ORIGINAL ARTICLE

Association Between Risk of Falls and Body Mass Index Among Elderly Diabetic Patients

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ABSTRACT

Background: most the countries of the world in the twenty-first century are witnessing a rapid growth of their population of the elderly. Aging has serious consequences for health and bodily functions and loss of balance, which increases the risk of falling and the risk of disease. 424,000 people around the world die due to falls. To avoid falling and maintaining a position we require balance. In this regard, the body mass index is one factor that may have an impact on balance.

Aims of the study: To identify the association between the risk for falls and body mass index among diabetic elderly patients

Methodology: A correlation design was conducted to study the association between risk for falls and body mass index among elderly diabetic patients from 18 / December /2021 to 1 /March /2022. The type of the sample was a non-probability (Purposive) sample to ensure that the data obtained from the study is accurate. (107) elderly diabetic patients were the sample size of this study from the Diabetes Center.

Results: (37.4%) of participants within the age group (60-64) years old. (49.5%) was a man, (50.5%) was a woman. Illiterate (33.6%), (64.5%) of the participants are married, (37.4%) are unemployed, (94.4%) are living with family and (59.8%) are live in Urban. (48.6%) of participants have a moderate risk for falls. A High percentage of the study sample (44.9%) was overweight.

Conclusion: The study concluded that body mass index (BMI) has an effect on body balance among the elderly, where there is a significant relationship between the risk of falling and body mass index (the p-value of marital status was 0.002). Where it found that the risk of falling was high among the overweight with a percentage (13.1%) because a higher proportion of the elderly participants in the study were in this category. In the second place, underweight, and then obesity, they had a high risk of falling than normal weight.

Recommendation: Conduct periodic check-ups for the elderly concerning weight and height to find out the appropriate BMI for each person. Conducting introductory courses or seminars on the subject of falls, risk factors and consequences for the elderly from the age of 60 and over in all centers for the elderly. Conducting educational programs on fall prevention in all centers visited by the elderly and the nursing elderly home. Concerning diabetes patients, monthly check-ups should be carried to control patients and to clarify the prevention of complications of the disease that directly affect the fall.

Keywords: risk of fall, body mass index, elderly, diabetic patients

INTRODUCTION

Most of the countries of the world in the twenty-first century are witnessing a rapid growth of their population of the elderly, both in terms of number or as a percentage of the population. Due to advances in medicine and the field of health promotion, the mortality rate among the elderly has decreased, and is the reason for this growth. In 2015, the proportion of the world's population over the age of 60 was (12%). It is expected that in 2050, this percentage would rise to (22%), which is 1.2 billion elderly people [1].

The gradual deterioration in organic, physical, psychological, and social functions is what has been defined as aging, which varies from person to person. Aging has serious consequences for health and bodily functions in addition to changes that occur in body composition where there is a gradual decrease in body mass and an increase in body fat, which causes a decrease in physical activity. Changes in the body because of age affect metabolism, physical activity, the risk for falls, and the risk of disease [2].

A fall is defined as one of the accidental events in which a person falls because of their loss of the center of gravity and no effort or ineffective effort is made to restore balance. Falls are the second leading cause of death from unintentional injuries in the world among the elderly. 424.000 people around the world die from falls. Injuries to the elderly because of falling can be serious, but the physical and psychological consequences they cause may be more dangerous for the elderly. The most frequent consequences are pelvic and hip fractures, fear of falling, anxiety, and depression, which negatively affect the lives of the elderly [3][4].

To avoid falling and maintaining a position, being stable when shifting from one posture to another, completing daily activities, and moving freely in the community all require balance. The loss of function in several physiological domains, including balance, is a hallmark of aging. The loss of postural control is crucial since it is one of the key reasons contributing to an increased risk of falling in older persons, making fall prevention and identifying which variables may accelerate balance deterioration a major public health concern. In this regard, the body mass index is one factor that may have an impact on balance [5][6].

Unhealthy body weight is still an issue today, and it can lead to a variety of illnesses. In Indonesia, (28.3%) of the aged population is underweight, (42.4%) is at optimal body weight, 6.7 percent is overweight, and (3.4%) is obese. The ideal BMI is significant because it influences daily physical activity. If it is not optimal, causing the old to become weak and restrict their physical activity, and affecting body equilibrium if unaddressed Balance problems lead the elderly to withdraw from the outside world and rely on others because of the fear of falling [7][8].

Every year, one out of every three community-dwelling older adults falls. Even non-traumatic falls can harm one's quality of life, leading to a decrease in social and physical activities, as well as physical decline, institutionalization, and mortality. Although falls have a multiple etiology, those with diabetes have a higher risk of falling than those who do not have the disease [9].

Diabetes mellitus is a major public health issue that affects people all over the world. Falls are a big issue for diabetics and loss of sensory function due to neuropathy or retinopathy may increase the risk of falling. The annual incidence of falls among senior diabetics was as high as (39%). Recurrent falls are reported by (30.6%) of those with diabetes and (19.4%) of people without diabetes [10]. Hence, the researcher wants to know whether the body mass index of an elderly person effects on body balance. Because there are few studies in this regard, the researcher's goal of this study was to identify the relationship between the risk of falls and body mass index among elderly diabetic patients.

METHODOLOGY

Study design and setting: The study design was a correlation design that were conducted on the association between risk for falls and body mass index among elderly diabetic patients in the Endocrinology and Diabetes Center affiliated to Al-Hussein

Teaching Hospital in Al-Muthanna Governorate during the period from 18 December 2021 to 1 March 2022. The type of the sample was a non-probability (Purposive) sample to ensure that the data obtained from the study is accurate. The Minimum sample size was (130) patients after using the equation to calculate the required number (sample size calculator). Ten patients for the pilot study excluded from the study. Eight of the patients refused to participate in the research, two patients were excluded because they had a foot amputation, and three were excluded for using a wheelchair. Of the rest (107) for the study implementation, (53) were males and (54) were females for those who went to the center during the time of the study period and met the study criteria, and agreed to participate in the study.

Instrument of study: To find the association between risk for falls and body mass index and assess the prevalence of falls among elderly diabetic patients 60 years and above, and here the researcher formed a questionnaire (constructed) a questionnaire format to achieve the objectives of the study, a questionnaire consisting of the following:

Part I: Socio-demographic characteristics of the elderly diabetic patients

This section relates to information about socio-demographic characteristics taken from the elderly by interview questionnaire sheet and consists of (7) items that include age, gender, educational level, marital status, occupation, living situation, and place of residency.

Part (II): Questionnaire Related to variables related to the patient this part was constructed to assess some variables related to the patient and what is the relationship between them and the risk of falling. It consisted of questions in (2) domains:

First Domain: This part includes an assessment of patients' body mass index and consists of two questions (height in centimeters and weight in kilograms) Thus, obtaining a body mass index. To measure the body mass of patients participating in the study, the researcher used a digital scale available inside the specialized center consisting of a scale to measure weight and a ruler that can be heightened to measure height, and the device can measure body mass index. Participants removed shoes, and heavy clothes before measurements taken. BMI is measured by body weight in kilograms divided by the square of height in meters. The content of the questionnaire is based on a review of related literature.

Part (III) the Berg Balance Scale

To assess the risk of falling in the elderly, in this study the researcher used the Berg balance scale. In 1989, Berg, Wood-Dauphinee, Williams, and Gayton developed the scale this scale is dependent evaluating performance efficiency through some job tasks. The scale consists of 14 items (Physical examinations) performed by sample members and it is a five-point scale score ranging from (0-4) the (0) indicates the patient's inability to perform the task and (4) indicates the patient's ability to perform the task completed in a specific time. Therefore, the maximum test score is 56 points. The scale contains 14 items including: Sitting to standing, standing unsupported, Sitting unsupported, Standing to sitting, Transfers, Standing with eyes closed, Standing with feet together, Reaching forward with an outstretched arm, Retrieving object from the floor, Turning to look behind, Turning 360 degrees, Placing an alternate foot on the stool, Standing with one foot in front, Standing on one foot. The Berg Scale score is used to predict who is at risk of falling and whom else. (Cut – off point) It reveals who is likely to fall according to the distribution of the following points: 0-20 means high risk of fall and 21-40 means moderate risk of fall and 41-56 means there is a low risk of fall. In regards to the scale of the study, the researcher used the observation method. Permission was obtained from the author. Patients were interviewed during the morning period only.

This constructed questionnaire took approximately (5-10) minutes to complete and implementation of the study scale items took about 15 - 20 minutes for patients. A committee consisting of 12 experts approved the validity of the questionnaire and the study scale, and they have experience of 5 years or more in their field of work to investigate the scale and content of the questionnaire and determine its validity for the research project.

Ethical approval: Ethical approval was obtained from the required authorities and the ethical committee of the College of Nursing, University of Baghdad. Study participants completed the questionnaire without asking for any identifying information about themselves. Written consent was obtained and the participants were assured that the results of this questionnaire are used for study purposes only and patients can refuse to participate in the study.

Statistical analysis: The data were analyzed using the program SPSS version 25. Descriptive statistics (frequencies, percentage, mean, standard deviation), and inferential statistics (hi-squared) test was used to identify the association between the risk for fall and socio-demographic characteristic with a significance level of $p<0.05$.

RESULT OF THE STUDY

Table 1: Distribution of Study Sample According to the Socio-demographic attributes Data (N=107).

Socio-demographic	Groups	Freq.	%
Age Groups	60-64	40	37.4
	65-69	29	27.1
	70-74	25	23.4
	75-79	6	5.6
	80-84	2	1.9
	85-89	2	1.9
	90-94	3	2.8
Total		107	100.0
Mean ± SD67.73± 7.001 yrs.			
Gender	Male	53	49.5
	Female	54	50.5
	Total	107	100.0
level of education	Illiterate	36	33.6
	Read and write	14	13.1
	Primary School	21	19.6
	High School	17	15.9
	Institute	11	10.3
	College Graduate or Postgraduate	8	7.5
	Total	107	100.0
Marital Status	Single	6	5.6
	Married	69	64.5
	Widower	31	29.0
	Divorced	1	0.9
Total		107	100.0
Occupation	Retired	39	36.4
	Self-employed	28	26.2
	Unemployed	40	37.4
	Total	107	100.0
Living Situation	Live with Family	101	94.4
	Live alone	6	5.6
	Total	107	100.0
Place of Residency	Urban	64	59.8
	Rural	43	40.2
	Total	107	100.0

(Freq.): Frequency, (%): Percentage, (N): number of samples, (S.D): Stander Deviation

Table 1 shows Information about the socio-demographic attributes of the study sample. where we note that (37.4%) of the study samples are within the first age group (60-64) years old (the mean age of the study sample was 67.73± 7.001). concerning gender the percentages were very close: 53 (49.5%) for men, 54 (50.5%) for women. in respect to the level of education, a high percentage (33.6%) of patients are not able to read or write (Illiterate). Concerning to The study subjects' marital status indicates that (64.5%) of the study, subjects are married. Regarding occupation status (37.4%) of the study, sample was unemployed and (26.2%) of study samples, they were Self-employed Between office work and manual work. In respect to Living Situation a high percentage of 101 (94.4%) of study,

subjects are Live with Family. Regarding the place of Residency, a high percentage (59.8%) of samples live in Urban.

Table 2: Patient-Related Variables (body mass index).

Body mass index	Groups	Freq.	Percent
BMI	Underweight	8	7.5
	Normal weight	22	20.6
	Overweight	48	44.8
	Obesity	29	27.1
	Total	107	100.0

Table (2) shows the groups of body mass index, which is calculated through the following equation: Body mass index = weight (in kilograms) ÷ length (m2). Where a high percentage of the study sample (44.9%) was overweight.
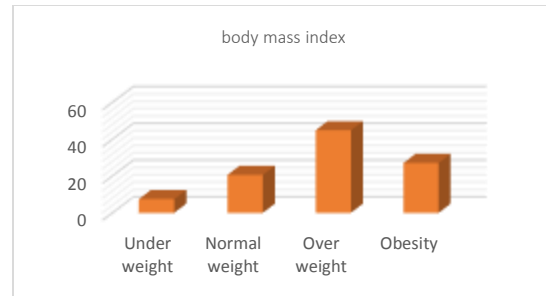

Figure 1: Percentage Distribution of Elderly according to Body Mass Index (n=107)

Table 3: The distribution of the study sample according to (Cut – off point) for the berg Balance Scale

Body mass index			Berg balance Scale			
			0-20	21-40	41-56	Total
	Under	Count	7	1	0	8
		% within BMI (Binned)	87.5%	12.5%	0.0%	100.0%
		% within Berg Scale	21.9%	1.9%	0.0%	7.5%
		% of Total	6.5%	.9%	0.0%	7.5%
	Norm	Count	5	15	2	22
		% within BMI (Binned)	22.7%	68.2%	9.1%	100.0%
		% within Berg Scale	15.6%	28.8%	8.7%	20.6%
		% of Total	4.7%	14.0%	1.9%	20.6%
	Over	Count	14	19	15	48
		% within BMI (Binned)	29.2%	39.6%	31.3%	100.0%
		% within Berg Scale	43.8%	36.5%	65.2%	44.8 %
		% of Total	13.1%	17.8%	14.0%	44.8 %
	Obesity	Count	6	17	6	29
		% within BMI (Binned)	20.7%	58.6%	20.7%	100.0%
		% within Berg Scale	18.8%	32.7%	26.1%	27.1%
		% of Total	5.6%	15.9%	5.6%	27.1%
Total		Count	32	52	23	107
		% of Total	29.9%	48.6%	21.5%	100.0%
Main Domain		Risk for falls X body mass index	Chi-square	D f	P-Value	C.S.(*)
Body mass index		score	20.796	6	0.002	HS

(HS): Highly Significant at P<0.01, (C.S): correlation significant, d f: degree of freedom

DISCUSSION

Table No. (1) Analyzes the sociodemographic characteristics data of (107) elderly diabetic patients. The mean age of the patients was (67.73± 7.001) years which ranged from (60-94) years and the highest percentage was found in the age group (60-64) years. This result was close to the result of the study conducted by [10], which found that the mean age of study participants was (69.6± 0.18). Respect to the gender of the samples participants in the research, the results indicated that the percentages were very close: 53 (49.5%) for men and 54 (50.5%) for women. This result is in agreement with some other research findings that found the ratio between men and women was close and their study conducted in many countries such as Russia, India, Ghana, Africa, China, and Mexico, indicated that (51.2%) of participants were women and (48.8%) was men [12]. Regarded to educational level, the results of the study showed that 33.6% of the research sample was illiterate (Not able to read or write). This result was analogous to a study conducted in China, where they found that the elderly was Illiterate (Not able to read or write) and the percentage was (41.7%) [13]. the most recent studies conducted in India by [14] indicate that about three-fourths of the study samples were no read and no write (Illiterate). In related to marital status, the results showed that (64.5%) of the sample participating in the study was married. This result is analogous with results some studies who stated that (62.5%) of the study, participants were married [15]. Occupation status, the results showed that 37.4% of the participants in the study they were unemployed. This result is consistent with the majority of studies such as study that conducted in Egypt stated

that most of the participants were unemployed [16]. Regarding the living situation, the results showed that study participants were (94.4%) lived with family, while (5.6%) of the participants were live alone. This result was analogous to a study conducted by [17] confirmed in their study that (23.0%) of the total participants live alone and that (77.0%) of the study sample live with family and [18] who indicated that (18.6%) live alone while (81.4%) live with family. As for the Place of Residency, the results indicated that (59.8%) of the participants in the study were residing in urban and (/40.2%) of participants were reside in Rural. These results are close to a study performed in Indonesia, which found that (52.1%) of study, participants reside in urban [19].

Discussion of the Relationship between risk of falls with the body mass index as Shown in Tables (4): Balance is the ability of a person to maintain a straight posture while performing static and motor functions and you need interactions between peripheral and central elements such as vision, somatosensation, vestibular sensation, motor output, and musculature. As people get older, the loss in the aforementioned characteristics has a substantial impact on their movement and work capacity, increasing their risk of falling. While some studies found the effect of BMI on balance in the elderly, and thus increases the risk of falls in them, and some other studies found no effect of BMI on balance, and in our current study, the researcher found that BMI has an effect on body balance among the elderly, where there is a significant relationship between the risk of falling and body mass index (the p-value of marital status was 0.002). Where it found that the risk of falling was high among the overweight with a percentage (13.1%) because a higher proportion of the elderly participants in the study were in this

category. In the second place, underweight, and then obesity, they had a high risk of falling than normal weight. [20] They found in their studies a significant relationship between the risk for fall and body mass index where they found that the highest percentage of fall was within underweight and obesity Categories. [1] They found in their study a significant relationship between the risk for fall and body mass index where they found that the elderly who suffer overweight or obese they are at great risk for fall. In a study conducted in Indonesia on the elderly to measure balance and the relationship of BMI to the risk of falling, they found a very strong relationship between the risk of falling and BMI among the elderly. Where they also found that if the body mass index moved away from the normal value, i.e. underweight, overweight and obesity, this would affect the person's balance and this leads to an increased risk of falls among the elderly [7]. [21] In their study, they found that a person's be overweight has an effect on balance and walking among the elderly, because it has an impact on both alterations in the body's center of gravity and higher fat concentration in the body than muscle mass.

CONCLUSION

The results obtained from this study show the effect of BMI on body balance among the elderly. Where the researcher found a strong relationship between the risk of falling and body mass index among elderly diabetic patients.

Recommendations: Conduct periodic check-ups for the elderly concerning weight and height to find out the appropriate BMI for each person. Conducting introductory courses or seminars on the subject of falls, risk factors and consequences for the elderly from the age of 60 and over in all centers for the elderly. Conducting educational programs on fall prevention in all centers visited by the elderly and the nursing elderly home. Concerning diabetes patients, monthly check-ups should be carried to control patients and to clarify the prevention of complications of the disease that directly affect the fall.

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