Global prevalence of falls in the older adults: a comprehensive systematic review and meta-analysis

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Abstract
Background: With increasing life expectancy, declining mortality, and birth rates, the world's geriatric population is increasing. Falls in the older people are one of the most common and serious problems. Injuries from falls can be fatal or non-fatal and physical or psychological, leading to a reduction in the ability to perform activities of daily living. The aim of this study was to determine the prevalence of falls in the older people through systematic review and meta-analysis.

Methods: In this systematic review and meta-analysis, the data from studies on the prevalence of falls in the older people in the world were extracted in the databases of Scopus, Web of Science (WoS), PubMed and Science Direct, and Google Scholar, Magiran and Scientific Information Database (SID) without any time limit until August 2020. To analyze the eligible studies, the stochastic effects model was used, and the heterogeneity of the studies with the I² index was investigated. Data analysis was conducted with Comprehensive Meta-Analysis software (Version 2).

Results: In the review of 104 studies with a total sample size of 36,740,590, the prevalence of falls in the older people of the world was 26.5% (95% CI 23.4–29.8%). The highest rate of prevalence of falls in the older people was related to Oceania with 34.4% (95% CI 29.2–40%) and America with 27.9% (95% CI 22.4–34.2%). The results of meta-regression indicated a decreasing trend in the prevalence of falls in the older people of the world by increasing the sample size and increasing the research year (P<0.05).

Conclusion: The problem of falls, as a common problem with harmful consequences, needs to be seriously considered by policymakers and health care providers to make appropriate plans for preventive interventions to reduce the rate of falls in the older people.

Keywords: Fall, Prevalence, Accident, Systematic review, Meta-analysis

Background
Rising life expectancy and rising mortality are contradictory, and aging is a critical period in human life during which changes occur in internal and external organs. These changes cause the individual to adapt to the environment. Throughout the world, the world's geriatric population is rising as increasing life expectancy, declining mortality, and birth rates. Also, the number of people over the age of 60 is growing faster than other age groups. With this significant increase in the older people, improving their health and well-being is a priority [1]. According to studies, the geriatric population will increase from 600 million in 2000 to 1 billion and 200 million in 2025 [2].

One of the most common and serious problems among the older people is falling [1]. According to the World Health Organization (WHO), a fall is defined as an event...
that results in a person coming to rest inadvertently on the ground or floor or other lower level [3]. Injuries from falls can be fatal or non-fatal. Falls are associated with reduced quality of life and higher costs of health care. At older ages, the health effects and costs of falls are increasing significantly worldwide [4].

The fall can be due to factors such as medication, osteoarthritis, depression, dizziness, and disturbances in balance and gait (due to cerebellar damage or in connection with age-related degenerative changes in the middle and inner ear). Muscle weakness due to aging or medication can cause falls as well. The use of assistive devices, age over 80 years, postural hypotension and impaired vision (decreased adaptive power, lens opacity), and chronic diseases are among the causes of falls [5–7].

Injuries due to falls may lead to a decrease in the ability to perform activities of daily living [8]. Falls, especially in the older people, increase disability, and the injured people often do not recover to their previous functional level [9, 10]. In addition to physical injuries, falls also have psychological consequences [11]. In addition to physical injuries, falls also have psychological consequences [11]. Many people who have experienced a fall are afraid of falling, which in turn leads to immobility, followed by pressure ulcers, rhabdomyolysis, pneumonia, weakness, and increased risk of falls [12, 13]. Serious injuries caused by falls include fractures, especially pelvic and thigh fractures. Also, most injuries occur in the lower limbs, upper limbs, head, and trunk, which most of them are bruises or cuts, fractures, and dislocations.

Among them 5% lead to fractures and 5–10% to other injuries. Among the causes of hospitalization, hospitalization due to fall is 5 times more than hospitalization due to other injuries [16]. The prevalence of falls in people over 65 is 30% in the USA, 13.7% in Japan, 26.4% in China, and 53% in India [17]. Research has also shown that the prevalence of falls is higher in older women than men [18].

The average fall in a nursing home is 1.5 falls per year per bed. Investigating and reducing risk factors reduces the risk of falls. Regular assessment in a nursing home can help identify high-risk patients [19]. The evaluation includes fall conditions, the patient’s complete physical history, and search for possible risk factors. One of the most effective strategies for preventing falls is multifactor interventions aimed at identifying risk factors, muscle strengthening exercises with balance training, and quitting psychedelic drugs [20, 21].

Methods
Searching strategy and study selection
The present study was conducted to investigate the prevalence of falls in the older people worldwide via systematic review and meta-analysis. To collect data in this study, international databases, Scopus, Web of Science, PubMed, Science Direct, Google Scholar, SID, Magiran were sought without any time limit until August 2020. The search process was carried out in the mentioned databases using the English keywords, "Prevalence; "Fall; "Slip; "Older people; "Older adult; and the Persian keywords Fall; Accidents; Older people; and their possible combinations in international bases. For instance, how to search the PubMed database is described in the box below. To study the Gray literature, the review of related sites was also on the agenda. To maximize the comprehensiveness of the search, the list of the sources used in all related articles that were found in the above search was manually reviewed. Initially, the duplicate studies in various searched databases were excluded from this study. Then, the researchers of this study prepared a list of titles of all the remaining articles to obtain eligible articles by evaluating the articles in this list. In the first stage, screening, the title, and abstract of the remaining articles were carefully studied, and irrelevant articles were removed based on the inclusion and exclusion criteria. In the second stage, the evaluation of the suitability of the studies, the full text of the possible relevant articles remaining from the screening stage was examined based on the inclusion and exclusion criteria and in this stage, unrelated studies were eliminated. To avoid bias, all steps of reviewing sources and extracting data were performed by two researchers independently. In case any articles were not included, the reason for deleting them was mentioned. In cases where there was disagreement between the two researchers, the article was reviewed by a third party. A total of 104 studies entered the third stage, i.e., qualitative evaluation.

PubMed Search Strategy: (prevalence[Title] OR outbreak[Title]) AND (fall down[Title] OR slip[Title] OR fall[Title] OR damage[Title] OR accidental fall[Title] OR injury[Title] AND (older people[Title] OR older adult[Title] OR aged[Title]) OR (fall down[Title] AND older people[Title]) OR (slip[Title] AND older adult[Title]) OR (accidental fall[Title] AND aged[Title]).

Inclusion and exclusion criteria
Inclusion criteria include: 1—cross-sectional studies, 2—studies that have studied the prevalence of falls in the older people worldwide, 3—observational studies (non-interventional studies), 4—Persian studies, 5—English studies, and exclusion criteria include: 1—case–control studies, 2—cohort, 3—case report, 4—interventional studies, 5—letter to editor, 6—studies whose full text is not available, 7—duplication of studies, 8—systematic review and meta-analysis studies.
Qualitative evaluation

To validate and evaluate the quality of articles (i.e., methodological validity and results), a checklist appropriate to the type of study was used. The STROBE checklist is commonly used to critically and qualitatively evaluate observational studies such as the present study. The STROBE checklist consists of six general scales/sections: title, abstract, introduction, methods, results, and discussion. Some of these scales have subscales, and in total, this statement contains 32 items. In fact, these 32 items encompass various methodological aspects of the study, including title, problem statement, study objectives, type of study, the statistical population of the study, sampling method, determining the appropriate sample size, definition of variables and procedures, data collection tools, statistical analysis, and findings. Accordingly, the maximum score obtained from the qualitative assessment in the STROBE checklist will be 32. Considering the score of 16 as the cutoff point, those articles obtaining a score of 16 and above will be considered as articles with suitable and average methodological quality, and those obtaining below 16 were considered as poor and were therefore excluded from the study.

Extracting the data

The information related to all selected articles which were entered into the systematic review and meta-analysis process was extracted from a pre-prepared checklist. This checklist includes the title of the article, the name of the first author, the year of publication, the country, the sample size, the number of falls per sample, the average age of the sample, and the prevalence and continent percentage.

Statistical analysis

I² test was used to evaluate the heterogeneity of selected studies. To investigate the dissemination error, due to the large statistical sample size included in the study, Begg and Mazumdar test was used at a significance level of 0.1 and its corresponding Funnel plot. The data were analyzed using the Comprehensive Meta-Analysis Software (Version 2).

Results

Study selection and data extraction

This study examined the prevalence of falls in the older people of the world through systematic review and meta-analysis. After searching in various databases, from a total of 4251 articles, 1795 articles from the PubMed database, 172 articles from the Science Direct database, 160 articles from the Scopus database, 160 articles from Web of Science database, and 1720 articles from Google Scholar database, 136 articles from Magiran database, and 111 articles from SID database were selected for the study. Out of a total of 4251 identified studies, 66 were duplicate and were excluded. In the screening stage, out of 4185 studies, 3651 articles were excluded through studying the title and abstract sections based on inclusion and exclusion criteria.

In the competency assessment stage, out of 540 studies, the remaining 436 articles were excluded regarding the inclusion and exclusion criteria due to being irrelevant through perusing the full text of the articles. In the qualitative evaluation stage, through studying the full text of the articles and based on the STROBE checklist, out of the remaining studies, no article was removed due to the poor methodological quality.

The studies were reviewed based on the four-step PRISMA 2009 process, including article identification, screening, review of article acceptance criteria, and finally, the articles entered to the meta-analysis (Fig. 1). Ultimately, 104 studies were included in the final analysis, the information of which was mentioned in the tables (Table 1) [14, 19, 22–123].

The probability of bias in the dissemination of fall outcomes in the older people of the world by Funnel plot and Begg and Mazumdar test at a significance level of 0.1 indicated no dissemination bias in the present study (P = 0.101) (Fig. 2).

Based on the test results (I²: 99.9) and due to the heterogeneity of selected studies, a random-effects model was used to combine the studies and the shared prevalence estimate. The reason for heterogeneity between studies can be due to differences in sample size, sampling error, year of study, or place of study. Out of the 104 articles submitted for systematic review and meta-analysis with a sample size of 1,741,613 patients, 48 studies were conducted in Asia, 16 studies in Europe, 2 studies in Africa, 32 studies in America, and 6 studies in Oceania. The smallest and highest sample sizes were related to the studies of Aktaş, S. et al. (2004) (n = 32) [23] and J.A. Steven et al. (2008) (n = 922,200) [38]. The characteristics of the eligible studies shown in the meta-analysis are given in Table 1.

Meta-analysis

According to the results of the present study, the prevalence of falls in the world’s older people was 26.5% (95% CI 23.4–29.8%). The midpoint of each line segment shows the prevalence in each study, and the diamond shows the population prevalence for the entire studies (Fig. 3).

Meta-regression test

To investigate the effects of potential factors in the heterogeneity of the prevalence of falls in the older people in
the world, meta-regression was used for the two factors of the sample size (Figs. 4, 5). According to Fig. 4, with increasing sample size, the prevalence of falls in the older people of the world decreases, which there is a statistically significant difference ($P<0.05$). It was also reported (Fig. 5) that with the increase in the research year, the prevalence of falls in the older people of the world decreases, which there is also a statistically significant difference ($P<0.05$).

**Subgroup Analysis**

Table 2 reports the prevalence of falls in the world's older people in Asia, Europe, Africa, and America and Oceania. The highest rate of prevalence of falls in the older
| Published in | First author | Country      | Average age | Sample size | Number of falls | Prevalence | Continent |
|-------------|--------------|--------------|-------------|-------------|----------------|------------|-----------|
| 1 2012      | Demura [14]  | Japan        | 70.3 ± 6.8  | 1850        | 386            | 20.9       | Asia      |
| 2 2016      | Johansson [19]| Sweden       | 70          | 1350        | 148            | 11         | Europe    |
| 3 2008      | Steven [22]  | USA          | ≥ 65        | 922,200     | 5.8 m          | 15.9       | America   |
| 4 2004      | Aktas [23]   | Turkey       | 78          | 32          | 8              | 25         | Asia      |
| 5 2015      | Al Tehewy [24]| Egypt       | 67.7        | 411         | 46             | 11.2       | Europe    |
| 6 2018      | Aljwadi [25] | Saudi        | ≥ 60        | 2964        | 388            | 13.2       | Asia      |
| 7 2015      | Almada [26]  | Europe       | 70 ± 8.9    | 41,098      | 3452           | 8.4        | Europe    |
| 8 2018      | Almegbel [27]| Saudi Arabia | 68.8 ± 9    | 1182        | 590            | 49.9       | Asia      |
| 9 2019      | Almeida [28] | Brazil       | ≥ 65        | 211         | 60             | 28.9       | America   |
| 10 2013     | Antes [29]   | Brazil       | 70–7        | 1705        | 322            | 19         | America   |
| 11 2004     | Avdić [30]   | USA          | 72.38 ± 5.9 | 77          | 21             | 27.77      | America   |
| 12 2009     | Barker [31]  | Australia    | 81.59       | 87          | 46             | 52.87      | Oceania   |
| 13 2010     | Bauer [32]   | Germany      | 75.6 ± 8.3  | 61          | 42             | 71.2       | Europe    |
| 14 2010     | Bekibele [33]| Nigeria      | ≥ 65        | 2096        | 482            | 23         | Africa    |
| 15 1997     | Berg [34]    | USA          | 71.7        | 96          | 50             | 52         | America   |
| 16 2004     | Bergland [35]| Norway       | 80.8        | 307         | 155            | 50.8       | Europe    |
| 17 2019     | Bernard [36] | France       | 72.45 ± 5.1 | 1471        | 485            | 33         | Europe    |
| 18 1988     | Blake [37]   | Colombia     | ≥ 65        | 1042        | 356            | 35         | America   |
| 19 2009     | Boyd [38]    | USA          | ≥ 65        | 35 m        | 3.5 m          | 10         | America   |
| 20 2009     | Carpenter [39]| USA         | ≥ 65        | 263         | 102            | 39         | America   |
| 21 2015     | Cevizci [40] | Turkey       | 74.1 ± 6.8  | 1001        | 321            | 32.1       | Asia      |
| 22 2011     | Chin-Liang [41]| China   | 82.1 ± 5.1  | 371         | 33             | 8.9        | Asia      |
| 23 2012     | Da Cruz [42] | Brazil       | 69.7        | 420         | 135            | 32.1       | America   |
| 24 2019     | Del Brutto [43]| USA       | 70.4 ± 7.9  | 463         | 173            | 53         | America   |
| 25 2011     | Demura [44]  | Japan        | 70.7 ± 7    | 968         | 150            | 15.49      | Asia      |
| 26 2016     | Dhargave [45]| India        | 74.61 ± 8.4 | 163         | 47             | 28.9       | Asia      |
| 27 2019     | Dias [46]    | Brazil       | 73          | 211         | 60             | 28.9       | America   |
| 28 2009     | Divani [47]  | New Zealand  | 74.4 ± 7.2  | 1104        | 408            | 37         | Oceania   |
| 29 2019     | Dos Santos [48]| Brazil    | 70          | 820         | 229            | 27.9       | America   |
| 30 2018     | Ehrlich [49] | USA          | ≥ 65        | 7601        | 1482           | 19.5       | America   |
| 31 2018     | Fahlström [50]| Sweden    | ≥ 65        | 148         | 117            | 79         | Europe    |
| 32 2013     | Fhon [51]    | Brazil       | 73.5 ± 8.4  | 240         | 92             | 38.6       | America   |
| 33 1996     | Fletcher [52]| Canada       | ≥ 65        | 63          | 20             | 31.7       | America   |
| 34 2016     | Foran [53]   | Ireland      | ≥ 65        | 753         | 200            | 26.7       | Europe    |
| 35 2016     | Gale [54]    | England      | ≥ 50        | 4301        | 1144           | 28.4       | Europe    |
| 36 2014     | George [55]  | USA          | ≥ 65        | 1653        | 294            | 18         | America   |
| 37 2017     | Handriyan [56]| Canada   | ≥ 65        | 15,860      | 3172           | 20         | America   |
| 38 2013     | Hanlin [57]  | USA          | 73.2        | 103         | 55             | 54         | America   |
| 39 2020     | Henwood [58] | USA          | 62.5        | 237         | 134            | 57         | America   |
| 40 2011     | Holt [59]    | New Zealand  | ≥ 65        | 101         | 35             | 35         | Oceania   |
| 41 2013     | Isernring [60]| Australia | 74.3        | 254         | 73             | 28.6       | Oceania   |
| 42 2019     | Janakiraman [61]| Ethiopia| ≥ 50        | 599         | 170            | 28.4       | Africa    |
| 43 2002     | Izumi [62]   | Japan        | 75          | 746         | 93             | 12.5       | Asia      |
| 44 2014     | Kabeshova [63]| France     | 71 ± 5.1    | 1760        | 346            | 19.7       | Europe    |
| 45 2011     | Kadir [64]   | Malaysia     | 67.5 ± 5.6  | 131         | 17             | 12.9       | Asia      |
| 46 2015     | Kamińska [65]| Poland       | 78.6 ± 7.4  | 304         | 233            | 76.6       | Europe    |
| 47 2018     | Kang [66]    | China        | 67.4 ± 5.6  | 619         | 125            | 20.1       | Asia      |
| 48 2012     | Kantayaporn [67]| Thailand | 75.35       | 10,329      | 1244           | 12.04      | Asia      |
| 49 2020     | Kim [68]     | Korea        | ≥ 45        | 9279        | 347            | 3.7        | Asia      |
| Published in | First author | Country | Average age | Sample size | Number of falls | Prevalence | Continent |
|-------------|--------------|---------|-------------|-------------|----------------|------------|-----------|
| 50 2019     | Kistler [69] | USA     | 54.5        | 181,208     | 47,894         | 26.4       | America   |
| 51 2007     | Laesse [70]  | Denmark | 73.7        | 94          | 14             | 15         | Europe    |
| 52 2018     | Lastrucci [71]| Finland | 77.8 ± 8.7  | 1220        | 142            | 11.6       | Europe    |
| 53 2011     | Lim [72]     | Korea   | 73.5 ± 6.3  | 828         | 108            | 13         | Asia      |
| 54 2020     | Lin [73]     | China   | ≥ 60        | 335         | 77             | 23.28      | Asia      |
| 55 2012     | Logiudice [74]| Australia | ≥ 45       | 363         | 113            | 31         | Oceania   |
| 56 2018     | Mahmooodabad [75]| Iran  | 71.42 ± 5.9 | 200         | 60             | 30         | Asia      |
| 57 2001     | Milisemiller [76]| Canada | 62 ± 15.7  | 435         | 228            | 52.4       | America   |
| 58 2007     | Milisen [77] | Belgium | 67.2 ± 18.4 | 2568        | 136            | 5.29       | Europe    |
| 59 2019     | Ofori-Asenso [78]| USA  | 62          | 1019        | 445            | 43.7       | America   |
| 60 2013     | Orces [79]   | Brazil  | ≥ 60        | 5227        | 1954           | 37.4       | America   |
| 61 2018     | Ouyang [80]  | China   | 60.5 ± 9.2  | 12,527      | 2041           | 16.3       | Asia      |
| 62 2014     | Pal [81]     | New Zealand | ≥ 45    | 135         | 36             | 27         | Oceania   |
| 63 2018     | Pathania [82]| India   | 75.2        | 335         | 55             | 16.4       | Asia      |
| 64 2017     | Pereira [83] | Brazil  | 83.7        | 3496        | 164            | 46.9       | America   |
| 65 2019     | Pintch [84]  | India   | 69.6        | 2049        | 512            | 24.98      | Asia      |
| 66 2004     | Schoenfelder [85]| USA  | 84.1        | 81          | 42             | 53         | America   |
| 67 2014     | Schumacher [86]| Germany | 65.7       | 862         | 30             | 3.5        | Europe    |
| 68 2016     | Secil [87]   | Turkey  | 68.3 ± 3.2  | 343         | 124            | 36.2       | Asia      |
| 69 2013     | Seifer [88]  | USA     | 77          | 81          | 21             | 25.9       | America   |
| 70 2018     | Shir [89]    | USA     | ≥ 60        | 370         | 188            | 50.8       | Asia      |
| 71 2015     | Shir [90]    | Iran    | 76.2        | 194         | 52             | 27.3       | Asia      |
| 72 2009     | Shin [91]    | Korea   | 72.82       | 335         | 48             | 15         | Asia      |
| 73 2011     | Siqueira [92]| Brazil  | 70.9        | 6616        | 1826           | 27.6       | America   |
| 74 2012     | Suzuki [93]  | Japan   | 86.94       | 135         | 50             | 37.04      | Asia      |
| 75 2018     | Tanaka [94]  | Japan   | 68.1        | 1561        | 437            | 28         | Asia      |
| 76 1993     | Topper [95]  | USA     | 83          | 100         | 59             | 59         | America   |
| 77 2014     | Tsai [96]    | China   | ≥ 65        | 775         | 378            | 48.8       | Asia      |
| 78 2009     | Vassallo [97]| UK      | 82.1        | 825         | 150            | 18.1       | Europe    |
| 79 2018     | Vieira [98]  | Brazil  | ≥ 60        | 1451        | 407            | 28.1       | America   |
| 80 2004     | Weir [99]    | Canada  | ≥ 65        | 73,113      | 62,146         | 85         | America   |
| 81 2019     | Whitney [100]| USA     | ≥ 65        | 7598        | 827            | 10.88      | America   |
| 82 2016     | Ylitalo [101]| USA     | 62          | 280,035     | 756            | 27         | America   |
| 83 2009     | Yu [102]     | China   | ≥ 60        | 1512        | 272            | 18         | Asia      |
| 84 2018     | Zhou [103]   | China   | ≥ 60        | 1557        | 227            | 17.8       | Asia      |
| 85 2019     | Bagheri Ruchi [104]| Iran | 70.11       | 300         | 100            | 33.3       | Asia      |
| 86 2014     | Taheri Tanjani [105]| Iran | ≥ 60        | 1323        | 337            | 25.5       | Asia      |
| 87 2020     | Habibeh [106]| Iran    | 67.04       | 400         | 110            | 27.5       | Asia      |
| 88 2016     | Hoseini [107]| Iran    | 69.37       | 1616        | 274            | 17         | Asia      |
| 89 2016     | Khazaee [108]| Iran    | ≥ 60        | 11,954      | 2581           | 21.59      | Asia      |
| 90 2013     | Jafarian amiri s.r. [109]| Iran | 70.1        | 350         | 123            | 35.1       | Asia      |
| 91 2007     | Nader [110]  | Iran    | 67          | 207         | 121            | 58.46      | Asia      |
| 92 2017     | Vakili Sadeghi [111]| Iran | ≥ 60        | 1482        | 271            | 18.3       | Asia      |
| 93 2018     | Gorzin [112] | Iran    | ≥ 60        | 148         | 29             | 20.13      | Asia      |
| 94 2015     | Aghae [113]  | Iran    | 72.24       | 2336        | 1033           | 44.2       | Asia      |
| 95 2016     | Nabavi [114] | Iran    | 70.42       | 288         | 88             | 30.9       | Asia      |
| 96 2015     | Najafi Ghazalche [115]| Iran | 67.63       | 160         | 15             | 9.4        | Asia      |
| 97 2018     | Naamani [116]| Iran    | 78 ± 8      | 400         | 112            | 28         | Asia      |
| 98 2015     | Borhani Nezhad [117]| Iran | 78.65       | 204         | 69             | 33.8       | Asia      |
people was related to Oceania with 34.4 (95% CI 29.2–40) and America with 27.9 (95% CI 22.4–34.2) (Table 2). Table 2 is based on the studies performed, and in order to reduce the heterogeneity created in the whole study, as reported in Table 2, the number of studies does not have the same distribution and therefore the higher or lower prevalence in a continent. It is based only on studies of that continent.

Discussion

Out of the 104 articles submitted for systematic review and meta-analysis with a sample size of 1,741,613 people, 48 studies were conducted in Asia, 16 studies in Europe, 2 studies in Africa, 32 studies in America, and 6 studies in Oceania. According to the results of the present study, the prevalence of falls in the world's older people was 26.5% (95% CI 29.4.8%). To investigate the effects of potential factors in the heterogeneity of the prevalence of falls in the older people in the world, meta-regression was used for the two factors of the sample size. According to it, with increasing sample size, the prevalence of falls in the older people of the world decreases, which there is a statistically significant difference ($P < 0.05$). Also, with the increase in the research year, the prevalence of falls in the older people of the world decreases, which was also statistically significant ($P < 0.05$). According to the results of subgroup analysis, the highest prevalence of falls in the older people was related to Oceania with 34.4% (95% CI 29.2–40) and America with 27.9% (95% CI 22.4–34.2%).

Falls are common among the geriatric population; this incident is one of the main causes of disability and death among these people [43, 45]. It is said that those who fall and are not harmed often suffer the negative consequences of that fall. Older people who fall are more likely to fall within a year. These people are also more at risk

| Published in | First author Country | Average age | Sample size | Number of falls | Prevalence | Continent |
|--------------|----------------------|-------------|-------------|----------------|------------|-----------|
| 99           | Iranfar [118] Iran    | ≥ 60        | 400         | 292            | 73         | Asia      |
| 100          | Ghodsi [119] Iran     | ≥ 60        | 960         | 672            | 70         | Asia      |
| 101          | Mazhanzad [120] Iran  | ≥ 60        | 300         | 141            | 47.3       | Asia      |
| 102          | Hadinejad [121] Iran  | 70 ± 9      | 77,576      | 24,824         | 32         | Asia      |
| 103          | Safzadeh [122] Iran   | 69.05 ± 7.9 | 11,120      | 1234           | 11.1       | Asia      |
| 104          | Torkaman Gholami [123]| 60–80       | 378         | 264            | 70         | Asia      |

Fig. 2 Funnel plot results of the prevalence of falls in the older people worldwide
### Meta Analysis

#### Characteristics of studies included in the analysis

| Study name | Study design | Setting | Sample size | Country |
|------------|--------------|---------|-------------|---------|
| Study 1    | Cohort       | Hospital | 1000        | Japan   |
| Study 2    | Case-control | Community | 500         | USA     |

#### Study characteristics

| Study name | Event | Control | Odds Ratio | 95% CI | p-value |
|------------|-------|---------|------------|--------|---------|
| Study 1    | 0.5   | 0.3      | 2.0        | 1.5    | 1.6     |
| Study 2    | 0.2   | 0.4      | 0.5        | 0.3    | 0.8     |

### Data from each study

| Study name | Event | Control | Odds Ratio | 95% CI | p-value |
|------------|-------|---------|------------|--------|---------|
| Study 1    | 0.5   | 0.3      | 2.0        | 1.5    | 1.6     |
| Study 2    | 0.2   | 0.4      | 0.5        | 0.3    | 0.8     |

### Meta Analysis

#### Results of fixed-effects and random-effects models

| Model | Event | Control | Weight | Mean Odd Ratio | 95% CI | p-value |
|-------|-------|---------|--------|----------------|--------|---------|
| Fixed-effects | 0.5   | 0.3      | 0.8    | 1.9            | 1.6    | 0.001   |
| Random-effects | 0.2   | 0.4      | 0.5   | 0.3            | 0.8    | 0.8     |

### Summary of findings

- The meta-analysis of study characteristics suggests a strong association between event and control variables.
- The results from the fixed-effects model indicate a significant association (p-value = 0.001), whereas the random-effects model shows no significant association (p-value = 0.8).

### Limitations

- The sample size in Study 2 is relatively small, which may affect the reliability of the results.
- There is potential for publication bias due to the limited number of studies included.

### Conclusion

Further research with larger sample sizes and more studies is needed to confirm these findings.
**Fig. 4** Meta-regression chart of the prevalence of falls in the older people of the world by sample size

**Fig. 5** Meta-regression chart of the prevalence of falls in the older people of the world by the year

**Table 2** Prevalence of falls in the older people of the world according to different continents

| Continents | Number of articles | Sample size | $I^2$ | Begg and Mazumdar test | Prevalence % (95% CI) |
|------------|--------------------|-------------|-------|------------------------|----------------------|
| Asia       | 48                 | 164,593     | 99.4  | 0.210                  | 25.8 (95% CI 22.1–29.9) |
| America    | 32                 | 36,513,725  | 99.9  | 0.109                  | 27.9 (95% CI 22.4–34.2) |
| Europe     | 16                 | 57,533      | 99.5  | 0.964                  | 23.4 (95% CI 15.8–33.2) |
| Africa     | 2                  | 2695        | 86.3  | –                      | 25.4 (95% CI 20.5–31)  |
| Oceania    | 6                  | 2044        | 79.4  | 0.573                  | 34.4 (95% CI 29.2–40)  |
of falling. This fear of falling can lead to depression and limitation of movement [38].

A study by Boyd, R. et al. showed that 3.5 million people, or about 10 percent of the older people in the USA, have fallen in the past three months. About 1.7 million people were injured, and 875,000 of the injured people went for medical treatment. Based on the results of this study, 12.9 million, or 36%, of the older people in the USA are relatively afraid of falling. According to this study, there is a significant relationship between falling and fear of falling. Among those who recently had a fall, 16% feared a severe or moderate fall; however, only 6% of these people were not afraid or were a little afraid [38].

According to a study by Cevizci, S. et al., those who do not walk at home or out of the house, or walk less, and those who cannot meet their daily needs, have a higher risk of falling than other people. It was also asserted that those who have at least one case of chronic disease, or people with physical and mental impairment, or people with lower quality of life, are at higher risk of falling [40].

The study by Handrigan et al. showed that, according to the dose–response relationship between BMI and prevalence, underweight and obese people were reported to be more common among men. For women, unlike men, obesity was not significantly linked with a higher prevalence of falls [56].

The results of a study carried out by Habibeh Ahmadi-pour in Kerman, Iran, found that more than a quarter of the older people who referred to the comprehensive health service centers and bases in Kerman during the past 6 months had a history of at least one fall and more than 10 percent also had a history of falling more than once [106]. In a study by Habibeh Ahmadi-pour and et al., it was stated that the use of more than four drugs, the use of inappropriate shoes, and the presence of underlying disease were the most common risk factors for health-related in the older people, respectively [106].

With the increase in the elderly population, the need for more care of this population for fractures has increased, because fractures greatly reduce the quality of life of the elderly [107]. Among fractures, pelvic fractures, which occur due to falls in the elderly, are significant, and reports indicate that one-third of patients do not survive more than a year after pelvic fractures [107]. Primary prevention to reduce fractures in the elderly can be done by reducing falls and strengthening bones by eliminating risk factors or by medication [124].

Conclusion
In conclusion, it is stated that due to the increasing percentage of the world’s aging population, the problem of falls, as a common problem with adverse consequences, needs to be seriously considered by policymakers and health care providers to make appropriate plans for interventions and take precautions to reduce falls in the older people. Most of the reasons that lead to falls in the elderly are related to the living environment of the elderly, and by following simple tips and providing assistive equipment to the elderly, the risk of falls in the elderly can be significantly reduced, so appropriate policy to create appropriate living environment for the elderly, such as proper lighting of the house and avoiding total darkening of the house, use of bath chairs and toilets, use of appropriate shoes, not walking after taking sleeping pills, regular eye examinations in the elderly, not carrying heavy equipment, making the phone available, and installing handles in different parts of the house, can help prevent falls in the elderly.
References

1. Nabavi SH, Hatami ST, Norouzi F, Gerivani Z, Hatami SE, Monadi Ziarat H, Delbari A. Prevalence of fall and its related factors among older people in Bojnurd in 2015. Salmand Iran J Ageing. 2016;11(3):466–73.

2. Bakhtiyari M, Emaminaeini M, Hatami H, Khodakarim S, Sahaf R. Depresion and perceived social support in the older people. Iran J Ageing. 2017;12:192–207.

3. Organization WH, Ageing WHO, Unit LC: WHO global report on falls prevention in older age: World Health Organization; 2008.

4. The prevention of falls in later life. A report of the Kellogg International Work Group on the Prevention of Falls by the Older people. Dan Med Bull. 1987;34(Suppl 4):1–24.

5. Barrett-Connor E, Weiss T, McHorney C, Miller P, Siris E. Predictors of falls among postmenopausal women: results from the National Osteoporosis Risk Assessment (NORA). Osteoporos Int. 2009;20(5):715–22.

6. Enrietto JA, Jacobson KM, Baloh RW. Aging effects on auditory and vestibular responses: a longitudinal study. Am J Otolaryngol. 1999;20(6):371–8.

7. Rubenstein LZ. Falls in older people: epidemiology, risk factors and strategies for prevention. Age Ageing. 2006;35(2):37–41.

8. Tinetti ME, Williams CS. The effect of falls and fall injuries on functioning in community-dwelling older persons. J Gerontol A Biol Sci Med Sci. 1998;53(2):M12–19.

9. Kosorok MR, Omenn GS, Diehr P, Koepsell TD, Patrick DL. Restricted activity days among older adults. Am J Public Health. 1992;82(8):1263–7.

10. Scaf-Klomp W, van Sonderen E, Sanderman R, Ormel J, Kempen GI. Recovery of physical function after limb injuries in independent older people living at home. Age Ageing. 2001;30(3):213–9.

11. Mancini C, Williamson D, Binkin N, Micheletto F, De Giacomi GV. Epidemiology of falls among the older people. Igiene e sanità pubblica. 2005;61(2):117–32.

12. Friedman SM, Munoz B, West SK, Rubin GS, Fried LP. Falls and fear of falling which comes first? A longitudinal prediction model suggests strategies for primary and secondary prevention. J Am Geriatr Soc. 2002;50(8):1329–35.

13. Hindmarsh JJ, Estes EH, Jr. Falls in older persons. Causes and interventions. Arch Intern Med. 1989;149(10):2217–22.

14. Demura S, Yamada T, Kasuga K. Severity of injuries associated with falls in the community dwelling older people are not affected by fall characteristics and physical function level. Arch Gerontol Geriatr. 2012;55(1):186–9.

15. Zur O, Carmeli E, Himelfarb M, Berner YN. Vestibular function, falls and hip fracture in older people—a relationship study. Haferufah. 2004;143(3):197–202.

16. Alexander BH, Rivara FP, Wolf ME. The cost and frequency of hospitalization for fall-related injuries in older adults. Am J Public Health. 1992;82(9):1263–7.

17. Mehta R, Wagle S, Agarwal P, Desai S, Dubey R. Prevalence of falls and its related factors among older people. J Frailty Aging. 2017;6:66.

18. Carpenter CR, Schatzlein MD, D’Antonio JA, Ricci PT, Coben JH. Identification of risk factors of fall in older adult emergency department patients. Acad Emerg Med Off J Soc Acad Emerg Med. 2009;16(3):211–9.

19. Ceveci S, Uluocak S, Aslan C, Gokulu G, Bilir O, Bakar C. Prevalence of falls and associated risk factors among aged population: community based cost-sectional study from Turkey. Cent Eur J Public Health. 2015;23(2):233–9.

20. Chu C-L, Jiang C-K, Chow PC, Lin Y-T, Tang K-Y, Chou M-Y, Chen L-K, Lu T, Pan C-C. Fear of falling (FF): psychosocial and physical factors among institutionalized older Chinese men in Taiwan. Arch Gerontol Geriatr. 2011;53(2):e232–6.

21. da Cruz DT, Ribeiro LC, Vieira MD, Teixeira MTB, Bastos RR, Leite ICG. Prevalence of falls and associated factors in older people individuals. Rev Saude Publica. 2012;46(1):38–46.

22. Del brutto OH, Mera RM, Peinado CD, Sedlter MJ. Prevalence, severity, and risk of future falls in community-dwelling older adults living in a rural community: the Atahualpa Project. J Community Health. 2019;44(3):487–91.

23. Demura S, Yamada T, Uchiyama S, Sugiura H, Hamazaki H. Selection of useful items for fall risk screening for community dwelling Japanese older people from the perspective of fall experience, physical function, and age level differences. Arch Gerontol Geriatr. 2011;53(2):123–30.
45. Dhargave P, Sendhilkumar R. Prevalence of risk factors for falls among older people living in long-term care homes. J Clin Gerontol Geriatr. 2016;7(3):99–103.
46. Dias LZ. Comment: ‘Prevalence of falls in older people: a population-based study’. Rev Assoc Med Bras. 2019;65(1):1404–1–1404.
47. Divani AA, Vazquez G, Barrett AM, Asadollahi M, Luft AR. Risk factors associated with injury attributable to falling among older people population with history of stroke. Stroke. 2009;40(10):3286–92.
48. dos Santos F, Lange C, de Llanos PMP, Lemos MMO, Pastore CA, Paskulin LMG, da Costa AEK, Raymundo JLP. Falls of older people living in rural areas: prevalence and associated factors. Rev Bras Enferm. 2019;72:177–83.
49. Ehrlich JR, Granger A, Bissen K, Hassan SE, Stagg BC. High prevalence of falls, fear of falling and impaired balance in older adults with vision impairment. Invest Ophthalmol Vis Sci. 2018;59(9):66.
50. Fahad S, Galvane K, Forsberg J, Bodin L. Fall prevention by nursing assistants among community-living older people. A randomised controlled trial. Scand J Car Sci. 2018;32(2):75–85.
51. Filer PC. Falls among the older people. Risk factors and prevention strategies. 1996.
52. Foran S, McCallion P, McCarron M. The prevalence of falls among older adults with intellectual disability in Ireland. Age Ageing. 2016;45:55–55.
53. Gale CR, Cooper C, Sayer AA. Prevalence and risk factors for falls in older men and women: The English Longitudinal Study of ageing. Age Ageing. 2016;45(6):789–94.
54. George M, Ashar G, Milner G, Miller S, Bynum L, Balamurugan A. Falls and comorbid conditions among community dwelling Arakan-sas older adults from a population-based survey. J Ager Med Soc. 2014;11(7):136–9.
55. Henwood BF, Kamwendo K, Forsberg J, Bodin L. Fall prevention by nursing assistants among community-living older people living in long-term care homes. J Clin Gerontol Geriatr. 2016;7(3):99–103.
56. Henwood BF, Rhoades H, Lahey J, Pynoos J, Pitts DB, Brown RT. Examination of falls of older people living in rural communities of Guangzhou. Psychol Health Med. 2022;666.
57. Herold BJ, Khudchandani D, Smith K, Atkinson D, Dwyer A, Lautenschlager NJ, Almeida OA, Flicker L. Preliminary evaluation of the prevalence, fall and urinary incontinence in remote living Indigenous Australians over the age of 45 years. Intern Med J. 2012;42(6):E102–7.
58. Highmore J, Zareipour M, Askarishahi M, Beigomi A. Prevalence of falling and its relation with chronic diseases and balance of older adults in Urmia City. Int J Ayrvedic Med. 2018;9(4):273–8.
59. Holt KR, Noone PL, Short K, Elley CR, Haavik H. Fall risk profile and preventive needs assessment in an older adult Latino popula- tion: a model community global health partnership. Prog Community Health Partnersh. 2013;7(2):191–9.
60. Henwood BF, Rhoades H, Lahey J, Pynoos J, Pitts DB, Brown RT. Examination of falls among older people living in permanent supportive housing. Health Soc Care Community. 2020;28(8):842–9.
61. Holt KR, Noone PL, Short K, Elley CR, Haavik H. Fall risk profile and quality-of-life status of older chiropractic patients. J Manipul Physiol Ther. 2011;34(7):78–87.
62. Issenin E, Baker J, Kerr G, Malnutrition and falls risk in community- dwelling older adults. J Nutr Health Aging. 2013;17(3):277–97.
63. Janakiraman B, Temesgen MH, Jember G, Gelaw AY, Gebremeskel BF, Desalegn A, Sambu J, Negussie T. Prospective study of fall risk among formerly homeless older adults living in permanent supportive housing. Health Soc Care Community. 2020;28(8):842–9.
64. Kadir AA, Hasim H. Prevalence of falls among older people living in long-lived adults and association with extrinsic factors. Revista latino-americana de enfermagem. 2017;25:66.
65. Kistler BM, Khubchandani J, Wiblishauser M, Wilund KR, Sonnoff JJ. Epi- demiology of falls and fall-related injuries among middle-aged adults with kidney disease. Int Urol Nephrol. 2019;51(9):1613–21.
66. Laessoe U, Hoeck HC, Simonsen O, Sinkjaer T, Voigt M. Fall risk in an active older people population—Can it be assessed? J Negat Results Biomed. 2007;6:2.
67. Lastrucci V, Lorini C, Rinaldi G, Bonaccorsi G. Identification of fall predictors in the active older people population from the routine medical records of general practitioners. Primary Health Care Res Dev. 2018;19(2):131–9.
68. Lim JY, Jang S-N, Park W-B, Oh MK, Kang EK, Paik N-J. Association between exercise and fear of falling in community-dwelling older people Koreans: results of a cross-sectional public opinion survey. Arch Phys Med Rehabil. 2011;92(6):954–9.
69. Lin WQ, Huang TY, Liu L, Yang YO, Li YH, Sun MY, Qin FJ, Yang QY, Shen JC. Prevalence and related factors of depression and falls among the older people living in rural communities of Guangzhou. Psychol Health Med. 2022;666.
70. LoGiudice DC, Smith K, Atkinson D, Dwyer A, Lautenschlager NJ, Almeida OA, Flicker L. Preliminary evaluation of the prevalence, fall and urinary incontinence in remote living Indigenous Australians over the age of 45 years. Intern Med J. 2012;42(6):E102–7.
71. Mahmoodabad SSM, Zareipour M, Askarishahi M, Beigomi A. Prevalence of falling and its relation with chronic diseases and balance of older adults in Urmia City. Int J Ayrvedic Med. 2018;9(4):273–8.
72. Miller WC, Speechley M, Deathe B. The prevalence and risk factors of falling and fear of falling among lower extremity amputees. Arch Phys Med Rehabil. 2001;82(8):1031–7.
73. Milisen K, Staelens N, Schwidmendin R, De Paepe L, Verhaeghe J, Braes T, Boonen S, Pelemans W, Kessig RW, Dejaeger E. Fall prevention in inpa- tients by bedside nurses using the St. Thomas’s Risk Assessment Tool in Falling Older people Inpatients (STRATIFY) instrument: a multicenter study. J Am Geriatr Soc. 2007;55(S5):725–33.
74. Oforio-Assenzo R, Ackerman IN, Soh SE. Prevalence and correlates of falls in a middle-aged population with osteoarthritis: data from the Osteoar- thritis Initiative. Health Soc Care Community. 2022;666.
75. Orces C. Prevalence and determinants of falls among older adults in Ecuador: an analysis of the SABI E survey. J Am Geriatr Soc. 2013;61:534–534.
76. Ouyang P, Sun W. The association between depressive symptoms and fall accidents among middle-aged and older people people in China. Environ Health Prev Med. 2018;23(1):42.
77. Pal J, Hale L, Mirfin-Veitch B, Claydon L. Injuries and falls among adults with intellectual disability: a prospective New Zealand cohort study. J Intellect Dev Disabil. 2014;39(1):35–44.
78. Pathania A, Haldar P, Kant S, Gupta SK, Pandav CS, Bachani D. Prevalence of fall, and determinants of repeat incidents of fall in older persons living in old age homes in the National Capital Territory of Delhi. India Natl Med J India. 2018;31(6):329–33.
79. Pereira SG, dos Santos CB, Doning M, Portella MR. Prevalence of house- hold falls in long-lived adults and association with extrinsic factors. Revista latino-americana de enfermagem. 2017;25:66.
80. Pitchal P, Dedhia HB, Bhandari N, Krishnan D, D’Souza NR, Bellara JM. Prevalence, risk factors, circumstances for falls and level of functional independence among geriatric population—a descriptive study. Indian J Public Health. 2019;63(1):21–6.
81. Schoenfelder DP, Rubenstein LM. An exercise program to improve fall- related outcomes in older people nursing home residents. Appl Nurs Res. 2004;17(1):21–31.
82. Schumacher J, Pientka L, Trampisch U, Moschyn A, Hinrichs T, Thiem U. The prevalence of falls in adults aged 40 years or older in an urban, German population: results from a telephone survey. Z Gerontol Geriatr. 2014;47(2):141–6.
83. Secil GG, Nesrin N. Prevalence of and risk factors for falls and disability among older people individuals in a Turkish population (Trabzon Province). Int J Med Res Health Sci. 2016;5(8):156–63.
88. Seifer C, Kenny RA. The prevalence of falls in older persons paced for atrioventricular block and sick sinus syndrome. Am J Geriatr Cardiol. 2003;12(5):298–305.
89. Sharif SI, Al-Harbi AB, Al-Shihabi AM, Al-Daour DS, Sharif RS. Falls in the older people: assessment of prevalence and risk factors. Pharmacy Practice-Internat. 2018;16(3):66.
90. Sharif F, Fakhrzadeh H, Memari A, Najafi B, Nazari N, Khoee MA, Arzaghi SM, Bakhtiari F, Ghasemi S, Salavatian SN, et al. Predicting risk of the fall among aged adult residents of a nursing home. Arch Gerontol Geriatr. 2015;61(2):124–30.
91. Shin KR, Kang Y, Hwang EH, Jung D. The prevalence, characteristics and correlates of falls in Korean community-dwelling older adults. Int Nurs Rev. 2009;56(3):87–92.
92. Siqueira FV, Facchini LA, da Silveira DS, Piccini RX, Tomasi E, Thume E, Silva SM, Dilelio A. Prevalence of falls in older people in Brazil: a country-wide analysis. Cad Saude Publica. 2011;27(9):1819–26.
93. Suzuki M, Kurata S, Yamamoto E, Makino K, Kanamori M. Impact of fall-related behaviors as risk factors for falls among the older people patients with dementia in a geriatric facility in Japan. Am J Alzheimers Dis Other Dement. 2012;27(6):439–46.
94. Tanaka T, Matsumoto H, Son BK, Imaeda S, Hwang EH, Jung D. The prevalence, characteristics and risk factors for falls in older adults in the South of Brazil: prevalence and determinants. Revista da De Saude Publica. 2018;52:66.
95. Tocher AK, Maki BE, Holliday PJ. Are activity-based assessments of balance and gait in the older people predictive of risk of falling and/or type of fall? Am J Geriatr Soc. 1993;41(5):479–87.
96. Tsai L-Y, Tsay S-L, Hsieh R-K, Yu S, Tsai J-M, Chien H-H, Liu S-J. Fall injuries and related factors of older people patients at a Medical Center in Taiwan. Int J Gerontol. 2014;8(4):203–8.
97. Vassallo M, Mallela SK, Williams A, Kwan J, Allen S, Sharma JC. Fall risk factors in older patients with cognitive impairment with rehabilitation towards. Geriatr Gerontol Int. 2009;51(1):46–1.
98. Vleira LS, Gomes AP, Bierhals IO, Farias-Antunez S, Ribeiro CG, Miranda WA, Lutz BH, Barbosa-Silva TG, Lima NP, Bertoldi AD, et al. Falls among older adults in the South of Brazil: prevalence and determinants. Revista de Saude Publica. 2018;52:66.
99. Weir E, Culmer L. Fall prevention in the older people population. Can Med Assoc J. 2004;171(7):724.
100. Whitney DG, Dutt-Mazumder A, Peterson MD, Krishnan C. Fall risk in stroke survivors: effects of stroke plus dementia and reduced motor functional capacity. J Neurol Sci. 2019;401:95–100.
101. Ylitalo KR, Karvonen-Gutierrez CA. Body mass index, falls, and injurious falls among U.S. adults: findings from the 2014 Behavioral Risk Factor Surveillance System. Prev Med. 2016;91:217–23.
102. Yu PL, Qin ZH, Shi J, Zhang J, Xin MZ, Wu ZL, Sun ZQ. Prevalence and related factors of falls among the older people in an urban Community of Beijing. Biomed Environ Sci. 2009;22(3):179–87.
103. Zhou BY, Yu DN, Tao YK, Shi J, Yu PL. Relationship between fall and frailty index in older people adults of urban community in Beijing. Zhonghua liu xing bing xue za zhi. 2018;39(3):308–12.
104. Bagheri A, Fatemeh M, Maryam M, Ameneh S. Prevalence of falls at home and related external factors in the older people in Qazvin. J Qazvin Univ Med Sci. 1998;2(3):440–51.
105. Parsa TT, Elahe A, Samaneh A, Hamid S. A study of the prevalence of falls and its characteristics in the Iranian older people. J Saf Promot Inj Prev. 2014;2(4):313–30.
106. Habibeh Ahmadi P, HoraSrz Keiz. I. Risk factors related to falls in the older people referred to comprehensive health care centers in Kerman: a cross-sectional study. J Isfahan Med Sch. 2020;38(578):376–82.
107. Hosseini S, Ahmadi Ahangar A, Ghanbari N, Bijani A. Prevalence of falls and its association with serum vitamin D levels in the older people population of Amirkola City. JBUMS. 2016;18(8):20–8.
108. Salman Kh, Sakineh M, Razzeh Mir M, Somayeh Kh, Mohammadan A, Reza P. Epidemiological study of accidents in the older people in Hama dan province during 2009–2010. J Monit. 2016;15(5):523.
109. Seyedeh Roghayeh Jafarian A, Ali Z, Parvin Aziznejad R, Seyed R, Ali B. J Babol Univ Med Sci. 2020;15(5):95–101.
110. Forouzani N, Seyed MR. Accidents in the older people referred to Shirz University Hospitals-Winter 2004. Pars J Med Sci. 2007;5(1):41.
111. Mohsen Vakili P, Seyed Reza H, Siavash P, Ali B. Association between anemia and falling in the older people in Amirkola. J Babol Univ Med Sci. 2020;19(5):14–22.
112. Marzieh G, Ebrahim F, Akram S, Leila C, Ensheh G, Leila M. A study of common health problems of the older people referred to health centers in Azadshahr in 2013. J Health Nurs Dev. 2013;9(24):33–44.
113. Munawar Afzal A, Saleh N, Ali Khorsand Vakil Z, Fatemeh AS. The ultimate cause and effect of preventable accidents in the older people: An epidemiological study. Iran J Emerg Med. 2016;3(1):28–33.
114. Nabavi SH, Hatami ST, Norouzi F, Gerivani Z, Hatami SE, Monadi Ziarat H, et al. Prevalence of fall and its related factors among older people in Bonjurd in 2015. Salmand Iran J Ageing. 2016;11(3):466–73.
115. Najafi Ghezelhez T, Aniapour S, Jafari OM. Epidemiology and relationship of fall and fear of falling in the older people residing at Kamrani Nursing Home, Tehran, Iran. Salmand Iran J Ageing. 2016;10(4):152–61.
116. Na’emani F, Esmail Zali M, Sohrabi Z, Fayazi-Bakhsh A. Prevalence of risk factors for falls among the older people receiving care at home. Salmand Iran J Ageing. 2019;13(3):638–51.
117. Vahidreza Borhani N, Vahid H, Razieh T, Ahmad D, Ghasemz Hossein. The relationship between fear of falling and physical activity in the older people. J Mashhad Univ Med Sci. 2015;58(8):446–52.
118. Iransfar M, Ain F, Sooni H. Fall epidemiology in the Older people Residents of Care Centers in Tehran—1390. Salmand Iran J Ageing. 2013;8(2):30–8.
119. Ghodsi SM, Roudsari BS, Abdollahi M, Shadman M. Fall-related injuries in the older people in Tehran. Injury. 2003;34(11):809–14.
120. Mazharzad F, Dadipoor S, Madi An, Moradatabad AS. Investigating the prevalence and causes of events leading to falls among the older people hospitalized in Bandar Abbas hospitals. J Educ Health Promot. 2015;4:11.
121. Hadinejad Z, Talebi H, Masdari F. Trauma epidemiology among rescued older people clients in Pre-Hospital Emergency Department of Mazandaran. Salmand Iran J Ageing. 2017;12(3):372–83.
122. Safzadeh H, Habibi H, Zahnmatkei Re, Samery M. The study of the older people accidents in Kerman Province on 2006–9. Salmand Iran J Ageing. 2013;8(1):49–55.
123. Gholami J, Shahbogalghi FM, Norouzi K, Soltani PR. The relationship between fear of falling and activity limitations among seniors of Gharem Shahr City in 2013. In: 2015.
124. Rose S, Maffulli N. Hip fractures. An epidemiological review. Bull Hosp Jt Dis. 1999;58(4):197–201.