2599)	23.4% (233/994)
<55 years	26.0% (676/2599)	36.1% (359/994)
Followed cardiac rehabilitation programme if advised	69.7% (796/1142)	67.5% (313/464)
Low physical activity	60.0% (1559/2598)	64.9% (645/994)
Reduced calorie intake since discharge	56.1% (1161/2068)	51.3% (411/801)
Reduced fat intake since discharge	83.3% (1519/1824)	83.0% (575/693)
Currently following regime	22.6% (587/2598)	24.1% (239/993)
Stopped smoking since discharge	36.5% (391/1071)	57.9% (312/539)

measures.[17] Besides therapeutic interventions to control blood pressure, blood lipids and diabetes and the selective use of prophylactic drug therapies in these patients, lifestyle intervention through smoking cessation, healthy food choices and increased physical activity is the most important step to reduce the risk of recurrent non-fatal and fatal disease. Lifestyle modification should particularly be targeted to the subgroup of overweight and obese patients needing professional support to lose weight and thereby reduce blood pressure, cholesterol levels, and improve glucose tolerance and insulin sensitivity. According to the recommendations, the food composition should be modified so that the total dietary intake of fat is reduced to 30% or less of the total energy intake, and the intake of cholesterol to less than 300 mg/day, with an increase of monounsaturated and polyunsaturated fats from vegetables and fish, and carbohydrates from fresh fruits, cereals and vegetables. According to the European Heart Network recommendations, saturated fat intake should be less than 10% of the total energy intake with a consumption of fresh fruits and vegetables of at least 400 grams/day.[18]

Nevertheless, despite these recommendations the prevalence of overweight and obesity in this specific target group of patients with established disease are still sharply rising seemingly at an even more pronounced rate than observed in the general population. In a comparison of the two EUROASPIRE surveys it was found that the population of overtly obese CHD patients has been growing from 1 in 4 to 1 in 3 in a period of approximately 5 years, consistently in both sexes, in all diagnostic categories and the nine participating centres and independently of age.[11] In the larger pool of 15 centres in EUROASPIRE II, we report here that 80% of all patients were having a body mass index or waist circumference well above the target consistently in all centres. Over 30% was actually obese while excess visceral adiposity amendable for intensive intervention was seen in the majority of patients (52%). These rates proved to be even more alarming in women with a prevalence rate of obesity of 38% especially above the age of 55 years when rates for abdominal obesity are even reaching 70% or more.

Also, our results confirm that in patients with established CHD elevated body mass index still remains correlated with an adverse coronary profile especially raised blood pressure and diabetes. The apparent inverse association of body mass index with smoking may in part be a reflection of the weight increase often seen after smoking cessation. More striking are our results regarding therapeutic control of classical coronary risk factors according to BMI status. Among overweight and obese patients, over half of the subjects using blood pressure lowering agents was still found to have raised blood pressure while the same result was obtained for the therapeutic control of raised total cholesterol. Even in the presence of considerable levels of pharmacological treatment the unfavourable coronary profile persists in obese patients. This result stresses even more the importance of risk factor control through lifestyle modification as a supplement to more intensified drug treatment in the population of overweight coronary patients.

From our data, we can conclude that despite the several recommendations and guidelines in secondary prevention published, still much progress can be made in informing and convincing coronary patients to alter their food habits and to increase their physical activity level. Twenty percent of our obese patients reported never having been advised to lose weight and a same proportion never attempted to do so. Only 1 in 3 obese patients was following a prescribed regime at the time of interview. Only a minority of all overweight and obese subjects reported to have their diet and physical activity level changed since they left the hospital, but these lifestyle changes were not more intensive than in patients found to have a normal weight. Even more worrying is the fact that body weight did increase since the time of hospital admission, with a quarter of the patients having a weight gain of 5 kg or more. A similar finding was obtained by Hankey in a group of overweight post-MI patients after a period of 52 weeks.[19] Apparently, our observation can only partly be explained by the effect of smoking cessation alone. Our finding about weight gain since hospital admission is to be taken with some reservation. The measurements as found in the patients' medical record are often self-reported and are hence likely to be underestimations. It is however very unlikely in this respect that differences of at least 5 kg are entirely attributable to this kind of bias.

Numerous research has shown that obesity is a result of an imbalance between caloric intake and caloric expenditure, embodied on an accumulation of metabolic, psychological, cultural and genetic factors.[20–22]

From our results however, there can be no doubt that future guidelines for the secondary prevention of CHD need to reinforce that the pharmacological treatment of coronary risk factors is of limited value if not accompanied by intensive lifestyle modifications. The speculative suggestion that we may be dealing with a subgroup of patients in which any further weight loss effort is hopeless, needs to be addressed taking into account the extent of the problem and the size of this group of obese people, and provides no excuse against intensifying their management. The view recently expressed by Peters et al. that most of the people in the current Western environment who are not devoting substantial conscious effort to managing body weight are probably gaining weight, seems definitely applicable to CHD patients.[23]

In the subgroup of obese coronary patients we found an overrepresentation of people with a lower educational level comparable to findings from the population-based MONICA study.[24] We should hence also ask ourselves whether the current recommendations may be too much attuned towards the higher educational public and, if so, consider to model future guidelines to more readily reach the lower education levels.

As formal treatment should focus on substantial weight loss through increased physical activity and low-calorie and low-fat diets, the treatment of obesity should preferably be the responsibility of a multidisciplinary team of health care professionals. In this respect, the framework of cardiac rehabilitation programmes offered in many cardiac centres obviously provides a good opportunity for periodical diet counselling and nutrition education. Management of overweight and obese patients should moreover involve partners and families who could play a primary role in psychological and emotional support of the overweight patient. As long-term adherence to diet and regular exercise programs seems to be a major challenge, not only creating but equally so maintaining a stimulating and rewarding supportive environment for the patient, is of primary importance and should result in less frustrations for patients themselves and their treating physicians.

In conclusion, the results of our study emphasize the need for urgent reinforcing of the current intervention strategies for combating the growing obesity epidemic in CHD patients. More than ever, reducing obesity and sedentary life through substantial reorienting of lifestyle behaviour is crucial to the health and quality of life of at least one third of all patients with established coronary heart disease.

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