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Body mass index, physical activity and fear of fall among community dwelling elderly population in urban Surat, Gujarat-A pilot study

Salvi Shah PT
Ph.D. Scholar and Assistant Professor, SPB Physiotherapy College, Surat, Gujarat, India

Abstract
Background and Objectives: Body Mass Index (BMI), Physical Activity (PA) and Fear of Falls (FoFs) are important construct of geriatric population. Fear of falling is a phenomenon reported in the elderly, which is associated with reduced mobility and lower PA levels. The studies have shown that fear of fall is one of the major reasons for the actual falls in elderly, which in turn gives rise to a greater number of fractures in them. But there is a scarce evidence regarding the relationship of BMI and PA with FoFs among community dwelling elderly population in developing countries like India**.** So the present study was undertaken.
Methodology: A pilot study was undertaken comprising 10 older adults (age ≥ 65 years, ambulant and oriented). BMI was calculated by using the anthropometric measurements and PA was evaluated using the Physical Activity Scale (PAS) for the Elderly. The Falls Efficacy Scale-International (FES-I) was used to calculate the FoFs. Data was analyzed using descriptive statistics and Spearman rank-order correlation test at 0.05 level of significance.
Results: Results of the present study showed that lower PA and high prevalence of FoFs were noted among older adults. A significant moderate positive correlation between BMI and FoFs ($r=0.45$, $p<0.05$), significant moderate negative correlation between PA and FoFs ($r=-0.53$, $p<0.05$) and significant weak negative correlation between BMI and PA($r=-0.24$, $p<0.05$) were noted among community dwelling elderly people of urban Surat.
Conclusion: It can be concluded from the present study that significant relationship existed between BMI, PA and FoFs among community dwelling elderly population of urban Surat, Gujarat.

Keywords: fear of falls, Physical activity, body mass index, community dwelling elderly

Introduction

The occurrence of falls in community dwelling elderly constitutes an important public health problem [1]. Reported prevalence of fear of falls (FoFs) varies from 21 to 85% among community dwelling older adults who have previously fallen, 33 to 46% in older adults who have not fallen [2, 3, 4, 5] and an even more frequent occurrence among women [1].

Fear of Falling is defined as an exaggerated concern about falling or the belief that one cannot prevent a fall. Intense anxiety about falling can be experienced by elderly who have fallen, as well as those who have not [6]. The fear of falling is a common condition among elderly that results in functional restriction and is recognized as an important indication of future falls. Although obesity is associated with higher occurrence of falls, the mechanisms responsible for this increased risk are still unclear [7]. Falls have serious physical and psychological consequences for individuals, for society, and for health services due to the high cost of inpatient admissions and long term care [4]. High levels of fear of falling can increase the risk of future falls, while low levels can be protective for falling, irrespective of the presence of balance impairments. Therefore, in addition to improving balance, it is important to understand how fear of falling can be reduced [5].

Adipose tissue accumulation and body mass can influence the body balance, mobility and the overall wellbeing and is also a major contributing factor concerning falls. Those who are underweight (Body mass index) < 18.5) and those who are obese (Body mass index > 30) were more likely to present with falls. But, in India there is no significant evidence of the fear of falls (FoFs) in them [7].

Regular physical activity (PA) is very essential for healthy living and ageing. Among older adults, active lifestyles aid in the maintenance and promotion of health and well-being, and in reducing the need for care and hospitalization and the risk of mortality and premature death. It also contributes to the primary and secondary prevention of several chronic diseases (including cardiovascular diseases, cancer, hypertension and obesity) and the enhancement of social interactions, mobility and cognitive performance. On the other hand, physical inactivity can lead to: high morbidity, substantial economic burden and early death. Some older adults disengage from physical, social or leisure activity after having experienced a fall. This disengagement may be due to fear of falling which may be influenced by physical, psychological or functional factors. A previous study had shown older individuals with FoF to have poorer PA level than those without FoF [8]. Fallers have lower levels of self-reported PA perhaps due to mobility limitations after an injury or avoiding activities because of fear of falling [9]. Despite the beneficial effects of PA and the adverse effects of physical inactivity, majority of older adults do not meet the recommended levels of PA (engaging in 150 minutes a week of moderate-intensity, or 75 minutes a week of vigorous-intensity PA, or an equivalent combination of moderate-and vigorous-intensity PA) [10]. The lower activity levels may in turn decrease strength and balance and initiate

a downward cycle towards losing independence and entering long-term care [8].

In the previous studies, high prevalence of falls and FoFs were noted among community dwelling elderly individuals. To the best of our knowledge, very few previous studies have analyzed different aspects responsible for the higher occurrence of falls in community dwelling elderly individuals. Therefore, the aim of the present study was to verify the association between BMI, PA and FoFs among community dwelling elderly individuals of urban Surat, Guajrat.

Methodology

A pilot study was conducted on conveniently chosen 10 community dwelling elderly individuals aged ≥ 65 years. The participants (both males and females) who were ambulant and well-oriented with time, place and person were included in the present study. Participants with any neurological, cognitive, cardiovascular or musculoskeletal disorders and visual disturbance that could compromise the assessments, as well as those who underwent surgical procedures within six months were excluded. In addition, the Mini Mental state examination [11] was used before recruiting the participants in the study to ensure that none of the participants had cognitive impairment. Informed consent was sought and obtained from the participants after the aims and procedures of the study had been explained to them in their vernacular language. Information on participants' socio-demographic characteristics was sought and obtained through oral interview. The Falls Efficacy Scale – International (FES- I) and Physical Activity Scale for the Elderly (PASE) were used to measure the participants' levels of FoFs and PA respectively. Interview method was used to collect data regarding FoFs and PA level through questionnaires from the participants.

Measures

BMI

BMI was calculated based on weight (kg)/height2 (m). Digital weighing machine was used for the weight measurement. Participants were asked to stand with minimal movement of body with barefoot and feet 15 cm apart, wearing their usual clothing and weight equally distributed on each leg along with hands by their side. Weight was recorded to the nearest 100 grams. The participants were asked to stand in an erect position against a vertical scale of portable stadio meter and with the head positioned so that the top of the external auditory meatus was in level with the inferior margin of the bony orbit. They were instructed to stand with feet together and arms by the sides along with the heels, buttocks and upper back were in contact with the wall when the measurement was taken. The reading must be taken to the last completed 1 milimeter (mm). According to BMI, the older adults were categorized as normal weight (BMI from 18.5 to 24.99 kg/m2), overweight (BMI from 25.0 to 29.99 kg/m2) or obese (BMI ≥ 30.0 kg/m^2). The obese category included grade 1 (BMI 30.0 to 34.99 kg/m2), grade 2 (BMI 35 to 39.99 kg/m2), and grade 3 obesity (BMI ≥ 40 kg/m2) [12].

Fear of falling

Fear of falling was studied using the data collected on the dichotomous question ''Are you afraid of falling?'' and the level of concern about falling was measured via the Falls Efficacy scale -International (FES-I-). FES-I is a reliable questionnaire containing 16 items that assess the concern of individuals about falling during activities of daily living. The score ranges from 16 (not at all) to 64 (very concerned), and values >23 points correspond to worse fall-related self-efficacy and greater fear of falling [1, 12, 13]. All the participants in the database presented data for fear of falling-related variables.

Physical activity scale for the elderly (PASE)

The PASE is a 12-item reliable and valid instrument designed specifically to assess PA in older persons over a one-week time frame. It comprises of items regarding the frequency and duration of leisure activity (e.g., sports, jogging, swimming, strengthening and endurance exercise), household activity, and work-related activity during the previous 7-day period. Participation in leisure-time and strengthening activities are scored as never, seldom (1–2 days per week), sometimes (3–4 days per week), and often (5–7 days per week). Duration of these activities is scored as less than 1 h, 1–2 h, 2–4h and more than 4 h. Household and work-related activities are scored as yes or no. In work-related activities, paid or unpaid work is scored in hours/week. The total PASE score is computed by multiplying either the time spent in each activity (hours per week) or participation (i.e., yes/no) in an activity, by empirically derived item weights and then summing overall activities. The overall PASE score ranges from 0 to 400 or more and higher scores reflect higher PA level [14, 15].

Interview method was used to collect the data from participants regarding the questionnaire of PA and FoFs.

Statistical analysis

All analyses were conducted in the Statistical Package for Social Sciences (SPSS) software version 20.0 with the level of significance at $p<0.05$. Initially, variables were checked for normality distribution using the Shapiro wilk test. Numerical variables were expressed as Mean ± standard deviation. Additionally, Categorical variables were presented in relative frequency. Since the data followed the normalcy, Spearmen's correlation coefficient was used to establish the correlation between FoFs, BMI and PA among community dwelling elderly.

Results

This was a pilot study involving both the genders aged ≥ 65 years. The study took place in the community dwelling elderly for a period of 20 days. During the study period, a sample of 10 were included and screened for BMI, PA and FoFs. The participants' characteristics are presented in Table 1.

Results of the present study showed that lower PA and high prevalence of FoFs were noted among older adults. A significant moderate positive correlation between BMI and FoFs ($r=0.45$, $p<0.05$), significant moderate negative correlation between PA and FoFs ($r=-0.53$, $p<0.05$) and significant weak negative correlation between BMI and PA($r=-0.24$, $p<0.05$) were noted among community dwelling elderly people of urban Surat. (Table 2)

Table 1: Characteristics of the participants (n=10)

Characteristic	Numbers or mean ± SD
Gender(M:F)	4:6
Marital status (Single: married: divorced/widow)	1:7:2
Literacy level (Literate: Non literate)	7:3
Age (years)	68.7±4.4
Height (m)	1.66±0.06
Weight(kg)	63.2±7.4
BMI (kg/m^2)	25.8±4.5
BMI category	
Underweight	00
Normal weight	5
Overweight	4
Obese	1
Afraid of falling?(Yes: No)	9:1
Self-reported frequency of falls in last year (none: once: more than once)	5:2:3
FES score	34.30±6.6
PASE score	129.7±30.60

Table 2: Correlations between BMI, Physical activity (PA) and FoFs among the participants (n=10)

Variable	r value	P value
BMI and FoFs	0.45	<0.05
PA and FoFs	-0.53	
BMI and PA	-0.24	

Discussion

Present study was aimed to find out the association of BMI and PA with FoFs among community dwelling elderly of urban Surat. Lower PA and higher prevalence (90%) of FoFs were noted among the participants of present study. Significant association was noted between the variables like BMI, PA and FoFs among the elderly individuals.

PA level of the participants

Lower PA was noted among community dwelling elderly of urban Surat with mean PASE score of 129.7±30.60 in the present study which is lower that of study conducted by Christopher Olusanjo Akosile *et al*. [10] on 114 older adults (mean score of 146.77).Another study conducted by Akosile CO *et al* [16]. in 2014 showed a low PA(mean PASE score of 95.61) level among elderly of Nigeria. Moreover, a study conducted on 420 older adult participants in Euorope showed even a lower score of PASE in sarcopenic (40.2±89.0) than in non-sarcopenic (92.0±52.4) older adults [17]. The fact that the study participants in the Akosile *et al* [16]. study were slightly older and had fewer occupationally active participants compared to this study could have resulted to this difference.

BMI and FoFs

A significant moderate positive correlation between BMI and FoFs ($r=0.45$, $p<0.05$) was found among community dwelling elderly in the present study. Chaitrali Lomte and Dr. Parag Ranade conducted a study on 90 elderly in Pune and found significant weak positive correlation between BMI and FoFs [18]. A study conducted by Gilly Rosic *et al* [19]. reported that obese younger women experienced high levels of fear of falling, irrespective of the measure used. Epidemiological data indicate an increased risk of falls related to obesity. Mitchell *et al*. observed that the prevalence of falls among obese subjects was 30%, whereas among those with normal weight was only 23%. Another similar study also reported that the higher prevalence of FoFs among obese women (45%) as compare to normal weight obese women [1].

Study of Hannah *et al*. on "Biomechanical Effects of Obesity on Balance" concluded that obesity leads to compromised balance during various day to day activities when subject needs to maintain stability. Thus, any impairment in maintaining balance increases risk of fall for obese individuals [20].

BMI and PA

A significant weak negative correlation between BMI and PA ($r=-0.24$, $p<0.05$) among community dwelling elderly people of urban Surat. Obese or overweight individuals are typically sedentary as there is an inverse relationship between BMI and activity levels. An increase in BMI is not only negatively associated with PA levels, but it is also associated with an increase in functional impairment, which could possibly lead to impaired balance and an increased risk of falls, leading to fear of falling in them [20, 21]. Leisure time Physical activity was inversely associated with BMI, Weight Circumference (WC) and incidence of general and abdominal obesity [22]. Prospective evidence in populations younger than 60 years indicates a favorable impact of PA on controlling BMI and WC [23, 24]. A study with 288498 individuals from 10 European countries evaluated the association between baseline total physical activity (categorized as inactive, moderately inactive, moderately active and active) and annual change in body weight, for a mean follow-up of 5.1 years. In individuals aged 50 years and older, they found that women with obesity, but not normal or overweight, who had a higher PA category at baseline had less weight gain. This association was not observed for men in any BMI category [23].

FoFs and PA

A significant moderate negative correlation was noted between FoFs and PA ($r=-0.53$, $p<0.05$) in the present study. Worse modified falls efficacy scale (MFES) and Modified Survey of Activities and Fear of Falling in the Elderly Scale (MSAFFE) scores were associated with lower PA levels in the previous study. These results potentially provide an evidence for novel interventions to promote activity in the elderly [19]. A recent Cochrane systematic review suggests that exercise interventions are probably effective in reducing fear of falling in community dwelling

older adults [25], but there is less evidence available about the impact of psychological interventions.

The probable reasons for significant association between BMI, PA and FoFs could be increase in FoFs leads to restriction of PA leads to more difficulties undertaking activities and hence, concerns about falling if they undertake these activities due to concern of falling and ultimately increase in BMI.

Very small sample size and cross sectional nature of the study would limit the generalization of results. Factors responsible for FoFs other than BMI and PA were not considered in the analysis.

Conclusion

Based on the results presented, it is possible to conclude that body mass index and physical activity are associated with fear of falling in community dwelling elderly. Thus, health professionals should promote the physical activity interventions among them to have positive effects on Body mass index and Fear of falling when dealing with prevention of falls in the elderly.

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