

# Assessment of Falls among the Elderly in the Emergency Department of the Idrissa Pouye General Hospital in Dakar, Senegal: A Cohort of 100 Cases

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## Abstract

**Background:** Falls in the elderly are a global public health problem with serious medical and socio-economic consequences, especially in low and middle-income countries. The aim of this study was to describe the characteristics of falls among the elderly in trauma units in Senegal. **Materials and Methods:** This was a descriptive, prospective study from April 20, 2022 to October 30, 2022 among people aged at least 60 and admitted to the surgical emergency department of Idrissa Pouye Hospital in Dakar following a fall. Socio-demographic, clinical, therapeutic and evolutionary characteristics were collected and analyzed using Sphinx Plus 2 and Excel 2019 for Windows software. **Results:** Out of 730 elderly people seen during this period, 100 met the criteria, representing a prevalence of 13.69%. The average consultation time was 3.25 +/- 4 days. The average age was 73 +/- 8.43 years, with women predominating (74%). Medical expenses were mainly covered by the family (73%). Most falls occurred during the day (68%), at home (82%), especially in the bedroom (30%), with stumbling (32%) as the main mechanism. The majority of patients (86%) spent less than 30 minutes on the floor. Predisposing factors were dominated by visual disorders (56%) and precipitating factors were mainly environmental (62%). Geriatric syndromes were dominated by frailty (22%). Complications were dominated by fractures (86%), and almost half (47%) had lost their autonomy for post-fall Activities Daily Living (ADL). Prescription medication was almost systematic (98%), dominated by analgesics (98%). Surgery was indicated in 58% of patients. The average waiting time for surgery was 25.36 +/- 19 days. A death rate of 1% was recorded in the emergency department. **Conclusion:** Falls in the elderly are a

frequent occurrence in traumatological emergencies, with etiological factors that are often multiple and interrelated, leading to significant morbidity. Raising awareness among people at risk and setting up an ortho-geriatric service would help prevent falls and optimize care in the short and long term.

## Keywords

Falls, Elderly People, Senegal

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## 1. Introduction

Worldwide, around 37.3 million falls are recorded every year. They are responsible for 684,000 deaths per year, 80% of which occur in low and middle-income countries [1]. Prevalence increases with age. It has been established that a third of people aged 65 and over and half of those aged 85 and over fall at least once a year, with 50% of them falling repeatedly [2]. Falls are therefore a major public health problem. In Senegal, the prevalence of falls varies between 9.26% and 26.6% in elderly subjects [3] [4].

Falls are a major cause of morbidity and mortality in this often frail population. In addition to their traumatic consequences (10% to 15%) [5], falls are responsible for frequent non-traumatic complications (metabolic, psychological and psychomotor) that may be life-threatening or functionally compromising [6]. In geriatric medicine, a fall can be a non-specific presentation of several acute pathologies (pneumonia, urinary tract infection or myocardial infarction) and is also a factor that can decompensate pre-existing co-morbidities, creating a vicious circle that is often deleterious [7]. Around a quarter (25%) of elderly people admitted for falls die within a year, compared with 6% of those admitted for other reasons [8]. Falls are also a major socio-economic burden. In the United States, the global annual cost of falls was estimated at around \$40 billion in 2018 [9].

In Senegal, two previous studies have been carried out on falls in the general population and geriatrics [3] [4]. These studies provided an overview of some of the risk factors of falls found in the Senegalese elderly population, as well as some of the mechanical and social complications of falls. However, the data were collected at a distance from the falls and did not provide information on the patient's state of health at the time of their falls. We therefore proposed to carry out this study with the main objective of updating our knowledge on falls in elderly trauma patients in Senegal by integrating geriatric dimensions.

## 2. Materials and Methods

### 2.1. Study Site

This research was conducted in the surgical emergency department (SED) at the Idrissa Pouye General Hospital (IPGH) in Dakar, Senegal. Originally established

in 1989 as the Traumatology and Orthopedics Centre (TOC), the facility was renamed IPGH in 2020 and boasts the largest orthopedics and traumatology department in the country. It is considered a national standard for the treatment of related pathologies. On average, the SED receives between 60 and 70 patients per day. Patients who have experienced a fall and are suspected of having suffered trauma are directed to the surgical emergency department, where orthopedic surgeons provide treatment. In the absence of serious trauma, patients reporting feelings of sickness or loss of consciousness are directed to the medical emergency department. Head injuries, regardless of the origin, are treated by neurosurgeons.

## **2.2. Study Design and Population**

This was a six-month, cross-sectional, and descriptive study conducted prospectively from April 20 to October 30, 2022, concentrating on the elderly population admitted to trauma emergencies. The included subjects were above the age of sixty and were admitted to trauma emergencies as a consequence of experiencing a fall. Participants who were below 60 years were not part of the study. Similarly, individuals who were above 60 years old with incomplete or unusable data collection forms were also excluded from the study.

## **2.3. Data Collection**

The questionnaire was utilized for gathering and examining information on the subsequent factors: socio-demographic features; history and co-morbidities; style of life; medicine being taken at the time of admission; fall description; intended treatment and resulting outcome. Specific geriatric syndromes were methodically assessed using established scales for older individuals. Katz's Activities of Daily Living (ADL) were utilized to evaluate functional autonomy, along with the Mini-Nutritional Assessment (MNA) to assess nutritional status, the Geriatric Depression Scale (GDS 15 items) to evaluate mood, and Fried's frailty scale to assess the frailty.

The data was gathered through questionnaires that were administered to patients. Interviews were conducted Monday to Friday between 8 am and 5 pm in either French or Wolof, the most widely spoken national language in Senegal. Completion times for surgeries were obtained by consulting the registers of operating theaters. Interviews were conducted solely with patients who provided informed consent. In instances where patients suffered from confusion, accompanying individuals were required to provide consent.

## **2.4. Statistical Analysis**

Data was collected via a questionnaire which was entered into Sphinx Plus2 software. Analysis was conducted using Excel and Sphinx software. Quantitative variables were analyzed to determine the means, medians, and standard deviations, with simple frequencies calculated for qualitative variables.

## 3. Results

### 3.1. Socio-Demographic Aspects

During the study period, 8154 patients were seen in trauma emergencies, 730 of them were elderly patients (8.95%). Of these, 103 patients were interviewed. Three forms were excluded because they could not be used. We were therefore able to use 100 survey forms, which constituted our study sample, representing a prevalence of 13.69%.

The average age was  $73 \pm 8$  years (extremes 60 and 92 years) and the 70 - 74 age group was the most representative (23%). Women predominated (74%), giving a sex ratio (men to women) of 0.35:1. Most of the patients were from the Dakar region (89%). Most of our patients (55%) were living without a spouse, widowed (47%) or alone (10%). The vast majority of patients (94%) lived with their family, although 33% were isolated at home. Only 9% of patients were physically active, mainly walking (7%). Twenty patients (20%) used technical aids, mainly walking sticks (11%) (**Table 1**). The vast majority of our patients (96%) were autonomous before the fall, with a mean ADL score of  $5.57 \pm 1.05$  points

### 3.2. Clinical Aspects

The main comorbidities were visual disorders (56%), high blood pressure (55%) and osteoarthritis (21%). Past history was dominated by falls (36%) and strokes (14%). Twenty-four patients (24%) had fallen at least twice in the previous year, and 12% had had only one fall in the previous 12 months (**Table 1**).

Medication on admission was found in 66% of patients, with an average of 2.5 drugs/patient. Poly medication (>4 drugs/day) was found in 13.64% of patients. Cardiovascular therapeutic classes (55%) were the most commonly used, with antihypertensive (37%) and aspirin (14%) followed by analgesics (17%).

The average consultation time was  $3.25 \pm 4$  days (extremes 0 and 22 days). Forty-one (41%) patients consulted the emergency department within 24 hours of their fall. The only prodromal symptoms were dizziness in 15% of patients. Falls occurred mainly during the day (68%), most frequently at home (82%), especially in the bedroom (30%) and the courtyard or living room (28%). The main mechanisms were stumbling (32%), slipping (28%) and loss of balance (26%). Eighty-six patients (86%) got up within 30 minutes of falling (**Table 2**). Only 23% of patients had recovered from falls alone, and 77% with help from family and friends.

The geriatric syndromes found in our patients were mainly pre-fragility (32%), followed by frailty (22%), risk of malnutrition (24%), malnutrition (15%), acute mental confusion (9%) and depression (4%).

The main traumatic complications were fractures (86%) and soft tissue contusions (10%). The topographies of the injuries were mainly in the lower limbs (92%), with a preponderance of hip (59%) and foot (9%) injuries (**Table 2**).

**Table 1.** Distribution by general population characteristics.

<b>Variables étudiées</b>		<b>Fréquence (%)</b>
<b>Age range</b> <b>Average age:</b> <b>73 +/- 8 years</b>	60 - 64	17
	65 - 69	21
	70 - 74	23
	75 - 79	13
	80 - 84	15
	≥85	11
<b>Gender</b> <b>M/W ratio: 0.35</b>	Women	74
	Men	26
<b>Marital and family status</b>	Widowed	47
	Married	43
	Divorced	8
	Single	2
	Living with family	94
	Not isolated at home	61
	Isolated at home	33
	Living alone	6
<b>Group and/or social activities</b>	No	84
	Yes	16
<b>Financial support</b>	Family	73
	Own resources	26
	Insurance	2
<b>Sporting activities</b>	Walking	7
	Gymnastics	1
	Swimming	1
	Golf	1
<b>Use of technical aids</b> <b>(n = 20)</b>	Walking sticks	11
	Walking frame	3
	Other types of aids	6
<b>Medical and surgical history</b>	1 fall in the year	24
	≥2 falls in a year	12
	Strokes	14
	Fractures	13
	Orthopedic surgery	4
	Myocardial infarction	1
	Urinary tract infection	1

## Continued

	Visual disorders	56
	High blood pressure	55
	Arthritis	21
	Problems with gait and/or balance	18
	Diabetes	16
<b>Comorbidities</b>	Memory disorders	13
	Digestive disorders	13
	Non-arthritic rheumatism	7
	Asthma	6
	Prostate diseases	5
	Venous thrombosis of the lower limbs	2

**Table 2.** Distribution by characteristics of falls.

<b>Variables</b>	<b>Effectifs</b>	<b>Fréquence (%)</b>	
<b>Schedule</b>	Daily	68	
	Night	32	
<b>Place occurrence</b>	Bedroom	30	
	Courtyard or common room	28	
	Home (n = 82)	Kitchen	14
		Toilets	8
		Stairs	2
	Away from home (n = 18%)	Public roads	15
		Places of work	2
	Hospital	1	
<b>Mechanisms of occurrence</b>	<b>Stumbling</b>	32	
	<b>Slipping</b>	28	
	<b>Balance problem</b>	26	
	Getting in and out of bed	5	
	Transferring	5	
	False step	3	
	Collision	1	
<b>Time spent on the ground (in minutes)</b>	<30	86	
	30 - 60	2	
	>60	3	
	Indéterminated	9	

## Continued

	Fractures	86	
	Contusions and/or haematomas	10	
<b>Complications</b>	Sprain	3	
	Luxation	3	
	Opened wounds	1	
<b>Lesion topography</b>	Hip	59	
	Ankle	6	
	<b>Lower limbs (92%)</b>	Foot	9
		Leg	5
		Knee	1
		Thigh	1
		Wrist	8
	<b>Upper limbs (17%)</b>	Arm	5
		Elbow	2
		Shoulder	1
		Forearm	1
	<b>Others (5%)</b>	Spine	4
		Pelvis	1

Acute loss of autonomy for ADL was found in 47% of patients. Fifty-three (53%) of patients were autonomous overall for DLA, but with a decline in 25% of patients.

Apart from female gender (74%), the other predisposing risk factors identified were dominated by visual disorders (56%), a history of falls (36%), lower-limb muscular atrophy (29%) and age > 80 years (26%). The precipitating factors were dominated by environmental factors (62%), represented mainly by obstacles on the ground (27%) and slippery surfaces (19%); behavioral factors (15%) and dizziness (15%) (**Table 3**).

### 3.3. Therapeutic Aspects

Management consisted mainly of quasi-systematic drug prescription (98%) represented mainly by analgesics (98%); Enoxaparin in preventive dose (69%), proton pump inhibitors (8%) and muscle relaxants (4%).

Surgery was indicated for 58% of patients. However, only 33% of patients underwent surgery in the department, with an average time to surgery of 25.36 +/- 19 days, with extremes of 7 and 87 days. The main surgical procedures were nailing (n = 23; 69.7%), including one Gamma nail, one retrograde nail and 21 proximal anti-rotation femoral nails (PFNA); hemi arthroplasty (n = 10; 30.3%) of the hip (30.3%) with a bipolar hip prosthesis (PHB).

**Table 3.** Distribution according to etiological factors.

Variables	Percentage (%)	
	Female	74
	Decreased visual acuity	56
	History of fall	36
	Lower limb muscular atrophy	29
	Age $\geq$ 80 ans	26
	Lower limb muscular atrophy	25
	Frailty	22
<b>Predisposing factors</b>	Osteoarthritis of lower limb and/or spine	20
	Cognitive decline	13
	History of traumatic fracture	10
	Polymedication ( $\geq$ 5 drugs per day)	9
	Use of psychotropic drugs, diuretics, Digoxin	6
	Depression	3
	Foot deformities	2
	Impaired sensitivity of low limb	1
	Obstacles on the ground	27
	Slippery surfaces	19
	Unsuitable clothing/shoes	13
<b>Environment</b>	Unsuitable clothing/shoes	9
	Poor lighting	6
	Lack of support	5
<b>Precipitating factors</b>	Defective walking aids	13
	Behavioural factors	15
	Dizziness	15
<b>Factors intrinsic to the patient</b>	Loss of balance	8
	False step	3
	Confusion	1
	Collision	1

### 3.4. Evolutionary Aspects

Two-thirds of patients (66%) were discharged home within 24 hours of admission, and 28% were admitted to the trauma department. Only one case of death was recorded in the emergency department. This involved an 80-year-old patient with unfavorable geriatric conditions (malnourished, dehydrated, poor general



condition), although the precise cause of death was not documented.

#### 4. Discussion

The prevalence of falls found in our series (13.69%) is corroborated by several data in the literature. In a 2016 study of fall injuries in the general population at IPGH, Dieng *et al.* [4] found a prevalence of 9.26% of elderly people among fallers. In Japan, a survey of elderly people found an almost similar prevalence of 16.5% [10]. However, our prevalence is much lower than that found in the literature from Africa and developed countries. In England, for example, a prevalence of 52% was found in a geriatric population [11], and 24.98% in elderly people in India [12]. A study conducted at the Ouakam Geriatrics and Gerontology Center (Dakar) in 2016 on falls in geriatrics by Gbehi *et al.* [3] identified a double prevalence (26.67%). This difference could be explained, on the one hand, by the framework of this study where the population received was exclusively geriatric and, on the other hand, by the frequency of non-traumatic complications (decompensations of comorbidities, post-fall syndrome, rhabdomyolysis, etc.) indicating a referral to a geriatric medical unit. This difference in prevalence could therefore be explained by the variability in study frameworks and methodology.

In our series, the mean age was 73  $\pm$  8.43 years, which is higher than that found by Gbehi *et al.* [3] with a mean age of 69.39  $\pm$  7.45 years. However, in developed countries, the average age is generally higher. In 2016, the ChuPADom study evaluating the profiles of French elderly patients aged 65 and over who suffered an accidental fall at home resulting in a fall found an average age of 84.5  $\pm$  7.9 years [13]. In the Netherlands, a study of a geriatric population found an average age of 80  $\pm$  8 years [14].

A clear predominance of women was found in our patients, in agreement with most of the data in the literature [15] [16], which identified the female sex as a risk factor for falls in the geriatric population. The study by Gbehi *et al.* [3] found the same predominance of women, but in smaller proportions (61.43%). However, a few studies disagree with our findings. In India, Pitchai *et al.* [12] conducted a study in 2019 assessing falls in a cohort of 2049 people aged 60 or over, and found a predominance of men (53.83%). Other authors found no significant differences between men and women [17]. Our finding could be explained by the configuration of the Senegalese population, with a female predominance in people aged over 60 [18]. In addition, postmenopausal osteogenic deficiency favors the occurrence of traumatic complications (fractures+++ ) due to osteoporosis [19], indicating a referral to trauma emergencies department.

In our study, the majority of falls occurred during the day (68%). This diurnal predominance is corroborated by several studies. In the United States and Tunisia, 62% and 82.5% respectively of falls occurred during the day [11] [20]. The ChuPADom study found a lower frequency of 62.9% [13].

The majority of patients fell at home (82%), more frequently in the bedroom (30%), the courtyard or common room (28%) and the toilet (14%). The study by

Gbehi *et al.* [3] identified lower proportions (64.29%). A study in New Zealand on falls among the elderly found the dining room (27.4%) and bedroom (21.4%) to be the most frequently involved areas [21], while Pitchai *et al.* found the toilets (50.75%), halls (18.21%) and in the bedroom and kitchen (11.94%) to be the most frequently involved areas [12]. Furthermore, a Norwegian study of a population of elderly women found that falls predominated outside the home (57.5%) [22]. This finding could be explained by the greater frequency of natural daytime activities for this age group, and also by the high frequency of environmental risk factors, as evidenced by the frequency of obstacles on the ground (27%) and wet or slippery surfaces (19%) in our series.

The main mechanisms of falls in our patients were tripping (32%), slipping (28%) and loss of balance (26%). These results are relatively similar to those of Gbehi *et al.* [3], who found floor obstacles (35.49%), wet floors (16.13%) and loss of balance (21.81%) to be the main mechanisms of falls. According to several authors, the elderly fall more often from a height than from high places or stairs [13] [17].

In our series, most patients (86%) had risen from the ground within 30 minutes of the fall with help (77%) and without help (9%). The vast majority of our patients lived with their family, which meant that they were not necessarily far from any relative to help them get up quickly. Only three patients (3%) had spent more than 1 hour on the floor. It has been established that time spent on the floor in excess of an hour exposes patients to metabolic complications (dehydration, rhabdomyolysis, acute renal failure, etc.), bedsores and inhalation pneumonitis. These complications increase the morbidity and mortality associated with falls.

The geriatric syndromes found in our patients were mainly pre-fragility (32%), followed by frailty (22%), risk of malnutrition (24%), malnutrition (15%) and mental confusion (9%). In the ChuPADom cohort, pre-fragility and frailty were found in 42.7% and 45.3% of patients respectively [13]. This difference with our study may be explained by the higher average age in this study (84.5 years vs. 73 years in ours). The prevalence of frailty increases with advancing age, and frailty increases the risk of falling [19]. A survey carried out in the homes of elderly people in Dakar found a prevalence of undernutrition of 2.4% and a risk of undernutrition of 39.76%, with a significant association between a risk of falling of 30.30% in cases of risk of undernutrition compared with 4.16% when nutritional status was normal [23]. Undernutrition is accompanied by sarcopenia and the consequent reduction in the adipose pannicle, which increases the risk of falls and fractures. Mental confusion in the elderly corresponds to a cerebral disorder caused by physical, psychological or emotional stress. It is associated with increased mortality, more frequent institutionalization and an increase in the number of falls [24].

In our series, the main factor predisposing to falls was visual impairment (56%), followed by a history of falls (36%) and isolation at home (35%). The stu-

dies by Gbehi *et al.* [3] and ChuPADom [13] found visual problems to be more prevalent, accounting for 83.3% and 91.9% of falls in the elderly respectively. Pitchai *et al.* [12] found that 23.01% of elderly people suffering a fall had visual problems. Aging is accompanied by a deterioration in the various sensory functions, particularly vision, which plays an essential role in the mechanisms for maintaining posture and balance. What's more, the prevalence of eye diseases (cataracts, glaucoma, age-related macular degeneration, etc.) increases with age. A third of our patients (36%) reported at least one fall in the current year, which is about the same as the series by Tinetti *et al.* [16] in the United States (30% of patients) and less than Pitchai *et al.* [12], who found a history of falls in almost half their patients.

The factors precipitating falls were mainly environmental (62%), in particular the presence of obstacles on the ground (27%) and slippery surfaces (19%). Floor obstacles accounted for 20% of the causes of falls in the study by Campbell *et al.* [21]. Gbehi *et al.* [3] identified floor obstacles as the main precipitating factor (35.49%), followed by slippery surfaces (16.13%) and stairs (8.07%). Clutter in the living environment of elderly people is often blamed for falls in other series [21]. Furniture (chairs, stools, beds, etc.) and irregular stones and paving stones were the main factors found in our study.

The main complications found in our patients were traumatic, dominated by fractures (86%) and soft tissue contusions (10%). A Moroccan study in 2019 found a prevalence of 66% of fractures in elderly patients who had fallen [25]. However, our results differ from those found in the literature. In the United States, Phelan *et al.* [26] mainly noted bruises (70%), followed by sprains (16%) and fractures (14%). A French study of everyday accidents found that post-fall complications were dominated by fractures (41%), followed by contusions and concussions (30%) and wounds (19%) [27]. This predominance of fractures in our series can be explained by our study setting, which is a national reference trauma department for the management of severe trauma. Less severe trauma was probably treated in peripheral health facilities. On the other hand, the predominance of women in our study population is also incriminated as being responsible for bone demineralization under the influence of post-menopausal estrogen deficiency and advanced age [19].

Drug treatment was almost systematic (98%), mainly analgesics (98%) and Enoxaparin in preventive doses (69%). Heparin therapy to prevent thromboembolic complications using low molecular weight heparin is recommended by several learned societies for patients with severe lower limb trauma requiring prolonged immobilization [28]. Pain management is an essential but often complex stage in the management of trauma in the elderly. When poorly managed, pain can lead to acute mental confusion, regressive syndromes with withdrawal, anorexia or depression [29]. Conversely, excessive analgesia exposes elderly patients to impaired alertness, depression of the upper respiratory centers and an increased risk of falls.

In our series, surgery was indicated for 58% of patients, but only 33% of patients were able to have surgery in the department, with an average waiting time for surgery of 25.36 +/- 19 days (extremes of 7 and 87 days). We did not find such long waiting times in the literature. In elderly patients, the time to surgery has a prognostic value. Surgery delayed beyond 48 hours exposes elderly patients to frequent intra and post-operative complications (acute mental confusion, pressure sores, inhalation pneumonitis, thromboembolic accidents, etc.) and increases the risk of death [30]. In our context, this is a scheduled surgery that responds to organizational (availability of the operating theatre and staff) and financial (availability of osteosynthesis equipment and payment of surgery costs) imperatives. Further studies on the pre and post-operative state of these patients would give us a better understanding of the consequences of these long delays on the health of elderly Senegalese. In addition, studies have shown the benefit of an ortho-geriatric organization, of whatever type, in improving the prognosis in the management of fractures of the upper end of the femur in the elderly [29] [31]. In fact, multidisciplinary management (emergency physicians, anesthetists, orthopedists, geriatricians, etc.) can reduce the rate of complications, mortality, length of hospitalization and healthcare costs, while improving post-operative functional prognosis [29] [32].

However, our study had limitations due to selection and information bias. Because of the way emergency departments were organized for triage, elderly patients with falls due to fainting or loss of consciousness were referred to the medical emergency department, and those with head trauma were referred to neurosurgeons. Only those consulting for pain following a fall and with normal consciousness were referred to orthopedic surgeons. In addition, the working and reception conditions sometimes made it impossible to assess and interview patients and their relatives, which greatly reduced the size of our sample.

## 5. Conclusion

Falls in the elderly are a frequent occurrence in trauma emergencies, with etiological factors that are often multiple and interrelated, leading to significant morbidity. They are associated with a relatively long delay in consultation and surgical intervention, which can have negative consequences on the autonomy of the elderly in the medium and long term. Raising awareness among at-risk populations, free surgical devices such as prostheses through government initiatives, and the establishment of an ortho-geriatric network would enable prevention and optimized management in the short and long term.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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