Open Access Journal
Indian Journal of Medical Research and Pharmaceutical Sciences
October 2016;3(10) ISSN: ISSN: 2349-5340
DOI: 10.5281/zenodo.159668 Impact Factor: 3.052

FRACTURE RISK ASSESSMENT IN GERIATRIC HOMES IN EGYPT

Moatasem S. Amer, MD, Sarah A. Hamza, MD, Wessam H. El-Kawaly, MD*, Elham R. Arif, MSc

* Geriatrics and Gerontology Department; Faculty of Medicine, Ain shams university, Cairo, Egypt.
Geriatrics and Gerontology Department; the Internal medicine Department; Faculty of Medicine, Ain shams university, Cairo, Egypt.
Geriatrics and Gerontology Department; Faculty of Medicine, Ain shams university, Cairo, Egypt
Geriatrics and Gerontology Department; Faculty of Medicine, Ain shams university, Cairo, Egypt

Keywords:
Fracture risk, Osteoporotic fracture, Geriatric homes

Abstract

Fractures in elderly are an important public health issue, especially as incidence increases with age, and the population of elderly people is growing. Function and quality of life may deteriorate drastically after a fracture. Detecting the most prevalent risk factors of fractures may help preventing further fractures and decrease their functional and economic burden.

Objectives: To assess fracture risk among elderly living in geriatric homes and detect the most prevalent risk factors of fractures

Methods: This Cross sectional study was performed among 100 elderly (≥ 60 years) subjects including both males and females living in four geriatric homes in Cairo, Egypt, in the time period between June 2014 and September 2015. Comprehensive geriatric assessment was obtained, then fracture risk calculators to estimate the absolute risk of fractures were applied for each participant including; Fracture Risk Assessment Tool (FRAX) (without bone mineral density measurement), Q fracture, and Garvan tool.

Results: The prevalence of fractures in the included geriatric homes was 21%. The most prevalent risk factor of fractures is recurrent falls (49%) and the least prevalent risk factor is chronic kidney disease (2 %). There was a statistically significant difference between subjects with history of fractures and subjects without regarding history of recurrent falls in the last year, prolonged Timed up and go test and functional impairment ($P<0.05$). The cutoff of significant 10 year major osteoporotic fracture risk according to FRAX, Q fracture and Garvan is 7.1%; 17.5%and 19% respectively. The cutoff of significant 10 year hip fracture risk according to FRAX, Q fracture and Garvan is 3%; 5.7% and 2 % respectively.

Conclusion: According to the current study Garvan tool has the highest sensitivity and FRAX tool has the highest specificity to calculate the estimated 10 year risk of hip and major osteoporotic fracture

Introduction

Elderly are more prone to develop fractures due to many risk factors as osteoporosis and many other independent risk factors as frequent falls, slow gait, visual impairment, functional impairment, many medical illnesses and drugs (1).

Osteoporosis is a common disease characterized by low bone mass with microarchitectural disruption and skeletal fragility that result in an increased risk of fracture, particularly at the spine, hip, wrist, humerus, and pelvis (2).

Indian Journal of Medical Research and Pharmaceutical Sciences
October 2016;3(10) ISSN: ISSN: 2349-5340
DOI: 10.5281/zenodo.159668 Impact Factor: 3.052

Osteoporotic fractures (fragility fractures, low-trauma fractures) are those occurring from a fall from a standing height or less, without major trauma (3). Hip fracture has been recognized as the most serious problem resulting from osteoporosis because it leads to chronic pain, disability, diminished quality of life and premature death (4).
Regarding falls, 30 to 40% of elderly people living in the community and 50% of nursing home residents have a fall, every year, falls cause >40% of nursing home admissions and are the 7th cause of death in people ≥65 (5).
Many studies stated that incidence of fracture in institutionalized elderly is generally higher than the general population; residents are generally more frail than elderly living in the community. They tend to be older with greater limitations in their activities of daily living. They also have more chronic illnesses, are physically dependent, and have a higher prevalence of gait problems (6).
Function and so quality of life deteriorate dramatically after a fracture; at least 50% of elderly people who were ambulant before fracturing a hip do not return to their previous level of function. After falling, elderly people may fear of falling again, that`s why mobility is reduced because confidence is lost. Some people even avoid certain activities as shopping and cleaning because of this. Decreased activity may increase joint stiffness and weakness, further reducing mobility (5).
Moreover, most fractures occur in patients having T-scores better than -2.5, so treatment strategies relying on bone mineral density measurement only will miss many patients who are at risk of fractures and might benefit from interventions that reduce fracture risk (7). Thus assessment of clinical conditions or risk factors independent of bone mineral density measurement is important for the prediction of fracture (8).
Many risk assessment tools have been used to predict the probability of fractures and the need of drug therapy accordingly (9).
One of the most famous tools is the WHO Fracture Risk Assessment Tool (FRAX) which predicts the 10-year probability of major osteoporotic fractures (i.e. hip, spine, forearm, or humerus) and hip fracture using clinical risk factors for fractures alone or with femoral neck bone mineral density (10).
Other fracture risk assessment tools as the Q fracture tool, a risk prediction algorithm used to estimate absolute risk of osteoporotic fracture and hip fracture in primary care (11) and the Garvan fracture risk calculator, that was developed by the Garvan Institute of Medical Research which is valid and can be used in identifying individuals at high risk of fracture (12).

.Methods

Study design

A Cross sectional study. 100 elderly (≥ 60 years) subjects including men and women living in four nursing homes in Cairo were recruited in the time period between June 2014 and September 2015. All residents admitted to the included nursing homes who agreed to participate in the study were included while those who refused to participate in the study were excluded.
At first, comprehensive geriatric assessment was obtained (with a special consideration to risk factors of falls), weight and height were measured then fracture risk calculators to estimate the absolute risk of fractures were applied for each participant including;
a- Fracture Risk Assessment Tool (FRAX), which estimates the 10-year probability of hip fracture and major osteoporotic fracture (hip, clinical spine, proximal humerus, or forearm), using clinical risk factors for fracture (age, gender, BMI, history of personal fracture, history of parental hip fracture, smoking status, glucocorticoids use, alcohol intake, and presence of rheumatoid arthritis or secondary osteoporosis) alone or in combination with femoral neck BMD (g/cm^2, using dual energy x-ray absorptiometry [DXA]), in the current study the FRAX score used was FRAX without BMD we used [FRAX-body mass index (BMI)].
b- Q fracture, which calculates the risk of developing any osteoporotic fracture or hip fracture alone by entering some simple clinical data. An updated version was developed in 2012 to improve the use of Q Fracture, such as extending the age range to patients older than 85 years and including additional variables as previous fragility fracture, ethnic group, epilepsy and use of anticonvulsants, care home residency, additional inflammatory arthropathies, chronic obstructive airways disease, type 1 diabetes, and other causes of immobility (such as Parkinson's disease or dementia).
c- Garvan tool, developed by the Garvan Institute of Medical Research allows individuals to make informed judgments about their actual risk of having an osteoporotic fracture by entering risk factors as age, gender, number

Indian Journal of Medical Research and Pharmaceutical Sciences
October 2016;3(10) ISSN: ISSN: 2349-5340
DOI: 10.5281/zenodo.159668 Impact Factor: 3.052

of falls in the past year, and number of fractures since age 50 years. As with FRAX, Garvan was calculated with BMI and not BMD.

Ethical considerations

Informed consent was taken from each elderly participating in this study. The study methodology was reviewed and approved by the board of the Geriatrics and Gerontology Department, Faculty of medicine, Ain Shams University.

Statistical methods

Analysis of data was performed by using version 20 of the Statistical Package for Social Science (SPSS). Data were expressed as mean and standard deviation (SD) for all quantitative variables. Frequency and percentage for all qualitative variables was calculated. Comparison between quantitative variables was done using t-tests to compare 2 groups. Comparison of qualitative variables was carried out using the Chi-square test. A $P < 0.05$ (two sided) was considered significant. Receiver operating characteristic (ROC) curve analysis was used to assess the ability of each calculator to discriminate between individuals who sustained any fracture and those who did not.

Results

According to presence of positive history of fractures our study concluded that the prevalence of fractures in the included nursing homes was 21%.

The mean age of our study population is 72.15 years with standard deviation ±8.78 with 49 male and 51female patients

The most prevalent risk factor of fractures in geriatric homes according to the current study is recurrent falls (49%) [Falls ≤ 2 last year (28%) and falls >2 last year (21%)] and the least prevalent risk factor is chronic kidney disease (CKD) (2 %). Other prevalent risk factors are Functional impairment in instrumental activities of daily living (IADL) (35%), Timed Up & Go Test (TUGT) >14 seconds (34%), functional impairment in activities of daily living (ADL) (32%), depression by geriatric depression score (GDS) (26%). (Table 1)

We divided the subjects recruited in this study into 2 groups; Group I, includes subjects with history of fractures and Group II, includes subjects without history of fractures.

There was a statistically significant difference between subjects with history of fractures (Group I) and subjects without (Group II) as regards history of recurrent falls in the last year, prolonged Timed Up & Go Test and functional impairment in ADL and IADL ($P<0.05$). However there was no statistically significant difference between both groups as regards diabetes mellitus, dementia, epilepsy, history of parent osteoporotic fracture, visual and hearing impairment, liver cirrhosis, cancer, COPD and Depression. (Table 2)

Group I had the higher mean of estimated 10 year fracture risk according to the three risk assessment tools (FRAX, Q fracture and Garvan) than Group II with high statistically significant difference between the two groups ($P<0.001$). (Table 3)

Table (4) and Figures (1and 2) show that the cutoff for significant 10 year risk of hip fracture by the FRAX tool is >3% with specificity 89.9% and sensitivity 66.7% and accuracy87%, and the cutoff of 10 year major osteoporotic fracture risk according to FRAX is >7, with sensitivity 76.2% and specificity 87.3% with accuracy 90.3%.

Also, the cutoff of 10 year hip fracture risk according to Garvan is >2, with sensitivity 85.7% and specificity 73.4% with accuracy 85.2%, and the cutoff of 10 year major osteoporotic fracture risk according to Garvan tool is >19, with sensitivity 95.2% and specificity78.5% and accuracy 93.9%

Moreover, the cutoff of 10 year hip fracture risk according to Q fracture tool is >5.7, with sensitivity 71.4% and specificity 85.9% and accuracy 80.9%, and the cutoff of 10 year major osteoporotic risk according to Q fracture tool is >17.5%, with specificity 97.5% and sensitivity 61.9% and accuracy 85.1%.

According to the current study Garvan tool has the highest sensitivity to calculate the estimated 10 year risk of hip and major osteoporotic fracture with accuracy 85.2 and 93.9 respectively and FRAX tool has the highest specificity to calculate the estimated 10 year risk of hip and major osteoporotic fracture according to the current study with accuracy 87 and 90.3 respectively.

Open Access Journal
Indian Journal of Medical Research and Pharmaceutical Sciences
October 2016;3(10) ISSN: ISSN: 2349-5340
DOI: 10.5281/zenodo.159668 Impact Factor: 3.052

Tables

Table (1): Prevalence of risk factors of fractures in the geriatric homes included in the study

Risk factors of fractures	Number of cases	%
Recurrent Falls	49	49.00
Diabetes Mellitus	36	36.00
Visual Impairment	36	36.00
Functional impairment in IADL	35	35.00
***TUGT >14 seconds**	34	34.00
Functional impairment in *ADL	32	32.00
Falls ≤ 2 last year	28	28.00
Depression by *GDS	26	26.00
Falls >2 last year	21	21.00
***COPD**	16	16.00
Liver cirrhosis	8	8.00
Parental fracture	4	4.00
Cancer	4	4.00
Dementia	3	3.00
Epilepsy	3	3.00
***CKD**	2	2.00

***TUGT: Timed up and go test, *IADL: instrumental activities of daily living, *ADL: activities of daily living, *GDS: geriatric depression score, *COPD: chronic obstructive pulmonary disease, *CKD: chronic kidney disease**

Table (2): Comparison of clinical risk factors between subjects with history of fractures (Group I) and subjects without (Group II).

Risk factors of fractures	Fracture groups						chi-square	
	Group I		Group II		Total			
	N	%	N	%	N	%	X^2	P-value
***DM**	8	38.10	28	35.44	36	36.00	0.050	0.822
Dementia	1	4.76	2	2.53	3	3.00	0.254	0.615
Falls < =2 last year	12	57.14	16	20.25	28	28.00	26.794	0.000
Falls > 2 last year	8	38.10	13	16.46	21	21.00	26.794	0.000
Epilepsy	1	4.76	2	2.53	3	3.00	0.254	0.615
Parent Fracture	2	9.52	2	2.53	4	4.00	1.726	0.189
***TUGT> 14**	13	61.90	21	26.58	34	34.00	10.909	0.004
Visual impairment	9	42.86	27	34.18	36	36	0.533	0.465

Indian Journal of Medical Research and Pharmaceutical Sciences
October 2016;3(10) ISSN: ISSN: 2349-5340
DOI: 10.5281/zenodo.159668 Impact Factor: 3.052

Hearing impairment	5	23.81	6	7.59	11	11.00	3.786	0.052
Depression by *GDS	7	33.33	19	24.05	26	26.00	1.138	0.566
Functional impairment in *ADL	13	61.90	19	24.05	32	32.00	10.301	0.001
Functional impairment in *IADL	13	61.90	22	27.85	35	35.00	9.886	0.007
***COPD**	2	9.52	14	17.72	16	16.00	0.916	0.338
Cancer	0	0.00	4	5.06	4	4.00	1.930	0.165
Liver cirrhosis	1	4.76	7	8.86	8	8.00	0.027	0.870
***CKD**	0	0.00	2	2.53	2	2.00	0.954	0.329

***DM: Diabetes mellitus*TUGT: Timed up and go test, *IADL: instrumental activities of daily living, *ADL: activities of daily living, *GDS: geriatric depression score, *COPD: chronic obstructive pulmonary disease, *CKD: chronic kidney disease**

Table (3): Estimated 10 years risk of fracture according to the risk assessment tools (FRAX, Q fracture and Garvan) between subjects with history of fractures (Group I) and subjects without (Group II).

		Fracture groups		T-test	
		Group I	Group II	T	P-value
***FRAX**					
***Major %**	**Range**	3.90 - 22.00	1.70 - 12.00	8.951	0.000
	Mean±SD	10.75 ± 4.77	4.49 ± 2.08		
***Hip %**	**Range**	1.00 - 9.60	0.20 - 6.40	7.357	0.000
	Mean±SD	4.50 ± 2.50	1.58 ± 1.29		
Q fracture					
***Major %**	**Range**	2.40 - 32.90	0.80 - 21.60	8.268	0.000
	Mean±SD	18.79 ± 10.08	6.13 ± 4.77		
***Hip %**	**Range**	1.00 - 32.90	0.30 - 21.60	7.464	0.000
	Mean±SD	15.18 ± 11.17	3.75 ± 4.06		
Garvan					
***Major %**	**Range**	9.00 - 100.00	2.00 - 51.00	11.089	0.000
	Mean±SD	55.24 ± 26.15	12.73 ± 11.44		
***Hip %**	**Range**	0.30 - 97.00	0.00 - 24.00	6.864	0.000
	Mean±SD	26.66 ± 31.03	2.31 ± 3.91		

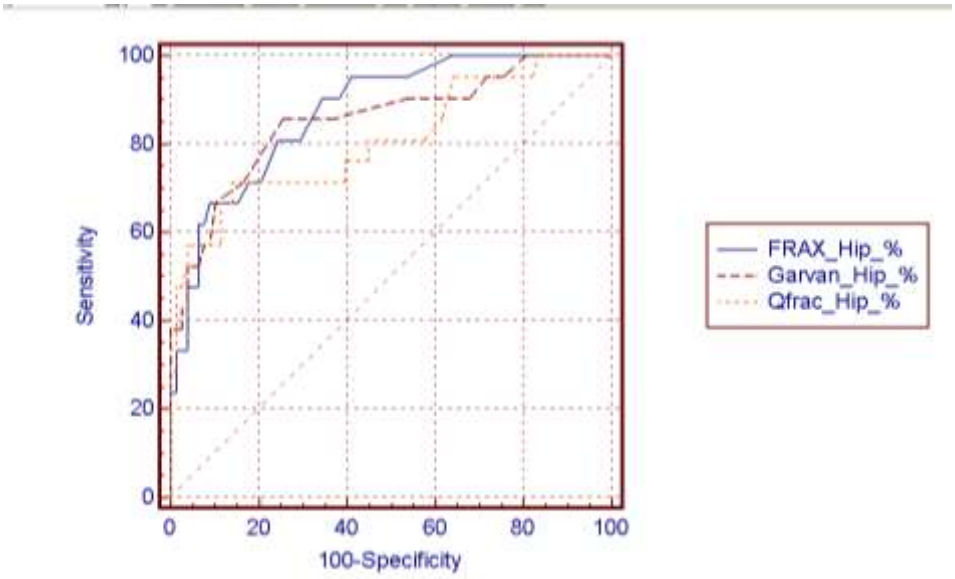
***FRAX: Fracture risk assessement tool, *Major %: percentage of major osteoporotic fractures, *Hip %: percentage of hip fractures**

Indian Journal of Medical Research and Pharmaceutical Sciences
October 2016;3(10) ISSN: ISSN: 2349-5340
DOI: 10.5281/zenodo.159668 Impact Factor: 3.052

Table (4): Cutoff of 10 year risk of hip fracture and major osteoporotic fracture according to FRAX, Garvan tool and Q fracture tool

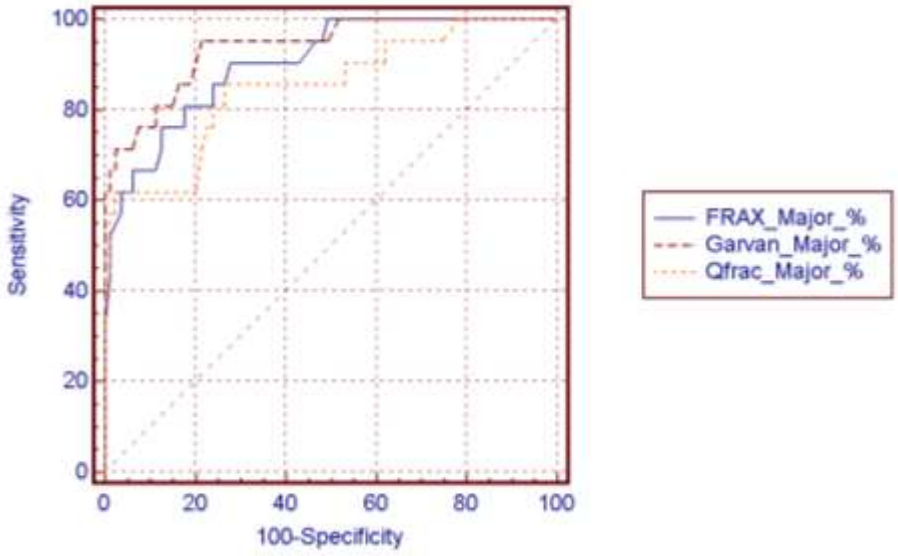
ROC curve between Group I and Group II as regard:						
	Cutoff	**Sensitivity**	**Specificity**	**PPV**	**NPV**	**Accuracy**
***FRAX Hip**	> 3%	66.7%	89.9%	63.6	91.0	87.0%
***FRAX Major**	> 7.1%	76.2%	87.3%	61.5	93.2	90.3%
***Garvan Hip**	> 2%	85.7%	73.4%	46.2	95.1	85.2%
***Garvan Major**	> 19%	95.2%	78.5%	54.1	98.4	93.9%
***Qfracture Hip**	> 5.7%	71.4%	85.9%	57.7	91.8	80.9%
***Qfracture Major**	> 17.5%	61.9%	97.5%	86.7	90.6	85.1%

***FRAX Hip: Hip fractures according to fracture risk assessment tool, *FRAX Major: Major osteoporotic fractures according to fracture risk assessment tool, *Garvan Hip: Hip fractures according to Garvan tool, *Garvan Major: Major osteoporotic fractures according to Garvan tool, *Q fracture Hip: Hip fractures according to Q fracture tool, *Q fracture Major: Major osteoporotic fractures according to Q fracture tool.**



Figure(1): AUC curve between Group I and Group II as regard FRAX hip %, Q-fracture hip % and Garvan hip %.

Open Access Journal
Indian Journal of Medical Research and Pharmaceutical Sciences
October 2016;3(10) ISSN: ISSN: 2349-5340
DOI: 10.5281/zenodo.159668 Impact Factor: 3.052



Figure(2): AUC curve between Group I and Group II as regard FRAX Major %, Q-fracture Major % and Garvan Major %.

Discussion

The current study showed that prevalence of fractures in geriatric homes was 21% and that prevalence of previous falls was 49%. Many researchers studied the prevalence of falls and fractures in nursing homes in different countries and the results vary widely according to the equipments available in nursing homes, application of fall prevention programs, degree of frailty and associated comorbidities of residents included in each study.

The cross sectional study of Del Duca et al. (13) done at long term care facilities in Brazil showed that prevalence of falls was 38.9%, and among those who experienced falls 19.2% developed fractures. On the other hand Neutel et al. (14) found that prevalence of falls in nursing homes in Canada was 55%.

In the current study the most prevalent fracture risk factor in geriatric homes in Cairo was previous falls (49%) (2 falls or less last year 28%, more than 2 falls last year 21%). The comparison between subjects who sustained fractures and others who didn't as regard this factor showed a high statistical significance (P.value = 0.000). This can be compared to Greenspan et al. (15) who concluded that a fall to the side is one of the most important independent risk factors for hip fracture in long term facilities. Also Chen et al. (16) and Egan et al. (17) all agreed with these results.

Diabetes mellitus is the second most prevalent risk factor in the current study (36%), however it doesn't show a statistical significance between the two groups of the study (p-value: 0.82). This may be attributed to that most of our study subjects had a short duration of Diabetes with only few complications.

Previous studies showed a controversy as regard Diabetes as a risk factor of bone fractures. Janghorbani et al. (18) found an association between diabetes and increased risk of hip fracture; however type 2 Diabetes was weakly associated with fractures at other sites. On the other hand, other studies showed that there was no statistically significant difference regarding incidence of fractures between controls and diabetics (19, 20).

Visual impairment is the third prevalent risk factor in the current study (36%), however it didn't show a statistically significant difference between both groups (p-value: 0.46). This may be attributed to that visual impairment in most of the subjects was mild and didn't affect their function or activity pattern. However other studies showed a significant relation between visual impairment and bone fractures as (21, 22).

As regard functional impairment in ADL and IADL in the current study, their prevalence was 35% and 32% respectively, they showed a statistically significant difference between the two study groups (p-value 0.007 and 0.001 respectively). Most of the studies agreed with that result (15, 23).

As regard the Timed up and Go Test (TUGT), prolonged TUGT >14 seconds was highly prevalent (34%) and was statistically significant between both groups (p-value: 0.004). Other previous studies agreed with this study regarding this factor. Karlsson et al. (24) found that low performance in physical ability tests such as 6-m walk and

October 2016;3(10) ISSN: ISSN: 2349-5340
DOI: 10.5281/zenodo.159668 Impact Factor: 3.052

20-cm narrow walk test in elderly men is associated with recurrent falls which in turn increases risk of falls. Also Kauppi et al. (25) stated that maximal walking speed was a significant and independent predictor of hip fracture.

Regarding depression as a risk factor of fractures, in the current study the prevalence of depression was 26%, however it didn't show a statistically significant difference between the two groups of the study which is not consistent with other studies. This may be related to that most of the depressed subjects in the current study suffered from mild degrees of depression according to the geriatric depression score and because most of them didn't use antidepressants which increase risk of fractures. Wu et al. (26) found an association between depression and increased risk of fractures and bone loss which is sometimes mediated by antidepressants. Ping et al. (27) reported similar findings.

As regard COPD, its prevalence in the current study was 16%, it was more prevalent in the group of the subjects who didn't sustain fractures but without any statistically significant difference between the two groups of our study. This is not consistent with other studies as Chen et al. (28) and Graat-Verboom et al. (29) and may be related to the low prevalence of COPD in the current study and the fact that most of the study subjects were not heavy smokers and didn't receive regular steroids (which increases risk of fractures) as their conditions were mild.

Factors as liver cirrhosis, dementia, epilepsy, parental osteoporotic fractures and chronic kidney disease, although are important risk factors of fractures, but their low prevalence in the current study (8%, 3%, 3%, 4% and 2% respectively) diminished their statistical significance between both groups.

The presence of previous fragility fractures is considered an independent risk factor for development of future bone fractures (30). This is consistent with the current study where the subjects in group I (those with previous fractures) had higher estimated 10 year risk of fractures according to the three risk assessment tools.

Regarding the estimation of 10 year risk of major osteoporotic and hip fracture by FRAX, the mean risk for group I (those who sustained fractures) was (10.75) ± 4.77 and (4.50) ± 2.50 respectively while it was lower in the other group (4.49) ± 2.08 and (1.58) ± 1.29 respectively with high statistical significance (P-value: 0.000). This is consistent with other studies as the study of Edwards et al. (31) who concluded that a history of previous fractures increases estimated 10 year fracture risk by FRAX significantly.

Also Regarding the estimation of 10 year risk of major osteoporotic and hip fracture by Q fracture, the mean risk for group I was (18.79) ± 10.08 and (15.18) ± 11.17 respectively while it was lower in group II (6.13) ± 4.77 and (3.75) ± 4.06 respectively with high statistical significance (P-value: 0.000). This agrees with the study of Hippisley-Cox and Couplan (32) which concluded that history of previous fractures significantly increased estimated 10 years risk of fractures according to the Q fracture tool.

As with the previous tools the estimated 10 year risk of major osteoporotic and hip fracture by Garvan tool for group I was (55.24) ± 26.15 and (26.66) ± 31.03 respectively, while it was lower in group II (12.73) ± 11.44 and (2.31) ± 3.91 respectively with high statistical significance (P-value: 0.000). This is consistent with the study of Ahmad et al. (12) who found that sustained fractures had higher percentage in their estimated risk according to Garvan risk calculator.

The current study showed that cut off for estimated 10 year risk of major osteoporotic fracture and hip fractures according FRAX is >7% and >3% respectively, which is lower than the cutoff of the current guidelines for treatment**.** (The current cutoff is >20% for10 year risk of major osteoporotic and >3% for 10 year risk of hip fracture).

However, these guidelines are based upon a United States-specific economic analysis and intervention thresholds have been estimated for other countries and country-specific guidelines are available or are in development.

In Greece the cost effective threshold for treatment according to FRAX , thresholds were 2.5% and 10 % for hip fracture and major osteoporotic fracture respectively under the age of 75, while for older patients, the thresholds were 5% and 15 %, respectively (33). Another study conducted on postmenopausal Chinese women considered a threshold of 9.5% for major osteoporotic fracture significant for treatment (34). In the United Kingdom, treatment was cost effective only when the 10-year probability of a major fracture exceeded 7% (8).

In addition, this study showed that cutoff for major osteoporotic and hip fracture risk according to Q fracture is >17.5% and >5.7% respectively, and >19% and >2% respectively according to Garvan tool.

By reviewing previous studies there is no generally agreed threshold regarding the definition of high risk for Garvan and Q fracture. The 10-year hip fracture risk at which intervention is cost-effective varied with different ages and countries. For women starting therapy at an age of 70 years, the intervention threshold varied from a hip fracture

October 2016;3(10) ISSN: ISSN: 2349-5340
DOI: 10.5281/zenodo.159668 Impact Factor: 3.052

probability of 5.6% to 14.7% % in Japan and Spain respectively (35). It was considered cost-effective when the 10-year hip fracture probability reached approximately 3% in the USA model (36).

In the current study Garvan risk assessment tool had the higher sensitivity to estimate the 10 year risk of major osteoporotic and hip fractures than the other tools used in this study, while FRAX had the higher specificity.

Thus FRAX tool is considered less sensitive which is consistent with many other studies, which stated that FRAX underestimated risk of fractures. This is probably due to some limitations as lack of measurement of physical activity and vitamin D deficiency in the algorithm. FRAX also does not take into consideration dose-response relationships, i.e. FRAX does not make a difference between one versus multiple fractures, different doses and duration of glucocorticoids use, and different doses and duration of use of alcohol or smoking. It also does not consider characteristics for prior fractures such as number, severity, and type (8).

In a prospective study, 506 postmenopausal women aged ≥60 years were followed for 5 years and incidence of new fractures was detected. 8.9% only of those who sustained a fracture had an estimated risk of fracture ≥20% using FRAX compared with 53.3% using Garvan. Although both underestimated the observed fracture risk, the Garvan performed significantly better for women who sustained a fracture (i.e. higher sensitivity) and FRAX for women who did not sustain a fracture (i.e. higher specificity) (10). Also Rubin, (37) in a Meta analysis concluded that a simple fracture assessment tool as Garvan is more predictive than complex tools as FRAX and Q fracture.

Bolland et al. (9) checked the performance of the FRAX and Garvan Institute fracture risk calculators in postmenopausal women with normal bone mineral density (BMD) for their age and concluded that, none of the calculators provided a better discrimination than models based on age and BMD, and their discriminative ability was only moderate, which may decrease their clinical utility. Also, Sambrook et al. (38) stated that a simple model that includes age and prior fracture only performs as well as more complex models when BMD is unknown.

Conclusion

Prevalence of fractures in geriatric homes in Cairo according to our study is 21%.The most prevalent risk factor for fractures is recurrent falls with 49%, while the least prevalent risk factor is chronic kidney disease (2%). Garvan tool is considered the most sensitive in predicting the 10 year risk of hip and major osteoporotic fractures, while FRAX is considered the most specific tool to calculate such risk.

References

1. Gillespie LD, Robertson MC, Gillespie WJ, Sherrington C, Gates S, Clemson LM et al. Interventions for preventing falls in older people living in the community. Cochrane Database Syst Rev 2012; 9:CD007146.
2. Riggs BL and Melton LJ 3rd. The worldwide problem of osteoporosis: insights afforded by epidemiology. Bone 1995; 17(5 Suppl):505S-511S.
3. Johnell O and Kanis JA. An estimate of the worldwide prevalence and disability associated with osteoporotic fractures. Osteoporos Int 2006; 17(12):1726-33.
4. Khatib R, Santesso N, Pickard L, Osman O, Giangregorio L, Skidmore C et al. Fracture risk in long term care: a systematic review and meta-analysis of prospective observational studies. BMC Geriatrics 2014; 14:130.
5. Laurence ZR. Falls in the elderly**,** Merck manual of geriatrics Content last modified November2013http://www.merckmanuals.com/professional/geriatrics/falls_in_the_elderly.
6. Nakamura K, Oyama M, Takahashi S, Yoshizawa Y, Kobayashi R, Oshiki R et al. Fracture incidence in nursing homes in Japan. Osteoporosis Int 2010; 21(5): 797-803.
7. Cranney A, Jamal SA, Tsang JF, Josse RG, Leslie WD. Low bone mineral density and fracture burden in postmenopausal women. CMAJ 2007; 177(6): 575-80.
8. Kanis JA, Johnell O, Oden A, Johansson H, McCloskey E. FRAX and the assessment of fracture probability in men and women from the UK. Osteoporos Int 2008; 19(4):385-97.
9. Bolland MJ, Siu AT, Mason BH, Horne AM, Ames RW, Grey AB et al. Evaluation of the FRAX and Garvan fracture risk calculators in older women. J Bone Miner Res 2011; 26(2):420-7.
10. Van Geel TA, Eisman JA, Geusens PP, van den Bergh JP, Center JR, Dinant GJ. The utility of absolute risk prediction using FRAX® and Garvan Fracture Risk Calculator in daily practice. Maturitas 2014; 77(2):174-9.

October 2016;3(10) ISSN: ISSN: 2349-5340
DOI: 10.5281/zenodo.159668 Impact Factor: 3.052

11. Hippisley-Cox J and Coupland C. Predicting risk of osteoporotic fracture in men and women in England and Wales: prospective derivation and validation of QFracture Scores. BMJ 2009; 339: b4229.
12. Ahmed LA, Nguyen ND, Bjørnerem Å Joakimsen RM, Jørgensen L, Størmer J et al. External validation of the Garvan nomograms for predicting absolute fracture risk: the Tromsø study. PLoS One2014; 9(9): e107695.
13. Del Duca GF, Antes DL and Hallal PC. Falls and fractures among older adults living in long-term care. Rev Bras Epidemiol 2013; 16(1):68-76.
14. Neutel CI, Perry S and Maxwell C. Medication use and risk of falls. Pharmacoepidemiol Drug Saf 2002; 11(2): 97-104.
15. Greenspan SL, Myers ER, Kiel DP, Parker RA, Hayes WC, Resnick NM. Fall direction, bone mineral density, and function: risk factors for hip fracture in frail nursing home elderly. Am J Med1998; 104(6):539-45.
16. Chen JS, Simpson JM, March LM, Cameron ID, Cumming RG, Lord SR et al. Risk factors for fracture following a fall among older people in residential care facilities in Australia. J Am Geriatr Soc. 2008; 56(11):2020-6.
17. Egan M, Jaglal S, Byrne K, Wells J, Stolee P. Factors associated with a second hip fracture: a systematic review. Clin Rehabil. 2008; 22(3):272-82.
18. Janghorbani M, Van Dam RM, Willett WC, Hu FB. Systematic review of type 1 and type 2 diabetes mellitus and risk of fracture. Am J Epidemiol 2007; 166(5):495-505.
19. Dobnig H, Piswanger-Sölkner JC, Roth M, Obermayer-Pietsch B, Tiran A, Strele A, et al. Type 2 diabetes mellitus in nursing home patients: effects on bone turnover, bone mass, and fracture risk. J Clin Endocrinol Metab 2006; 91(9):3355-63.
20. Hothersall EJ, Livingstone SJ, Looker HC, Ahmed SF, Cleland S, Leese GP et al. Contemporary risk of hip fracture in type 1 and type II diabetes: a national registry study from Scotland. J Bone Miner Res 2014; 29(5):1054-60.
21. Chew FL, Yong CK, Mas Ayu S, Tajunisah I. The association between various visual function tests and low fragility hip fractures among the elderly: a Malaysian experience. Age Ageing. 2010 ; 39(2):239-45.
22. Loriaut P, Boyer P, Massin P, Cochereau I. Visual impairment and hip fractures: A case-control study in elderly patients. Ophthalmic Res 2014; 52(4):212-6.
23. Ferencz V, Horváth C, Huszár S, Bors K. Assessment of risk factors for fractures in postmenopausal women with osteoporosis. Orv Hetil 2015; 156 (4): 146-53.
24. Karlsson MK, Ribom E, Nilsson JÅ, Ljunggren Ö, Ohlsson C, Mellström D et al. Inferior physical performance tests in 10,998 men in the MrOS study is associated with recurrent falls. Age & Ageing 2012; 41(6):740-6.
25. Kauppi M, Stenholm S, Impivaara O, Mäki J, Heliövaara M, Jula A. Fall-related risk factors and heel quantitative ultrasound in the assessment of hip fracture risk: A 10-year follow-up of a nationally representative adult population sample. Osteoporos Int 2014; 25(6):1685-95.
26. Wu Q, Liu J, Gallegos-Orozco JF, Hentz JG. Depression, fracture risk, and bone loss: a meta-analysis of cohort studies. Osteoporosis International 2010; 21(10): 1627-35.
27. Ping G, Shikai W, Yiping Z, Xinhua S, Xuemin J, Mincai Q, et al. Prevalence of osteopenia and osteoporosis and factors associated with decreased bone mineral density in elderly inpatients with psychiatric disorders in Huzhou, China. Shanghai Arch Psychiatry 2012; 24(5): 262–270.
28. Chen SJ, Liao WC, Huang KH, Lin CL, Tsai WC, Kung PT et al. Chronic obstructive pulmonary disease and allied conditions is a strong independent risk factor for osteoporosis and pathologic fractures: A population-based cohort study. QJM *2015;* 108 (in press).
29. Graat-Verboom L, Smeenk FW, van den Borne BE, Spruit MA, Jansen FH, van Enschot JW, et al. Progression of osteoporosis in patients with COPD: A 3-year follow up study. Respir Med 2012; 106(6):861-70.
30. Nguyen ND, Eisman JA, Center JR, Nguyen TV. Risk factors for fracture in nonosteoporotic men and women. J Clin Endocrinol Metab 2007; 92(3):955-62.

October 2016;3(10) ISSN: ISSN: 2349-5340
DOI: 10.5281/zenodo.159668 Impact Factor: 3.052

31. Edwards MH, Jameson K, Denison H, Harvey NC, Sayer AA, Dennison EM et al. Clinical risk factors, bone density and fall history in the prediction of incident fracture among men and women. Bone 2013; 52(2):541-7.
32. Hippisley-Cox J and Coupland C. Derivation and validation of updated QFracture algorithm to predict risk of osteoporotic fracture in primary care in the United Kingdom: Prospective open cohort study. BMJ 2012 ; 344:e3427.
33. Makras P, Athanasakis K, Boubouchairopoulou N, Rizou S, Anastasilakis AD, Kyriopoulos J et al. Cost-effective osteoporosis treatment thresholds in Greece. Osteoporos Int 2015;26(7):1949-57
34. Cheung E, Cheung CL, Kung AW, Tan KC. Possible FRAX-based intervention thresholds for a cohort of Chinese postmenopausal women. Osteoporos Int 2014; 25(3): 1017-23.
35. Borgström F, Johnell O, Kanis JA, Jönsson B, Rehnberg C. At what hip fracture risk is it cost-effective to treat? International intervention thresholds for the treatment of osteoporosis. Osteoporos Int 2006; 17 (10): 1459-71.
36. Tosteson AN, Melton LJ 3rd, Dawson-Hughes B, Baim S, Favus MJ, Khosla S et al. National Osteoporosis Foundation Guide Committee. Cost-effective osteoporosis treatment thresholds: the United States perspective. Osteoporos Int 2008; 19(4):437-47.
37. Rubin KH. The use of risk assessment tools in the clinical management of osteoporosis 2013. http://findresearcher.sdu.dk /portal /files / 85918640 / Afhandling_samlet_med_forside_FINAL_KHR.pdf
38. Sambrook PN, Flahive J, Hooven FH, Chapurlat R, Lindsay R, Nguyen TV et al. Predicting Fractures in an International Cohort Using Risk Factor Algorithms without BMD. J Bone Miner Res 2011; 26(11): 2770-7.