

Risk Factors for fall among Elderly in a Rural Community in El-Monofya Governorate

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Abstract

Introduction: The onset of falls is shocking for elderly and their families, extremely affecting elderly quality of life and taking a severe economic fee. Falls and its consequent injuries are major problems that often require medical attention. Thus, the aim of the current study was to assess risk factors for fall among elderly in a rural community in El-Monofya Governorate. **Design:** A descriptive exploratory research design was utilized in the current study. **Setting:** the study was conducted at in a rural community in El-Monofya Governorate, Egypt. **Tools:** Data were collected through elderly falls interview schedule which was designed by research investigators based on an extensive literature review. Including two parts: The first part; includes personnel characteristics of elderly as age, sex, history of fall, level of education, previous and current occupation, the second part included question about intrinsic as well as extrinsic risk factors of falls. **Results:** the study revealed that the mean age of elderly was 73.842 ± 8.375 ; meanwhile 35.3% of elderly were exposed to falls during the last year. Intrinsic risk factors for falls such as chronic conditions (hypertension, arthritis, asthma, osteoporosis, anemia, renal failure, liver diseases, cardiac problems, cerebrovascular stroke, leg fracture affecting mobility, Alzheimer, and Parkinson's) were reported by 76.8%, 68.4%, 28.3%, 23.9%, 14.3%, 28.7%, 27.9%, 7.4%, 7%, 4%, 4.4% and 2.6% of elderly respectively. A statistical significance relationship was found between incidence of falls during the last year and computed intrinsic risk factor for falls such as (chronic diseases, poly-pharmacy, stability and movement, vision problems, hearing problems, muscle strength, cardiac problems, orthostatic hypotension, foot and foot wear and fear of falls) at $p=0.000$. **Conclusion:** the study highlights falls risk factors which can help in fall prevention program. **Recommendations:** further researches are needed to identify preventive measures for falls. Raise awareness of elderly and care giver regarding falls and its sequences through health education programs and mass media.

Keywords: Falls, elderly, risk factors, rural area.

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INTRODUCTION

The number of people aged 60 or older increases by time. It is estimated that the number of elderly in the world will grow from 524 million in 2010 to nearly 1.5 billion in 2050, most of this increase will occur in developing countries[1]. In Egypt, elderly number represents 6.9% of the total population, while it is expected to rise to 11.6% in 2030 "Central Agency for Public Mobilization and Statistics [2]. Fall among elderly is defined as involuntarily coming to rest on the ground, floor or other lower level, excluding intentional change in position to rest in furniture, wall or other object [1]. Falls exponentially increase with age related biological change and frailty level. In fact, incidence of many fall injuries has markedly increased by 131% during the last three decades. If preventive measures are not taken, the number of injuries caused by falls of elderly is projected to be 100% higher in the year 2030 [3].

The latest statistics of falls across the world reached 28-35% of elderly fall each year, increasing to reach 32-42% for those over 70 years of age. Globally, an estimated 391 000 people died due to falls in 2002, making it the 2nd leading cause of unintentional injury death globally after road traffic injuries [1]. Bergen, Stevens, & Burns reported that one out of five falls causes a serious injury such as broken bones or a head injury. Each year, 3 million older people are treated in emergency departments for fall injuries, over 800,000 patients a year are hospitalized because of a fall injury, most often because of a head injury or hip fracture, and each year at least 300,000 older people are hospitalized for hip fractures. More than 95% of hip fractures are caused by falling, usually by falling sideways[4].

There are great consequences of falling that may be physical consequences including fracture (wrist, arm, ankle, hip fractures), head injuries, open wound,

and bruise or extravasation of blood, sprain, joint dislocation, brain injury, strained muscle, and joint dislocation. Functional decline as a consequence of the fall includes decline in functional status, and decline in social and physical activities [5]. Fall is one of the major causes of disability and dependency among older people worldwide. There is also a lack of awareness and understanding of falls and its risk factors. Consequently, this will lead to great physical, psychological and economic burden that will extend to families and societies as well [36]. Many elderly who fall, even if they are not injured, become afraid of falling, this fear may cause elderly to cut down on their everyday activities, when an elderly is less active, he become weaker and this increases the chances of falling [6].

Elderly exposed to falls due to either extrinsic or intrinsic risk factors. Extrinsic risk factors are related to the surrounding environment (poor building design, slippery floors and stairs, looser rugs, insufficient lighting, cracked or uneven sidewalks). Intrinsic risk factors are related to elderly age, sex, chronic illnesses (such as Parkinson's, arthritis and osteoporosis), physical and cognitive capacities decline) [7]. Gerontological nurse play an important role in preventing falls according to three levels of prevention, on the primary level the nurse act as educator aiming to promote elderly health. Preserving elderly health is the main goal as it plays an important role in preventing falls. On the secondary level, the main goal is to assess presence of risk factor for falls to educate the elderly and their family care giver how to deal and control these risk factors to prevent falls as possible. on the tertiary level, the main goal is rehabilitation of the elderly who exposed to fall [8].

Significance of the Study

The onset of falls is shocking for elderly and their families, extremely affecting the quality of life and taking a severe economic fee. Falls and its consequent injuries are major problems that often require medical attention. Falls lead to 20-30% of mild to severe injuries and more than 50% of injury related hospitalizations among elderly over 65 years and older. The major underlying causes for fall-related hospital admission are hip fracture, traumatic brain injuries and upper limb injuries [9].

Falls are a leading cause of unintentional injury and premature death worldwide. In 2015, falls were responsible for approximately 80 % of disability stemming from unintentional injuries excluding traffic accidents in adults aged 60 years and over. Globally falls are a major public health concern for older adults, and with the growing numbers of older people in populations in all parts of the world, research is urgently needed in order to establish effective policies to reduce risk also to cover the gap in falls researches about falls among elderly living in the community[10].

Already over 70 % of the world's older population live in developing countries. The proportion will increase in coming decades due to increasing longevity in all regions of the world. One of the consequences of this demographic change is that a greater share of the burden of morbidity and mortality due to falls and other chronic conditions will occur in low- and middle-income countries (Egypt is one of low- and middle-income countries)[11], therefore, falling among elderly people should be considered as a part of the public health agenda in all countries and identifying the common risk factors of falls can be used to develop specific preventive measures for reducing the falls among elderly and consequently reducing the physical, social and financial burden of fall facing the client, family and community. Although many researches were conducted to assess risk factors of falls among elderly living in geriatric homes in Egypt yet, few studies are conducted about the risk factors of falls among community dwelling elderly. Therefore, the aim of this study was to assess risk factors for falls among elderly in a rural community in El-Monofya Governorate.

Research Question

1-What are the risk factors for falls among elderly in a rural community in El-Monofya Governorate?

MATERIALS AND METHODS

Research Design

Descriptive exploratory design was conducted to fulfill this study.

Participants

$$n = \frac{N}{1 + N(e)^2}$$

Based on sample size equation [12].If (n) is the sample required and (N) is the total population and (e) is the confidence interval=850 elderly which represent 3.4% of total population , e=.05. So sample size was calculated to be 272 elderly. Elderly who met the following inclusion criteria was selected to participate in the study.

- Live in the selected villages and accept to share in the study.
- Aged 60 years or above.
- Able to communicate.
- Free from dementia

Setting: The proposed study was conducted in Grise village which is affiliated to Ashmoon city in El-Monofya Governorate. Monofia, an Egyptian province, located north of Cairo in the Nile Delta.

Tools: Data were collected using the following tool, elderly falls interview schedule: It was designed by the research investigators in Arabic langue, after reviewing of related literature. It consists of two parts:

The first part; includes the personnel characteristics of elderly as age, sex, history of falls level, of education, previous and current occupation (containing 13 questions). The second part was about risk factors of falls: Intrinsic risk factors (containing 58 questions) about gait, balance, mobility, medications, visual acuity, other neurological and cognitive impairments, muscle strength, heart rate and cardiac impairments, postural hypotension, feet and footwear, chronic diseases and fear of falls. Extrinsic risk (containing 17 questions) include factors related to the surrounding environment such as unclear pathway, inadequate lightening, slippery floors, etc.,

Scoring system: All questions were in the form of yes / no questions. Yes, answers were given 2 score while no took 1 score. Risk factors were computed and divided into mild (1-30), moderate (31-60) and severe (61-90).

Validity & Reliability: The study tool was submitted to five experts in the field of community health nursing to test the content validity. The experts agreed on the content of the tool, but recommended minor question changes that would make the information clearer and more precise. Reliability of tool was performed to confirm its consistency by using α coefficient test; it was 0.88, which means high internal consistency and consequently high reliability.

Procedure: An official permission was obtained from the Research Ethics Committee, Faculty Nursing, Cairo University, as well permission from Ministry of Social Solidarity and the Directorate of Social Affairs in Elmonofia was obtained after explaining the purpose and nature of the study. First, the investigator determined the starting point for data collection from the Primary Health Care Center of the village, then considering the four geographical directions north, east, south and west according to the geographical map of the village, the investigator selected homes that include elderly client among the family members and fulfilled the inclusion criteria was asked to participate in the study. Before the interviewing schedule, the elderly was informed about the purpose and nature of the study. Written consent was obtained from the elderly. The data was collected through the personal interviews with elderly clients at their homes over 30 minute from 4/2017 to 2/2018. Home visit continued till the required sample size was reached.

Pilot Study: A pilot study was conducted on 10% of total number of participants to investigate and ensure the feasibility, objectivity, applicability, clarity, adequacy, content validity, and internal consistency of the study tool and determine possible problems in the methodological approach or instrument. The result of the pilot study was used to test the proposed statistical

analysis methods. Elderly who participated in the pilot study were included in the study.

Ethical Consideration: A written approval was obtained from ethical and research committee of the Faculty of Nursing, Cairo University. Written informed consent was sought and obtained from each participating subject after explaining the nature & objectives of the study. Each assessment sheet was coded and subject's name was not appearing on the sheets for the purpose of anonymity and confidentiality. Subjects are free to withdraw from the study at any time. They were assured that the results of the study will not be used for any performance evaluation.

Statistical Analysis: On completion of data collection, data were tabulated and analyzed using statistical package for social sciences (SPSS) program version 20. Descriptive and inferential statistics were performed such as mean and standard deviation; frequency; percentage and correlation coefficient. Probability (p-value) less than 0.05 was considered significant and less than 0.001 was considered as highly significant. There are no significant differences in incidence of falls regarding smoking $p=0.800$

RESULTS

Research findings are presented in four parts: i: personal characteristics of elderly. Part ii: frequency distribution of intrinsic risk factors of falls among elderly. Part iii: frequency distribution of extrinsic risk factors of falls among elderly. Part iv: correlation between falls risk factors and incidence of falls.

Part I: Personal characteristics of elderly

Figure one shows that 33.5% of elderly aged from $60 \leq 65$, 15% aged from $65 \leq 70$, 20% aged from $70 \leq 75$ year, 13% aged from $75 \leq 80$, 9% aged from $80 \leq 85$, 10% aged from 85 year to more. Figure (2) shows that 48.9% of elderly were males while 51.1% were females, the figure also shows that 2.6%, 53.3%, 39.7%, 4.4 % were not married, Married, Widowed, Divorced respectively. Regarding level of education, 40.4%, 15.8%, 7.4%, 7.4%, 17.6%, 11.4% cannot read nor write, read and write, Primary level, Preparatory level, Secondary level, University respectively. As regards past work table 1 shows that 24.6% of elderly were employees, while 30.5% were farmers, 9.9% was craft men and 34.9% of them were house wives. The table also shows that only 13.2% of elderly were working while 86.8 % doesn't work, furthermore 72.1% of elderly reported that income was not enough and 27.9% was enough. 11.4% of elderly lives in rented houses and 88.6% lives in their homes. 10.7% of elderly lives alone, 20.6% house band, 32.4% lives with their sons, 2.6% lives with their relatives. As regards to history of falls, 35.3% of elderly exposed to falls during the last year. As regards to number of falls 18.75% fell once, while 46.8% exposed to twice falls, 27% exposed to three falls, 4.1% exposed to four times falls and

2.08% exposed to 5 falls. The table also shows that 24.3%, 14%, 14.3%, 9.6% and 23.9% of elderly were exposed to fracture, wounds, abrasion and joint dislocation as a result of falls respectively as showed in table 2. Respondent are not mutually exclusive.

Part II: intrinsic risk factors (chronic conditions, age- related changes such as visual function, neurological function, and musculoskeletal function, female sex)

As regards chronic conditions table (3) shows that 76.8%, 68.4%, 28.3%, 23.9%, 14.3%, 28.7%, 27.9%, 7.4%, 7%, 4%, 4.4% and 2.6% of elderly complaining of hypertension, arthritis, asthma, osteoporosis, anemia, renal failure, liver diseases, cardiac problems, and cerebrovascular stroke, leg fracture affecting mobility, Alzheimer, and Parkinsonism disease respectively. While 14.3% were smokers.

Regarding elderly medication table (4) showed that the highest percentage (57%) were taking analgesics while the lowest percentage (7.4%) were taking thyroid medication. medication for diabetes elderly taken was (44.5%) while the antihypertensive drugs represented 34.9%. Concerning movement and stability of elderly table (5) showed that 33.5%, 30.9%, 22.4%, of elderly were reported that imbalance during standing or walking, felt of unsteady or imbalance during standing or walking and use a stick respectively. While only 2.9% of elderly used wheel chair.

Regarding visual problems table (6) shows that 43% of elderly reported poor eye sight followed by (26%) complaining from cataract. While only (8.1%) of elderly reported difficult in seeing side. Regarding hearing problems table (7) shows that 21.7%, 19.9% and 11.8 % of elderly respectively complain of hearing problems, use hearing aid and hearing problems affect their activity of daily living. Regarding cognitive and neurological disturbances table 8 shows that (37.3%) of elderly complain of polyuria, it was the highest percentage followed by (35.3%) of elderly who complain of urinary incontinence. While only (8.1) % of elderly complains of chronic diarrhea. Regarding muscle strength table (9) shows that (56.6%) of elderly complain of leg weakness during walking and it is the highest percentage. Also more than of one quadrant of elderly complains of bone fracture, arthritis and musculoskeletal weakness respectively. While the lowest percentage was (13.2%) of elderly complain of central nervous system complication affect muscles.

Regarding cardiac problems table 10 shows that the highest percentage is (34.6%) of elderly complain of cardiac problems, while only (8.5%) of elderly complain of mitral valve problems. Regarding orthostatic hypotension table 11 shows that 32%, 30.1% and 25% of elderly complain of complain of

dizziness as a result of coming out of the bed, dizziness during walking and fall as a result of hypotension respectively. While only 18.8% of elderly complain of hypotension and dizziness as a result of getting up standing from sitting position. Regarding foot and foot wear table 12 shows that 18.01% of elderly lost sensation in their feet and 22.8% of elderly has difficulties in wearing their shoes. Regarding fears of falls table 13 shows that 40.8 %, 27.9% and 26.1% of elderly have fears of falling on the ground, fears affect elderly activity and stop doing their activity as a result from fear of falling respectively.

Part III extrinsic risk factors of falls

Regarding external falls risk factors table 14 shows that 84.6%, 76.1%, 36.4%, 24.6%, 52.6%, 74%, 79%, 71.7%, 72.1%, 86%, 83.8%, 77.2%, 76.5%, 47.8%, 23.5% of elderly described sitting chairs as suitable, can stand up easily from chairs, there were electrical cables in pathways, there were rugs on the round, light switches were accessible, they can use telephone without moving from their place, can use television without moving along distance, light switches was near to bed, the way from bed to path room was clear ,there was a light in bed room during sleeping, there was a light in the way from bed to path room, there was a telephone near from bed, they can switch light when enter bathroom, used bathroom with high seats and there were rugs in pathways that increase risk for falls respectively. Regarding level of dependence in activity of daily living table 15 shows that more 50% of elderly are independent personal hygiene, using bathroom and wearing clothes respectively. Also around 50% of elderly independent in food preparation, moving and transportation.

Table 16 shows that there is significant statistical positive correlation between incidence of falls and chronic conditions, multiple Medication, Stability and movement, Vision problems, hearing, CNS, muscle strength, Cardiac problems, Orthostatic hypotension, Foot and foot wear and Fear of, incidence of falls. While there no significant statistical correlation between environmental factor and incidence of falls. There are significant differences in incidence of falls regarding sex, housing, work now, income p less than 0.05, while table (17). Table (18) shows that there are significant differences in incidence of falls regarding age ($p=0.002$). While there are no significant differences in incidence of falls regarding past work ($p=0.18$) and education ($p=0.671$). There are significant differences in incidence of falls regarding age ($p=0.002$). While there are no significant differences in incidence of falls regarding past work ($p=0.18$) and education ($p=0.671$).

Part I: Personal characteristics of elderly

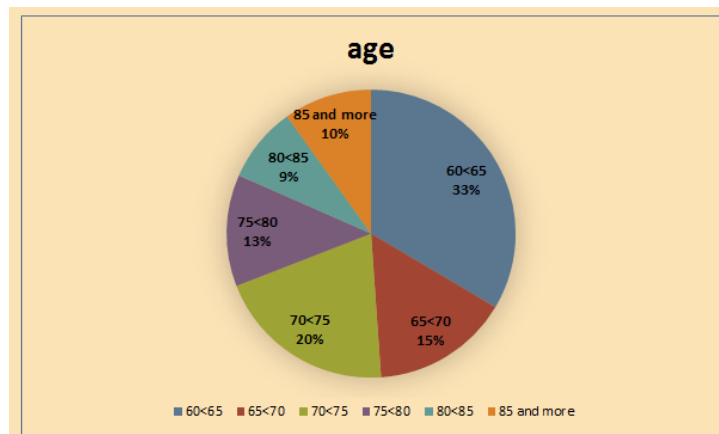


Fig-1: Percentage distribution of elderly according to age (n=272)

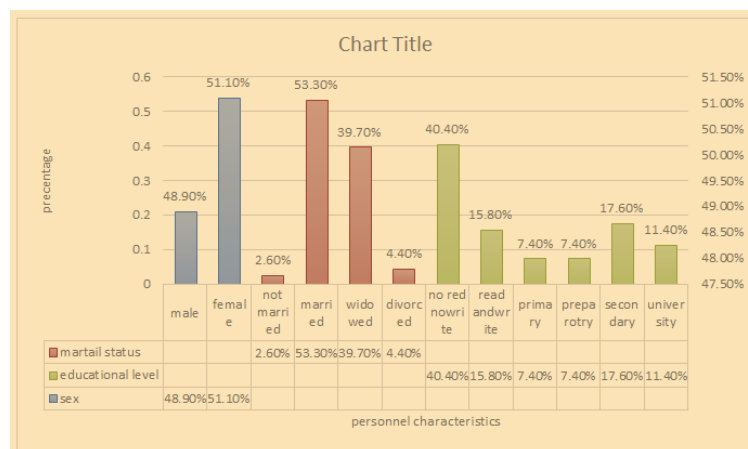


Fig-2: Frequency distribution of elderly according to personnel characteristics (n=272)

Table-1: Frequency distribution of elderly according to job history, income, housing and lives with home (n=272)

Variables		N	Percent %
Past work	Employee	67	24.6
	Farmer	83	30.5
	Craft	22	8.1
	House wife	95	34.9
	Retired	5	1.8
Current Work	Yes	36	13.2
	No	236	86.8
Income	Enough	76	27.9
	Not enough	196	72.1
Housing	Rent	31	11.4
	Owner	241	88.6
With whom elderly lives	Alone	29	10.7
	spouse	56	20.6
	Sons	88	32.4
	Extended family	92	33.8
	Relatives	7	2.6

Table-2: Frequency distribution of elderly according to history of falls (n=272)

Variables	Frequency (NO)	Percent (%)
History of falls		
Incidence of falls last year	96	35.3

Number of falls	1	18	18.75
	2	45	46.8
	3	26	27
	4	5	4.1
	5	2	2.08
Exposure to slips without falling		56	23.9
Place of falls	Indoor	193	71
	Out door	79	29
Consequence of falls (injury)		87	32
Fracture		66	24.3
Wounds		38	14
Abrasions		39	14.3
Joint dislocation		26	9.6
Visiting doctor or ER		75	27.6
Exposure to slips without falling		56	23.9

Part II: intrinsic risk factors for falls

Table-3: Frequency distribution of elderly according to chronic conditions as an intrinsic risk factors of falls (n=272)

Chronic conditions	No.	%
Hypertension	209	76.8
Arthritis	186	68.4
Asthma	77	28.3
Osteoporosis	65	23.9
Anemia	39	14.3
Chronic renal failure	78	28.7
Chronic liver diseases	76	27.9
Cardiac problem	20	7.4
Cerebrovascular stroke	19	7
Leg fracture affecting mobility	11	4
Alzheimer	12	4.4
Parkinsonism	7	2.6

Table-4: Frequency distribution of elderly according to medication as an intrinsic risk factors of falls (n=272)

Medication	No.	%
Narcotics	45	15.4
Diuretics	45	16.5
Mood stabilizers	31	11.4
Anti-convulsions	40	14.7
Anti-arrhythmic	83	30.5
Analgesics	155	57
Medications that control blood glucose level	121	44.5
Antihypertension	95	34.9
Medication to treat cancer	32	11.8
Laxatives	66	24.3
Medication to treat any thyroid disorder	20	7.4

Table-5: Frequency distribution of elderly according to movement and stability as an intrinsic risk factors of falls (n=272)

Movement and stability	No.	%
Feeling of instability during walking	84	30.9
Imbalance during standing or walking	91	33.5
Using a walker	43	15.8
Wheel chair	8	2.9
Stick	61	22.4
Crutch	18	6.6
need help in ADL	43	15.8

Risky for falls during walking	79	29
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Table-6: Frequency distribution of elderly according to visual problems as an intrinsic risk factors of falls (n=272)

visual problems	No.	%
Cataract	72	26.5
Glaucoma	53	19.5
Difficult seeing side	22	8.1
Eye dryness	25	9.2
Diabetic retinopathy	50	18.4
poor eyesight	117	43

Table-7: Frequency distribution of elderly regarding hearing problems as an intrinsic risk factors of falls (n=272)

Hearing problems	No.	%
Complain of hearing problems	59	21.7
Using hearing aids	54	19.9
Hearing problems affect ADL	32	11.8

Table-8: Frequency distribution of elderly according to cognitive and neurological condition as an intrinsic risk factors of falls (n=272)

Items.	No.	%
Forgetfulness	76	27.9
Forgetfulness noticed by friends or family	79	29
problem in IADL(going to familiar places)	59	21.7
Urinary incontinence	96	35.3
Polyuria	102	37.5
Chronic diarrhea	22	8.1

Table-9: frequency distribution of elderly according to muscle strength and its causes as an intrinsic risk factors of falls (n=272)

Items	No.	%
Musculoskeletal weakness	71	26.1
Central nervous system complication affecting muscle	36	13.2
Fracture of bone.	72	26.5
Arthritis	72	26.5
Leg weakness during walking	154	56.6
Ankle weakness during walking	86	31.6

Table-10: Frequency distribution of elderly according to cardiac problems as an intrinsic risk factors of falls (n=272)

Items	No.	%
Complain of cardiac problems	94	34.6
Cardiac arrhythmia	74	27.2
Myocardia infraction	44	16.2
Chest pain	34	12.5
Heart failure	33	12.5
Mitral valve problems	23	8.5

Table-11: Frequency distribution of elderly according to orthostatic hypotension as an intrinsic risk factors of falls (n=272)

Orthostatic hypotension	No.	%
complain from hypotension	51	18.8
falls as a result of hypotension	68	25
complain from dizziness as a result of coming out of the bed	87	32
complain from dizziness during walking	82	30.1
complain from dizziness as a result of standing from sitting position	51	18.8

Table-12: Frequency distribution of elderly according to foot and foot wear as an intrinsic risk factors of falls (n=272)

Foot and foot wear	N	%
Did you lost sensation in your foot	49	18.01
Did you have any difficulties in wearing your shoes	62	22.8

Table-13: Frequency distribution of elderly according to fears of falls as an intrinsic risk factors of falls (n=272)

Fears of falling	No.	%
fears of falling on the ground	111	40.8
Fears of falling affect your activity	76	27.9
Stopping of certain activity as a result from fear of falling	71	26.1

Part III extrinsic risk factors of falls**Table-14: Frequency distribution of elderly in relation to external risk factors of falls (n=272)**

Items	No.	%
Suitable sitting chair	230	84.6
easily stand up	207	76.1
Is there electrical cables in pathways	99	36.4
Is there rugs on the ground	67	24.6
Accessible of light switch	143	52.6
reachable telephone	203	74
easily turn on and off television	215	79
light switches near to bed	195	71.7
Clear pathway to bed	196	72.1
light on during sleeping	234	86
light in the way to path room	228	83.8
telephone near to the bed	210	77.2
Switches on the light when enter path room	208	76.5
Using path room with high seats	130	47.8
Rugs in path ways that increase the risk for falls	64	23.5

Table-15: Level of dependency of elderly regarding to the activity of daily living (n= 272)

Activity of daily living	Degree of dependence	Frequency	Percentage
Personal hygiene	Dependent	29	10.7
	Partial	93	34.2
	Independent	150	55.1
wearing clothes	Dependent	27	9.9
	Partial	87	32
	Independent	158	58.1
Using bathroom	Dependent	25	9.2
	Partial	90	33.1
	Independent	157	57.7
Food preparation	Dependent	29	10.7
	Partial	110	40.4
	Independent	133	48.9
Moving and transportation	Dependent	36	13.2
	Partial	101	37.1
	Independent	135	49.6

Table-16: Correlation between risk factors and incidence of falls among elderly (n=272)

Computed risk factors	Incidence of falls	
	R	P
Chronic conditions	.318	0.00
Medication	0.338	0.00
Stability and movement	0.510	0.00
Vision	0.296	0.00
Hearing	0.214	0.00
CNS	0.239	0.00

muscle strength	0.484	0.00
Cardiac problems	0.288	0.00
Orthostatic hypotension	0.298	0.00
Foot and foot wear	0.280	0.00
Fear of falls	0.432	0.00
Environmental external	0.009	0.887

Table-17: Correlation between Sociodemographic and Incidences of falls (a nova test)

Variables		Mean	SD	F	P
Age	60<65	1.3077	.46410	4.026	.002
	65<70	1.1429	.35417		
	70<75	1.3636	.48548		
	75<80	1.4118	.49955		
	80<85	1.5217	.51075		
	85 and more	1.5926	.50071		
Education	no read, no write	1.3909	.49019	.638	.671
	read, write	1.3256	.47414		
	Primary	1.4000	.50262		
	Preparatory	1.3500	.48936		
	Secondary	1.3542	.48332		
	University	1.2258	.42502		
Income source	Work	1.1379	.35093	3.015	.030
	Retirement	1.3471	.47803		
	Sons	1.4314	.49771		
	Social	1.3000	.47016		
Marital status	Not married	1.0000	.00000	6.549	.000
	Married	1.2621	.44128		
	Widowed	1.4722	.50156		
	Divorced	1.5833	.51493		
Past work	Employee	1.2388	.42957	1.579	0.180
	Farmer	1.3976	.49238		
	Craft	1.4091	.50324		
	Housewife	1.3684	.48494		
	Retired	1.6000	.54772		
With whom elderly lives	Alone	1.4828	.50855	3.185	0.014
	Husband	1.2679	.44685		
	Sons	1.4659	.50170		
	All	1.2609	.44152		
	Relative	1.2857	.48795		

Table-18: Difference of elderly incidence of falls according to their demographic characteristics

Variables	Categories	Mean	SD	t	P
Sex	Male	1.406	.49294	1.793	0.001
	Female	1.302	.46085		
Smoking	No	1.3391	.47441	-	.080
	Yes	1.4359	.50236		
Income	Enough	1.4211	.49701	1.429	0.015
	Not enough	1.3265	.47014		
Housing	Rented	1.2581	.44480	-	0.03
	Owner	1.3651	.48247		
Current work	No	1.3898	.48875	4.501	0.00
	Yes	1.1111	.31873		

There are significant differences in incidence of falls regarding sex, housing, work now, income p

DISCUSSION

Part i: personal characteristics of elderly

less than 0.05, while there are no significant differences in incidence of falls regarding smoking p=0.800.

According to age the current study revealed that more than one quadrant of elderly aged from sixty

to fewer sixty-five years. This result was supported by Kamel, Abdulmajeed, & Ismail, [13] who conducted a study to assess risk factors of falls among elderly living in urban Suez – Egypt and founded that more than half of the studied population (53.5%) were in the age group of 60-64. Regarding the marital status the current study revealed that more than half of the elderly were female. This result was supported by Hong Wua and Peng Ouyangb [14] who conducted a study about fall prevalence, time trend and its related risk factors among elderly people in China and founded that more than half of elderly were female. Current study revealed more than half of elderly were married. This study was similar to anjos *et al.* [15] who conducted a study to assess falls in elderly adults—an analysis of injuries and sociodemographic conditions in Fortaleza, Ceara, Brazil, and founded that more than one half of participants were married.

In relation to educational level this study indicated that more than one third of elderly cannot read nor write, this result doesn't supported by Basler, O'connell, & Bundy[14] who conducted a study about near-falls in elderly community-dwelling blacks from two out-patient clinics in Harlem and founded that founded that about one third of elderly have Associate's degree and higher (28%). From the investigator point of view, this result may be due to the nature of rural community as there weren't great interest about education in the past. Due to the nature of rural community as there weren't great interest about education in the past. Regarding previous employment, research investigators founded that more than one than one quadrant of elderly were not employed, this study was similar to Gamage, Rathnayake, & Alwis[16] who conducted a study about knowledge and perception of falls among community dwelling elderly in SriLanka, more than the half of elderly were un employed. Regarding with whom elderly lives the current study revealed that more than one quadrant of elderly lived with their husband and children. This study was similar to Gamage *et al.*, (2018) who showed more than two third of elderly lived with their families.

The current study also revealed that more than one third of elderly were exposed to at least one falls during last year. This result was supported by kamel *et al.* [13] who conducted a study to assess risk factors of falls among elderly living in urban Suez – Egypt and founded that more than half of the studied population were fallen at least on time last year. As Regards the place of fall the current study revealed that more than one half of falls occurred in door. This result was supported by kamel *et al.* [13] who founded that more than one third of elderly were fallen in door. This result goes with do, change, Kuran, & Thompson[17] who reported that in 2014, 28.7% of older adults in the united states reported an estimated 29.0 million falls in the preceding 12 months do, chang, kuran, & thompson[17]. In Iran astudy about prevalence,

circumstances and consequences of unintentional falls among elderly Iranians, that was done by sotoudeh, mohammadi, mosallanezhad, viitasara, & soares[18] showed that the prevalence of falls was 39.7% and higher in women than in men. Regarding consequence of falls (injury) the current study revealed that near one quadrant of elderly who exposed to falls complained from fractures as a result of falls. This result was supported by do, chang, kuran, & thompson[17] who conducted a study about fall-related injuries among Canadian seniors, (2005–2013): an analysis of the Canadian community health survey founded that fall-related injuries by type of injury, the majority of fall related injuries involved broken or fractured bones (37%), sprains or strains (27%) and scrapes, bruises or blisters (17%) respectively.

Part ii: Intrinsic risk factors of falls among elderly

Regarding chronic conditions, the current study revealed that the most common chronic condition was hypertension represented 76.8% of total elderly followed by arthritis representing 68.4% of total elderly, this result was supported by Sibley, Voth, Munce, Straus, & Jaglal[20] who conducted a study about chronic disease and falls in community-dwelling Canadians over 65 years old: a population-based study exploring associations with number and pattern of chronic conditions, in Candia, founded that hypertension prevalence among elderly was 50.2 % followed by arthritis 43.4%. Another study that was done by Damián, Pastor-barriuso, Valderrama-gama, & Pedro-cuesta[19] about factors associated with falls among older adults living in institutions in Spain, reported that the strongest risk factor was number of diseases. Other variables associated with falls were: urinary incontinence, antidepressant use, arrhythmias, and polypharmacy.

Concerning commonly used medication the current study revealed that elderly use analgesics followed by hypoglycemic medication. This result was not supported by another study that was done in Egypt by kamel *et al.* [13] about risk factors of falls among elderly living in urban Suez – Egypt, founded that about one third of the elderly use of non-steroidal anti-inflammatory drugs and about half use hypoglycemic medications. A study about risk factors of falls in community dwelling active elderly that was done by [21] in Finland, founded that more than half of elderly used antihypertensive medication followed by NSAID (less than one half). This difference may be due to the prevalence of chronic condition among elderly. Egyptian elderly use medication without doctor prescription (peer advice). Poly pharmacy increases the risk for falls as it may lead to hypoglycemia or syncopal attack as a result of drug interaction leading to falls.

In respect of walking aids, the current study revealed that nearly one quadrant of elderly use stick. The finding was at the same line with Fong, Siu,

Yeung, Cheung, & Chan[23]who conducted a study about falls among the community-living elderly people in Hong Kong and founded that more than one quadrant of elderly use walking stick also this result was supported by Roman de mettelinge & Cambier, (2015) who conduct a study in Belgium to understanding the relationship between walking aids and falls in older adults: a prospective cohort study, founded that half of elderly use walking aids. Using walking aid is great proof that elderly need assistance during walking that increase elderly risk for falls.

Concerning visual problems, the current study revealed that nearly half of elderly complain from diminished vision followed by about one quadrant of elderly complain from cataract. In the same line Dhargave & Sendhilkumar[24] who conducted a study about prevalence of risk factors for falls among elderly people living in long-term care homes in India and reported that about half of elderly complain from poor vision. From research investigator point of view visual impairment can increase the risk for falls among elderly.

In relation to hearing problems, the current study revealed that nearly one quadrant of elderly have hearing problems, this results was supported by Lin & Ferrucci[25]who conducted a study about hearing loss and falls among older adults in the united states, founded that hearing loss was prevalent in 14.3% of these participants, and 4.9% of the participants reported falling over the preceding 12 months. In the same line Gopinath, McMahon, Burlutsky, & Mitchell[26] who conducted a study about hearing and vision impairment and the 5-year incidence of falls in older adults in Australia reported that participants with severe self-perceived hearing problems versus no hearing problems and using hearing aids had 75% increased likelihood of incident falls.

Regarding cognitive and neurological disturbances the current study showed that urinary incontinence representing about one third of elderly, this results was supported by a systematic review that was done by Noguchi, Chan, Cumming, Blyth, & Naganathan[27]about the association between lower urinary tract symptoms and falls, injuries, and fractures in community-dwelling older men, reported that urinary incontinence and lower urinary tract storage symptoms have weak to moderate association with falls in community-dwelling older men in studies with low risk of bias for confounding. Urinary incontinence increase elderly risk for falls as it increases elderly fast movement without caring for any obstacles in the way to bathroom

Regarding muscle strength and falls the current study showed that more than half of elderly complained from leg weakness during walking. Cebolla, Rodacki, & Bento[28] conduct a study about balance, gait, functionality and strength: comparison

between elderly fallers and non-fallers in Brazil founded that fallers have reduced lower limb strength, gait alterations, Another study about muscle strength of lower extremities related to incident falls in community-dwelling older adults that was done by (Yusuke Suzuki, 2015) reported that muscle strength have a great relation with falls. Reduced lower limb strength lead to unsafe movement and gait alterations increasing the risk for falls.

As regards cardiac problems, the current study showed that the most common cardiac problem among elderly was cardiac arrhythmia this results was not in agreement with Stenhagen, Ekström, Nordell, & Elmståhl[29]who conducted a study about falls in the general elderly population prospective study of risk factors using data from the longitudinal population study 'Good ageing in Skane' in sweden and found that heart failure more common this difference may be related to life style difference from Egypt and sweden.

Regarding orthostatic hypotension, the current study revealed that about one third of elderly complained from dizziness as a result of coming out of the bed this result was supported by Dhargave & Sendhilkumar[24]who conducted a study about prevalence of risk factors for falls among elderly people living in long-term care homes in India and founded that vertigo is one of falls risk factors among elderly followed by orthostatic hypotension. Also another study that was done in Sohag governorate by Hamed, Mohammed, & Aly[30]about elderly falls prevalence and associated factors in Sohag governorate, concluded that more than half of elderly complained from orthostatic hypotension. Orthostatic hypotension almost followed by falls on the ground among elderly. Sherrington & Menz, (2003) conducted a study about footwear worn at the time of fall-related hip fracture Footwear advice in, Sydney, Australia and founded that many older people who have had a fall-related hip fracture were wearing potentially hazardous footwear when they fell. The wearing of slippers or shoes without fixation may be associated with increased risk of tripping. Additionally, a systematic literature review that was done by Menant, Steele, Menz, Munro, & Lord, (2008), reported that older people should wear shoes with low heels and firm slip-resistant soles both inside and outside the home to decrease the risk for falls. From the research investigators point of view, some shoes or slippers can make elderly more likely to slip, trip or stumble. Foot wear advice is effective at reducing foot pain in this age group reducing the risk for falls. Foot wear should be appropriate to elderly condition as if not it increase elderly risk to slips and falls..

Regarding foot and foot wear the current study founded that the most common risk factor is that the elderly has difficulties in wearing their shoes this result was supported by Duckham *et al.* [31] who conducted a study about footwear and falls in the home among

older individuals in Boston founded that may be advisable for older individuals to wear shoes in their home whenever possible to minimize the risk of falling. Foot pain affects at least one in four older people, is frequently disabling, and is associated with mobility impairment and falls in this age group. The major risk factors for the development of foot pain are increasing age, female sex, obesity, depression and common chronic conditions such as diabetes and osteoarthritis.

Regarding to fear of falls the current study founded that more than ded that more than one third of elderly complained from fears of falling on the ground has result was supported by liu[32] who conducted a study about fear of falling in robust community-dwelling older people: results of a cross-sectional study in china [28] and founded that more than half of elderly have fear of fall on the ground. Kalron, aloni, givon, & menascu[33] also reported that fear of falls has a great effect on level of elderly physical activity and increase the risk for falls among elderly.

Part iii: frequency distribution of extrinsic risk factors of falls among elderly

Regarding the second part, extrinsic risk factors of falls it related to the surrounding environment, the current study showed that the most common risk factor founded in the surrounding environment was presence of rugs and in general this results was supported by lord, menz, & sherrington[34]who conducted a study about home environment risk factors for falls in older adults in Australia and reported that people and the efficacy of home modifications the existence of home hazards alone is insufficient to cause falls. Rather, the interaction between an older person's physical abilities and their exposure to environmental stressors appears to be more important. Environmental hazards may pose the greatest risk for older people with fair balance, whereas those with poor balance are less exposed to hazards and those with good mobility are abler to withstand them.

Regarding level of dependency in activity of daily living the current study showed that more than one half of elderly are independent in pathing, take off and take on clothes and using bathroom, also showed that nearly one half of elderly are independent in nutrition and moving and transportation this may be due to the nature of the rural community as the elderly maintain appropriate level of physical activity after the age of 60-year-old.this result was supported by another study that was done in use by alvarez barbosa *et al.* [35]about factors associated with the risk of falls of nursing home residents aged 80 or older and founded that participants of no-fall risk group showed better lower limb performance, quality of life, and functional status. It may be due to great level of dependence of elderly in geriatric homes and deceased level of activity. Level of dependence among elderly is another

indicator of risk for falls as come more frail and dependent

Part iv: correlation between falls risk factors and incidence of falls

The current study showed that there was significant statistical positive correlation between incidence of falls and chronic conditions, multiple medication, stability and movement, vision problems, hearing, CNS, muscle strength, cardiac problems, orthostatic hypotension, foot and foot wear and fear of, incidence of falls. Foot and foot wear and fear of, incidence of falls. While there no significant statistical correlation between environmental factor and incidence of falls. In the same line a study was done in Sohag governorate by hamed *et al.*[30]about elderly falls prevalence and associated factors in Sohag governorate, reported that factors significantly affected elderly leading to falls were age, living alone, most of the environmental factors, medication use significantly affected falls occurrence among elderly population. In addition, balance and mobility factors, sensory and neuromuscular factors. This result is due to the falls among elderly is multifactorial not depend only on one risk factor.

The current study showed that there was significant statistical positive correlation between incidence of falls and chronic conditions, multiple medication, stability and movement, vision problems, hearing, CNS, muscle strength, cardiac problems, orthostatic hypotension, foot and foot wear and fear of, incidence of falls. In relation to foot problems and foot wears the current study revealed that there was significant statistical correlation between incidence of falls and foot wears and foot problems, this result was supported by (Menz, Auhl, & Spink, 2018) who conducted :a systematic review and meta-analysis about foot problems as a risk factor for falls in community-dwelling older people and reported that foot problems, particularly foot pain, hallux valgus and lesser toe deformity, were associated with falls in older people.

While there no significant statistical correlation between environmental factor and incidence of falls this results weren't supported by (Kim & Portillo, 2018) who conducted a study about fall hazards within senior independent living: a case-control study and founded that home hazards were significantly and independently associated with the incidence rate of falls.

Regarding fears of falls the current study showed that there was a significant statistical positive correlation between incidence of falls and fear of falls this result was supported by (Greenberg, Sullivan-Marx, Chittams, & Cacchione, 2016) who conducted a study about Measuring fear of falling among high-risk, urban, community-dwelling older adults in West Philadelphia USA reported that fear of falling affect overall function, including potential hindrance to

conducting various activities that could lead to deconditioning, decreased mobility, increased falls, anxiety, social isolation, depression, and other negative consequences. This result also supported by (Young & Mark Williams, 2015) who carried out a study about how fear of falling can increase fall-risk in older adults and reported that fear of falls has a great impact on falls rate among elderly.

In relation to muscle strength the current showed that there was a significant statistical positive correlation between incidence of falls and low muscle strength. This result was supported by (Gadelha, Neri, Bottaro, & Lima, 2018) who concluded that low-muscle strength is associated with a higher incidence of falls among elderly.

CONCLUSION

It is important to take a holistic view of what contributes to falls prevention among elderly. Falls is multifactorial that's mean no one risk factor can lead to falls but combination of intrinsic and extrinsic risk factor leads to falls. Some of falls risk factors are preventable as polypharmacy, keep elderly physical active and independent in activity of daily living. Other preventable risk factors are vision and hearing problems through regular checkup and treatment of any disorder. Other risk factors are not preventable as chronic diseases; cardiac problems elderly should be educated how to deal with.

Recommendations

Based on the findings of the study, the following recommendations were suggested:

- Replication of the study on a nationwide large scale sample of elderly in rural communities in Egypt.
- Further researches to identify best preventive measures for falls.
- Raise awareness of elderly and care giver regarding falls and its sequences through health education programs and mass media.

REFERENCES

1. WHO. (2017). Global Health and Aging. *NIH Publication No 117737*, 1(4), 273–277. Retrieved from [http://links.jstor.org/sici?sici=0095-9006\(196024\)1:4%3C273:HAA%3E2.0.CO;2-C](http://links.jstor.org/sici?sici=0095-9006(196024)1:4%3C273:HAA%3E2.0.CO;2-C)
2. Central Agency for Public Mobilization and Statistics (Egypt) | GHDx. (n.d.). Retrieved December 23, 2018, from <http://ghdx.healthdata.org/organizations/central-agency-public-mobilization-and-statistics-egypt>
3. Kenny, R. A & McGrath, M. (2012). Prevention in the Home: Challenges for New Technologies. *Intelligent Technologies for Bridging the Grey Digital Divide*, 46–63. <https://doi.org/10.4018/978-1-61520-825-8.ch004>
4. Bergen, G., Stevens, M. R., & Burns, E. R. (2016). Falls and Fall Injuries Among Adults Aged ≥65 Years — United States, 2014. *MMWR. Morbidity and Mortality Weekly Report*, 65(37), 993–998. <https://doi.org/10.15585/mmwr.mm6537a2>
5. Stel, V. S., Smit, J. H., Pluijm, S. M. F., & Lips, P. (2010). Consequences of falling in older men and women and risk factors for health service use and functional decline. *Age and Ageing*, 33(1), 58–65. <https://doi.org/10.1093/ageing/afh028>
6. Croyle, B., & Johnson, J. (2015). Message from Check out these news books in our Library!, (November).
7. Deliverable, D., Annicchiarico, R., & Barban, F. (2012). Taxonomy of ICT Fall Management Services. 1–53.
8. Kirkpatrick, H., Boblin, S., Ireland, S., & Robertson, K. (2014). The nurse as bricoleur in falls prevention: Learning from a case study of the implementation of fall prevention best practices. *Worldviews on Evidence-Based Nursing*, 11(2), 118–125. <https://doi.org/10.1111/wvn.12026>
9. Rippke, M., Briske, L., Keller, L., Strohschein, S., & Simonetti, J. (2010). Public Health Interventions Applications for Public Health Nursing Practice. *Minnesota Department of Health*, (March). 72–81.
10. Gamage, N., Rathnayake, N., Alwis, G., Beattie, B. L., Litwic, A., Edwards, M. H., ... WHO. (2015). No Title Development status and application of phenolic foam. *Age and Ageing*, 5(1), 99–103. <https://doi.org/10.1007/s00391-003-0143-8>
11. Dionyssiotis, Y. (2012). Analyzing the problem of falls among older people. *International Journal of General Medicine*, 5, 805–813. <https://doi.org/10.2147/IJGM.S32651>
12. Israel, G. D. (1992). *Using Published Tables Using Formulas To Calculate A Sample Size Using A Census For Small Populations. Distribution*. <https://doi.org/10.1007/11915034>
13. Kamel, M. H., Abdulmajeed, A. A., & Ismail, S. E.-S. (2013). Risk factors of falls among elderly living in urban Suez--Egypt. *The Pan African Medical Journal*, 14, 26. <https://doi.org/10.11604/pamj.2013.14.26.1609>
14. Basler, G. V., O'Connell, K. A., & Bundy, K. (2017). Near-falls in elderly community-dwelling blacks from two out-patient clinics in Harlem. *Nursing Research*, 66(1), 49–53. <https://doi.org/10.1097/NNR.0000000000000195>
15. Anjos, R. E. D. S. Dos, De Lima Saintrain, M. V., Pinheiro, S. S., De Carvalho Pádua Cardoso, L., Filho, M. A. M. C., De Almeida, M. I., & Santos, Z. M. S. A. (2016). Falls in Elderly Adults - An Analysis of Injuries and Sociodemographic Conditions. *Journal of the American Geriatrics Society*. <https://doi.org/10.1111/jgs.14058>
16. Gamage, N., Rathnayake, N., & Alwis, G. (2018). Knowledge and perception of falls among community dwelling elderly: A study from southern Sri Lanka. *Current Gerontology and Geriatrics Research*. <https://doi.org/10.1155/2018/7653469>

17. Do, M. T., Chang, V. C., Kuran, N., & Thompson, W. (2015). Fall-related injuries among Canadian seniors, 2005-2013: an analysis of the Canadian Community Health Survey. *Health Promotion and Chronic Disease Prevention in Canada : Research, Policy and Practice*. <https://doi.org/http://dx.doi.org/10.1016/j.chb.2013.07.020>
18. Sotoudeh, G. R., Mohammadi, R., Mosallanezhad, Z., Viitasara, E., & Soares, J. J. F. (2018). SC. *Archives of Gerontology and Geriatrics*. <https://doi.org/10.1016/j.archger.2018.08.001>
19. Damian, J., Al, E., Damián, J., Pastor-Barriuso, R., Valderrama-Gama, E., & de Pedro-Cuesta, J. (2013). Factors associated with falls among older adults living in institutions. *BMC Geriatr*, 13(6). <https://doi.org/10.1186/1471-2318-13-6>
20. Sibley, K. M., Voth, J., Munce, S. E., Straus, S. E., & Jaglal, S. B. (2014). Chronic disease and falls in community-dwelling Canadians over 65 years old: A population-based study exploring associations with number and pattern of chronic conditions. *BMC Geriatrics*. 14(1), 1–11. <https://doi.org/10.1186/1471-2318-14-22>
21. Tuunainen, E., Rasku, J., Jäntti, P., & Pyykkö, I. (2014). Risk factors of falls in community dwelling active elderly. *Auris Nasus Larynx*. <https://doi.org/10.1016/j.anl.2013.05.002>
22. Roman De Mettelinge, T., & Cambier, D. (2015). Understanding the relationship between walking AIDS and falls in older adults: A prospective cohort study. *Journal of Geriatric Physical Therapy*. <https://doi.org/10.1519/JPT.0000000000000031>
23. Fong, K. N. K., Siu, A. M. H., Yeung, K. A., Cheung, S. W. S., & Chan, C. C. H. (2013). Falls among the community-living elderly people in Hong Kong: A retrospective study. *Hong Kong Journal of Occupational Therapy*. 21(1), 33–40. <https://doi.org/10.1016/j.hkjot.2011.05.005>
24. Dhargave, P., & Sendhilkumar, R. (2016). Prevalence of risk factors for falls among elderly people living in long-term care homes. *Journal of Clinical Gerontology and Geriatrics*. 7(3), 99–103. <https://doi.org/10.1016/j.jcgg.2016.03.004>
25. Lin, F. R., & Ferrucci, L. (2013). Hearing loss and falls among older adults in the United States. *Archives of Internal Medicine*. <https://doi.org/10.1001/archinternmed.2011.728>
26. Gopinath, B., McMahon, C. M., Burlutsky, G., & Mitchell, P. (2016). Hearing and vision impairment and the 5-Year incidence of falls in older adults. *Age and Ageing*. 45(3), 353–358. <https://doi.org/10.1093/ageing/afw022>
27. Noguchi, N., Chan, L., Cumming, R. G., Blyth, F. M., & Naganathan, V. (2016). A systematic review of the association between lower urinary tract symptoms and falls, injuries, and fractures in community-dwelling older men. *Aging Male*. <https://doi.org/10.3109/13685538.2016.1169399>
28. Cebolla, E. C., Rodacki, A. L. F., & Bento, P. C. B. (2015). Balance, gait, functionality and strength: Comparison between elderly fallers and non-fallers. *Brazilian Journal of Physical Therapy*. <https://doi.org/10.1590/bjpt-rbf.2014.0085>
29. Stenhagen, M., Ekström, H., Nordell, E., & Elmståhl, S. (2013). Falls in the general elderly population: A 3- and 6- year prospective study of risk factors using data from the longitudinal population study Good ageing in Skane. *BMC Geriatrics*. <https://doi.org/10.1186/1471-2318-13-81>
30. Hamed, A. F., Mohammed, N. A., & Aly, H. (2017). Elderly Falls Prevalence and Associated Factors in Sohag Governorate. 35(4), 1–13.
31. Duckham, R. L., Procter-Gray, E., Hannan, M. T., Leveille, S. G., Lipsitz, L. A., & Li, W. (2013). Sex differences in circumstances and consequences of outdoor and indoor falls in older adults in the MOBILIZE Boston cohort study. *BMC Geriatrics*. 13(1), 133. <https://doi.org/10.1186/1471-2318-13-133>
32. Liu, J. Y. W. (2015). Fear of falling in robust community-dwelling older people: Results of a cross-sectional study. *Journal of Clinical Nursing*. 24(3–4), 393–405. <https://doi.org/10.1111/jocn.12613>
33. Kalron, A., Aloni, R., Givon, U., & Menascu, S. (2018). Gait & Posture Fear of falling , not falls , impacts leisure-time physical activity in people with multiple sclerosis. *Gait & Posture*, 65(June), 33–38. <https://doi.org/10.1016/j.gaitpost.2018.06.174>
34. Lord, S. R., Menz, H. B., & Sherrington, C. (2014). Home environment risk factors for falls in older people and the efficacy of home modifications. In *Age and Ageing*. <https://doi.org/10.1093/ageing/afl088>
35. Álvarez Barbosa, F., Del Pozo-Cruz, B., Del Pozo-Cruz, J., Alfonso-Rosa, R. M., Sañudo Corrales, B., & Rogers, M. E. (2016). Factors associated with the risk of falls of nursing home residents aged 80 or older. *Rehabilitation Nursing*. <https://doi.org/10.1002/rnj.229>
36. Rechel, B., Doyle, Y., Grundy, E., & Mckee, M. (2011). How can health systems respond to population ageing? *WHO Europe*, 43. Retrieved from http://www.euro.who.int/__data/assets/pdf_file/0004/64966/E92560.pdf