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Profile of Geriatric Trauma in a Developing Country

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Abstract

Geriatric trauma patients require special consideration. They frequently have comorbidities and reduced physiologic reserves, influencing treatment decisions and outcomes. Hence, a comprehensive approach is fundamental to ensure better results. The authors retrospectively evaluated the profile of 332 cases of geriatric trauma over ten years (January 2010-December 2019) at National Orthopaedic Hospital Enugu, in South-East Nigeria. The mean age of patients was 74.78 years (SD = 8.69), with females presenting at a later age than men (76.05 vs 73.69 years), p = 0.013. The commonest mechanism of injury was ground-level fall (47.59%), with proximal femoral fractures being the most common (41.27%). Only 47% of geriatric patients presented to a hospital within 24 hours following injury, and the mean duration of admission was 28 days. Approximately 77% of patients had operative care, and 68.67% expressed satisfaction with the outcome of their management. The mortality rate was 2.11%. In conclusion, most geriatric fractures require surgical intervention and education to facilitate early hospital presentation is needed.

Keywords

Geriatric, Trauma, Developing Country

1. Introduction

Older patients pose a unique challenge at trauma centres [1], and as their numbers increase, their proportion of injuries is expected to increase [2]. Many geriatric patients present to orthopaedic facilities with fractures, which challenge the

surgeons as they tend to have comorbid issues that may affect the timing and intervention given. The projection of a doubling of the older population in Sub-Saharan Africa (SSA) between 2000 and 2030 [3] will likely increase geriatric fractures. The type and location of fracture will depend on the mechanism of injury and other risk factors. Details of injury patterns in geriatric patients will guide health practitioners on preventive measures and effective management modalities for this group of patients. There is a need to understand the physiologic changes in geriatric patients and the functional limitations of this group. When all these are considered, planning is initiated to reduce surgical stress and restore an active, enjoyable life.

Early mobilisation is vital in reducing morbidities and mortalities, so timely surgical intervention should be emphasised when the patient is fit. Patients who lose even one activity of daily living following a traumatic incident are more likely to sustain additional trauma, require placement in a rehabilitation facility, and have higher mortality rates [4]. There is a tendency to increase complications when hospital admission is prolonged in elderly patients. Their vulnerability to such complications as nosocomial infections, decubitus ulcers, and deep vein thrombosis is due, in part, to coexisting comorbid conditions and decreasing functional reserves [5]. Therefore, efforts should be made to attend to these patients urgently and rehabilitate them early to avoid such complications. Adequate workup is essential to correct any comorbidities and optimise them for surgical intervention where indicated.

This study described the pattern of presentation of geriatric trauma, highlighting the injury mechanism and fracture type and the relationship between injury mechanism and fracture location. It also examined the relationship between injury mechanism and age and looked at treatment options and outcomes.

2. Methodology

This work was a retrospective study of geriatric trauma patients admitted from 1st January 2010 to 31st December 2019 at a tertiary orthopaedic and trauma centre in South-East Nigeria. Trauma is defined as bodily injury that affects the musculoskeletal system for the purpose of this work. The exclusion criteria were age below 65 years, non-orthopaedic injuries, and patients with missing information. Data extracted from the case notes include the sociodemographic parameters, injury duration, place of initial treatment, and presenting complaints. Others are injury mechanisms and locations, clinical characteristics, complications, comorbidities, and diagnosis. The authors also extracted the therapy given, surgery type, and implants used. Other information includes admission duration, deep vein thrombosis (DVT) prophylaxis type, and duration and treatment outcome. Data retrieved were analysed using the Statistical Product and Service Solutions, IBM SPSS version 26 [6]. Descriptive statistics were used to characterise demographics besides the association between categorical variables was tested using the chi-square test of independence, while other relevant parametric and

nonparametric tests were employed where necessary. Ethical approval was obtained from the hospital research and ethics committee.

3. Results

Three-hundred and thirty-two records of geriatric trauma patients were retrieved and analysed with a male to female ratio of 1.2:1. The mean age of the patients was 74.78 years (SD = 8.69), with females presenting at a later age than men (76.05 vs 73.69 years), p = 0.013. Most of the patients were in the seventh and eighth decades of life and were mostly retired from civil service. Table 1 summarises the sociodemographic variables of the participants.

The commonest injury mechanism in this cohort of patients is ground-level fall, 47.59% (158), a low-energy transfer injury mechanism (Table 2). There is a statistically significant association between the age categories and injury mechanism, χ^2 (20, n = 332) = 61.59, p < 0.001. High-energy injuries such as road traffic accidents decreased as the age category increased. By contrast, low-energy injuries are the commonest cause of trauma in the older age groups (Table 3).

Table 1. The sociodemographic parameters of the study population.

Variable	n	%
Gender		
Male	179	53.92%
Female	153	46.08%
	332	**100.00%**
Age		
65 - 74	185	55.72%
75 - 84	93	28.01%
85 - 94	42	12.65%
95 - 104	10	3.01%
105 - 114	2	0.60%
	332	**100.00%**
Occupation		
Retired Civil Servant	89	26.81%
Farmer	66	19.88%
Trader	50	15.06%
Housewife	46	13.86%
Civil Servant	22	6.63%
Artisan	17	5.12%
Dependent	10	3.01%
Teacher	7	2.11%
Others	25	7.53%
	332	100%

Table 2. The injury mechanism in geriatric patients.

Injury Mechanism	N	%
Ground Level Fall	158	47.59%
Road Traffic Accident	115	34.64%
Fall From Height	31	9.34%
Other Injuries	16	4.82%
Pedestrian Motor Vehicle Accident	10	3.01%
Gunshot Injury	2	0.60%
Grand Total	**332**	**100.00%**

Table 3. The association between age category and the mechanism of injury.

Age category (yrs.)	Injury mechanism	N	%
65 - 74	Road Traffic Accident	89	26.81%
	Ground Level Fall	57	17.17%
	Fall From Height	17	5.12%
	Other Injuries	13	3.92%
	Pedestrian-Motor-Vehicle Accident	7	2.11%
	Gunshot Injury	2	0.60%
		185	**55.72%**
75 - 84	Ground Level Fall	58	17.47%
	Road Traffic Accident	21	6.33%
	Fall From Height	9	2.71%
	Pedestrian Motor Vehicle Accident	3	0.90%
	Other Injuries	2	0.60%
		93	**28.01%**
85 - 94	Ground Level Fall	31	9.34%
	Fall From Height	5	1.51%
	Road Traffic Accident	5	1.51%
	Other Injuries	1	0.30%
		42	**12.65%**
95 - 104	Ground Level Fall	10	3.01%
		10	**3.01%**
>104	Ground Level Fall	2	0.60%
		2	**0.60%**
Grand Total		**332**	**100.00%**

The lower limb is the commonest region injured 77.41% (257) followed by the upper limb 9.94% (33), spine 7.23% (24), pelvis 2.41% (8), multiple site 2.11% (7), chest 0.60% (2) and head 0.30% (1). Fractures are the predominant injury

type among these geriatric patients with 84.34% (280), then spinal cord injury with 7.23% (24), dislocations 3.92% (13), fracture-dislocations 3.92% (13), and sprains 0.60% (2). Proximal femoral fractures (41.27%) were the commonest musculoskeletal injury in geriatric patients in this study (Table 4). Tibia shaft fracture was the most common fracture in the youngest age category, consistent with a higher mechanism of injury. In contrast, an intertrochanteric femoral fracture was the most common fracture in the older age groups, except for the oldest age category where a distal femoral fracture occurred. This association between age category and specific lower limb fracture occurrence was statistically significant, χ^2 (104, n = 332) = 133, p = 0.029. Table 5 shows the distribution

Table 4. The frequency of injuries observed in the study.

Specific injury	n	%
Intertrochanteric Fracture	64	19.28%
Femoral Neck Fracture	60	18.07%
Tibia Shaft Fracture	32	9.64%
Distal Femur Fracture	31	9.34%
Femoral Shaft Fracture	24	7.23%
Cervical Spine Fracture	14	4.22%
Subtrochanteric Fracture	13	3.92%
Ankle Fracture-Dislocation	11	3.31%
Pelvis Fracture	10	3.01%
Lumbar Spine Fracture	10	3.01%
Ankle Fracture	9	2.71%
Humeral Shaft Fracture	7	2.11%
Soft Tissue Injury	7	2.11%
Shoulder Dislocation	5	1.51%
Distal Tibia Fracture	5	1.51%
Radio-Ulna Fracture	4	1.20%
Distal Radius Fracture	4	1.20%
Patella Fracture	4	1.20%
Proximal Tibia Fracture	3	0.90%
Elbow Dislocation	3	0.90%
Hip Dislocation	3	0.90%
Distal Humerus Fracture	2	0.60%
Proximal Humerus Fracture	2	0.60%
Hand Fracture	2	0.60%
Ulna Fracture	1	0.30%
Foot Fracture	1	0.30%
Clavicle Fracture	1	0.30%
Grand Total	**332**	**100.00%**

Table 5. The association between age category and specific injury type.

Age category (yrs.)	Specific lower limb injury	n	%
65 - 74	Tibia Shaft Fracture	24	20.17
	Femoral Neck Fracture	23	19.33
	Distal Femur Fracture	19	15.97
	Femoral Shaft Fracture	18	15.13
	Intertrochanteric Fracture	14	11.76
	Subtrochanteric Fracture	7	5.88
	Ankle Fracture	7	5.88
	Distal Tibia Fracture	2	1.68
	Hip Dislocation	2	1.68
	Patella Fracture	1	0.84
	Proximal Tibia Fracture	1	0.84
	Foot Fracture	1	0.84
		119	**100.00%**
75 - 84	Intertrochanteric Fracture	26	32.10
	Femoral Neck Fracture	26	32.10
	Distal Femur Fracture	7	8.64
	Tibia Shaft Fracture	5	6.17
	Subtrochanteric Fracture	4	4.94
	Patella Fracture	3	3.70
	Femoral Shaft Fracture	3	3.70
	Proximal Tibia Fracture	2	2.47
	Distal Tibia Fracture	2	2.47
	Ankle Fracture	2	2.47
	Hip Dislocation	1	1.23
		81	**100.00%**
85 - 94	Intertrochanteric Fracture	19	51.35
	Femoral Neck Fracture	8	21.62
	Femoral Shaft Fracture	3	8.11
	Distal Femur Fracture	3	8.11
	Tibia Shaft Fracture	2	5.41
	Distal Tibia Fracture	1	2.70
	Subtrochanteric Fracture	1	2.70
		37	**100.00%**
95 - 104	Intertrochanteric Fracture	5	50.00
	Femoral Neck Fracture	3	30.00
	Tibia Shaft Fracture	1	10.00
	Subtrochanteric Fracture	1	10.00
		10	**100.00%**
>104	Distal Femur Fracture	2	100.00%

of specific lower limb fractures across the age categories. Only 0.90% (3) of geriatric patients presented as polytrauma, consistent with the predominant low-energy injury in this population.

Only about 47% of geriatric patients with musculoskeletal injuries presented immediately (within 24 hours) to a hospital (Figure 1). The median duration of hospital presentation was five days after trauma with a minimum of one day and a maximum of 12 years.

About 10% of the patients presented with various complications, either due to the trauma, like cord paralysis in 16 patients (4.82%), or from the late presentation and prior mismanagement with non-union, wound infection, osteomyelitis, and joint stiffness. About 48.16% of the patients have medical comorbidities at presentation, with 14.16% having multiple medical conditions (Table 6). Hypertension and diabetes mellitus predominate in all age groups in this study. Similarly, about 22.29% have had previous surgery, with 4.22% undergoing multiple previous surgeries and anaesthesia (Table 7).

One-hundred and twenty patients (36.14%) were anaemic (Hb < 10 g/dl) at presentation, but only 64 patients (19.28%) received a blood transfusion during the initial resuscitation. The number of blood units received was two in 8.43% (28 patients), one in 6.63% (22), three in 3.61% (12), and four in 0.60% (2). About 77% of the patients received an operative intervention, with the rest managed conservatively (Table 8). Two-hundred and seventy-seven patients (83.43%) received deep vein prophylaxis while on admission. Figure 2 shows the agents

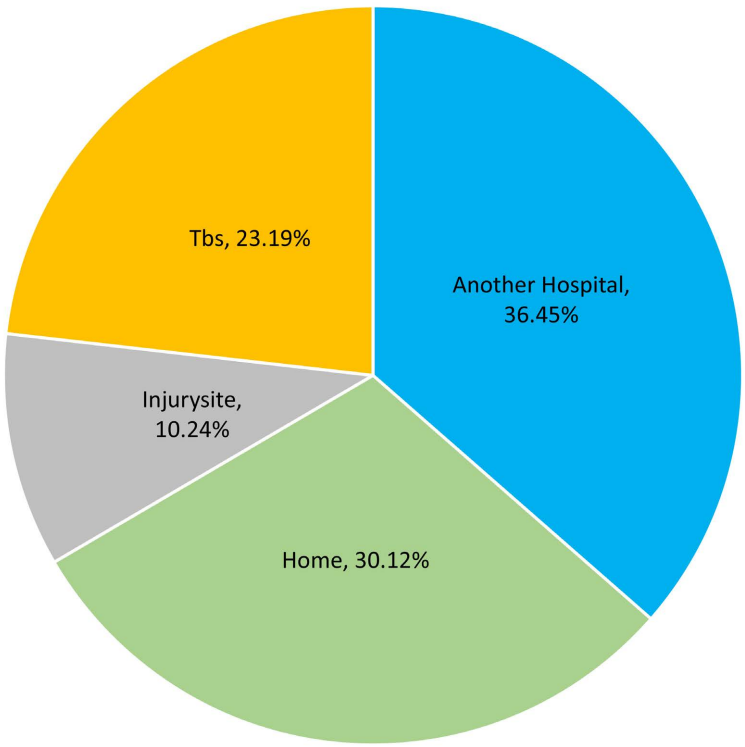

Figure 1. The initial actions of geriatric trauma patients after injuries. TBS (Traditional Bone Setters). Injury site (presented to our hospital from the injury site).

Table 6. The distribution of comorbidities in the patients.

Comorbidity	Type	N	%
Multiple Comorbidities	Hypertension, Diabetes Mellitus	28	8.43%
	Hypertension, Diabetes Mellitus, PUD	2	0.60%
	Hypertension, BPH, Cataract	2	0.60%
	Diabetes, Parkinson's Disease	1	0.30%
	Hypertension, Diabetes Mellitus, CVA	1	0.30%
	CAP, Dementia	1	0.30%
	Hypertension, Asthma, CAP	1	0.30%
	Hypertension, Diabetes Mellitus, Cataract	1	0.30%
	Hypertension, Cataract	1	0.30%
	Hypertension, Diabetes Mellitus, Knee OA	1	0.30%
	Hypertension, dementia	1	0.30%
	Hypertension, Glaucoma	1	0.30%
	Hypertension, Hip OA, Knee OA	1	0.30%
	Hypertension, Prostate Cancer	1	0.30%
	Hypertension, PUD	1	0.30%
	Hypertension, Diabetes Mellitus, Alzheimer, CVA	1	0.30%
	Alzheimer's Disease, CAP	1	0.30%
	Hypertension, Diabetes, BPH	1	0.30%
	PUD, Cataract	1	0.30%
		47	**14.16%**
Single Comorbidity	Hypertension	73	21.99%
	Diabetes Mellitus	14	4.22%
	PUD	13	3.92%
	Cataract	3	0.90%
	Parkinson's Disease	1	0.30%
	Breast Cancer	1	0.30%
	Cervical spondylosis	1	0.30%
	Lumbar Spondylosis	1	0.30%
	Psychosis	1	0.30%
	CCF	1	0.30%
	Visual Impairment	1	0.30%
	Chronic leg ulcer	1	0.30%
	BPH	1	0.30%
	CVA	1	0.30%
		113	**34.04%**
None	None	171	51.51%
		171	**51.51%**
Grand Total		**332**	**100.00%**

Table 7. The surgical history of the patients.

Surgical History	Surgery Type	N	%
Single Previous Surgery	Inguinal Herniorrhaphy	20	6.02%
	C/S	7	2.11%
	Cataract Surgery	5	1.51%
	Appendectomy	5	1.51%
	Bilateral Inguinal Herniorrhaphy	3	0.90%
	Exploratory Laparotomy	3	0.90%
	Prostatectomy	2	0.60%
	Umbilical Herniorrhaphy	2	0.60%
	Suprapubic Cystostomy	1	0.30%
	ORIF Humerus	1	0.30%
	Orchidectomy	1	0.30%
	ORIF Shoulder	1	0.30%
	TURP	1	0.30%
	Debridement for Gunshot Iinjury to the leg	1	0.30%
	SSG	1	0.30%
	ACDF	1	0.30%
	Craniotomy	1	0.30%
	Bilateral Cataract Surgery	1	0.30%
	Varicocelectomy	1	0.30%
	Hysterectomy	1	0.30%
	Inguinal Herniorrhaphy	1	0.30%
		60	**18.07%**
Multiple Previous Surgeries	Lumbar spine decompression, Orchidectomy	2	0.60%
	THR, TKR	1	0.30%
	Prostatectomy, Inguinal Herniorrhaphy	1	0.30%
	Bilateral Inguinal Herniorrhaphy, Appendectomy	1	0.30%
	Bilateral Cataract & Glaucoma Surgery	1	0.30%
	C/S, Appendectomy	1	0.30%
	Prostatectomy, Cataract Surgery	1	0.30%
	Cataract Surgery, Appendectomy	1	0.30%
	Radical Mastectomy & Radiotherapy	1	0.30%
	Hysterectomy, Cholecystectomy	1	0.30%
	Uterine Myomectomy, TKR	1	0.30%
	Inguinal Herniorrhaphy, Cataract Surgery	1	0.30%

Continued

	Inguinal Herniorrhaphy, Laparotomy	1	0.30%
		14	**4.22%**
No Previous Surgeries	No Previous Surgery	**258**	**77.71%**
		258	**77.71%**
Grand Total		**332**	**100.00%**

Table 8. The definitive treatment given to the patients.

Treatment	Type	N	%
Conservative Treatment	Cast Immobilization	40	12.05%
	Skin Traction	17	5.12%
	Skull Traction	11	3.31%
	Skeletal Traction	7	2.11%
		75	**22.59%**
Surgery	Surgery	257	77.41%
		257	**77.41%**
Grand Total		**332**	**100.00%**

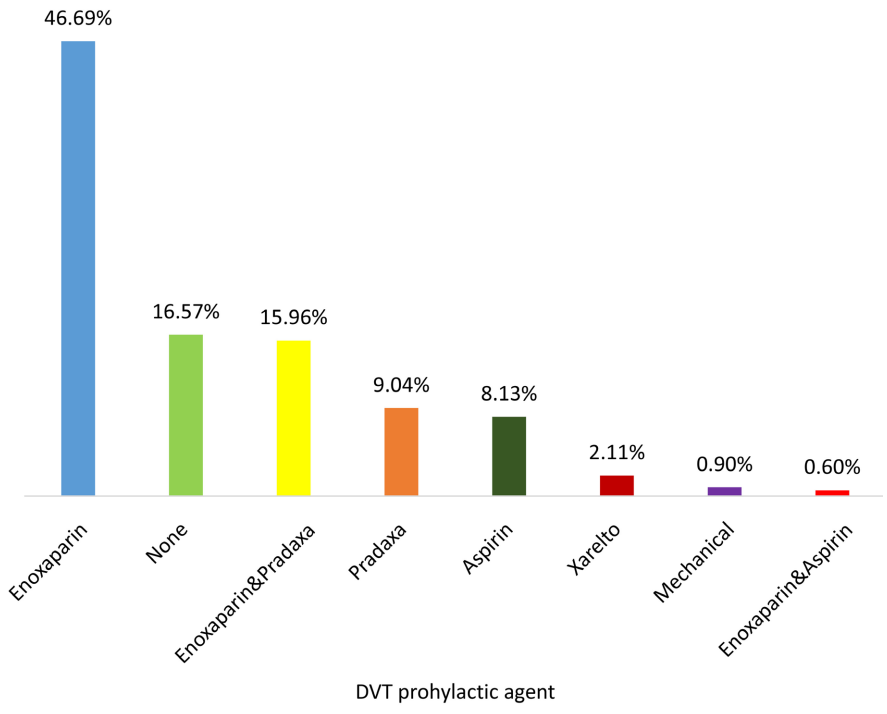

Figure 2. The DVT prophylactic regimen in the patients.

used in the present work. Two-hundred and fifty-five patients (76.81%) required an assistive device to aid mobilisation and discharge from the hospital, 9.6% (32) did not need an assistive device to mobilise, and the remaining 13.6% (45) had no record or had died or discharged against medical advice. The median dura-

tion of admission was 28 days, with a minimum of two and a maximum of 210 days. Two hundred and twenty-eight patients (68.67%) were satisfied with the outcome of their management (Table 9). The mortality rate in this series was 2.11%.

4. Discussion

Improved quality of life of the elderly with increased life expectancy makes them active, exposing them to accidents with a growing number of major trauma cases [7]. So, continued research in managing this subset of patients can lead to protocols and practice guidelines to improve outcomes [8].

Our study found a mean age of 74.78 years, similar to a study done in Turkey [9] with a mean age of 77.16 years and other reports [10] [11] [12] [13]. Males were more than females in our study, similar to other studies [14] [15]. This is explained by the fact that males are the breadwinners in most families and are more active and exposed to trauma than females. Zhu *et al.* [10] noted the reverse as females were more in their study probably because of their high proportion of ground-level falls (89.4%) compared to their RTA (3.1%). In contrast, we had a higher rate of RTA (34.64%) and a lower proportion of ground-level falls (47.6%) than theirs. Females presented later than men (76.05 vs 73.69 years). This was similar to a study in which the percentage of male patients decreased with age [4] and another work where the men were more frequent in the lower age group [14]. It is possible that more females may present with more orthopaedic trauma with increasing age than men, probably because of depleting hormones from menopause.

Table 9. Clinical outcome of the treatment at follow-up.

Outcome	N	%
Good	228	68.67%
Unspecified	71	21.39%
Referred For Multidisciplinary Care	13	3.92%
Death	7	2.11%
Nonunion	5	1.51%
Infection	2	0.60%
Post-Traumatic Osteoarthritis	1	0.30%
Amputation	1	0.30%
Depression	1	0.30%
Chronic Regional Dystrophy	1	0.30%
Malunion	1	0.30%
Femoral head Avascular Necrosis	1	0.30%
Grand Total	**332**	**100.00%**

In our study, ground-level fall (GLF) was the commonest mechanism of injury, similar to some other reports [10]-[17]. The possible reasons include reduced balance alongside continuing physiologic changes resulting in impaired vision and hearing, decreased motor strength, cognitive impairment, and medications for comorbidities [18]. Though typically regarded as a minor mechanism of injury, studies have reported the need to take ground-level falls in geriatric patients seriously and carry out a full trauma assessment, especially where cognitive function is impaired, to avoid missing associated injuries. Equally important is the greater likelihood of medical comorbidities they may have [19] [20]. This study found a significant association between age and the injury mechanism, with high-energy injuries decreasing as age increased and higher age groups associated with low-energy ones. This finding is similar to the study by Peterson *et al.* [8], where most patients aged 70 and above sustained falls. Falls associated with higher age groups may result from frailty, instability, and environmental hazards. A similar report by Miyoshi *et al.* [14] found more traffic injuries in the 65 - 79 age group and more falls in the ≥80 age group.

The lower limb was the most common area in our study, similar to reports in some other studies [13] [21] [22] [23] [24]. This is because the lower limb receives the highest impact during GLF. Fractures were the predominant injuries noted in our study, 84.34%, similar to other studies [21] [23]. Hip fractures are the commonest fracture seen in elderly patients [10] [17] [25], identical to our findings. Proximal femoral fractures predominated in 41.27%, with an increasing incidence as age increased. The main predisposing factor for proximal femoral fractures is low bone mineral density. The risk for these fractures increases by 2 - 6 fold for each standard deviation reduction in bone mineral density [26].

Tibia shaft fractures were the commonest in the youngest age category of 65 - 74 years with 20.17%. The reason is that RTA is the commonest injury mechanism in that age group which is more outgoing than their elderly counterparts and more prone to high-energy trauma. Intertrochanteric fractures were the most common in the older age category, except for those above 104 years, where a distal femoral fracture was the only recorded injury. This pattern is similar to the report by Anyaehie *et al.* [25]. The association between age category and specific lower limb fractures was significant. As age increased, proximal femoral fractures predominate, while tibia shaft fracture was the most common fracture in the youngest age category, consistent with a higher mechanism of injury. Only 0.9% presented with polytrauma because most geriatric patients presented with low-energy injury usually localised to one body region. Most of the fractures required surgical treatment, similar to reports by Zhu *et al.* [10].

Less than half of the patients presented within 24 hours to a hospital after the injury (**Figure 1**). The late hospital presentation tends to delay management. Studies report that early hip surgery within 48 hours reduces mortality risk and carries fewer perioperative complications [27].

Most patients, 90%, did not present with any complications, probably because of the low-energy mechanisms that restrict the injury to the impact site. The rest had complications due to the trauma resulting from late presentation and prior mismanagement. Hypertension and diabetes mellitus were the predominant medical comorbidities in this study. Peterson *et al.* [8] reported hypertension, hyperlipidemia, and heart disease as the most prevalent comorbidities. His conclusion on refining trauma care to include medical services to co-manage these comorbidities is vital to enhance optimal patient care and reduce mortality. Our study reported that 22% of the patients had previous surgery (**Table 7**). Knowledge about surgical history and exposure to anaesthesia is necessary. Reports of unusual reactions associated with previous anaesthetic agents are vital to the anaesthetist in averting perioperative complications.

One-hundred and twenty patients (36.14%) were anaemic (Hb < 10 g/dl) at presentation supporting reports [28] that elderly trauma patients have lower haemoglobin levels on admission. Our study had about 77% of the patients receiving an operative intervention. A systematic review and meta-analysis reported significantly higher 30-day and 1-year mortality in nonoperatively treated hip fractures, supporting the need to actively manage and rehabilitate these patients in the fastest and safest way possible [29].

Most patients (83.43%) received deep vein thrombosis prophylaxis. Elderly patients are a high-risk group for deep vein thrombosis and should be on prevention. The bleeding risk should be weighed against the risk of thrombosis, and the patient should be monitored.

In this study, 76.81% of the patients required an assistive device to aid mobilisation until hospital discharge. This is not unexpected as the majority had some form of surgery or intervention and thus needed aid. Because they are frail with some functional impairment, weight-bearing support is required until they are fully rehabilitated.

The median duration of admission was 28 days, with a wide range. It has been noted that establishing interdisciplinary care protocol can decrease the length of stay in the hospital [30] [31] [32]. This co-management protocol for elderly patients with fractures includes thorough perioperative assessment, expeditious surgical treatment, and continued primary geriatric care postoperatively by a team from different clinical departments. Most patients were satisfied with the outcome of their management, and the mortality rate in this series was 2.11%. No patient-related outcome measure was used in this study, being a retrospective study.

5. Conclusion

Hip fractures constitute the commonest injury and are associated with higher age categories. Ground-level fall remained the commonest cause of geriatric trauma. It increased significantly with age, which plays a role in determining the mechanism of injury and the region of the affected body. A holistic approach to

managing these patients' comorbidities is imperative while educating patients and relatives on mitigating ground-level falls and encouraging early hospital presentation.

Study Limitation

There were many excluded folders due to missing information which is a drawback of the retrospective design.

Conflicts of Interest

Authors declared they have no conflicts of interest.

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