Z Gerontol Geriat 40:43–51 (2007)
DOI 10.1007/s00391-006-0374-6

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Independent contribution of overweight/obesity and physical inactivity to lower health-related quality of life in community-dwelling older subjects

Unabhängiger Einfluss von Übergewicht/Korpulenz und geringer Bewegungsaktivität auf die Gesundheit und Lebensqualität älterer Personen, die zu Hause leben

▶ **Abstract** The study examined the association of nutritional status, obesity and physical activity (PA) with health-related quality of life (HRQL) in the elderly, and whether this relationship persists after controlling for confounders attributable to comorbidities, functional status and cognitive function. A total of 300 community-dwelling persons (177 women and 123 men) between 66 and 79 years of age were randomly chosen from all inhabitants of one district of the city of Lodz (Poland). HRQL was assessed with the Euroqol 5D questionnaire. PA was assessed by two questionnaires: the Seven Day Recall PA Questionnaire and the Stanford Usual Activity Questionnaire. Comorbidities, nutritional state (Mini Nutritional Assessment questionnaire – MNA), physical disability, cognitive function and psychological state were also assessed. In bivariate relationships body mass index (BMI), waist-to-hip ratio (WHR) and the percentage of body fat were negatively related to several HRQL scores both in women and men. Similarly, many HRQL scores were positively related to PA indices in both genders. In multivariate relationships, after adjustments for age, gender, smoking status, number of medications taken, comorbidities and geriatric physical and cognitive function, BMI predicted lower mobility while the percentage of body fat independently contributed to more frequent pain/discomfort and anxiety/depression problems. An adequate MNA added to a higher usual activity score, while a higher Stanford Moderate PA Index predicted better overall perceived health state. These results indicate that excess body fatness and sedentary lifestyle have, together with several functional and medical comorbidities, an independent contribution to inferior HRQL in community-dwelling older subjects.

▶ **Key words** Euroqol 5D – elderly – well-being – physical activity – physical function – depression

▶ **Zusammenfassung** Die Untersuchung prüfte den Einfluss des Ernährungszustandes, des Übergewichts und der Bewegungsaktivität auf Gesundheit und Lebensqualität (HRQL) bei älteren Personen, und ob dieser Zusammenhang weiter besteht, wenn die Störungen eliminiert werden, die mit dem begleitend auftretenden Krankheiten, dem funktionellen Zustand und der Erkenntnisfunktionen verbunden sind. An der Untersuchung nahmen 300 durch Los ausgewählte ältere (177 weibliche und 123 männliche) zu Hause lebende Einwohner der Stadt Lodz im Alter von 66 bis 79 teil. Gesundheit und Lebensqualität wurden mittels Euroqol 5D-Fragebogen beurteilt. Die Bewegungsaktivität wurde aufgrund zweier Fragebögen bewertet: Dem siebentägigen Fragebogen über die Bewegungsaktivität (SDPAR)

Received: 7 September 2005
Accepted: 14 February 2006

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und dem Fragebogen über die gewöhnlichen Tätigkeiten (Stanford Usual Activity Questionnaire). Der Ernährungszustand wurde gemäß der MNA-Skala (Mini Nutritional Assessment) eingeschätzt. Der Beurteilung unterlagen ebenfalls: begleitende Auftreten von Krankheiten, Behinderungen, die funktionelle Leistungsfähigkeit und der psychische Zustand der Gefragten. In der einfaktoriellen Analyse der Varianten ANOVA, BMI, waren die Kennziffer des Umfangs der Taille und Hüften (WHR), und der prozentuale Gehalt an Fettgewebe entsprechend reziprok zu manchen Ergebnissen der Lebensqualität sowohl bei den Frauen als auch bei den Männern. Eine ähnlich große Zahl von Ergebnissen dieser Lebensqualität wies eine proportionale (positive) Abhängigkeit von den Kennzahlen der physischen Aktivität für beide Geschlechter aus. In der multifaktoriellen Analyse, unter Berücksichtigung von Alter, Geschlecht, Rauchen, der Menge von eingenommenen Arzneimitteln, sowie der psychischen und körperlichen Aktivität, beeinträchtigte der BMI die Mobilität (Beweglichkeit). Der prozentuelle Gehalt des Fettgewebes dagegen beeinflusste ein öfteres Schmerzempfinden/Discomfort bzw. Unruhe/Depression. Die entsprechende Beurteilung des Ernährungszustandes MNA verursachte ein höheres Aktivitätsergebnis als gewöhnlich, wobei der höhere ‚Stanfort Moderater PA-Koeffizient' den besseren allgemeinen Gesundheitszustand bestimmte. Diese Ergebnisse bedeuten, dass das Übergewicht und die sitzende Lebensweise samt funktionell und medizinisch begleitenden Auftreten von Krankheiten einen unabhängigen Einfluss auf die Gesundheit und Lebensqualität der zu Hause lebenden älteren Personen haben.

▶ **Schlüsselwörter** Euroqol 5D – Alter – Wohlbefinden – Bewegungsaktivität – funktionelle Leistungsfähigkeit – Depression

Introduction

The prevalence of overweight and obesity is increasing in elderly subjects [18]. In an aging society, this trend has many adverse medical and economic consequences. Obesity causes multiple morbidity, disability, increased mortality and augmented medical care costs [28]. The potential health benefits from reduction in excess body fatness are of considerable public health importance. Improvements in health can be achieved already with moderate weight reduction [18].

Recently, health-related quality of life (HRQL), rather than mortality and morbidity, has emerged as the key goal for health promotion in the elderly [19, 32]. In the Healthy People 2010 report, the chief goal of health promotion is the HRQL and overall well-being [10]. Both in the US and Europe, policies and programs on aging are increasingly focused on identifying ways to improve HRQL and health status rather than just extending life span. Therefore, there is a growing need to collect HRQL data on different contributing factors to overall HRQL in older subjects. The impact of obesity on health-related quality of life (HRQL) has been less well studied than how it affects physical morbidity and mortality. In general population obesity reduces the HRQL, but quantification of obesity's impact on HRQL is difficult [12].

The prevalence of obesity in the elderly should be considered in a wider aspect of nutritional status. Available data used classic estimates of body fatness (usually BMI), while other measures used in geriatric assessment of nutritional state might have been of additional value. Frequency of nutritional deficiencies increases with advancing age and is an important health problem in geriatrics [3]. Poor nutritional status is an independent predictor of mortality, it may also impair HRQL indirectly as a consequence of increased morbidity and decline in functional status [21]. Studies involving alternative measures of nutritional status and HRQL in the elderly are scarce. Available data indicate that nutritional risk is an independent predictor of poor HRQL [21].

A sedentary lifestyle, on the one hand, may enhance nutritional risk in the elderly, and on the other hand, is considered to be an important contributor to the increasing prevalence of obesity. Advantageous influence of physical activity (PA) on HRQL in older subjects has also been suggested [19, 23, 34].

These potential predictors of HRQL may be further confounded by multiple co-existing diseases as well as physical and cognitive function impairments in older population. Comorbidity has been usually restricted to obesity-related comorbid conditions known to reduce HRQL [29]. There is insufficient knowledge on independent influence of nutritional status as well as PA on overall HRQL in older individuals. This may be especially true in Central-Eastern European societies which underwent important social changes during last few decades [5, 15, 26]. Such knowledge could improve the efficacy of preventive mesures and health promoting behaviors to influence HRQL in older people.

Therefore, the aim of the present study was to estimate the potential association of nutritional status, obesity and PA with HRQL and whether this relationship persists after controlling for confounders attributable to comorbidities, functional status and cognitive function.

Subjects and methods

Subjects

The study was carried out in the Gorna district of the city of Lodz (Poland) during 2002 and 2003. A total of 1200 respondents (780 women and 420 men) were randomly chosen using a proportional poll pattern from all inhabitants of Lodz-Gorna aged >65 years (21 539 women and 11 458 men). Then, an invitation for a physical examination in the outpatient clinic of the Department of Preventive Medicine, Medical University of Lodz, was sent to 600 consecutive subjects aged 66–79 years. There were 645 (82.7%) women and 363 (86.4%) men who fulfilled these age criteria. The choice of age range (66–79 years) was set in order to further implement medical and preventive measures in this population. Three hundred fifty three subjects (58.8%) accepted the invitation and participated in the physical examination and laboratory tests in the outpatient clinic. All these subjects were relatively healthy community-dwelling elderly aged 65–79 years, able and wishing to visit the outpatient clinic as well as to complete multiple questionnaires. They were free from terminal illness, important disability or severe dementia. Of these 353 elders, 300 consecutive subjects agreed for the home visit of a qualified investigator, during which medical recommendations were conveyed to the patient and the rest of the comprehensive geriatric assessment was done. These 300 elderly constituted the final sample of the present study. All respondents were informed about the aim of the study and written informed consent was obtained.

Protocol and measures

The physical examinations were performed in the Department of Preventive Medicine, Medical University of Lodz. The rest of each evaluation was carried out in the patients' homes where a multi-dimensional assessment was performed with each subject. All questionnaires were completed with a qualified investigator (K. B., university degree in nursing) during a personal interview of about 2 hours. Information concerning age, social variables, current and past diseases, medications being taken, and tobacco/alcohol consumption was obtained. Other elements of the comprehensive geriatric assessment were measured by different questionnaires. Nutritional state was assessed using the Mini Nutritional Assessment questionnaire (MNA) [17]. The assessment of the nutritional state was completed by evaluating the percentage of body fatty tissue, using the 4 skinfolds method [11], measuring calf circumference, the waist-to-hip ratio (WHR) and calculating the body mass index (BMI). Physical disability was evaluated by the Katz activities of daily living (ADL) scale [20] and the Lawton instrumental activities of daily living (IADL) scale [24]. ADL has 6 questions concerning basic daily activities, such as: eating, dressing, bathing, continence, toileting and transferring. IADL is identified by eight elements of activities that enable a person to live independently in a house or apartment: using the telephone, doing shopping, preparing meals, housekeeping, doing laundry, using the means of transport, taking medications and dealing with money. Cognitive functions were evaluated using the mini-mental state examination (MMSE) [14] and the 15-item geriatric depression scale (GDS) [36].

PA was assessed by two popular PA questionnaires: the Seven Day Recall PA Questionnaire [2] and the Stanford Usual Activity Questionnaire [31]. These questionnaires have been chosen because of their high validity recently demonstrated in older individuals [4]. The Seven Day Recall Moderate, Hard and Total scores and the Stanford Moderate Index (six habitual moderate activities) were calculated and used for further comparisons. As none of the subjects reported any very hard activities in the Seven Day Recall PA Questionnaire, and only five subjects reported any habitual vigorous activities in the Stanford Usual Activity Questionnaire, the Seven Day Recall Very Hard and the Stanford Vigorous activity indices were not used in this study.

HRQL was assessed with the Euroqol 5D questionnaire [22]. This is a widely used and validated generic instrument that has five dimensions: mobility, self care, usual activities, pain/discomfort and anxiety/depression. Each dimension has three levels: no problems (no limitations), some problems, and severe problems. In addition, each subject was asked to describe his/her overall actual health state using the Euroqol visual analogue scale (VAS), where 0 denotes the worst imaginable health state and 100 indicates the best imaginable health state.

Statistical analysis

Data were verified for normality of distribution and equality of variances. The one way analysis of variance (ANOVA), Kruskal-Wallis test and chi-square test (with Yates' correction for 2×2 tables) were used to compare the two gender groups and BMI groups. In bivariate analyses, single logistic regression and Pearson product moment correlation coefficients were calculated for associations of Euroqol 5D measures with body composition and physical activity

in each group. Multiple logistic regression and general linear model were used to select variables that independently predict Euroqol 5D scores in the whole examined group of community-dwelling elderly. For both bivariate and multivariate analyses the Euroqol 5D dimensions were dichotomized (no problem vs any problem). Odds ratios (OR) and confidence intervals (CI) with 95% confidence limits were calculated. For numeric variables results are presented as mean (standard deviation). The limit of significance was set at $p = 0.05$ for all analyses.

Results

Table 1 shows the baseline participant characteristics for the subjects participating in the study. There was no age or education level difference between the women and the men. Fifty-nine women lived alone, 66 with a partner, and 52 women lived with family, while only 9 men lived alone, 87 with a partner, and 27 men lived with family (chi-square = 39.1; $p < 0.001$, not shown in Table 1). Average family income per capita was classified as high in 34 women, medium in 131 women, and low in 12 women. In men, 25 had high income, 95 medium, and 3 men had low income (chi-square = 4.33; $p = 0.15$, not shown in the Table). The percentage of smokers and current drinkers was higher in men. Number of regularly taken medications and the prevalence of diseases were similar in both genders except for the percentage of musculoskeletal disorders which was higher in women. In comparison with women, men were characterized by higher values of ADL and lower values of IADL. This may reflect the fact that many instrumental activities are gender specific (e.g., cleaning, preparing meals). Depressive symptomatology was more pronounced in women as reflected by higher GDS values. MMSE was similar in both genders. Men had higher WHR and lower BMI and the percentage of body fat. Calf circumference and MNA were similar in both genders. The Seven Day Recall Hard and Total scores were higher in men while the Seven Day Recall Moderate score and the Stanford Moderate Index were similar in both genders.

Table 2 shows HRQL scores in both genders. Women more often reported problems with self care, pain/discomfort and anxiety/depression. Usual activities score was of borderline significance. Women had also lower scores on the visual analogue scale.

Tables 3a and 3b show bivariate relationships of Euroqol scores to body composition and physical activity measures in elderly women and men. Both in women and men, BMI, WHR and the percentage of body fat were negatively related to several Euroqol

Table 1 Baseline participant characteristics of elderly women and men

	Women (n = 177)	Men (n = 123)	p-value
Age (years)	70.0 (4.1)	70.2 (4.2)	NS
Education (years)	9.5 (3.1)	9.8 (3.2)	NS
Currrent smokers (%)	6.8	18.7	0.003
Alcohol at least once a week (%)	40.1	74.0	< 0.001
Medications (number)	3.7 (2.5)	3.3 (2.6)	NS
Diabetes (%)	17.5	17.9	NS
Hypertension (%)	68.4	65.9	NS
Ischemic heart disease (%)	37.3	37.4	NS
Post myocardial infarction (%)	7.9	14.6	NS
Post stroke (%)	2.8	4.1	NS
Chronic heart failure (%)	23.7	16.3	NS
Respiratory diseases (%)	2.8	5.7	NS
Musculoskeletal disorders (%)	37.9	22.8	0.008
Katz Activities of Daily Living	5.6 (0.5)	5.9 (0.3)	< 0.001
Lawton IADL	7.6 (1.0)	7.2 (1.3)	< 0.001
Geriatric Depression Scale	5.9 (3.4)	4.6 (3.0)	0.001
MMSE	26.8 (3.3)	27.2 (2.8)	NS
Body mass index ($kg \cdot m^{-2}$)	29.2 (4.9)	27.0 (3.9)	< 0.001
Waist-to-hip ratio	0.84 (0.06)	0.94 (0.06)	< 0.001
Body fat (%)	39.3 (5.9)	30.8 (4.6)	< 0.001
Calf circumference (cm)	37.1 (4.9)	37.4 (3.8)	NS
Mini Nutritional Assessment	24.8 (3.0)	24.4 (2.6)	NS
7-Day Recall Moderate score	58.7 (21.0)	61.3 (21.7)	NS
7–Day Recall Hardscore	6.5 (10.2)	11.5 (11.5)	< 0.001
7–Day Recall Total score	268.7 (15.9)	273.3 (14.4)	0.01
Stanford Moderate Index	2.3 (1.3)	2.5 (1.4)	NS

NS not significant; *IADL* Instrumental Activities of Daily Living, *MMSE* Mini Mental State Examination

Table 2 Quality of life in elderly women and men

	Women (N = 177)	Men (N = 123)	p-value
Mobility			
no problems, n (%)	106 (59.9)	77 (62.6)	
moderate, n (%)	69 (39.0)	46 (37.4)	0.72
severe, n (%)	2 (1.1)	0 (0.0)	
Self-care			
no problems, n (%)	155 (87.5)	118 (95.9)	
moderate, n (%)	21 (11.9)	5 (4.1)	0.02
severe, n (%)	1 (0.6)	0 (0.0)	
Usual activities			
no problems, n (%)	131 (74.0)	103 (83.7)	
moderate, n (%)	44 (24.9)	20 (16.3)	0.09
severe, n (%)	2 (1.1)	0 (0.0)	
Pain/discomfort			
no problems, n (%)	25 (14.1)	35 (28.5)	
moderate, n (%)	138 (78.0)	83 (67.5)	0.004
severe, n (%)	14 (7.9)	5 (4.0)	
Anxiety/depression			
no problems, n (%)	33 (18.7)	51 (41.5)	
moderate, n (%)	128 (72.3)	70 (56.9)	< 0.001
severe, n (%)	16 (9.0)	2 (1.6)	
Visual analogue scale, mean (SD)	60.1 (18.6)	66.8 (16.0)	0.002

For statistical analysis Euroqol 5D dimensions data were dichotomized (no problem vs any problem)

Table 3 a Bivariate relationships of Euroqol scores to body composition and physical activity measures in elderly women (n = 177)

	Mobility	Self-care	Usual activity	Pain/discomfort	Anxiety/ depression	VAS
Body mass index ($kg \cdot m^{-2}$)	1.13*** (1.06–1.21)	NS	NS	1.11* (1.01–1.22)	1.10* (1.01–1.20)	NS
Waist-to-hip ratio · 100	NS	1.10* (1.01–1.20)	1.07* (1.01–1.14)	NS	NS	NS
Body fat (%)	1.08** (1.02–1.14)	NS	NS	NS	NS	NS
Calf circumference (cm)	NS	NS	NS	NS	NS	NS
MNA	0.86** (0.77–0.96)	NS	0.81*** (0.72–0.91)	NS	NS	r = 0.32***
7-Day Recall Moderate score	NS	0.97* (0.95–0.99)	NS	NS	NS	NS
7-Day Recall Hard score	0.95** (0.92–0.99)	NS	NS	NS	NS	r = 0.15*
7-Day Recall Total score	NS	NS	NS	NS	NS	NS
Stanford Moderate Index	0.70** (0.54–0.89)	NS	0.64** (0.48–0.87)	NS	NS	r = 0.33***

For Euoroqol dimensions, values are expressed as odds ratios (95% confidence intervals). *VAS* visual analogue scale, *NS* not significant. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3 b Bivariate relationships of Euroqol scores to body composition and physical activity measures in elderly men (n = 123)

	Mobility	Self-care	Usual activity	Pain/discomfort	Anxiety/ depression	VAS
Body mass index ($kg \cdot m^{-2}$)	1.24*** (1.10–1.40)	NS	NS	1.10* (1.01–1.20)	NS	r = –0.23*
Waist-to-hip ratio · 100	1.07* (1.00–1.14)	NS	NS	NS	NS	NS
Body fat (%)	1.18*** (1.07–1.31)	NS	NS	1.32** (1.08–1.62)	1.10* (1.02–1.21)	r = –0.18*
Calf circumference (cm)	NS	NS	NS	NS	NS	NS
MNA	0.83* (0.71–0.96)	0.69* (0.49–0.97)	0.70*** (0.60–0.89)	NS	NS	r = 0.27**
7-Day Recall Moderate score	NS	NS	NS	NS	NS	NS
7-Day Recall Hard score	0.94*** (0.90–0.97)	NS	0.91*** (0.85–0.97)	0.95** (0.92–0.98)	0.96* (0.93–0.99)	r = 0.35***
7-Day Recall Total score	NS	NS	NS	NS	NS	NS
Stanford Moderate Index	NS	NS	0.53** (0.33–0.84)	NS	0.75* (0.57–0.98)	r = 0.30***

For Euoroqol dimensions, values are expressed as odds ratios (95% confidence intervals). *VAS* visual analogue scale, *NS* not significant. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

scores (i.e. higher values of these variables were connected with more frequent reporting of problems in Euroqol dimensions and adversely correlated to VAS). No such relationship could be found for calf circumference. On the contrary, several Euroqol scores were positively related to MNA in both genders. In women, higher Seven Day Recall Moderate score was associated with better self-care while the Seven Day Recall Hard score was associated with mobility and VAS. In men, the vast majority of HRQL scores were positively related to the Seven Day Recall Hard score. Neither in women nor in men were any of the Euroqol dimensions related to the Seven Day Recall Total score. Several Euroqol scores were also positively related to the Stanford Moderate Index in both genders.

All 300 participants were divided into four groups based on BMI: < 20 (underweight), 20 to < 25 (normal), 25 to < 30 (overweight) and ≥ 30 $kg \cdot m^{-2}$ (obese). VAS tended to be lower in overweight (61.9) and obese (60.8) groups ($F = 2.16$; $P = 0.09$), and was significantly inferior in comparison with normal group (67.3) when 8 underweight subjects were removed from the analysis ($F = 2.98$; $P = 0.05$). Frequency of mobility (chi-square = 21.3; $P < 0.001$), pain/discomfort (chi-square = 10.4; $P = 0.006$) and anxiety/depression problems (chi-square = 13.1; $P = 0.002$) was also higher in overweight/obesity groups.

Table 4 Multiple logistic regression analysis (five Euroqol dimensions) and multifactor ANOVA (VAS) for elderly women and men (n = 300)

	Mobility	Self-care	Usual activity	Pain/discomfort	Anxiety/ depression	VAS
Medications (number)	1.28*** (1.13–1.46)		1.29*** (1.12–1.48)	1.54*** (1.27–1.88)		F = 15.8***
Hypertension					2.11* (1.16–3.86)	
Ischemic heart disease	1.86* (1.06–4.72)			2.26* (1.00–5.24)		
Musculoskeletal disorders	2.22** (1.22–4.07)	3.16* (1.27–7.87)	2.38* (1.22–4.63)			
Katz Activities of Daily Living	0.45* (0.21–0.94)	0.22*** (0.09–0.52)	0.45* (0.21–0.99)			F = 6.73**
Lawton Instrumental Activities of Daily Living	0.66** (0.48–0.90)	0.73* (0.55–0.96)	0.59*** (0.44–0.80)			
Geriatric Depression Scale	1.15** (1.05–1.25)	1.18* (1.03–1.34)	1.14* (1.03–1.27)	1.14* (1.01–1.30)	1.36*** (1.21–1.53)	F = 47.1***
Body mass index ($kg \cdot m^{-2}$)	1.10** (1.03–1.18)					
Body fat (%)				1.07** (1.01–1.12)	1.07** (1.02–1.12)	
Mini Nutritional Assessment			0.89* (0.79–0.99)			
Stanford Moderate Index						F = 10.7**
Adjusted percentage of deviance (R-Squared) explained	23.51	17.60	23.46	21.22	16.11	31.32

For Euoroqol dimensions, values are expressed as odds ratios (95% confidence intervals). *VAS* visual analogue scale. *p < 0.05, **p < 0.01, ***p < 0.001

Table 4 shows multivariate relationships of Euroqol scores to independent variables in the whole group of elderly subjects studied. Body composition and physical activity measures as well as age, gender, education level, living conditions, average family income, smoking status, alcohol consumption, number of medications taken, co-existing morbidities and geriatric physical and cognitive function measures were included as independent variables into the model. Mobility was predicted by number of medications, ischemic heart disease, musculoskeletal disorders, ADL, IADL, GDS and BMI. Self care was predicted by ADL and IADL (as would be expected), and also by musculoskeletal disorders and GDS. Number of medications, musculoskeletal disorders, ADL, IADL, GDS and MNA independently influenced usual activity HRQL score. The presence of pain/discomfort problems was predicted by number of medications, ischemic heart disease, GDS and the percentage of body fat. Anxiety/depression problems appeared more frequently in community-dwelling elders with hypertension, higher GDS score and with higher percentage of body fat.

General linear model with all independent variables was also performed to determine factors responsible for the significant variation of VAS. Number of regularly taken medications, ADL, GDS and the Stanford Moderate Index predicted VAS variations.

Discussion

In the present study we assessed the potential association of nutritional status, obesity and PA with HRQL, using a generic HRQL instrument, in a relatively large random sample of the community-dwelling elderly. Association of nutritional status, obesity and PA with HRQL was further adjusted for social variables as well as medical and functional comorbidities potentially affecting HRQL. The major finding is that excess body fatness and low PA have, together with several functional and medical comorbidities, an independent contribution to overall HRQL in community-dwelling older subjects.

Overweight/obesity have not been a part of mainstream research on HRQL and measures of fatness have been usually confined to BMI. In general populations the relationships among BMI and quality of life in the mental and physical domains were usually nonlinear – HRQL scores were optimal when BMI was in the range of 20 to 25 $kg \cdot m^{-2}$ [12]. Each surplus above the normal BMI category was associated with an increasing risk of decline in perceived health, with the highest risk in the higher categories [9]. Few studies assessed the impact of obesity and associated conditions on HRQL in older adults and the obtained results suggest that these relationships

may be not the same as in younger adults [16]. In a recent study of 1326 adults from the Rancho Bernardo longitudinal cohort study, obese older adults tended to have lower HRQL than those who were overweight or of normal BMI. Being overweight but not obese did not have a significant impact on HRQL in this population [16]. In the cross-sectional study covering 3605 subjects aged 60 years and over, frequency of suboptimal physical functioning was higher among obese subjects (BMI > or = 30), both male and female [25]. However male, though not female, obesity was associated with a better HRQL on the SF-36 mental scales [25]. In another study of 82 subjects aged 55 to 75 years, body fatness was the strongest predictor of several HRQL scores [33].

In the present study, the frequency of mobility, pain/discomfort and anxiety/depression problems was higher and VAS was lower in overweight/obesity groups as compared to normal BMI group. Both in women and men, BMI, WHR and the percentage of body fat were negatively related to several Euroqol scores (i.e. higher values of these variables were connected with more frequent reporting of problems in Euroqol dimensions and adversely correlated to VAS). Therefore, our data are in accord with studies performed in younger populations and indicate an increased risk of decline in HRQL with higher BMI category, WHR and the percentage of body fat in both elderly women and men.

Not only overweight/obesity but poor nutritional status as well may impair HRQL, especially in older people [10]. Frail community-dwelling seniors with high nutritional risk had fewer good physical health days and whole-life satisfaction compared with those at low risk [21]. In the study of Yan et al. [35] both underweight men and women reported impairment in physical, social, and mental well-being. The authors concluded that compared with normal-weight people, both underweight and obese older adults reported impaired quality of life, particularly worse physical functioning and physical well-being [35].

In the present study we used three typical measures of nutritional state (BMI, WHR and the percentage of body fat) and two measures used in the comprehensive geriatric assessment for screening of malnutrition: calf circumference and MNA. Mean values of body mass index and calf circumference indicate that our population was in a general good nutritional state [3]. Only 3 subjects had BMI < 19 and 15 subjects had calf circumference < 30.5, respectively. These values are considered to be indices of malnutrition [3]. Calf circumference was not related to any dimensions of HRQL. Undernutrition, therefore, seems not to be a major problem in urban home-dwelling elderly aged 65–79, also from the point of view of its impact on HRQL. On the contrary, MNA, as a composite index assessing nutritional state together with physical and mental functioning, corroborated its value contributing to several of HRQL scores.

The relationship of nutritional status to HRQL may be further influenced by PA [34]. In younger and middle-aged obese subjects a higher level of PA is positively associated with diverse dimensions of HRQL. Several previous studies also found that regular PA may promote both physical and psychological well-being in the elderly. PA and tobacco avoidance predicted HRQL outcomes in community-dwelling older adults over an 8-year period [19]. HRQL, self-estimated level of PA, fitness and well-being were graded higher by trained older coronary patients than those who served as controls [32]. Twelve months of community-based moderate-intensity endurance and strengthening exercises resulted in improvements in important functional and well-being outcomes [23]. Combined diet and exercise intervention had the most consistent, positive effect on HRQL compared with the control group in obese, older adults with knee osteoarthritis [30]. Also aerobic fitness was reported to be a strong predictor of HRQL in older adults [33]. On the other hand, several studies were not able to substantiate the beneficial effects of exercise on HRQL in older adults [7, 8].

In the present study measures of PA were related to several HRQL scores both in women and men. Positive association of HRQL to the Stanford Moderate Index was similar in both genders. In women, higher HRQL scores were related to both Seven Day Recall Moderate and Hard indices. In men, the vast majority of HRQL scores were positively related to the Seven Day Recall Hard score. This may suggest that higher intensity PA is needed in older men than women to enhance well-being. Furthermore, lack of a relationship to Seven Day Recall Total score, which includes also low-intensity PA, indicates that certain minimal intensity threshold is needed in both genders.

In the elderly it is important not only to quantitate the effect obesity and PA have on HRQL, but to see these effects in a wider view of many co-existing disabilities. HRQL in the elderly is inter-related with other measures of physical and cognitive function. Comorbidity has been usually restricted to obesity-related comorbid conditions known to reduce HRQL. For instance, in elderly hypertensive patients poor HRQL was generally associated with increasing age, presence of cardiovascular complications and, among women, high BMI [13]. Insulin therapy, obesity and complications were associated with a lower HRQL in patients with type 2 diabetes, independently of age and sex [29]. In a recent mailed health survey obesity and overweight were associated with impaired physical well-being among older women. Associa-

tions weakened but remained significant with further adjustment for comorbidities [35]. In a relatively small study of 31 hospital-based patients over 65 years of age a linear relationship was found between BMI and HRQL, with poor nutritional status being associated with low levels of well-being and good nutritional status being associated with the highest levels of well-being [1]. However, when the contribution of potential confounding variables was analyzed, body mass was found to have no significant independent effect on well-being [1].

In the present study we have simultaneously considered the majority of the most important chronic diseases and health conditions. After controlling for other confounders, BMI predicted lower mobility while the percentage of body fat independently contributed to more frequent pain/discomfort and anxiety/depression problems. WHR and calf circumference did not appear as independent predictors for any HRQL dimensions, while an adequate MNA added to higher usual activity score. Of PA indices, lower Stanford Moderate Index predicted inferior overall HRQL as measured by VAS. These data indicate that excess body fatness and sedentary lifestyle may be independent predictors of lower HRQL in older subjects. BMI and the percentage of body fat seem to be more powerful determinants of well-being than WHR or calf circumference. Poor nutritional state is not a major determinant of HRQL in these independent community-dwelling seniors. Furthermore, simple physically active behaviors as listed by Stanford Moderate Index (e.g., walking or climbing stairs) may be more influential on well-being than absolute energy expenditure spent on PA.

Euroqol 5D scores obtained in this study are clearly lower as compared to the data from corresponding age groups in general population studies [6, 22]. It should be stated, however, that available information comes from surveys made in Western societies. Ecological and medical care disadvantages in Central and Eastern European Countries as compared to Western Europe are probably responsible for higher percentages of elderly with low QOL. Similar differences have been described between East and West German populations [26, 27]. The prevalence of comorbid metabolic conditions and heart disease is higher in Central-Eastern European Countries in comparison with Western Europe or the USA. In our study 42% of older subjects were overweight (BMI: 25–29.9) and 33.3% were obese (BMI >= 30). Thirty-two percent of adults aged 70 years and over reported heart disease in USA and 37.3% in the present study [28]. As many as 5.3% of our subjects reported three major metabolic conditions (obesity, hypertension and diabetes) as compared to 1–2% in USA [28]. Therefore, in our home-dwelling seniors aged 65–79 obesity detracts from HRQL similarly to its effects in younger populations. In nursing home residents as well as undernourished and frail oldest-old this relationship might have been the opposite [3].

This study has several shortcomings. Obtained data are limited to relatively healthy community-dwelling elderly aged 65–79 years, able and wishing to visit outpatient clinic. The cross-sectional method of this study leaves open the question of direction of causality. Although all the studied variables are potentially able to influence HRQL, for some of them this direction of causality may also be the opposite. For example, psychological well-being may be an important predictor for eating and health promoting behaviors, e.g., physical activity.

Conclusions

Overweight/obesity and sedentary lifestyle are independent predictors of lower HRQL in community-dwelling seniors aged 66–79 years. Poor nutritional state is not a major determinant of well-being in this population. This should be taken into account while programming care for older people. Preventing obesity and the value of regular PA in sustaining an adequate level of HRQL are important components of health in the elderly.

▶ **Acknowledgements** This study was supported by grant 502-16-109 from the Medical University of Lodz. We appreciate the help of Prof. W. Drygas and Dr. E. Borowiak in data collection.

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