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Research article

Associations between obesity, physical fitness, and urinary incontinence in non-institutionalized postmenopausal women: The elderly EXERNET multi-center study

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ABSTRACT

Objectives: To investigate the associations between body composition, fitness level, and urinary incontinence (UI) in 471 non-institutionalized women ≥ 65 years of age.
Study design: Cross-sectional study.
Method: UI was assessed using the International Consultation on Incontinence Questionnaire Short-Form and a specific severity UI item. Anthropometric measurements were obtained using standardized techniques and equipment. Body fat percentage (BF%) was measured by bioelectrical impedance. Physical fitness (PF) was evaluated by a set of 8 tests and a fitness index (FI) was calculated. Active and sedentary behaviors were recorded by standardized questionnaires.
Results: UI was reported in 28.5% of the participants. Women with UI showed higher values of body mass index (BMI), BF% and waist circumference (WC) (all $p < 0.05$) compared to urinary continent women, whereas there was a lower fitness index (FI) level in women with UI ($p = 0.08$). Among all fitness capacities, upper body flexibility showed the closest relationship with UI. UI risk increased by 87.0% [95% confidence intervals (1.01–3.17)] in obese women compared to the normal group, according to the BF% while no significant results were found when PF, WC and BMI were included in the model. Mean sitting and walking time per day were 4.3 ± 1.4 and 1.8 ± 0.9 h/d, respectively.
Conclusion: UI was associated with an excess of fat mass and poor PF, especially upper-body flexibility.

1. Introduction

Urinary incontinence (UI) is a common clinical complaint, with major incidence in older women, causing much social and physical morbidity [1,2]. Overall UI prevalence may reach up to 40% in older women, being higher in those institutionalized than in community-residing [2]. In elderly women, age-related changes in the lower urinary tract system are influenced by medical conditions, functional and cognitive impairment and obesity [1–5]. Moreover, incontinent obese women have low cardiorespiratory fitness with a subsequent loss of autonomy and capacity to carry out daily life activities [5].

Abbreviations: UI, urinary incontinence; BMI, body mass index; WC, waist circumference; PF, physical fitness; UB, upper body; BF%, body fat percentage; FI, fitness index; ICIQ-SF, International Consultation on Incontinence Questionnaire-Short Form; CS-UI, I am afraid of performing physical efforts because of my urine leaks; NUI, current number of times that got up during the night to urine; N5UI, number of times that got up during the night to urine 5 years ago in the past; CI, confidence intervals; LB, lower body; SD, standard deviation.

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Aging is accompanied by changes in body composition such as, weight gain, redistribution of fat mass especially in women, and a simultaneous loss of muscle mass and strength [3–5]. In addition, obese individuals have a reduced quality of life, mainly due to functional limitations and UI [3]. Physical activity is one of the most useful tools to improve health in elderly people. [4]. Exercise programs for postmenopausal women are effective against obesity and commonly result in increases in both aerobic power and muscle strength, preserving their body weight and lipid profile, decreasing hypertension and reducing central adiposity [5]. Moreover, physical fitness (PF) is a set of attributes (strength, endurance, agility and flexibility among others) that people have or achieve due to physical activity [6]. Many studies have shown a tendency to reduce physical activity and subsequently PF with aging [4,7]. Therefore, assessment of PF and sedentary levels in elderly are health-related to the capacity of undertaking normal everyday activities like standing up, walking and dressing [8].

The ability of walking is a key among the variables to assess PF in this population [8–10]. Poor lower-extremity function is related to mobility-related disabilities in elderly [11]. Moreover, the odds ratio of having better perceived health showed in a previous study was associated with better upper body (UB) flexibility compared with those women placed in the medium and lowest tertiles (34 and 77%, respectively) after adjusting for age [12]. Furthermore, obesity interferes with walking ability in older women, not only by reduced aerobic capacity and its association with a sedentary lifestyle, but also by sensations of discomfort and pain [13]. In fact, sitting time increases the overweight and obesity risk independently of walking time in elderly [14]. Additionally, higher odds ratio for having sarcopenic obesity were present in the unfit elderly compared with fit subjects [12].

In older women moderate regular physical activity is related to better PF and body composition [5] and is inversely associated with female UI [15]. However, very little is known about the association between fitness level, body composition and development of UI in postmenopausal women. Thus, the aim of this study was to investigate the relationship between UI and obesity, including body mass index (BMI), waist circumference (WC) and body fat percentage (BF%) measurements.

2. Methods

2.1. Study design

The study was carried out within the frame of the multi-center study on PF and body composition evaluation and its relation with healthy lifestyle among Spanish non-institutionalized elderly (EXERNET) [21]. Briefly, this cohort is a representative sample of community dwelling Spanish seniors selected by means of a multistep, simple random sampling, taking into account the locations (six different regions from Spain: Aragón, Castilla La Mancha, Castilla León, Madrid, Extremadura and Canarias) that ensure the geographical and cultural diversity of the sample. Subjects were recruited from three different cities of each region: the capital of the region and two other cities; one of 10 000–40 000 habitants and other of 40 000–100 000 habitants.

The information was collected through personal interviews using standard procedures and validated questionnaires that include UI-related questions, followed by a physical examination to measure anthropometric and body composition characteristics and PF. Data collection took place from January 2011 to December 2012. The study was approved by the Research Ethics Committees of Aragón (Spain) (18/2008) and performed according to the principles established with the revised Declaration of Helsinki [16]. Written informed consent was obtained from each participant.

2.2. Study sample

The study sample consisted in a sub-cohort of 471 women (aged 66–91 years) from the EXERNET multi-center study that completed all tests and UI questionnaires. To make maximum use of the data, all valid results on PF tests, body composition and questionnaires were included in this report. Consequently, sample sizes vary for different variables. The complete methodology of the study has been described elsewhere [17]. The exclusion criteria were: (1) women under 65 years; (2) those suffering from cancer and/or dementia; (3) those who were living in nursing homes and/or were not independent or able to take care of themselves; and (4) those women using walking aids. After finishing the field study, the subjects who did not fulfill the inclusion criteria were excluded.

2.3. Anthropometric and body composition measurements

Anthropometric and body composition measurements have been described elsewhere [17,18]. Briefly, height was measured using a portable stadiometer (Seca, Hamburg, Germany) with 2.10 m maximum capacity and a 0.001 m error margin. Subjects stood with their scapula, buttocks and heels resting against a wall; the neck was held in a natural non-stretched position, the heels were touching each other with the toe tips spread to form a 45° angle; and the head was held straight with the inferior orbital border in the same horizontal plane as the external auditory tube (Frankfort's plane) [19]. BMI was calculated as weight (kg) divided by height^2 (m^2). The prevalence (%) of overweight and obesity was calculated according to the World Health Organization guidelines, considering the thresholds of overweight as a BMI above 25 kg/m^2 and the thresholds of obesity as a BMI above 30 kg/m^2 [20].

WC was measured using a flexible non-elastic measuring tape. Individuals stood with feet together and arms resting by their sides. According to the International Society for the Advancement of Kinanthropometry, the WC was taken as the narrowest point between the inferior rib border and the iliac crest [21]. The WC was used to identify individuals with central obesity above threshold values of ≥88 cm for women [22].

A portable bioelectrical impedance analyzer Tanita BC 418-MA (Tanita Corp., Tokyo, Japan) with a 200 kg maximum capacity and a ±100 g error margin was used to measure the weight and estimate BF%. Individuals removed shoes, socks, and heavy clothes prior to weighing. The prevalence of high BF% was estimated considering the cut-off points published by Gallagher et al. [23]. Values of ≥38% were considered as overweight, and values of ≥43% were considered as obesity for women.

The anthropometric and body composition variables were respectively measured in 91.1% (height, weight and WC) and 86.6% (fat mass) of participants.

2.4. Physical fitness assessment

PF tests and their reliability are described elsewhere [7]. In short, the following PF components were assessed: static balance by the one leg test [24], lower and UB strength by the chair stand test and arm curl test, respectively [8], lower and UB flexibility by the chair sit-and-reach test and back scratch test, respectively [8], agility/dynamic balance by the 8-foot up-and-go test [8], speed by the 30-m walk [25] and aerobic endurance by the 6-min walk test [8]. All tests were performed only once, except the one leg test, which was performed twice with each leg, the 8-foot up-and-go test and the 30-m walk test, which were also performed twice. In the later cases, the best performance was selected for further analysis. To avoid the age effect on PF, a Fitness Index (FI) was created from the mean values of the eight tests, according to PF percentile values in Spanish elderly [7]. Thereafter, FI was categorized into

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