# Epidemiology of falls among elderly people attending primary healthcare centers in Abha City, Saudi Arabia

**Eman H. Assiri** (1)
**Majed H. Assiri** (2)
**Safar A. Alsaleem** (3)
**Ahmed H. Assiri** (4)
**Afrah H. Assiri** (5)
**Razia Aftab Ahmed** (3)
**Ossama A. Mostafa** (3)

(1) Family Medicine Resident, Ministry of Health, Saudi Arabia
(2) Nursing Specialist, Ministry of Health, Saudi Arabia
(3) Family and Community Medicine Department, King Khalid University, Saudi Arabia
(4) PharmD Student, King Khalid University, Saudi Arabia
(5) Ministry of Health, Saudi Arabia

**Corresponding author:**
Dr. Ossama A. Mostafa
Family and Community Medicine Department, King Khalid University,
Saudi Arabia
**Email:** dr.ossama@gmail.com

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## Abstract

Objectives: To assess the prevalence and determinants of falls among people aged 65 years or more attending primary health care centers in Abha City, 2018.

Methodology: A cross–sectional study was carried out in Abha City, Saudi Arabia. It included a representative sample of 402 elderly participants aged above 65 years who attended five selected primary health care (PHC) centers. A self-administered structured questionnaire in simple Arabic language was designed by the researchers and was used for data collection. It included socio-demographic variables, and variables related to falls (e.g. disease history, currently received medications, physical functional capacity assessment and falls history during the past 12 months).

Results: Participants' age ranged between 66 and 130 years (Mean± SD= 75.9±10.3 years). History of falling was reported among 58.5%. Multivariate logistic regression analysis revealed that never worked elderly persons were less likely to have falls compared to retired persons (adjusted odds ratio "AOR"=0.61, p=0.032). Patients with cardiac disease were at significant risk (AOR=2.19, p=0.021). Those with vertigo were at almost double risk to have a fall (AOR=2.40, p<0.001). Elderly persons with sensory visual problems were at a significant risk for fall (AOR=1.61, p=0.043). Those who needed a supporting aid to walk were at almost 3-folds risk to have falls (AOR=3.25; p<0.001).

Conclusions: Falls constitute a common health problem affecting more than half of elderly people attending PHC centers in Abha City, despite the fact that they can be easily prevented.

Key words: Falls, Elderly, Risk factors, Saudi Arabia.

## Introduction

In 2012, there were around 810 million elderly people alive worldwide; two-thirds of those were living in developing countries. It was postulated that this number will reach two billion by 2050(1). As for Saudi Arabia, in 2012, there were 4.9% (1.4 million) of the Saudi population over the age of 60 years(2) .The same report predicted that this number will reach up to 21.8% (10 million) by 2050(2).

Fall is defined as: “coming in contact with the ground or another surface, suddenly and without expectation”(3). Among older individuals, falls are common. Injuries that result from these falls can be life threatening. Moreover, with a foreseeable increase in the elderly group worldwide, falls and their resultant injuries in the elderly are becoming an important public health concern. This is a significant chunk of the population with health care needs on the increase, especially with outcomes from falls. Hence a need, not only to address risk factors, but also to bring to light interventions that work and improve upon overall quality of life for the elderly(4).

Falls and fall-related injuries among elderly people are major issues for health and social care providers worldwide. This is due to the rapid increases in life expectancy observed during the twentieth century. Fall-induced injuries are increasing more rapidly than can be accounted for by the increase in the elderly population. Fall causes considerable costs as well as physical and social costs(5).

The elderly experience their health differently from during their youth. Those who are more prone to falls usually suffer from more than one impairment in posture and balance, cognition, and overall physical health (6).

The ageing process results in progressive deterioration of the visual, vestibular, somatosensory systems, reduced speed of central processing and reductions in muscle strength. These physiologic changes are often accompanied by a generalized slowing of postural responses and altered movement patterns for older adults compared with young adults(7). Moreover, some factors are normally associated with falls among elderly are due to diseases and drugs side effects, although there are other factors like environmental factors(8).

Falling, or a fear of falling, has considerable implications on an elderly person’s lifestyle, resulting in decreased activity and mobility, and an increase in dependence affecting the person’s quality of life(9). Elderly persons who have fallen once or twice are likely to fall again within a year(10).

Falls and fall-induced injuries in elderly people are a major public health problem in modern societies with aging populations. Injuries, in turn, are the fifth leading cause of death in elderly people, and most of these fatal injuries are related to falls(11).Moreover, fall-induced injuries are increasing more rapidly than can be accounted for by the increase in the elderly population. Fall causes considerable costs as well as physical and social costs(12).

The magnitude of falls among the elderly in Malaysia was 4.07%,(13) 11.1% in China,(14) 8% in Japan,(15) and 19.3% in Hong Kong,(16) while in Riyadh, 49.9% of elderly Saudis had experienced one or more falls during a 12-month period(2).

Falls are the major reason for hospital admission or a residential care setting, even when no serious injury has occurred. Falls are the most serious and frequent home accident among elderly people(5). Falls can cause various serious outcomes in elderly persons, especially those in health care facilities. Examples of these outcomes include fall-related fractures of the lower extremities which will eventually lead to dependency. Having such an outcome will lead to prolonged hospitalizations and increase in healthcare costs, affecting the economy as a whole(17).

Falls among the elderly may also result in a post-fall syndrome that includes dependence, loss of autonomy, confusion, immobilization and depression. Moreover, falls among the elderly represent a major economic and social problem. This decreases their quality of life both at home and in institutional care settings, which will lead to a further restriction in daily activities(18).

The World Health Organization (WHO) reported that falls are the second leading cause of accidental or unintentional injury deaths worldwide. Each year an estimated 646,000 individuals die from falls globally of which over 80% are in low- and middle-income countries. Adults older than 65 years of age suffer the greatest number of fatal falls. Each year, 37.3 million falls occur that are severe enough to require medical attention(19).

Kannus et al. reported that the number of fall-induced deaths among the elderly shows a clear increase. Therefore, detailed epidemiological studies, in addition to investigations of possible behavioral, environmental, and biological predisposing factors and dynamics, are needed to better understand this phenomenon. There is a clear increase of falls in both women and men. For this reason, falls-prevention and interventions should be urgently implemented to control the problem(11).

The high risk of falls among elderly people can stem from the increased use of medications because of the many health problems acquired in the aged population which leads to drug-drug interactions. Another reason for the increase in falls is cognitive decline in this population and a greater use of psychotropic medications(20). Therefore, the elderly need to be educated and motivated on fall prevention strategies to help reduce the incidence of falls(17).

Since there have been reports of an increased risk of falls in people aged 65 and older, it is necessary to put fall-prevention interventions in place, so as to try to reduce the incidents(20). Moreover, the WHO noted that fall prevention strategies should emphasize education of elderly, training of caregivers and health care providers, creating safer environments, prioritizing fall-related research and establishing effective policies to reduce risk(19).

This study aimed to explore magnitude and epidemiology of falling among elderly people attending PHC centers in Abha City.

## Methods

This research followed a cross-sectional design. It was conducted in Abha City, Saudi Arabia. Five PHC centers were randomly selected to conduct the present study. All elderly (aged >65 years) attendants to the study PHC centers constituted the study population.

The inclusion criteria for the present study were being an elderly (aged >65 years) and being registered at a PHC center in Abha City. The exclusion criteria were being younger than 65 years or being a guest, i.e., not registered at the study PHC center.

Based on thorough review of literature, the researchers constructed a structured, self-administered questionnaire in a simple Arabic language. The questionnaire comprised the following two parts:

**I.** Socio-demographic characteristics: Age, gender, residence, nationality, educational status, occupation, marital status, and cohabitation status.

**II.** Variables about factors related to falls:

- Disease history: Presence of chronic diseases (e.g., diabetes, hypertension, osteoarthritis, cardiac or neurological disorders), gait or imbalance disorders, sensory (visual or auditory) problems.
- Currently received medications.
- Physical functional capacity assessment (23).
- History of falls during the past 12 months.

A pilot study was conducted on 15 subjects to test the wording, clarity and reliability of the questions. The results of this pilot study helped in re-phrasing, adding or omitting some questions. The collected data within the pilot study were not included into the main study. By way of feedback, the questionnaire was clear and understandable.

The researchers fulfilled all the required official approval. Interviews were applied by trained interviewers. During visits to the study PHC centers, elderly participants were briefed regarding objectives of the research. They were requested to fill out the study questionnaire in the presence of the interviewers. Participants were assured that there would be no negative consequences if they decided to participate or not to participate in this study. They were also assured about the anonymity and full confidentiality of their responses. Their verbal consent to participate was then requested.

Collected data were verified by hand then coded before computerized data entry. The Statistical Package for Social Sciences (IBM-SPSS version 25.0) was used for data entry and analysis. Descriptive statistics (e.g. number, percentage, range, mean, standard deviation) and inferential statistics (e.g., $X2$) were applied. Multivariate logistic regression analysis was performed for significant variables of bivariate analysis to control for confounding effect. Adjusted odds ratio (AOR) and their 95% confidence interval (CI) were computed and p-values <0.05 were considered as statistically significant.

This study was carried out at the full expense of the researchers, with no conflict of interest.

## Results

Four hundred and two elderly patients participated in the study. Their age ranged between 65 and 97 years with a mean±standard deviation (SD) of 75.9±10.3 years. The other personal characteristics are summarized in Table 1. Slightly more than half of them (51.2%) were males. The majority were Saudis (96%). Almost two-thirds of the participants (66.9%) were illiterate and married (65.2%) and 58.3% of the participants had never worked . Regarding living status, 56% of the elderly people lived with their spouse and children whereas only 8.7% lived alone.

Table 2 shows that the majority of participants reported a history of at least one chronic disease (80.6%). The commonest disease was diabetes mellitus (50.7%), followed by hypertension (49.3%), osteoarthritis (23.1%) and cardiac diseases (16.4%). Half of the participants had imbalance disorder, whereas vertigo was observed among 47% of them. Sensory auditory problems were reported among 35.3% of participants, whereas sensory visual problems were observed among 54%. History of drug intake was mentioned by most of the participants (79.4%). The commonest taken were anti-hypertensives (49.5%) and anti-diabetics (47.8%), followed by psychiatric drugs (16.4%) and diuretics (11.2%).

Table 3 shows that home activities and shopping were performed by 67.9% and 60% of participants, respectively. Need a companion and supporting aid to walk were stated by 44.8% and 61.2%, respectively. Daily climbing stairs was mentioned by 60.4%, whereas history of using grab-bars at home was mentioned by 52.2%.

Table 4 shows that history of falling was reported by 58.5%. Among these , it was once, among 71.5% or more than once among 28.5%. Regarding place of falling, indoors was reported by 65.5%, outdoors by 28.5% or both indoors and outdoors by 6%. Concerning time of falling, morning was stated by 67.7%, at night, by 24.7%, or both at morning and night by 7.7% of participants.

Table 5 shows that the highest falling incidents were observed among persons aged between 76 and 85 years (68.1%), whereas the lowest were observed among those aged between 66 and 75 years. This difference was statistically significant, p=0.017. There was a statistically significant association between educational level of the participants and their history of falls as 63.4% of illiterate persons compared to 40.7% and 46.2% of those of intermediate school and university graduation, respectively had a history of falls, p=0.014. Retired persons had more history of falls compared to those who had never worked (63.2% versus 50.9%). This difference was statistically

significant, p=0.015. Concerning the marital status, the highest falls incidents were reported among widowed persons (69%), whereas the lowest were reported among divorced persons (46.2%), p=0.043. Gender, nationality and living status of the participants were not significantly associated with history of falls.

Table 6 shows that cardiac patients had more history of falls compared to non-cardiac persons (75.8% versus 55.1%), p=0.002. Stroke patients had significantly more incidents of falls compared to non-stroke persons (87.5% versus 56.6%), p=0.002. Participants with imbalance disorders had more incidents of falls compared to those without these disorders (70.6% versus 46.3%), p<0.001. Also, participants with vertigo had more fall incidents compared to those without vertigo (74.1% versus 44.6%), p<0.001. Patients with sensory visual problems had more fall incidents compared with those without such problems (65.4% versus 50.3%), p=0.007. Patients with diabetes, hypertension, osteoarthritis, epilepsy, and sensory auditory problem were not significantly associated with more incidents of falls.

Table 7 shows that participants on daily medications had more history of falls compared to those without daily medication history (61.4% versus 47%), p=0.017. Patients on medications for analgesics, anti-coagulants, thyroid drugs, drugs for asthma, Alzheimer, etc., were significantly associated with more history of falls compared to those without such medications (78.6% versus 57%), p=0.025. History of daily intake of anti-diabetic, anti-hypertensive, anti-arrhythmic, psychiatric or diuretic medications was not significantly associated with history of falls.

Table 8 shows that participants who reported history of going shopping by themselves had significantly less history of falls compared to their counterparts (53.1% versus 66.5%), p=0.008. Elderly persons who need a companion or a supporting aid to walk had more incidents of falls compared to others, p<0.001. Elderly persons who used grab-bars at home reported more incidents of falls compared to those who did not use them (63.8% versus 52.6%), p=0.023. Doing home activities and daily climbing stairs were not significantly associated with history of falls.

Table 9 shows the multivariate logistic regression analysis of study variables. It revealed that, after controlling for confounding, neverworked elderly persons had less history of fall compared to retired persons (Adjusted odds ratio “AOR”=0.61; 95% confidence interval “CI”=0.38-0.96, p=0.032). Patients with cardiac disease were significantly associated with more falls compared to those without cardiac diseases (AOR=2.19; 95% CI=1.13-4.25, p=0.021). As opposed to patients without vertigo, those with vertigo were twice more associated with falls (AOR=2.40; 95% CI=1.51-3.81, p<0.001). Considering elderly persons without sensory visual problems as a reference category, those with sensory visual problems had significantly more falls (AOR=1.61; 95% CI=1.01-2.54, p=0.043). Elderly persons who need a supporting aid to walk had almost 3-folds more falls compared to those without the need of help to walk (AOR=3.25; 95% CI=2.04-5.17, p<0.001). Age, educational level, marital status, chronic diseases, stroke, imbalance disorder, medications, go shopping, need a companion to walk with and using grab-bars at home were not significantly associated with more falls.

**Table 1: Socio-demographic characteristics of elderly participants, primary healthcare centers, Abha City**

| Characteristics | Frequency | Percentage |
|---|---|---|
| **Age (years)** | | |
| • <75 | 231 | 57.4 |
| • 76-85 | 113 | 28.1 |
| • 86-95 | 36 | 9.0 |
| • >95 | 22 | 5.5 |
| Range | 66-97 | |
| Mean±SD | 75.9±10.3 | |
| **Gender** | | |
| • Male | 206 | 51.2 |
| • Female | 196 | 48.8 |
| **Nationality (n=399)** | | |
| • Saudi | 283 | 96.0 |
| • Non-Saudi | 16 | 4.0 |
| **Educational level (n=401)** | | |
| • Illiterate | 268 | 66.9 |
| • Primary school | 74 | 18.5 |
| • Intermediate school | 27 | 6.7 |
| • Secondary school | 19 | 4.7 |
| • University | 13 | 3.2 |
| **Job status (n=396)** | | |
| • Retired | 165 | 41.7 |
| • Never worked | 231 | 58.3 |
| **Marital status** | | |
| • Married | 262 | 65.2 |
| • Not married | 11 | 2.7 |
| • Widowed | 116 | 28.9 |
| • Divorced | 13 | 3.2 |
| **With whom are you living?** | | |
| • Spouse only | 43 | 10.7 |
| • Spouse and children | 225 | 56.0 |
| • Alone | 35 | 8.7 |
| • Children/relatives | 99 | 24.6 |

**Table 2: Participants' medical history, Abha City**

| Medical history | Frequency | Percentage |
|---|---|---|
| Chronic diseases | 324 | 80.6 |
| • Diabetes mellitus | 204 | 50.7 |
| • Hypertension | 198 | 49.3 |
| • Osteoarthritis | 93 | 23.1 |
| • Cardiac diseases | 66 | 16.4 |
| • Stroke | 24 | 6.0 |
| • Epilepsy | 4 | 1.0 |
| Imbalance disorder | 201 | 50.0 |
| Vertigo | 189 | 47.0 |
| Sensory auditory problems | 142 | 35.3 |
| Visual problems | 217 | 54.0 |
| Daily medication intake: | 319 | 79.4 |
| • Anti-hypertensives | 199 | 49.5 |
| • Anti-diabetes | 192 | 47.8 |
| • Psychiatric drugs | 66 | 16.4 |
| • Diuretics | 45 | 11.2 |
| • Anti-arrhythmia | 17 | 4.2 |
| • Others | 28 | 7.0 |

**Table 3: Physical functional capacity of elderly participants, primary healthcare centers, Abha City**

| Physical functional capacity | Frequency | Percentage |
|---|---|---|
| Doing home activities | 273 | 67.9 |
| Shopping | 241 | 60.0 |
| Need a companion to walk | 180 | 44.8 |
| Need a supporting aid to walk | 246 | 61.2 |
| Daily climbing stairs | 243 | 60.4 |
| Using grab-bars at home | 210 | 52.2 |

**Table 4: History of previous falling of elderly participants within the last 12 months, Abha City**

| History of falling | Frequency | Percentage |
|---|---|---|
| Falling within the last 12 months | 235 | 58.5 |
| Frequency: | | |
| • Once | 168 | 71.5 |
| • More than once | 67 | 28.5 |
| Place of falling: | | |
| • Indoor | 154 | 65.5 |
| • Outdoor | 67 | 28.5 |
| • Both indoor and outdoor | 14 | 6.0 |
| Time of falling: | | |
| • Morning | 159 | 67.7 |
| • Night | 58 | 24.7 |
| • Both | 18 | 7.7 |

Table 5: Association between participants' socio-demographic characteristics and history of falls during the last 12 months

| Sociodemographic Characteristics | Fall | | $\chi^2$ (p-value) |
|---|---|---|---|
| | No (167) No. (%) | Yes (n=235) No. (%) | |
| Age (years) | | | |
| • <75 (n=231) | 111 (48.1) | 120 (51.9) | |
| • 76-85 (n=113) | 36 (31.9) | 77 (68.1) | |
| • 86-95 (n=36) | 12 (33.3) | 24 (66.7) | 5.66 |
| • >95 (n=22) | 8 (36.4) | 14 (63.6) | (0.017*) |
| Gender | | | |
| • Male (n=206) | 92 (44.7) | 114 (55.3) | 1.69 |
| • Female (n=196) | 75 (38.3) | 121 (61.7) | (0.193)** |
| Nationality (n=399) | | | |
| • Saudi (n=383) | 157 (41.0) | 226 (59.0) | 0.51 |
| • Non-Saudi (n=16) | 8 (50.0) | 8 (50.0) | (0.473)** |
| Educational level (n=401) | | | |
| • Illiterate (n=268) | 98 (36.6) | 170 (63.4) | |
| • Primary school (n=74) | 36 (48.6) | 38 (51.4) | |
| • Intermediate school (n=27) | 16 (59.3) | 11 (40.7) | |
| • Secondary school (n=19) | 9 (47.4) | 10 (52.6) | 6.05 |
| • University (n=13) | 7 (53.8) | 6 (46.2) | (0.014)* |
| Job status (n=396) | | | |
| • Retired (n=231) | 85 (36.8) | 146 (63.2) | 5.98 |
| • Not working (n=165) | 81 (49.1) | 84 (50.9) | (0.015)** |
| Marital status | | | |
| • Married (n=262) | 120 (45.8) | 142 (54.2) | |
| • single (n=11) | 4 (36.4) | 7 (63.6) | |
| • Widowed (n=116) | 36 (31.0) | 80 (69.0) | 8.16 |
| • Divorced (n=13) | 7 (53.8) | 6 (46.2) | (0.043)* |
| With whom are you living? | | | |
| • Spouse only (n=43) | 18 (41.9) | 25 (58.1) | |
| • Spouse and children (n=225) | 100 (44.4) | 125 (55.6) | |
| • Alone (n=35) | 10 (28.6) | 25 (71.4) | 3.40 |
| • Children/relatives (n=99) | 39 (39.4) | 60 (60.6) | (0.335)* |

*Chi-square for trend **Pearson's Chi-square

**Table 6: Association between participants' medical history and their history of falls during the last 12 months**

| Medical history | Fall | | $\chi^2$ (p-value) |
|---|---|---|---|
| | No (167) No. (%) | Yes (n=235) No. (%) | |
| Chronic diseases | | | |
| • No (n=78) | 43 (55.1) | 35 (44.9) | 7.36 |
| • Yes (n=324) | 124 (38.3) | 200 (61.7) | (0.007)* |
| Diabetes mellitus | | | |
| • No (n=198) | 87 (43.9) | 111 (56.1) | 0.92 |
| • Yes (n=204) | 80 (39.2) | 124 (60.8) | (0.337)* |
| Hypertension | | | |
| • No (n=204) | 90 (44.1) | 114 (55.9) | 1.13 |
| • Yes (n=198) | 77 (38.9) | 121 (61.1) | (0.288)* |
| Osteoarthritis | | | |
| • No (n=309) | 126 (40.8) | 183 (59.2) | 0.32 |
| • Yes (n=93) | 41 (44.1) | 52 (55.9) | (0.570)* |
| Cardiac diseases | | | |
| • No (n=336) | 151 (44.9) | 185 (55.1) | 9.73 |
| • Yes (n=66) | 16 (24.2) | 50 (75.8) | (0.002)* |
| Stroke | | | |
| • No (n=378) | 164 (43.4) | 214 (56.6) | |
| • Yes (n=24) | 3 (12.5) | 21 (87.5) | 0.002** |
| Epilepsy | | | |
| • No (n=398) | 166 (41.7) | 232 (58.3) | |
| • Yes (n=4) | 1 (25.0) | 3 (75.0) | 0.448** |
| Imbalance disorders | | | |
| • No (n=201) | 108 (53.7) | 93 (46.3) | 24.59 |
| • Yes (n=201) | 59 (29.4) | 142 (70.6) | (<0.001) |
| Vertigo | | | |
| • No (n=213) | 118 (55.4) | 95 (44.6) | 35.82 |
| • Yes (n=189) | 49 (25.9) | 140 (74.1) | (<0.001) |
| Sensory auditory problems | | | |
| • No (n=260) | 117 (45.0) | 143 (55.0) | 3.62 |
| • Yes (n=142) | 50 (35.2) | 92 (64.8) | (0.057)* |
| Sensory visual problems | | | |
| • No (n=185) | 92 (49.7) | 93 (50.3) | 7.36 |
| • Yes (n=217) | 75 (34.6) | 142 (65.4) | (0.007)* |

*Pearson's Chi-square **Fisher Exact Test

**Table 7: Association between participants' medication history and their history of falls during the last 12 months**

| Medications Intake | Fall | | $\chi^2$ (p-value) |
|---|---|---|---|
| | No (167) No. (%) | Yes (n=235) No. (%) | |
| Medications | | | |
| • No (n=83) | 44 (53.0) | 39 (47.0) | 5.67 |
| • Yes (n=319) | 123 (38.6) | 196 (61.4) | (0.017)* |
| Anti-hypertensive drugs | | | |
| • No (n=203) | 90 (44.3) | 113 (55.7) | 1.32 |
| • Yes (n=199) | 77 (38.7) | 122 (61.3) | (0.251) |
| Anti-diabetics | | | |
| • No (n=210) | 92 (43.8) | 118 (56.2) | 0.93 |
| • Yes (n=192) | 75 (39.1) | 117 (60.9) | (0.335)* |
| Diuretics | | | |
| • No (n=357) | 150 (42.0) | 207 (58.0) | 0.30 |
| • Yes (n=45) | 17 (37.8) | 28 (62.2) | (0.587)* |
| Psychiatric drugs | | | |
| • No (n=336) | 142 (42.3) | 194 (57.7) | 0.44 |
| • Yes (n=66) | 25 (37.9) | 41 (62.1) | (0.509)* |
| Anti-arrhythmic drugs | | | |
| • No (n=385) | 163 (42.3) | 222 (57.7) | |
| • Yes (n=17) | 4 (23.5) | 13 (76.5) | 0.097** |
| Others° | | | |
| • No (n=374) | 161 (43.0) | 213 (57.0) | 5.01 |
| • Yes (n=28) | 6 (21.4) | 22 (78.6) | (0.025)* |

*Pearson chi-square **Fisher exact test

°Others: Analgesics, anti-coagulants, thyroid drugs, drugs for asthma, Alzheimer, etc.

**Table 8: Association between participants' physical functioning capacity and their history of falls within the last 12 months**

| Physical functional capacity | Fall | | $\chi^2$ (p-value)* |
|---|---|---|---|
| | No (167) No. (%) | Yes (n=235) No. (%) | |
| Doing home activities | | | |
| • No (n=129) | 46 (35.7) | 83 (64.3) | 2.71 |
| • Yes (n=273) | 121 (44.3) | 152 (55.7) | (0.100) |
| Go shopping | | | |
| • No (n=161) | 54 (33.5) | 107 (66.5) | 7.08 |
| • Yes (n=241) | 113 (46.9) | 128 (53.1) | (0.008) |
| Need a companion to walk | | | |
| • No (n=222) | 119 (53.6) | 103 (46.4) | 29.70 |
| • Yes (n=180) | 48 (26.7) | 132 (73.3) | (<0.001) |
| Need a supporting aid to walk | | | |
| • No (n=155) | 98 (63.2) | 57 (36.8) | 48.42 |
| • Yes (n=246) | 69 (28.0) | 177 (72.0) | (<0.001) |
| Daily climbing stairs | | | |
| • No (n=159) | 64 (40.3) | 95 (59.7) | 0.18 |
| • Yes (n=243) | 103 (42.4) | 140 (57.6) | (0.671) |
| Using grab-bars at home | | | |
| • No (n=192) | 91 (47.4) | 101 (52.6) | 5.19 |
| • Yes (n=210) | 76 (36.2) | 134 (63.8) | (0.023) |

*Pearson chi-square

**Table 9: Predictors of fall among the elderly participants, primary healthcare centers, Abha city: Results of multivariate logistic regression analysis**

| | B | SE | AOR | 95%CI | p-value |
|---|---|---|---|---|---|
| **Job status (n=396)** | | | | | |
| Retired (n=231)[a] | | | 1.0 | --- | |
| Not working (n=165) | -0.502 | 0.234 | 0.61 | 0.38-0.96 | 0.032 |
| **Cardiac diseases** | | | | | |
| No (n=336) [a] | | | 1.0 | --- | |
| Yes (n=66) | 0.783 | 0.339 | 2.19 | 1.13-4.25 | 0.021 |
| **Vertigo** | | | | | |
| No (n=213) [a] | | | 1.0 | --- | |
| Yes (n=189) | 0.875 | 0.236 | 2.40 | 1.51-3.81 | <0.001 |
| **Sensory visual problems** | | | | | |
| No (n=185) [a] | | | | | |
| Yes (n=217) | | | 1.0 | --- | |
| | 0.473 | 0.234 | 1.61 | 1.01-2.54 | 0.043 |
| **Need a supporting aid to walk** | | | | | |
| No (n=155) [a] | | | 1.0 | --- | |
| Yes (n=246) | 1.179 | 0.237 | 3.25 | 2.04-5.17 | <0.001 |

**a: Reference category B: Slope SE: Standard error**
**AOR: Adjusted odds ratio CI: Confidence interval**

Variables of age, educational level, marital status, chronic diseases, stroke, imbalance disorder, medications, going shopping, need a companion to walk and using grab-bars at home were removed from the final logistic regression model (i.e., not significant)

## Discussion

In the current study, falling was reported among more than half of the elderly people attending primary healthcare centers (58.5%). It occurred more than once among 28.5% of them. A similar figure has been reported in Riyadh, Saudi Arabia by Alshammari, et al. (57.7%)(24). However, the figures reported in this study and in another Saudi study carried out in Riyadh are higher than those reported in other Gulf countries, such as in Qatar (34%), being once among 47% of them and twice or more among 53% of them(25). Additionally, these figures are almost double those reported in other areas of the world such as Brazil,(26) United States, (27) India (28) and Japan (29) . In an earlier study conducted in the Eastern Mediterranean Region, the rate of falls among elderly ranged between 30% and 40% annually (30).

The high occurrence of falls reported among the Saudi elderly population could be a reflection of the lack of physical activity and their sedentary life which represents a serious health risk, particularly among elderly people(31).

Regarding place of falling, indoor falls were reported by most elderly (71.5%) whereas outdoor falls were reported by about one third. This finding is in agreement with that of Dhargave et al., who reported that 87.5% of falls occurred at home and 12.5% occurred outside(32).

Concerning time of falling, most incidents (75.4%) occurred during the morning, whereas 32.4% occurred at night. The same has been documented by Dhargave et al., who reported that 72.5% of falls occurred in the morning(32). This may be explained by the fact that most daily activities of the elderly people occur in the morning.

The highest rate of falling was observed among persons aged 76-85 years. However age was not a predictor for falls after controlling for confounders by multivariate logistic regression analysis. In Riyadh, falls progressively increased with advancing age(24). Also, in the Eastern Mediterranean Region, the incidence of falls was observed to increase steadily from middle-age onward, peaking in persons older than 80 years(30).

In the present study, falls did not differ according to gender. Similarly, several other studies, carried out in India(33) and the USA(34) reported no difference between elderly men and women regarding occurrence of falls. However, a Saudi study carried out in Riyadh revealed that falls were more significantly reported among elderly women(24). Also, several other studies found that females were more prone to falls compared to males (10, 32, 35-38).

In bivariate analysis, history of falls was more reported among illiterate, retired and widowed elderly people. However, after controlling for confounders by multivariate logistic regression analysis, only working status remained significant as retired people had more history of falls compared to non-working. This could be explained by the fact that the activity of retired people might be higher than that of non-working people, which may increase their susceptibility to falls.

In both bivariate and multivariate analysis in the current study, patients with visual sensory problems had more history of falls. The same has been observed by others(33, 39).

The present study showed that elderly people with a history of at least one chronic disease had more history of falls. Among studied individual chronic diseases, people with cardiac problems, stroke, imbalance disorder, vertigo, sensory visual problems had more history of falls. However, after controlling for confounders by multivariate logistic regression analysis, only those with cardiac diseases, vertigo and sensory visual problems had significantly more falls. In other studies carried out in Saudi Arabia(26) and Canada (40), the risk of falling was significantly higher in individuals with chronic conditions compared to those without. In a study carried out in India, elderly patients with chronic diseases, such as diabetes mellitus, hypertension, asthma, cardiovascular diseases, rheumatoid arthritis and cataract/refractive errors were at higher risk for falls(28). In another Indian study carried out in geriatric homes, poor vision, history of chronic diseases, use of walking aids, vertigo, and imbalance were significant risk factors for falls among elderly people(32). In a study carried out in Korea, visual and gait problems were responsible for most of falls among elderly(41). In Brazil, elderly patients with gait problems were more significantly like to have falls(26). In a meta-analysis that included 74 studies, the risk factors for falls were: previous history of falls, gait problems, using walking aids, vertigo, and Parkinson's disease(42).

Bivariate analysis in the present study revealed that elderly persons on medications had more falls compared to those without medications, particularly those on analgesics, anti-coagulants, thyroid drugs, drugs for asthma, Alzheimer. However, these effects disappeared after controlling for confounders in a multivariate logistic regression analysis. In a similar study carried out in India among residents of geriatric homes, use of multiple medications was significantly associated with falls(32). Also, in a recent study carried out in Riyadh, multiple drug use was a significant risk factor for falls(24). Mizukami et al. confirmed the association between polypharmacy and risk of falls among elderly individuals in Japan(29). Antiepileptic drugs use proved to be a risk factor for falls in a meta-analysis study(42). Using antidepressant medications was associated with increased risk of falls according to studies carried out by others(10, 33) .

The association between use of drugs and history of falls that was shown in bivariate analysis in the current study and was confirmed in other studies, could be attributed to the fact that elderly people may be more sensitive to drug effects and less efficient at metabolizing medications, leading to adverse events, which in turn lead to falls(43). In addition, using multiple drugs for chronic health problems can lead to dizziness, blackouts, and consequently

falls(44). Thus, falls may occur as a direct consequence of the patient's underlying impaired health status or it may be due to the side effects of some medications or the intake of multiple medications, or a combination of both of these factors.

Most falls are associated with the reduced functional capacity. The present study revealed that elderly persons who reported a history of going shopping had less history of falls compared to their counterparts, whereas those who needed a companion or a supporting aid to walk or used grab-bars at home had more history of falls compared to others. However, as a result of the cross-sectional design of the study, we could not establish if falls happened as a result of these behaviors or falls led to these behaviors. After controlling for confounders, only the need for a supporting aid to walk was shown to be a significant risk factor for falls. The finding of an association between reduced physical capacity and falls has been reported in several other studies(10, 34, 45-46).

**Strengths and limitations of the study**

The present study highlighted the existence of falls as a major problem among elderly patients attending PHC centers in Abha City and explored some important preventable risk factors. However the study has two important limitations. This study included only those who attended PHC centers, which could affect the generalizability of findings. Also, its cross-sectional design is another important limitation as it proves association, rather than causation, between the independent variables and falls.

## Conclusion

Falls are a common health problem affecting most elderly people attending PHC centers in Abha City. Falls mostly occur indoors during the daytime. Falls among elderly people are associated with several characteristics, such as job status, medical factors, such as vertigo, sensory visual problems and cardiac diseases and behavioral factors, such as using a supporting aid to walk. Therefore, there is a need to raise awareness of the public through mass media messages regarding the high occurrence of falls among elderly people. Elderly people must receive more attention and special care than the rest of the community through organizing and implementing of an effective preventive program for falls. PHC physicians should screen all elderly people for the risk of falls as their prediction is an easy task.

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