Full Length Research Paper

Factors associated with lower quality of life in Brazilian elderly people

Amauri Dalla-Corte MD, MsC[1], José L Vieira MD, PhD[2], Irenio G.Silva Filho MD, PhD[3], César L. Reichert MD, PhD[4] and Roberta R Dalla-Corte MD, PhD[1]

[1]Federal University of Rio Grande do Sul, Porto Alegre, Brazil
[2]Institute of Cardiology of Rio Grande do Sul, Porto Alegre, Brazil
[3]Pontifical Catholic University of Rio Grande do Sul, Porto Alegre, Brazil
[4]Physiology Exercise Laboratory, Feevale University Center, Novo Hamburgo, Brazil

To investigate the relation of lower scores of the World Health Organization Quality of Life-brief version (WHOQOL-BREF) and depressive symptoms, physical activity level, obesity, alcoholism, and smoking in community-dwelling elders. This is a cross-sectional population-based study, which included 379 community-dwelling elders from Novo Hamburgo, southern Brazil. The level of physical activity was estimated using the International Physical Activity Questionnaire and depressive symptoms were detected according to the Yesavage Geriatric Depression Scale. The relation between the level of physical activity and depressive symptoms with WHOQOL-BREF scores was analyzed by logistic regression. The risk of having lower scores in all four WHOQOL-BREF domains was significantly elevated in the groups with depressive symptoms irrespective of physical activity status. This work highlights the burden that depressive symptoms may have on the quality of life of older adults over and above other lifestyle factors.

Keywords: Quality of life, WHOQOL, depressive symptoms, physical activity, elderly.

INTRODUCTION

Population ageing is a major human challenge. It results in changes in the epidemiological profile, with an increase in the prevalence and incidence of chronic-degenerative diseases, thus creating different demands in terms of population oriented health care policies (World Health Organization, 2002; World Health Organization, 1999).

Interventions in older adults aim at maintaining mobility, independence, level of activity, social participation and ability to respond to the physical and psychological demands of old age. The main goal is to add quality of life (QOL) to years of life. The international literature has shown an increasing interest in QOL investigations in the older population, although measurement of classical health outcomes, such as morbidity, mortality and decrease in symptoms is deficient in this population (Bowling et al., 2002).

*Corresponding Author E-mail: robertarigod@gmail.com; Tel.: +55 5132222856

The World Health Organization Quality of Life (WHOQOL) Group defines QOL as the individual's perception of his position in life in the context of his culture and the value systems of the society in which he lives compared to his objectives, expectations, standards and concerns (The WHOQOL Group, 1995). This concept is based on the multi-dimensionality of the construct, the presence of positive and negative dimensions and the importance of subjective perception, and should be a fundamental aspect of public health assessments, as it is now widely acknowledged that personal burden of illness cannot be described fully by objective measures of disease status.

The WHOQOL-BREF is one of the most influential, widely used QOL assessment instruments employed for research in internal medicine and mental health. It was designed to make international cross-culturally comparable QOL evaluations. It assesses the individual's perceptions in the context of their culture and value systems, and their personal goals, standards and concerns. The WHOQOL instruments were developed collaboratively in a number of centers worldwide, and have been widely field-tested (Fleck et al., 2000; Jaracz wet al., 2006; Skevington et al., 2004; Hwang et al., 2003; Chachamovich et al., 2007; Berlim et al., 2005; Blay and Marchesoni, 2011).

Depressive symptoms are associated with substantial and long-lasting decrements in multiple domains of functioning and well-being (Hays et al., 1995) and are strongly associated with the burden of self-rated health in the population (Molarius and Janson, 2002). Depression is an important public-health issue, both because of the high lifetime prevalence (2% to 15%), and the association with substantial disability (Ustun et al., 2004). It is currently considered the fourth cause of disability-adjusted life years for incapacity or premature death.

Cross-sectional studies in the general adult and older population have demonstrated better health-related quality of life (HRQL) in more physically active people compared with those who are inactive (Acree et al., 2006; Brown et al., 2004; Vuillemin et al., 2005; Riise et al., 2003; Wendel-Vos et al., 2004). However, few efforts have been made to determine whether this relationship is direct or whether it potentially operates through other psychosocial factors.

In summary, the literature indicates the existence of relationships between QOL for depressive patients and activity participation, perceived competence, symptom severity, satisfaction with activities participation, demographic characteristics, age and gender. However, there is a lack of studies on the factors that influence the QOL in the elderly. If the use of scores obtained in the WHOQOL-BREF domains is a goal to be pursued among investigations, additional clarification of factors that influence the responses in distinct areas becomes a key objective to be explained. By using a homogeneous sample of community-dwelling elderly, the present study aims to determine the level at which depressive symptoms, physical activity level, obesity, alcoholism and smoking affects the scores of the WHOQOL-BREF domains. More specifically, it is hypothesized that depressive symptoms, insufficient physical activity, obesity, alcoholism and smoking are associated with lower QOL.

POPULATION AND METHODS

A total of 379 individuals (127 males and 252 females) were enrolled in this cross-sectional population-based study. Details on the methodology used have been published previously (Dalacorte et al., 2009). In brief, we conducted a study with senior citizens with a mean age of 68 years (range 60 to 79), from the city of Novo Hamburgo (approximately 236,000 inhabitants, mainly of German ethnicity) in the southern Brazilian state of Rio Grande do Sul. According to the Brazilian Institute of Geography and Statistics (IBGE), in 2000, the city had 17,101 people over the age of 60 and 98% resided in urban areas. Sex distribution was as follows: 51% female and 49% male. A probabilistic sample from census data was carried out. The sample was controlled for age, sex, area of residence and economic stratum according to the population distribution as reported by IBGE in 2000 and to regional data as reported by the National Association of Research Companies (Instituto Brasileiro de Geografia e Estatística - IBGE, 2001).

Subjects were contacted by telephone or letter and data were collected from January to July 2005. Each participant was invited to a clinical assessment at Feevale University Center. Men were more reluctant to take part in this investigation, as more than 50% of the men invited to the study declined to participate compared to 10% of women. The project was approved by the Ethics Committee of São Lucas Hospital, Pontifical Catholic University, RS, Brazil, and all participants signed an informed consent form.

The study included 6 variables and the assessment instruments used are described below.

Quality of life: To assess QOL, the short version of the World Health Organization Quality of Life Instrument (WHOQOL-BREF) was employed (The WHOQOL Group, 1998). It was translated and validated for the Brazilian population and its abbreviated version contains 26 questions grouped into four domains: physical, psychological, social-relational, and environmental. The instrument and syntax to calculate domain scores were

obtained with the WHO collaborators in Brazil (Fleck et al., 2000).

Depression: The short version of the Yesavage Geriatric Depression Scale (GDS-15) was used (Sheikh et al., 1986). The presence of depressive symptoms was determined based on the score of five or more points in the GDS.

Physical Activity: Each participant filled out a short form of the International Physical Activity Questionnaire (IPAQ) (Craig et al., 2003). The weekly energy expenditure was calculated according to international standards and was expressed as metabolic equivalent of task (MET/week) or converted to kcal/week using the relationship kcal = MET x weight ÷ 60. Depending on the weekly energy expenditure expressed in MET, individuals were classified as insufficiently active (up to 600 MET/week) or sufficiently active (over 600 MET/week) (Patterson, 2005).

Obesity: Weight and height were measured by trained investigators using a mechanical anthropometric scale (Welmy®, SP, Brazil) and body mass index (BMI) was calculated as the weight (kg) divided by the square of the height (m). Obesity was defined as BMI ≥ 30kg/m² in the 60-64 year age group and BMI > 27kg/m² in the age group ≥ 65 years (World Health Organization, 2000; Lipschitz, 1994).

Alcoholism: Participants answered the CAGE questionnaire (a four-item test with questions on Cutting down, Annoyance by criticism, Guilty feeling, and Eye-openers) and two or more positive responses were indicative of the presence of alcohol-related problems (Ewing, 1984).

Smoking: Smoking was defined as a positive response to the question: "Do you smoke?"

Statistical procedures

Quantitative data were expressed in mean±standard deviation or median and interquartile range when data were asymmetric. For categorical data we used counts and percentages. Most analyses were stratified by sex. To evaluate significance for categorical data we used the chi-square test. Continuous variables were assessed by the Student t test. To evaluate the impact of potential confounding factors on quantitative data we used a analysis of covariance (ANCOVA) model (Field, 2005). The effect size was calculated using the following formula: $r_{contrast} = \sqrt{\dfrac{t^2}{t^2 + df}}$ (29).

To analyze categorical outcomes, we used a logistic regression model obtaining odds ratios and their respective 95% confidence intervals. Significance level

was set to α=0,05 (two-tailed). Data were analyzed using SPSS version 18.0.

RESULTS

Sample characteristics

Table 1 presents the characteristics of the total sample and by depressive symptoms and physical activity level separately. The average age of the 379 participants was 68.8 years (standard deviation 5.8). The majority were women (66.5%) and subjects who were sufficiently active (66.5%). The prevalence of depressive symptoms in the total sample was 30.3%. Participants who were insufficiently active were more likely to have depressive symptoms than were those who were sufficiently active (P=0.025). No significant differences were found between participants with or without depressive symptoms and with sufficient or insufficient physical activity level, and the variables sex, obesity, alcoholism and smoking. A significantly greater proportion of participants with depressive symptoms presented lower WHOQOL-BREF scores in the physical, psychological, social and environmental domains, compared with participants with no depressive symptoms (P<0.001).

WHOQOL-BREF scores according to sex and variables studied

Sufficient physical activity level had a *significant* positive effect on *men's* scores in the physical (P<0.05) and environmental (P<0.005) domains, but did not affect women's scores (Table 2). The presence of depressive symptoms was correlated with significantly lower scores in all the four WHOQOL-BREF domains for both sexes. The lowest WHOQOL-BREF domain scores of this study were obtained by participants with depressive symptoms in the physical domain. Obese women presented *significantly lower scores in the physical domain (P<0.05), but obesity* did not affect men's scores. None of the WHOQOL-BREF domains were affected by alcoholism and smoking either in men or women.

WHOQOL-BREF scores according to depressive symptoms and physical activity level combined in four groups

Table 3 presents the absolute scores of WHOQOL-BREF domains concerning to depressive symptoms and physical activity combined into four groups. The lowest scores belonged to the groups in which depressive

Table 1. Demographic and clinical characteristics according to depressive symptoms and physical activity level.

Characteristic	Total sample (n=379)	Without depressive symptoms[#] (n=264)	With depressive symptoms[#] (n=115)	Sufficiently active[¶] (n=252)	Insufficiently active[¶] (n=127)
Age, mean (SD)	68.8 ± 5.8	68.7 ± 5.8	68.8 ± 6.0	68.4 ± 5.6	69.3 ± 6.3
Sex, n (%)					
Male	127 (33.5)	93 (35.2)	34 (29.6)	85 (33.7)	42 (33.1)
Female	252 (66.5)	171 (64.8)	81 (70.4)	167 (66.3)	85 (66.9)
Obesity[§], n (%)	185 (48.8)	136 (51.5)	49 (42.6)	126 (50.0)	59 (46.5)
Alcoholism[‡], n (%)	22 (5.8)	17 (6.4)	5 (4.3)	16 (6.3)	6 (4.7)
Smoking, n (%)	43 (11.3)	24 (9.1)	19 (16.5)	24 (9.5)	19 (15.0)
Depressive symptoms, n (%)	115 (30.3)	--	--	67 (26.6)	48 (37.8)
Insufficient physical activity, n (%) (%) activity, n (%)	127 (33.5)	79 (29.9)	48 (41.7)	--	--
Lower WHOQOL-BREF scores*, felifelife*,					
Physical domain	102 (26.9)	45 (17.0)	57 (49.6)	64 (25.4)	38 (29.9)
Psychological domain	90 (23.7)	35 (13.3)	55 (47.8)	60 (23.8)	30 (23.6)
Social domain	101 (26.6)	47 (17.8)	54 (47.0)	68 (27.0)	33 (26.0)
Environment domain	84 (22.2)	39 (14.8)	45 (39.1)	54 (21.4)	30 (23.6)

SD = Standard deviation. [#] Depressive symptoms: points in the Yesavage Geriatric Depression Scale ≥ 5. [¶] Insufficiently active: ≤ 600 MET/wk; sufficiently active: > 600 MET/wk. [§] Obesity: Body Mass Index (BMI) ≥ 30kg/m² in the 60-64 year age group and BMI > 27kg/m² in the age group ≥ 65 years. [‡] Alcoholism: positive answers to CAGE questions ≥ 2. [*] Lower WHOQOL-BREF scores: below lower quartile.

Table 2. WHOQOL-BREF scores according to physical activity level, depressive symptoms, obesity, alcoholism and smoking stratified by sex.

Factors	Men WHOQOL-BREF domains				Women WHOQOL-BREF domains			
	Physical	Psychological	Social	Environment	Physical	Psychological	Social	Environment
Physical activity[¶]								
Insufficient	50.9±3.3	61.5±2.4	66.4±2.9	53.9±2.5	56.9±3.1	66.9±2.9	65.3±3.3	62.0±2.8
Sufficient	57.2±2.8	62.8±2.1	68.3±2.4	61.1±2.1	59.4±3.0	65.3±2.8	65.2±3.3	61.7±2.8
P	0.044	0.585	0.466	0.003	0.192	0.345	0.972	0.848
Depressive symptoms[#]								
Yes	46.4±3.4	56.2±2.5	64.3±3.0	55.1±2.6	51.4±3.1	60.0±2.9	60.4±3.4	57.9±2.9
No	61.7±2.7	68.1±2.0	70.4±2.4	60.0±2.0	64.8±3.0	72.2±2.8	70.1±3.2	65.9±2.7
P	< 0.001	< 0.001	0.031	0.045	< 0.001	< 0.001	< 0.001	< 0.001
Obesity[§]								
Yes	51.8±3.2	61.4±2.4	66.5±2.8	56.5±2.4	55.9±3.2	65.8±3.0	63.6±3.4	61.7±2.9
No	56.2±2.8	62.9±2.0	68.2±2.4	58.6±2.1	60.3±2.9	66.4±2.7	66.8±3.1	62.1±2.7
P	0.138	0.492	0.517	0.342	0.017	0.709	0.100	0.805
Alcoholism[‡]								
Yes	50.7±4.5	60.1±3.3	66.8±3.9	54.8±3.3	57.0±5.1	67.7±4.9	63.3±5.6	64.8±4.7
No	57.4±2.1	64.2±1.5	67.9±1.8	60.3±1.5	59.3±1.8	64.4±1.6	67.2±1.9	58.9±1.6
P	0.151	0.222	0.776	0.113	0.643	0.487	0.479	0.206
Smoking								
Yes	53.6±3.7	61.2±2.7	65.9±3.2	57.0±2.8	58.8±4.0	66.0±3.8	63.6±4.4	60.6±3.7
No	54.4±2.7	63.1±2.0	68.8±2.4	58.0±2.0	57.5±2.6	66.2±2.4	66.8±2.8	63.1±2.4
P	0.828	0.490	0.376	0.721	0.718	0.961	0.404	0.451

Data are presented as mean ± standard error obtained in an ANCOVA model adjusted by the following factors: physical activity, depressive symptoms, obesity, alcoholism, smoking and age. All effect sizes are ≤ 0.41. [¶] Insufficient physical activity: ≤ 600 MET/wk; sufficient physical activity: > 600 MET/wk. # Depressive symptoms: points in the Yesavage Geriatric Depression Scale ≥ 5; [§] Obesity: Body Mass Index (BMI) ≥ 30kg/m² in the 60-64 year age group and BMI > 27kg/m² in the age group ≥ 65 years. ‡ Alcoholism: positive answers to CAGE questions ≥ 2.

Table 3. WHOQOL-BREF scores according to depressive symptoms and physical activity level combined in four groups and stratified by sex.

WHOQOL-BREF domains	Depressive symptomatology[#] and Physical activity level[¶]											
	Without depressive symptoms / Sufficiently active			Without depressive symptoms / Insufficiently active			With depressive symptoms / Sufficiently active			With depressive symptoms / Insufficiently active		
	All	Men	Women	All	Men	Women	All	Men	Women	All	Men	Women
	n = 185	n = 67	n = 118	n = 79	n = 26	n = 53	n = 67	n = 18	n = 49	n = 48	n = 16	n = 32
	(48.8%)	(52.7%)	(46.8%)	(20.8%)	(20.5%)	(21.0%)	(17.7%)	(14.2%)	(19.5%)	(12.7%)	(12.6%)	(12.7%)
Physical	64.5±1.9	64.3±2.0	64.6±2.2	60.9±2.2	60.7±2.3	61.0±2.3	50.4±2.2	50.2±2.4	50.6±2.4	46.8±2.3	46.6±2.5	46.9±2.4
Psychological	69.4±1.7	69.5±1.8	69.3±1.9	70.2±1.9	70.3±2.0	70.1±2.0	57.2±1.9	57.3±2.0	57.1±2.1	58.0±2.0	58.2±2.1	57.9±2.1
Social	70.7±1.9	70.9±2.1	70.5±2.2	70.2±2.2	70.4±2.3	70.0±2.4	62.0±2.2	62.1±2.4	61.8±2.4	61.5±2.3	61.6±2.5	61.3±2.5
Environment	63.7±1.7	64.0±1.8	63.3±1.9	61.9±1.9	62.2±2.0	61.5±2.0	56.4±1.9	56.7±2.0	56.1±2.1	54.6±2.0	54.9±2.1	54.3±2.1

Data are presented as mean ± standart error obtained in an ANCOVA model adjusted by the following factors: physical activity, depressive symptoms, obesity, alcoholism, smoking and age. [#] Depressive symptoms: points in the Yesavage Geriatric Depression Scale ≥ 5. [¶] Insufficiently active: ≤ 600 MET/wk; sufficiently active: > 600 MET/wk.

symptoms were present, independently of the physical activity level. The physical and the psychological domains were more decreased by depressive status than the social and environmental domains. On the other hand, the highest mean scores were in the psychological and social domains of those participants with no depressive symptoms. With no greater difference from the insufficient physical activity level, the sufficient physical activity level - with or without depressive symptoms - only affected positively the physical domain.

Association of lower WHOQOL-BREF scores with the variables studied

The risk of lower scores in all WHOQOL-BREF domains, defined as below lower quartile, significantly increased in the presence of depressive symptoms either in men or women. The highest adjusted odds ratios (OR) in all four domains were observed in women who reported depressive symptoms (all at P<0.001), while men with the same characteristic showed less significant OR in the social and environmental

domains (P<0.05) (Table 4). Obesity increased the risk of low physical domain in men and of low social domain in women. The risk of low social domain was also affected by smoking when considering all participants. Alcoholism increased the risk of low environment domain in men, however there was no woman scoring below lower quartile in this domain. Insufficient physical activity level did not significantly affect the risk of lower scores in all WHOQOL-BREF domains either in men or women.

Table 4. Association of lower WHOQOL-BREF scores* with insufficient physical activity level, depressive symptoms, obesity, alcoholism, and smoking.

	WHOQOL-BREF											
	Low physical domain			Low psychological domain			Low social domain			Low environment domain		
	OR (95% CI)			OR (95% CI)			OR (95% CI)			OR (95% CI)		
	All	Men	Women	All	Men	Women	All	Men	Women	All	Men	Women
	n = 102	n = 40	n = 62	n = 90	n = 26	n = 64	n = 101	n = 30	n = 71	n = 84	n = 26	n = 58
Characteristic	(26.9%)	(31.5%)	(24.6%)	(23.7%)	(20.5%)	(25.4%)	(26.6%)	(23.6%)	(28.2%)	(22.2%)	(20.5%)	(23.0%)
Insufficient physical activity¶	1.1 (0.6; 1.8)	1.3 (0.5; 3.1)	1.0 (0.5; 1.9)	0.8 (0.4; 1.4)	1.0 (0.3; 2.7)	0.7 (0.4; 1.4)	0.8 (0.5; 1.3)	1.3 (0.5; 3.3)	0.7 (0.3; 1.3)	0.9 (0.6; 1.6)	2.2 (0.8; 5.8)	0.7 (0.4; 1.4)
Depressive symptoms#	5.5 (3.3; 9.2)‖	4.1 (1.7; 10.0)†	6.6 (3.5; 12.6)‖	6.1 (3.6; 10.3)‖	6.1 (2.3; 16.3)‖	6.3 (3.3; 11.9)‖	4.4 (2.6; 7.3)‖	2.5 (1.0; 6.5)‡	5.5 (3.0; 10.4)‖	3.7 (2.2; 6.2)‖	3.4 (1.2; 9.0)‡	3.9 (2.1; 7.3)‖
Obesity§	2.0 (1.2; 3.4)†	2.8 (1.2; 6.8)‡	1.6 (0.8; 3.0)	1.1 (0.6; 1.9)	1.5 (0.5; 4.3)	0.9 (0.5; 1.7)	2.1 (1.2; 3.5)†	1.2 (0.5; 3.1)	2.6 (1.4; 5.0)†	1.2 (0.7; 2.0)	2.1 (0.8; 5.8)	0.8 (0.4; 1.6)
Alcoholism‡	1.4 (0.5; 4.0)	1.3 (0.4; 4.6)	1.4 (0.3; 8.1)	0.4 (0.1; 1.7)	0.8 (0.2; 4.2)	—	1.1 (0.4; 3.3)	1.1 (0.3; 4. 4)	1.4 (0.2; 7.6)	1.5 (0.5; 4.4)	4.8 (1.3; 17.5)‡	—
Smoking	1.1 (0.5; 2.5)	1.7 (0.6; 4.7)	0.6 (0.2; 2.2)	1.9 (0.9; 4.2)	2.5 (0.8; 8.0)	1.3 (0.4; 3.9)	2.8 (1.3; 5.8)†	2.6 (0.9; 7.6)	2.2 (0.8; 6.6)	1.7 (0.8; 3.7)	1.3 (0.4; 4.4)	1.8 (0.6; 5.4)

Data are presented as odds ratios and 95% confidence intervals obtained in a logistic regression model adjusted by the following factors: physical activity, depressive symptoms, obesity, alcoholism, smoking and age. OR = Odds Ratio. CI = Confidence Interval. * Lower WHOQOL-BREF scores: below lower quartile. ¶ Insufficient physical activity: ≤ 600 MET/wk. # Depressive symptoms: points in the Yesavage Geriatric Depression Scale ≥ 5. § Obesity: Body Mass Index (BMI) ≥ 30kg/m² in the 60-64 year age group and BMI > 27kg/m² in the age group ≥ 65 years. ‡ Alcoholism: positive answers to CAGE questions ≥ 2. ‖ P < 0.001. † P ≤ 0.01. ‡ P < 0.05.

Table 5. Association of lower WHOQOL-BREF scores* with depressive symptoms and physical activity level combined in four groups.

Depressive symptoms[#] and Physical activity level[¶]	WHOQOL-BREF			
	Lower scores in physical domain OR (95% CI)	Lower scores in psychological domain OR (95% CI)	Lower scores in social domain OR (95% CI)	Lower scores in environment domain OR (95% CI)
NDS + SA (Reference) n = 185 (48.8%)	1.00	1.00	1.00	1.00
NDS + IA n = 79 (20.8%)	1.2 (0.6; 2.5)	0.7 (0.3; 1.7)	0.8 (0.4; 1.6)	0.9 (0.4; 1.8)
DS + SA n = 67 (17.7%)	6.1 (3.2; 11.7)	5.9 (3.1; 11.3)	4.4 (2.4; 8.3)	3.4 (1.8; 6.5)
DS + IA n = 48 (12.7%)	5.7 (2.8; 11.8)	4.8 (2.3; 9.9)	3.5 (1.7; 7.1)	3.6 (1.8; 7.4)

Data are presented as odds ratios and 95% confidence intervals obtained in a logistic regression model adjusted by the following factors: age, sex, obesity, alcoholism and smoking. OR = Odds Ratio. CI = Confidence Interval. NDS = without depressive symptoms. DS = with depressive symptoms. SA = sufficiently active. IA = insufficiently active. * Lower WHOQOL-BREF scores: below lower quartile. [#] Depressive symptoms: points in the Yesavage Geriatric Depression Scale ≥ 5. [¶] Insufficiently active: ≤ 600 MET/wk; sufficiently active: > 600 MET/wk.

Association of lower WHOQOL-BREF scores with depressive symptoms and physical activity level combined in four groups

Participants were stratified by the presence of depressive symptoms and physical activity status using the group sufficiently active and with no depressive symptoms as the reference group. The risk of having lower scores in all four WHOQOL-BREF domains was significantly elevated in the groups with depressive symptoms irrespective of physical activity status (Table 5).

DISCUSSION

The present study showed that a higher prevalence of depressive symptoms among a population of elderly men and women is associated with significant impairments across all domains of WHOQOL-BREF (physical, psychological, social, and environmental). The probability of having symptoms of depression was 29.6% lower in elders classified as sufficiently active compared to those who were insufficiently active. However, physical activity level in itself was not associated with risk of lower scores in all WHOQOL-BREF domains either in men or women. In fact, among the other factors studied, only obesity was associated with significant lower scores, which were related to men's physical domain and women's social domain.

Some methodological issues must be considered when interpreting these results. The strengths of this study include the population-based design, applying weights to ensure data of non-institutionalized elderly respondents were community representative. Another positive feature of this study was the use of a

well-validated measure of QOL (Fleck et al, 2000). However, a number of limitations must be acknowledged. Firstly, the study was cross-sectional, so causal inferences cannot be drawn. In addition, our analyses did not account for how long depressive symptoms had been present, or the varying degrees of severity. Duration or onset may have an impact on WHOQOL-BREF reports, as it seems people continuously adapt to their illness (Sprangers et al., 1999). Type of depression treatment was unknown, and treatments may affect QOL differently. A further possible bias may be related to the questionnaire used to evaluate the level of physical activity, which tend to overestimate the physical activities (Fogelholm et al., 2006) and the sample size too small to detect difference in physical activity.

The negative association between depressive symptoms and QOL is pervasive, because all domains of WHOQOL-BREF were affected irrespective of activity status. Our results support two hypotheses. First, the depressive symptoms can be considered as the variable most predictive of worse QOL. This statement is consistent with data reported by the Medical Outcomes Study (Ware et al., 1992), which showed that the functioning of depressed patients was similar to or worse than the functioning of patients with chronic physical conditions independent of the nature of the physical disease. Cruz et al also found that regardless of the chronic condition, depressive symptoms were predictive for lower QOL in all domains, and the most affected was psychological domain of WHOQOL-BREF (Cruz et al., 2010). Moreover, the depressive symptoms seem to cause more impact in QOL than the physical disease. Because the construct of QOL measurements focuses on the person's satisfaction with his life, the presence of depressive symptoms could highly influence this perception, since depressed patients have a negative self-assessment, from the world and the future (Atkinson et al., 1997; Jacobson et al., 1997). Furthermore, probably there is a measurement overlap between QOL and depressive symptoms, since a number of items in the WHOQOL-BRIEF and the GDS-15 address the same phenomena. For this reason, some investigators have pointed out that such assessments can actually be, to a great extent, redundant (Naumann and Byme, 2004).

Second, as the risk of lower QOL scores was not statistically significantly different between sufficiently active and insufficiently active respondents with depressive symptoms in all WHOQOL-BREF domains, activity status may have less of an influence on QOL. It has been demonstrated that the effects of physical activity interventions on global self-esteem have tended to be rather small (Spence et al., 2005).

In contrast to the study of Schmitz et al. (2004), which examined the relationship between HRQL and physical activity in adult respondents with affective disorders, we found that respondents with no depressive symptoms and insufficiently active did not report significant lower WHOQOL-BREF scores across all domains, compared with sufficiently active and with no depressive symptoms respondents. Although the beneficial effects of regular physical activity in HRQL are widely accepted, the relationships between depressive symptoms, physical activity and QOL remain unclear, and data is still scarce regarding the evaluation of the level of physical activity in individuals of 60 years of age and over with depressive symptoms. In addition, recent studies have shown that WHOQOL-BREF domain scores among the middle-aged and elderly are influenced by socio-demographic variables such as age and ethnicity, depression, number of self-reported illnesses, and self-health assessment (Berlim et al., 2005; Xavier, 2002; Naumann and Byme, 2004; Aigner et al., 2006).

Some studies have pointed out that one main problem with the IPAQ questionnaire is the tendency to overestimate the level of physical activity in sedentary individuals. It has also been reported that this can be overcome by a careful application of the questionnaire, what occurred in our study (Ekelund et al., 2006; Fogelholm et al., 2006). We also took care to use only physical activity data pertaining to the seven days prior to the interview because we assumed that when assessing individuals older than 60 years of age this is the better way for preventing recall bias. The multi-centered validation study of IPAQ showed that the reliability of the information regarding the seven days prior to interview was comparable to that obtained concerning a usual week of activity (Craig et al., 2003). The mean level of physical activity of our population was 1,482 MET/week (1,750 kcal/week) and was lower than that found in other studies, like the mean of 2,514 MET/week reported in the IPAQ international validation study, although in this case the data refers to a general population sample and not a population of over 60 year olds (Craig et al., 2003). A South African study using the IPAQ and the Yale Physical Activity Survey to assess the level of physical activity in people over the age of 60 reported a weekly IPAQ energy expenditure very much higher than that of our study (Kolbe-Alexander et al., 2006). However, it could be explained by the sampling methodology used, which selected elderly who were members of 'lunch clubs' – a factor which could have chosen more active individuals.

The prevalence of depressive symptoms in the present study ranged from 26.6% (in sufficiently active participants) to 37.8% (in insufficiently active participants), which is higher compared to the prevalence found in other investigations (Regier et al., 1993). As stressed by Snowdon (Snowdon, 2002), different

countries present a highly variable prevalence of depression and depressive symptoms, with over a ten-fold difference among them. The higher prevalence of depressive symptoms observed in Brazilian elders may be explained by the country´s poor social and health system structures (Veras et al., 1994). Population studies show that, not only are depression prevalence rates high, but other psychiatric conditions are also frequent among adults and elderly populations (Herrera et al., 2002; Andrade et al., 2002; Blay et al., 2007; Scazufca et al., 2008), which can potentially influence QOL life assessments.

Another consideration relates to the sample's proportion of females, which, numerically, were twice as numerous as men, possibly bearing an influence on the results. Similar results, however, have been reported in other populations with a higher frequency of females, which, in turn, may be explained by their higher life expectancy or predisposition to participate as volunteers in studies involving medical consultation and clinical and laboratory evaluations. Brazilian women over 60 are the largest group in terms of medical consultations and also more prone to seek medical advice than Brazilian men (Barreto et al., 2006). Briscoe, while studying people's ways of expressing their health conditions, found more availability to bring up subjectivity issues, and also more easiness among women to express their inner experiences, which may influence the subjective perception and sensibility (Briscoe, 1978). Females were also found to have lower QOL than males (Lehman, 1996).

Anthropometrics is a valuable tool in the assessment of the low weight and obesity conditions, which are important risk factors for severe illnesses, mortality and elder inability (Jensen, 1998). High values of body mass index (BMI) have shown strong correlation with elderly female functional inability (Zoico et al., 2004). Some authors found that the HRQL burden of obesity was higher for women than for men (Muennig et al., 2006; Kortt and Clarke, 2005; Bentley et al., 2011). Given the importance of body image in cultural norms for women, it is plausible that the stigma attached to being overweight or obese is much more substantial for women than for men (Garner et al., 2011).

Results from the present study highlight the importance of assessing the perceived impact of depression on health. Our findings demonstrate that respondents' own evaluation of the impact of their depressive symptoms on their health may have an additionally negative influence on their QOL, over and above background characteristics and activity level. This finding has important implications for treatment, as subjective perceptions might differ from objective evaluations of disease status, and may be amenable to change. Our results provided strong and

consistent evidence in support of the hypothesis that elderly people with depressive symptoms show significantly poorer QOL in all the assessed domains. Thus, the negative repercussions of depressive status encompassed almost every aspect that individuals deemed an important part of their satisfaction and well-being. Previous studies found a negative relationship between distress and depressive symptoms and QOL (Chan et al, 2005; Jho, 2001; Kuehner, 2002; Bonicatto et al, 2001). Depressed individuals also perceived themselves as having less mobility and more dependence on medication. Bonicatto et al (Bonicatto et al., 2001), also found that even in the physical domain, the scores of depressed patients were worse than those of chronic physical disease group, which supports the view that QOL is sensitive to mood disorder and suggests that social, healthcare and mood disorder interventions may improve clinical, psychosocial and somatic health. Individuals' subjective perception of the several aspects of their lives is the key point to assess QOL and depression has always been considered a paradigm to study the interface between subjective states and QOL assessment. Psychopathology of depressive states usually compromises the observation of inner and outer reality by individuals suffering from this condition (Blay and Marchesoni, 2011). This information may help to analyze whether domains are distinct constructs or redundant, due to certain health conditions.

Finally, cross-sectional studies are designed to raise a hypothesis about the relationship between QOL and physical activity and depressive symptoms, as well as to search for other associated factors in the elderly. The almost isolated association observed between lower QOL and depressive symptoms should, however, be analyzed within the context of this type of design, where a positive association does not necessarily mean a causal relationship. Therefore, this study should be interpreted as a hypothesis-generating study, thus suggesting the need for further longitudinal studies.

CONCLUSIONS

The present population-based study showed a positive association between lower QOL and depressive symptoms in elderly individuals with sufficient or insufficient physical activity level. Based on the possibility that WHOQOL-BREF domains do not assess independent QOL aspects, but rather phenomena that interpenetrate and interconnect with each other, data from this study must be analyzed with caution and do not allow a generalization of the results. These results indicate the need for studies with different designs to identify a causal relationship.

REFERENCES

Acree LS, Longfors J, Fjeldstad AS, Fjeldstad C, Schank B, Nickel KJ,et al (2006). Physical activity is related to quality of life in older adults. Health Qual Life Outcomes. 4:37.

Aigner M, Forster-Streffleur S, Prause W, Freidl M, Weiss M, Bach M (2006). What does the WHOQOL-Bref measure? Measurement overlap between quality of life and depressive symptomsin chronic somatoform pain disorder. Soc Psychiatry Psychiatr Epidemiol. 41(1):81-86.

Andrade L, Walters EE, Gentil V, Laurenti R (2002). Prevalence of ICD-10 mental disorders in a catchment area in the city of Sao Paulo, Brazil. Soc Psychiatry Psychiatr Epidemiol. 37(7):316-325.

Atkinson M, Zibin S, Chuang H (1997). Characterizing quality of life among patients with chronic mental illness: a critical examination of the self-report methodology. Am. J. Psychiatry. 154(1):99-105.

Barreto SM, Kalache A, Giatti L (2006). Does health status explain gender dissimilarity in healthcare use among older adults? Cad Saude Publica. 22(2):347-355.

Bentley TG, Palta M, Paulsen AJ, Cherepanov D, Dunham NC, Feeny D, et al (2011). Race and gender associations between obesity and nine health-related quality-of-life measures. Qual Life Res. 20(5):665-674.

Berlim MT, Pavanello DP, Caldieraro MA, Fleck MP (2005). Reliability and validity of the WHOQOL BREF in a sample of Brazilian outpatients with major depression. Qual Life Res. 14(2):561-564.

Blay SL, Andreoli SB, Fillenbaum GG, Gastal FL (2007). Depression morbidity in later life: prevalence and correlates in a developing country. Am J Geriatr Psychiatry. 15(9):790-799.

Blay SL, Marchesoni MS (2011). Association among physical, psychiatric and socioeconomic conditions and WHOQOL-Bref scores. Cad Saude Publica. 27(4):677-686.

Bonicatto SC, Dew MA, Zaratiegui R, Lorenzo L, Pecina P (2001). Adult outpatients with depression: worse quality of life than in other chronic medical diseases in Argentina. Soc. Sci Med. 52(6):911-919.

Bowling A, Banister D, Sutton S, Evans O, Windsor J (2002). A multidimensional model of the quality of life in older age. Aging Ment Health. 6(4):355-371.

Briscoe ME (1978). Sex differences in perception of illness and expressed life satisfaction. Psychol. Med. 8(2):339-345.

Brown DW, Brown DR, Heath GW, Balluz L, Giles WH, Ford ES, et al (2004). Associations between physical activity dose and health-related quality of life. Med. Sci. Sports Exerc. 36(5):890-896.

Chachamovich E, Trentini C, Fleck MP (2007). Assessment of the psychometric performance of the WHOQOL-BREF instrument in a sample of Brazilian older adults. Int. Psychogeriatr. 19(4):635-646.

Chan PS, Krupa T, Lawson JS, Eastabrook S (2005). An outcome in need of clarity: building a predictive model of subjective quality of life for persons with severe mental illness living in the community. Am. J. Occup. Ther. 59(2):181-190.

Craig CL, Marshall AL, Sjostrom M, Bauman AE, Booth ML, Ainsworth BE,et al (2003). International physical activity questionnaire: 12-country reliability and validity. Med. Sci. Sports Exerc. 35(8):1381-1395.

Cruz LN, Fleck MP, Polanczyk CA (2010). Depression as a determinant of quality of life in patients with chronic disease: data from Brazil. Soc. Psychiatry Psychiatr. Epidemiol. 45(10):953-961.

Dalacorte RR, Reichert CL, Vieira JL (2009). Metabolic syndrome and physical activity in southern Brazilian community-dwelling elders: a population-based, cross-sectional study. BMC Public Health. 9:25.

Ekelund U, Sepp H, Brage S, Becker W, Jakes R, Hennings M, et al (2006). Criterion-related validity of the last 7-day, short form of the International Physical Activity Questionnaire in Swedish adults. Public Health Nutr. 9(2):258-265.

Ewing JA (1984). Detecting alcoholism. The CAGE questionnaire. JAMA. 252(14):1905-1907.

Field A (2005). Analysis of Covariance, ANCOVA (GLM 2). 2nd ed. Ltd SP, editor. London 2005.

Fleck MP, Louzada S, Xavier M, Chachamovich E, Vieira G, Santos L,et al (2000). [Application of the Portuguese version of the abbreviated instrument of quality life WHOQOL-bref]. Rev Saude Publica. 34(2):178-183.

Fogelholm M, Malmberg J, Suni J, Santtila M, Kyrolainen H, Mantysaari M, et al (2006). International Physical Activity Questionnaire: Validity against fitness. Med Sci Sports Exerc. 38(4):753-760.

Garner RE, Feeny DH, Thompson A, Bernier J, McFarland BH, Huguet N, et al (2011). Bodyweight, gender, and quality of life: a population-based longitudinal study. Qual Life Res.

Hays RD, Wells KB, Sherbourne CD, Rogers W, Spritzer K (1995). Functioning and well-being outcomes of patients with depression compared with chronic general medical illnesses. Arch Gen Psychiatry. 52(1):11-19.

Herrera E, Jr., Caramelli P, Silveira AS, Nitrini R (2002). Epidemiologic survey of dementia in a community-dwelling Brazilian population. Alzheimer Dis Assoc Disord. 16(2):103-108.

Hwang HF, Liang WM, Chiu YN, Lin MR (2003). Suitability of the WHOQOL-BREF for community-dwelling older people in Taiwan. Age Ageing. 32(6):593-600.

Instituto Brasileiro de Geografia e Estatística - IBGE. Censo 2000 com divisão territorial 2001. 2001 [cited 2009 Aug 24]; Available from: http://www.ibge.gov.br

Jacobson AM, de Groot M, Samson JA (1997). The effects of psychiatric disorders and symptoms on quality of life in patients with type I and type II diabetes mellitus. Qual Life Res. 6(1):11-20.

Jaracz K, Kalfoss M, Gorna K, Baczyk G (2006). Quality of life in Polish respondents: psychometric properties of the Polish WHOQOL-Bref. Scand. J. Caring Sci. 20(3):251-260.

Jensen GL, Rogers J (1998). Obesity in older persons. J. Am. Diet. Assoc. 98(11):1308-1311.

Jho MY (2001). Study on the correlation between depression and quality of life for Korean women. Nurs Health Sci. 3(3):131-137.

Kolbe-Alexander TL, Lambert EV, Harkins JB, Ekelund U (2006). Comparison of two methods of measuring physical activity in South African older adults. J. Aging Phys. Act. 14(1):98-114.

Kortt MA, Clarke PM (2005). Estimating utility values for health states of overweight and obese individuals using the SF-36. Qual Life Res. 14(10):2177-2185.

Kuehner C (2002). Subjective quality of life: validity issues with depressed patients. Acta Psychiatr. Scand. 106(1):62-70.

Lehman AF (1996). Measures of quality of life among persons with severe and persistent mental disorders. Soc. Psychiatry Psychiatr. Epidemiol. 31(2):78-88.

Lipschitz DA (1994). Screening for nutritional status in the elderly. Prim. Care. 21(1):55-67.

Molarius A, Janson S (2002). Self-rated health, chronic diseases, and symptoms among middle-aged and elderly men and women. J. Clin. Epidemiol. 55(4):364-370.

Muennig P, Lubetkin E, Jia H, Franks P (2006). Gender and the burden of disease attributable to obesity. Am. J. Public Health. 96(9):1662-1668.

Naumann VJ, Byrne GJ (2004). WHOQOL-BREF as a measure of quality of life in older patients with depression. Int Psychogeriatr. 16(2):159-173.

Patterson E (2005). Guidelines for the data processing and analysis of the International Physical Activity Questionnaire. [cited 2011 November, 19th]; Available from: http://www.ipaq.ki.se.

Regier DA, Farmer ME, Rae DS, Myers JK, Kramer M, Robins LN, et al (1993). One-month prevalence of mental disorders in the United States and sociodemographic characteristics: the Epidemiologic Catchment Area study. Acta Psychiatr. Scand. 88(1):35-47.

Riise T, Moen BE, Nortvedt MW (2003). Occupation, lifestyle factors and health-related quality of life: the Hordaland Health Study. J. Occup. Environ. Med. 45(3):324-332.

Scazufca M, Menezes PR, Vallada HP, Crepaldi AL, Pastor-Valero M, Coutinho LM, et al (2008). High prevalence of dementia among older adults from poor socioeconomic backgrounds in Sao Paulo, Brazil. Int. Psychogeriatr. 20(2):394-405.

Schmitz N, Kruse J, Kugler J (2004). The association between physical exercises and health-related quality of life in subjects with mental disorders: results from a cross-sectional survey. Prev. Med. 39(6):1200-1207.

Skevington SM, Lotfy M, O'Connell KA (2004). The World Health Organization's WHOQOL-BREF quality of life assessment: psychometric properties and results of the international field trial. A report from the WHOQOL group. Qual Life Res. 13(2):299-310.

Snowdon J (2002). How high is the prevalence of depression in old age? Rev. Bras Psiquiatr. 24(Supl I):42-47.

Spence JC, McGannon KR, Poon P (2005). The effect of exercise on global self-esteem: a quantitative review. J. Sport & Exercise Psychol. 27(3):311-334.

Sprangers MA, Schwartz CE (1999). Integrating response shift into health-related quality of life research: a theoretical model. Soc. Sci. Med. 48(11):1507-1515.

The WHOQOL Group (1998). The World Health Organization Quality of Life Assessment (WHOQOL): development and general psychometric properties. Soc. Sci. Med. 46(12):1569-1585.

The WHOQOL Group (1995). The World Health Organization Quality of Life assessment (WHOQOL): position paper from the World Health Organization. Soc Sci Med. 41(10):1403-1409.

Ustun TB, Ayuso-Mateos JL, Chatterji S, Mathers C, Murray CJ (2004). Global burden of depressive disorders in the year 2000. Br. J. Psychiatry. 184:386-392.

Veras RP, Murphy E (1994). The mental health of older people in Rio de Janeiro. Int. J. Geriatr Psychiatry. 9:285-295.

Vuillemin A, Boini S, Bertrais S, Tessier S, Oppert JM, Hercberg S,et al (2005). Leisure time physical activity and health-related quality of life. Prev. Med. 41(2):562-569.

Ware JE Jr, Sherbourne CD (1992). The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care. 30(6):473-483.

Wendel-Vos GC, Schuit AJ, Tijhuis MA, Kromhout D (2004). Leisure time physical activity and health-related quality of life: cross-sectional and longitudinal associations. Qual Life Res. 13(3):667-677.

World Health Organization. Ageing: Exploding the myths. Geneva1999 [cited 2012 Jan 18]; Available from: http://whqlibdoc.who.int/hq/1999/who_hsc_ahe_99.1.pdf.

World Health Organization. Noncommunicable Diseases and Mental Health Cluster, Noncommunicable Disease Prevention and Health Promotion Department, Course. Active aging: a policy framework.

World Health Organization. Obesity: preventing and managing the global epidemic: report of a WHO consultation. Geneva 2000. Report No.: 92 4 120894 5.Geneva, Switzerland 2002 April:60. (WHO/NMH/NPH/02.8)

Xavier FM, Ferraza MP, Argimon I, Trentini CM, Poyares D, Bertollucci PH, et al (2002). The DSM-IV 'minor depression' disorder in the oldest-old: prevalence rate, sleep patterns, memory function and quality of life in elderly people of Italian descent in Southern Brazil. Int. J. Geriatr. Psychiatry. 17(2):107-116.

Zoico E, Di Francesco V, Guralnik JM, Mazzali G, Bortolani A, Guariento S, et al (2004). Physical disability and muscular strength in relation to obesity and different body composition indexes in a sample of healthy elderly women. Int. J. Obes. Relat. Metab. Disord. 28(2):234-241.