

Introduction and Rational

Dizziness is considered the second most prevalent symptom until the age of 65 years. After that age, it is the most common one, present in 80% of individuals over 75 years old. Falls are the leading cause of injury-related death, and the third leading cause of poor health among persons aged 65 years and older (*Ganança et al.,2004; Evitt & Quigley, 2004*). Approximately one third of persons aged 65 and older fall annually (*Tromp et al., 2001*).

The etiology of falls among senior peoples is multifactorial (*Nevitt et al;1989*). Elderly are prone to a variety of diseases that affect postural control systems, including glaucoma, diabetic and hypertensive retinopathy, which all affect vision; diabetic peripheral neuropathy, arthritis which affects position sense in the feet and legs, cognitive impairment (*Leipzig et al;1999*). studies have reported that orthostatic hypotension is prevalent in older people with frequent falls. (*Rutan GH1 et al,1992*).

Postural stability was also impaired in patients taking psychoactive and/or anti-hypertensive medications (*Lord SR et al,1994*) .one of the factors is the functional decline of the vestibular system capabilities due to vestibular sensory loss

which is considered as part of the normal aging process (*Dalton et al, 2003*).

The motor and sensory systems are linked by higher order neurological processes and cognition, which are required for planning movements, divided attention and responding to changes within the environment. recent researches have demonstrated cognition has a key role in the regulation of gait and balance in older adults and cognitive impairment has been identified also as a fall risk factor in clinical practice guidelines (*Muir et al., 2012*).

Gradually, persons with balance disorders may encounter difficulties in essential daily activities and become restricted in participation within their community (*Alghwiri et al., 2012*) such activities may include walking alone, driving, and shopping (*Vellas et al., 1987; Howland et al., 1993; Wijnhuizen et al., 2007*).

Fall risk screening tools developed to identify individuals at risk of falling and are frequently used as a part of falls prevention programs in hospitals (*Terry et al., 2007*). Risk for falls screening tools should predict risk with a degree of certainty, be quick and easy to use, be readily available, not be too costly, not cause discomfort for the older person & be

consistent with what other organizations are using so information can be compared (**Wilcox, 2000**).

It may include questionnaires as Falls Efficacy Scale-International (FES-I), Activities-specific Balance Confidence (ABC) Scale and/or simple office test procedures as Timed Up and Go test, Dynamic Gait Index test and Minute Walk Test. Investigation of the cognitive function (as a risk for fall) may be completed by implementation of the mini-mental state examination (MMSE) or Folstein test which is used extensively in clinical and research settings to measure cognitive impairment (**Pangman et al., 2000**).

Fall Efficacy Scale-International (FES-I) is one of the questionnaires that assesses fear of falling. It has been validated in many European countries (**Yardley et al., 2005; Kempen et al., 2007; Helbostad et al., 2010**).

It contains items that are important to patients such as their ability to clean, shop, reach for objects, and go out to social engagements (**Alghadir et al., 2015**). Poor scores on the FES-I could facilitate conversations with patients as to why they are afraid of falling as well as guide medical, rehabilitative and psychological treatment (**Michael T et al., 2013**).

FES-I was translated to the Arabic version and was validated by *Alghadir et al., (2015)* in KSA, however some of the Arabic version questions were found not suitable to be applied on Egyptian population.

Accordingly, the present study was planned to apply some modifications on Arabic FES-I to be suitable to Egyptian culture, another issue is to explore the relation between the modified Arabic fall efficacy scale international results with a simple office test for walking and balance as timed up and go test and the cognitive function of the patient through the mini-mental state examination.

Aim of the Work

- Validation of the modified Arabic version of Fall Efficacy Scale International.
- Screening for Egyptian geriatric population having risk of fall through application of the modified Arabic version of Fall Efficacy Scale-International.
- To investigate the correlation between modified Arabic fall efficacy scale questionnaire, the Mini–Mental State Examination (MMSE) and results of Timed Up and Go test (TUG).

Chapter (1)

Definition, Impact and risk factors of falling in the elderly

Falls are a common and complex geriatric syndrome that cause Considerable mortality, morbidity, reduced functioning, and premature nursing home admissions (*Laurence et al., 2006*).

A fall is an event whereby an individual comes to rest on the ground or another lower level with or without loss of consciousness. Because presyncope and syncope can cause ‘unexplained’ falls and because of the frequent overlap of falls and syncope, the presence or absence of loss of consciousness has now been incorporated into the definition. In patients who are cognitively normal, falls can be classified according to their clinical characteristics. If a patient has tripped or slipped, the fall is ‘accidental’. If a patient has fallen and or lost consciousness for no apparent reason, the episode is described as an ‘unexplained’ fall (*Oliver et al., 2007*).

Each year, millions of older people (those 65 and older) fall. In fact, one out of three older people falls each year, but less than half tell their doctor. Older adults who fall once are 2 - 3 times as likely to fall again within a year (*Shumway-Cook et al., 1997*).

Falls result from uncorrected displacement of the body from its support base. Displacements can be of two types:

Initiated displacements

Initiated displacements are those which the subject induces himself in the course of his activities. For example, on rising from a chair or getting out of bed, or even during walking, the line of gravity is momentarily displaced beyond the support base. This displacement is detected and corrected to maintain equilibrium. Initiated displacement may be of extra- ordinary magnitude, for example the movements carried out in skating, skiing, ballet dancing, gymnastics and other sports. House-bound old people do not indulge in these activities, but may initiate large displacements, e.g. by suddenly turning around in response to an unexpected sound such as the telephone ringing, or by rising rapidly from a chair (*wild et al., 1981*).

Imposed displacements

Imposed displacements come unexpectedly from the outside world. An unperceived irregularity in the ground surface may displace the body unexpectedly beyond its usual range. There is, however, sufficient reserve capacity in the mechanism for the detection and correction of displacement to enable the subject to regain equilibrium rapidly. This is the normal mechanism and it does not usually result in a fall. Imposed displacements may be of extraordinary magnitude, for example slipping on an unseen patch of moisture or oil on a kitchen floor (***wild et al.,1981***)

As the balance system becomes less efficient in later life, the range and speed of activities is diminished to remain within its reduced competence. What might be an ordinary displacement at one age becomes an extraordinary one at another. The medical factors which may impair the mechanism for the detection and correction of displacement, or more simply the balance (***wild et al.,1981***)

The following three classifications best describe all types of falls according to Morse (2002):

- Accidental falls

occur when patients fall unintentionally (e.g., they may trip or slip). Although approximately 14% of all falls are accidental, most fall prevention strategies are targeted toward this type of fall.

- Unanticipated falls

Occur when the physical causes of the falls are not reflected in the patients' risk factors for falls. A fall in one of these patients is caused by physical conditions that cannot be predicted until the patient falls. For example, the fall may be due to fainting, a seizure, or a pathologic fracture of the hip. Unanticipated physiologic falls constitute 8% of all falls in the hospital.

- Anticipated falls

Occur in patients who are at risk of falling. These patients have some of the following characteristics: a prior fall, weak or impaired gait, use of a walking aid, intravenous access, or impaired mental status. These patients are expected to fall. Even if the actual "trigger" for the fall may be that a patient with an impaired gait tripped, because of the

impaired gait, it is expected that the patient will trip; therefore, the cause of the fall is classified as anticipated rather than accidental. Anticipated physiologic falls constitute 78% of all falls in the hospital population.

Sequel and impact of falling on elderly:

With the rising number of older adults, the occurrence of falls, fall-related injuries, and fall-associated costs will also rise significantly (*Costello & Edelstein, 2008*).

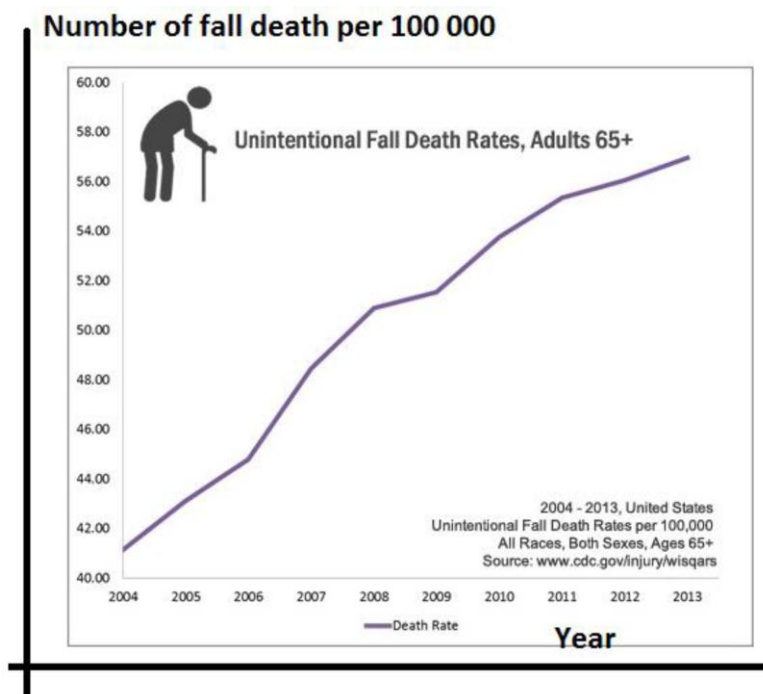


Figure (1): unintentional fall death rates per 100.000 all races, both sexes, age 65+ coated from (*Yared and Abdulrazak, 2016*)

Over 700,000 patients a year in USA are hospitalized because of a fall injury (***Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, 2013***)

One out of five falls causes a serious injury such as broken bones or a head injury (***Alexander et al., 1992; Sterling et al., 2001***). More than 95% of hip fractures are caused by falling. Falls are the most common cause of traumatic brain injuries (TBI) (***Hayes et al., 1993; Stevens et al., 2006***).

Adjusted for inflation, the direct medical costs for fall injuries are 31 billion American dollars annually. Hospital costs account for two-thirds of the total cost (***Burns et al., 2016***).

The implementation of effective fall prevention programs can reduce the economic costs of falls. Fall prevention programs also have the potential to decrease the number of serious injuries related to falls, hospitalizations and emergency room visits, while increasing occupational participation (***Rubenstein & Josephson, 2006***).

Risk factors of falling in elderly:

Fall risk factors can be classified as intrinsic and extrinsic risk factors according to ***Ebersole et al. (2004)***. Intrinsic factors are related to clients' functional and health status, Extrinsic factors are related to environment (***Berry and Kiel, 2008***).

The strongest risk factors for falling include previous falls; strength, gait, and balance impairments; and use of specific medications. Of note, falls and fractures share many risk factors (***Ensrud et al., 2007***).

A) Intrinsic Risk Factors of fall:

1. History of previous falls:

A history of previous falls is one of the best predictors of a future fall. Any previous fall increases the risk for another fall threefold. A previous fall may reduce mobility in older People, resulting in loss of strength, balance and reflexes. Feelings of fear and helplessness may also ensue, further adding to restrictions on activity and participation and reduces quality of life (***Petrella et al., 2000***).

2. Muscle Weakness and Sarcopenia:

Muscular strength has also been considered to be an important component in the ability to maintain a balanced upright posture for example, **Whipple et al.** in (1987) reported that the number of falls in the elderly population is related to weak ankle dorsiflexion strength.

More significant correlation was found between lower extremity strength and the occurrence of loss of balance among nursing home residents with a history of falls especially during dynamic postural tasks (**Tinetti et al., 1994; Wolfson, 1995**).

Sarcopenia: is a disease associated with the aging process. Loss of muscle mass and strength, which in turn affects the overall ability to perform tasks of daily living, are hallmark signs of this disease. Scientists have long believed muscle loss and others signs associated with aging are an inevitable process. However, they are looking for ways to slow these aging processes, specifically in relation to loss of muscle mass and strength (**Volpi et al., 2004**).

3. Balance system and Central nervous system disorders:

Balance is the process by which postural stability is maintained. The ability to maintain posture in a standing or sitting position, is operationally defined as static balance. The ability to maintain postural control during other movements, such as when reaching for an object or walking across a lawn, is operationally defined as dynamic balance. Both static and dynamic postural control systems are thought to be important and necessary motor abilities (*Shumway-Cook and Woollacott, 1995*).

Good balance requires reliable sensory input from the individual's **vision, proprioceptors** and **vestibular system** (sensors of position and movement in the feet and legs). Therefore, balance is a complex function and often there is no single identifiable cause of falls in an elderly person (*Woollacott and Shumway-Cook, 2000*).

The elderly is prone to a variety of diseases that affect the above-mentioned systems including:

a- Visual disorders:

Decline in visual acuity, decline in accommodative capacity, glare intolerance, altered depth perception,

presbyopia [near vision], decreased night vision, decline in peripheral vision. Age related macular degeneration, glaucoma, cataracts and diabetic retinopathy. These conditions can impair and decrease depth perception, adjustment to light, contrast sensitivity, visual fields, and acuity. It is common for older adults to have more than one vision impairment condition **(Källstrand-Ericson and Hilding, 2009).**

Visual impairments can affect daily activities such as walking, transfers, and balance for example decreased depth perception causes older adults to have a difficult time determining the depth of the steps of stairs and raised parts of floors **(NIH Senior Health, 2011).**

b- Proprioceptor and skeletal system disorders:

Diabetic peripheral neuropathy can affect position sense in the feet and legs. Also, joint abnormalities, osteoarthritis, osteoporosis and foot problems such as bunions, toe deformities, ulcers, deformed nails can lead to impaired mobility, decreased lower extremity strength affecting balance and mobility and increased fall risk **(Alexander et al., 1992; Tinetti et al., 1998).**