

# Risk of Falls among Obese Elderly Females

Hamza SA<sup>1,2</sup>, Elok M A<sup>1,2</sup>, Shaloot HM<sup>1</sup>, and Abohashim GS<sup>1</sup>.

1Geriatrics & Gerontology department, Faculty of Medicine, Ain Shams University, Cairo, Egypt.

2Ain Shams Ageing Research Center

## Abstract

**Background:** It has been suggested that obesity increases fall risk, based on diminished static balance and increased fall-related injury risk.

**Aim:** To determine whether overweight and obese individuals have higher fall risk than individuals of average weight.

**Methods:** A case control study conducted on 140 elderly females participants aged 60 years and above. They were divided into 2 groups (Obese and Non obese) according to their Body Mass Index (BMI). A comprehensive geriatric assessment was done and risk of falls was assessed by Fall Risk Assessment Tool and timed up and go test.

**Results:** Risk of falls assessed by both tools was higher among obese female elderly female compared to non-obese. Using timed up and go test 50% of obese subjects have positive risk of fall while only 20% of non-obese group at risk of fall.

**Conclusions:** It was concluded that obese elderly females are at higher risk of falling than non-obese.

**Keywords:** Obesity and risk of falls, Elderly females, Obesity in elderly.

## Background:

Older adults are a growing segment of the population worldwide. Accordingly, the number of persons with disability and dependence is also likely to increase over the next decades.<sup>1</sup>

Obesity is a rapidly increasing epidemic associated with has hazardous functional and economic implications in the elderly.<sup>2</sup>

Similarly, falls are among the important geriatric syndromes impeding the independence of elderly and it is usually a misdiagnosed and underreported problem in the primary health care with remarkable healthcare costs.<sup>3</sup>

Annually, 30 to 40% of the community dwelling elderly fall; In the USA, falls are considered the leading cause of accidental death in elderly and the 7th leading cause of all deaths in people over 65 years, 75% of deaths caused by falls occur in the 13% of the population who are  $\geq 65$  years.<sup>4</sup>

For older people, obesity can introduce or exacerbate existing health conditions (such as diabetes, arthritis or cardiovascular disease)<sup>5</sup> and can adversely affect an individual's ability to perform day-to-day activities.<sup>6</sup>

In turn, poor health can result in physical inactivity

that can influence an individual's weight. Obesity has been associated with an increased risk of falls among older people.<sup>7</sup>

## Methods

A case control study conducted to assess risk of falls among obese elderly females compared to non-obese elderly females

This study involved 140 elderly females participants aged 60 years and above. They were recruited from the inpatients wards and outpatients clinics of Ain Shams University Hospitals. They were divided into 2 groups (Obese and Non obese) according to their Body Mass Index (BMI).

The World Health Organization (WHO) defines "overweight" as a BMI equal to or more than 25, and "obesity" as a BMI equal to or more than 30. Class 1 obesity: BMI of 30 to < 35, Class 2: BMI of 35 to < 40, Class 3: BMI of 40 or higher. Class 3 obesity is sometimes categorized as "extreme" or "severe" obesity. These cut-off points provide a benchmark for individual assessment, but there is evidence that risk of chronic disease in population increase progressively

from a BMI of 21.

Patients unwilling to participate, or unable to perform TUG test were excluded from the study

After taking informed consent, all groups were subjected to:

1) **Comprehensive geriatric assessment**, including complete medical history. Physical examination, Activities of daily living <sup>8</sup>, Instrumental activities of daily living (IADL) assessment <sup>9</sup> Screening for depression using Geriatric depression scale-15 items (GDS-15).<sup>10</sup>

2) **Assessment of risk of falls by A- Timed up and go test (TUGT)**

The test started with subject sitting correctly in a chair with arms seat height of approximately 46 cm, the subjects back rested on the back of chair, and then she was asked to stand up and walk 3 m distance then turn around and walk back to the chair and set down. The subject wore her regular footwear and used any gait aid that she normally used in ambulation (e.g., cane or walker), no physical assistance was allowed. The physician or health care worker used a stopwatch or a wristwatch with a second hand to time this activity <sup>11</sup>

The interpretation of the TUGT is:

<10 seconds = Normal

<20seconds = Good mobility and can go without gait aid

< 30 seconds =can't go outside alone and require gait aid.

A score of more than or equal 14 seconds has been shown to indicate high risk of falls <sup>12</sup>.

**B-Fall Risk Assessment Tool (FRAT)** <sup>13</sup>

The FRAT is a validated tool that was developed to provide a quick assessment of fall risk for older adults. The score 3-5 indicated high risk of falls.

**Ethical consideration**

Informed oral consent was taken from every patient after explanation of the study aim and procedure and the study methodology was reviewed and approved by the Research Review Board of the Geriatrics and Gerontology Department, Faculty of medicine, Ain Shams University.

**Statistical Analysis**

The collected data were coded, tabulated, and statistically analyzed using IBM SPSS statistics (Statistical Package for Social Sciences) software version 22.0, IBM Corp., Chicago, USA, 2013. The level of significance was taken at P value < 0.050 is significant. The quantitative data were presented as mean, standard deviations; qualitative variables were presented as number and percentages. The comparison between groups with qualitative data was done by using Chi-square test and the comparison between two groups with quantitative data and parametric distribution were

done by using Independent t-test. Correlation between two quantitative variables was done using Pearson correlation coefficient. Regression analysis was performed to identify which variables were independently associated with risk of fall.

**Results**

Demographic data is presented in [Table (1,2)]. There is no significant difference between obese and non-obese regarding functional capacity. As regard risk of fall assessment, there was a higher risk of falls among obese elderly female subjects than the non-obese. 50% of obese female had positive risk of fall by TUGT while only 20% of non-obese group at risk of fall. Using FRAT, there was 12.9% of obese female at risk of falls and only 2.9% of non-obese group were at risk of falls [Table (3)]

Table 1: Demographic data of obese and non-obese subjects:

		Obese	Non obese	P-value
		No. = 70	No. = 70	
Age	Mean ±	66.01 ±	68.30 ±	0.038
	SD	6.11	6.81	
	Range	60 – 85	60 – 85	
BMI	Mean ±	36.47 ±	25.94 ±	0.000
	SD	4.72	2.41	
	Range	31 – 50	18 – 29	
WC	Mean ±	114.63 ±	87.57 ±	0.000
	SD	16.25	12.38	
	Range	80 – 150	58 – 120	

BMI: Body Mass Index

WC: Waist circumference

Table 2: Comparison between obese and non-obese regarding cognitive, functional and psychological domains

		Obese	Non obese	P-value
		No. = 70	No. = 70	
MMSE	Median (IQR)	28 (27 - 28)	27 (27 - 28)	0.561
	Range	21 – 30	22 - 29	
GDS	Depressed	10 (14.3%)	15 (21.4%)	0.270
	Not depressed	60 (85.7%)	55 (78.6%)	
ADL	Independent	57 (81.4%)	49 (70.0%)	0.131
	Assisted	12 (17.1%)	21 (30.0%)	
	Dependant	1 (1.4%)	0 (0.0%)	
IADL	Median (IQR)	6 (6 - 6)	6 (3 - 6)	0.234
	Independent	32 (45.7%)	21 (30.0%)	
	Assisted	32 (45.7%)	45 (64.3%)	
	Dependent	6 (8.6%)	4 (5.7%)	
	Median (IQR)	4 (3 - 6)	3 (2 - 6)	0.167

Table 3: Comparison between obese and non-obese as regard risk of falls

		Obese No. = 70	Non obese No. = 70	P-value
Risk of falls *	No risk of fall	35 (50.0%)	56 (80.0%)	0.000
	Risk of fall	35 (50.0%)	14 (20.0%)	
TUGT	Median (IQR)	13 (8 - 17)	9 (6 - 11)	0.000
	Range	4 – 60	3 – 30	
FRAT	Positive	9 (12.9%)	2(2.9%)	0.028
	Negative	61(87.1%)	68(97.1%)	

\*Based on TUGT.

Table 4: correlation between TUGT and other studied Variables

TUGT		BMI	WC	age	IADL	ADL
	Pearson Correlation	0.32	0.209	0.132	-0.334	-0.38
	p value	0.000	0.013	0.120	0.000	0.000

Table 5: Logistic regression analysis for predictors of falls

	B	S.E.	Wald	P-value	Odds ratio (OR)	95% C.I. for OR	
						Lower	Upper
Obesity	-1.994	0.500	15.920	0.000	0.136	0.051	0.363
Age	0.013	0.042	0.101	0.751	1.013	0.934	1.099
Polypharmacy	-0.533	0.463	1.324	0.250	0.587	0.237	1.455
GDS	0.266	0.615	0.187	0.666	1.305	0.391	4.357
ADL	0.537	0.720	0.556	0.456	1.710	0.417	7.007
IADL	1.695	1.490	1.951	0.313	1.449	0.084	4.249
history of fall	-1.114	1.553	0.053	0.570	0.328	0.111	1.171
Constant	-0.949	2.854	0.111	0.740	0.387		

TUGT scores significantly correlated with BMI, and WC, and negatively correlated to ADL, and IADL [Table (4)] Moreover, the association between obesity and risk of falls was evaluated using Logistic regression analysis. It was observed that obesity was an independent predictor of falls after adjustment of other risk factors [(OR= 0.136; P = 0.00) as shown in [Table (5)].

**Discussion**

Falls are a frequent and serious problem facing people aged 60 and older. Older adults are highly susceptible to both an increased incidence and an increased injury rate from falls, and the severity of fall-related complications Rises steadily after age of 60 years old. <sup>4</sup>

Women were reported to be more likely than men to experience a nonfatal fall injury. On the other hand, after taking age into account, the death associated with falls was higher for men than for women. Among older women, white race are 2.5 times more likely to die from falls as their black ones. <sup>14</sup>

Medications are one of the modifiable extrinsic risk factors for falls. Certain medication classes, including benzodiazepines, anti-hypertensive antidepressants, antipsychotics, and diuretics have been strongly associated with increased falling risks in population-based studies <sup>15</sup> Polypharmacy itself, was also considered an independent and important risk factor for falling. <sup>16</sup>

The decline in power (30% loss per decade) and endurance (10% loss per decade) after the age of 30 , result in physical functioning decline below the threshold where activities of daily living become difficult and then impossible to be done. <sup>17</sup>

There is an association between knee extension strength, ankle dorsiflexion strength, chair stands and falling. <sup>18</sup> There are exercise programs that have been tested to reduce the risk of fall. Most studies have used some combination between resistance exercises, balance exercises, endurance exercises, and flexibility. <sup>19</sup>

Obesity has become a major public health problem. The

current increase in life expectancy make the prevalence of obesity also raises steadily among older age groups.<sup>20</sup>

Controversial data exists regarding the association of obesity and increased risk of falls among elder population. Some studies proved the relationship between BMI and falling indicate that increased BMI increases the risk of falls.<sup>21</sup>

The present study showed that (50%) of the obese participants had positive risks of falls, (20%) of non-obese group have positive risk of falls.

This was consistent with the study of **Himes & Reynolds, (2012)** who reported that obese older adults were more likely to fall and that older adults who had fallen and were obese would be more likely to become disabled in ADLs.<sup>22</sup>

**Fjeldstad et al. (2008)** also found that obese individuals had a 31% higher risk of falls compared to individuals with a normal body weight.<sup>7</sup> **Mitchell et al. (2014)** reported that older obese individuals have 31% increased risk of falls and obese fallers have a higher prevalence of pain and inactivity than fallers of a healthy weight.<sup>23</sup>

Obesity has been associated with an increased risk of falls among older people. Obesity was associated with a 25% higher risk of fall compared to non-obese individuals.<sup>24</sup>

On the other hand, **Sheehan et al. (2013)** in a cross sectional study on 606 community dwelling adults aged 60 years and older, found that obesity was actually protective against falling while low body mass index increased risk of falling.<sup>25</sup> This could be explained by the observation that overweight and obese older adults have been shown to adopt a more tentative gait pattern, with a slower walking velocity, increased base of support and impaired both static and dynamic stability.<sup>26</sup>

### Conclusion

It was concluded that obesity in elderly females is an independent predictor of risk of falling.

### References

1. Tucker JM, Tucker LA, et al .Obesity increases risk of declining physical activity over time in women: a prospective cohort study. *Obesity (Silver Spring)*.2013 ;( 21):E715-E720.
2. HubbardRE,LangIA,et al(2010):frailty,body mass index,and abdominal obesity in older people.*JGerontol A BiolSci Med Sci* .2010,(65):377-381.
3. Rao SS Prevention of falls in older patients. *Am Fam Physician*.2005; 72(1): 81-8
4. Rubenstein LZ . Falls in older people: epidemiology, risk factors and strategies for prevention. *Age and Ageing*.2006; 35-S2: ii37-ii41.
5. Elia M. Obesity in the elderly. *Obesity*.2001, 9(S11),5-9
6. Houston D K, Nicklas BJ, Zizza C A. Weighty concerns: the growing prevalence of obesity among older adults. *Journal of the American Dietetic Association*.2009, 109(11), 1886-1895.
7. Fjeldstad C, Fjeldstad A S, Acree LS, Nickel K J, Gardner AW.The influence of obesity on falls and quality of life. *Dynamic Medicine*.2008, 7(1), 4.
8. Katz S , Ford AB ,et al. studies of illness in the aged.the index of ADL:astandardized measure of biological and psychological function.*JAMA*.1963;(185):914-919.
9. Lawton M P and Brody EM . Assessment of older people: self-

- maintaining and instrumental activities of daily living. *Gerontologist*.1969; (9): 179-186.
10. Shehta AS, El-Banouby MH, Mortagy AK and Ghanem M.Prevalence of depression among Egyptian geriatric community. *Ain Shams University: geriatric department library*.1998.
11. Podsiadlo, D; Richardson, S .The timed 'Up & Go': A test of basic functional mobility for frail elderly persons". *Journal of the American Geriatrics Society*.1991; 39 (2): 142-8.
12. Shumway-Cook A, Brauer S, Woollacott M. Predicting the probability for falls in community-dwelling older adults using the Timed up & Go Test. *Physical therapy*.2000, 80(9), 896-903.
13. Stapleton C, Hough P, Bull K, Hill k, Greenwood K, Old Meadow L. A four item falls risk screening tool for sub-acute and residential care: The first step in falls prevention. *Australasian Journal on Ageing*. 2009, 28 (3): 139 – 143.
14. Mark ST, Colley RC, Saunders TJ et al. Physiological and health implications of a sedentary lifestyle. *Applied Physiology, Nutrition, and Metabolism*.2010; 35(6): 725-740.
15. Woolcott JC, Richardson KJ, Wiens MO et al. Meta-analysis of the impact of 9 medication classes on falls in elderly persons. *Arch Intern Med*.2009; 169:1952-60.
16. Hilmer SN and Gnjjidic D. The effects of polypharmacy in older adults. *ClinPharmacolTher*.2008; 85:86-8.
17. Tommasini C, Talamini R, Bidoli E et al. Risk factors of falls in elderly population in acute care hospitals and nursing homes in north Italy: a retrospective study. *J Nurs Care Qua*.2008; 23(1):43-9.
18. Moreland JD, Richardson JA, Goldsmith CH et al. Muscle weakness and falls in older adults: a systematic review and meta-analysis. *J Am GeriatrSoc*.2004; 52 (7): 1121-9.
19. Tinetti ME and Kumar C.The patient who falls: "It's always a trade-off." *JAMA*.2009; 303(3): 258-266.
20. Kirkland J L. Translating advances from the basic biology of aging into clinical application. *Experimental gerontology*.2013, 48(1), 1-5.
21. Rosenblatt NJ, Grabiner M D. Relationship between obesity and falls by middle-aged and older women. *Archives of physical medicine and rehabilitation*.2012, 93(4), 718-722.
22. Himes CL, Reynolds S. L. Effect of obesity on falls, injury, and disability. *Journal of the American Geriatrics Society*.2013, 60(1), 124-129.
23. Mitchell R J, Lord SR, Harvey LA, Close JC. Associations between obesity and overweight and fall risk, health status and quality of life in older people. *Australian and New Zealand journal of public health* 2014, 38(1), 13-18.
24. Mitchell R J, Lord SR, Harvey LA, Close JC. Obesity and falls in older people: mediating effects of disease, sedentary behavior, mood, pain and medication use. *Archives of gerontology and geriatrics*.2015, 60(1), 52-58.
25. Sheehan KJ, O'Connell MD, Cunningham C, Crosby L, Kenny R A. The relationship between increased body mass index and frailty on falls in community dwelling older adults. *BMC geriatrics*.2013, 13(1), 132.
26. Lord SR, Menz HB, Tiedemann AA. physiological profile approach to falls risk assessment and prevention. *Physical therapy*. 2003, 83(3), 237-252.