Ophthofall: A risk factor for falls and fractures among Orthopaedic in-patients in Nigeria

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Citation

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Abstract

Purpose: To determine prevalence, aetiology of visual impairment (VI), and potential target population of fall fractures among Orthopaedic patients.

Methods: A three year prospective study at a University Teaching Hospital setting. Patient's informed consent and institution's ethical clearance were obtained. A protocol was established for patient's recruitment and structured questionnaires were drawn to extract information on the bio-data, pattern of fall fractures and ocular disorders. The ophthalmic status was assessed using Snellen's Visual acuity chart, funduscopy and tonometer. All the patients had plain radiography. CTscan was individualized. Data was analyzed using SPSS window version 11.The level of significance was taking as $p<0.05$.

Results: Of the 148 fall fracture patients (FFP), 78(52.7%, males-74.4%; females-25.6%) had impaired vision .The mean age was 45.6+/- 12.3 years (range: 28-83years) and 49.3 FFP/year. The aetiology of visual impairment was correctable refractive errors 40.6%, pterygium 26.0%, glaucoma 8.1%, cataract 11.4% and age related macular degeneration 2.4%. Neuro-ophthalmic diseases such as ptosis, strabismus and non glaucomatous optic atrophy were seen in 6.5%. Also corneal opacity, retinal detachment and phtysis bulbi in 1.6% each. Fractures sustained were hip, pelvic, femoral, scapular, humeral, clavicle and spinal fractures. High level falls were commoner in the younger patients and VI in them was mainly due to advanced pterygium, refractive errors and monocular cataract. Prevalence of significant visual impairment increases from 45 years upwards ($p< 0.003$).

Conclusion: The prevalence of visual impairment (VI) among Orthopedics in patients with fall fractures is high. VI could be causing falls or compounding the severity. Advanced pterygium was found to be a risk factor in these indigenous black African patients. To prevent fall fractures, routine screening eye tests should be incorporated into the medical assessment of all individuals whose job involves climbing.

INTRODUCTION

Most falls are multifactor in origin and are probably the result of an interaction between intrinsic and environmental factors. The risk of having an unintentional injury is higher for people who are visually impaired compared with the fully sighted population.[1] In this study, Ophthofall is defined as fall due to ocular pathology that impair vision .

Intuitively, there are two main reasons why people with visual impairment (VI) are more susceptible to injury: they have fewer visual clues to alert them to potential hazards such as oncoming traffic, and home environments and workplaces have not been suitably adapted, for example, with adequate lighting. Also, the risk of falling is exacerbated in certain groups, such as older people, who tend to be more dependent on vision to maintain vertical posture.[2]

Visual impairment has been shown to be associated with falls in several studies [1,2,3,4,5,6]. Visual risk factors include reduced visual acuity [1, 5, 7,8,9], reduced contrast sensitivity [1, 3, 10, 11], poor depth perception [6]), self-reported poor vision [4, 12], and visual field loss [1, 13]. One study also found that posterior sub capsular cataract and use of topically applied beta blockers as glaucoma drops were significant risk factors for falls [1]. Most of the previous studies concentrated on the

older folks.

The prevalence of visual impairment among fall fractures patients (FFP) in Nigeria is unknown. Hence the authors examined the aetiology, prevalence and outcome of visual impairment among orthopedics in-patients with fall fracture. The research question was that fall fractures are related to visual impairment among Nigerians.

PATIENTS AND METHODS

A prospective clinical based non randomized study of visual impairment among Orthopaedic admissions with fall fractures was conducted between December 31st, 2003 and December 30th, 2006 .

Patient's informed consent and Ethical approval of the protocol for the study was obtained from the ethical and research committee of Obafemi Awolowo University Teaching Hospital Complex (OAUTHC), ile-Ife, Nigeria

Eligible subjects were all patients hospitalized with a radio graphically confirmed fracture resulting from a fall in the Wesley Guild Hospital, Ilesha or the Ife State Hospital, Ile-Ife Unit of OAUTHC. Information was obtained on each identified individual with a fall fracture. Classification of fracture type was done by the managing Orthopedic surgeon. Computerized tomography scan was individualized.

Excluded were patients who had sustained a fracture from traffic accident, preexisting pathologic condition such as primary or metastatic bone tumour, and chronic osteomyelitis. Those chronically confused or who had other significant medical illness associated with fall, and none visually significant pterygium were also excluded.

The confounding factors such as age, gender, occupation, geographical weather variation such as wet/dry season, level of fall and pre-existing co-morbid state of the subjects were evaluated.

Demographic information was obtained on each of the fall fracture patients. Study participants completed the instrument of measurement which was a face-to-face interviewer-administered questionnaire .It included measure of functional impairment of Katz et al.'s Activities of Daily Living scale [12]. They were asked how they would describe their vision: blindness in eyes, minimal sight, adequate sight, or good sight. They were also asked whether a doctor or optician had told them that they currently had refractive errors, cataracts (including those who had already had cataracts removed), glaucoma, or double vision. Participants were asked what type of eyeglasses they wore (if at all) and whether they had been wearing these glasses at the time of the fall. Question was asked about the length of time since their last eye examination. The questionnaires were administered by two trained research nurses and a senior registrar ophthalmologist.

Visual acuity was measured on the ward by trained nurses using a Snellen's chart read at 6 m with or without pin-hole at constant illumination while the participant was wearing his or her current eyeglasses to correct for distance. Visual impairment was as defined by the American criteria, best visual acuity of 6/18 or worse in the better eye.

Depth perception (stereopsis) was measured using a TNO test chart carried out at 40 cm with constant illumination in a only a few number of patients by an ophthalmologist since only one set of testing instruments was available in just one of the study centers. The visual field was measured by confrontation method by the trained research nurses and a resident ophthalmologist after an initial pretest on the degree of agreement. In addition, they also assessed for the presence of cataract in the red reflex.

Those patients identified with impaired vision on initial screening were further assessed by an ophthalmologist using Perkins' tonometer and dilated direct funduscopy were done on their beds to identify the cause. Intraocular pressure (IOP) above 21mmHg was regarded as abnormal while cup disc ratio > 0.6 was taking as glaucomatous. Further assessments conducted in the ophthalmology department as soon as patient can ambulate included a dilated indirect funduscopy and slit-lamp examination. On completion of the examination, the Ophthalmologist documented the cause(s) of any visual impairment found.

All those patients with visual impairment were informed and counsel prior to discharge, and invited to report in the eye clinic for follow-up and further treatment. Refraction was done, glasses was prescribed where indicated and individualized surgery was performed. Our research question was that fall fracture is related to visual impairment and the outcome measures was visual acuity of fall fracture patients.

The limitations of the study are inabilities to use standardize method of automated visual field assessment and the contrast sensitivity was not assessed in all the patients due to in availability of these test equipments/instruments in all the study centers.

STATISTICAL ANALYSIS

Data were analyzed using the statistical Package for Social Sciences for Windows, Standard Version 11.0.Categorical variables such as the pattern of visual impairment and fracture were analyzed using Pearson's x^2 test. Fisher's exact test was performed where the expected incidence was less than 5. The median was compared using the Mann-Whitney U test. Relative risk ratios were calculated using EpiInfo, Version 6. Odds ratios, 95 percent confidence intervals, and tests of trend were calculated using logistic regression.

RESULTS

There were 703orthopaedic admissions and 148(21.1%) fall fracture patients examined. The fall fracture patient /year were 49.3. A total of 78 patients (58males, 74.4% and 20 females, 25.6%) had visual acuity of 6/18 or worse in at least one eye. Visually impaired FFP were 52.7% representing 11.1% of all orthopedic hospital admission. The hospital prevalence of ophthofall fracture patients was 26.0. Their age ranged between 28 and 83 years, (Mean 45.6+/- 12.3 years). The age and sex distributions of fall fracture patients with visual impairment are shown in table 1. About three quarters (75.6%) of the fall fracture patients with visual impairment were 45 years and above ($p<0.0013$). The prevalence of refractive errors increases with age in the study population.

Figure 1

Table 1: Age and gender distribution of fall fracture patients with visual impairment.

Age group (Years)	Male (%)	Female (%)	Total (%)
20-29	2 (2.6)	0 (0.0)	2 (2.6)
30-39	9 (11.5)	1(1.3)	10 (12.8)
40-49	4 (5.1)	3 (3.9)	7 (9.0)
50-59	16 (20.5)	5 (6.4)	21(26.9)
60-69	19 (24.3)	7 (9.0)	26 (33.3)
70-79	8 (10.2)	3 (3.8)	11 (14.1)
≥ 80	0 (0.0)	1 (1.3)	1(1.3)
Total	**58 (74.4)**	**20 (25.6)**	**78 (100.0)**

About half of the patients 38(48.7%) classified their vision as being poor in both eyes, 26 (33.3%) felt that their vision was good in both eyes while a few 14 (17.9%) were aware of poor vision in one eye. Only 13 (16.6%) of the patients had consulted an eye care specialist for their perceived eye problem but they did not go back for any treatment. All others had never sought for any form of treatment for their eye ailments. None of those who had refractive errors has had eye test done by an eye specialist in the past 5 years and none was wearing corrective lenses at the time of their injury.

Figure 2 shows the aetiology of visual impairment in 78 fall fracture patients (FFP) with 123 eye diseases. Majority,106 (86.1%) of the eye diseases causing visual impairment and blindness was caused by just four conditions; these were uncorrected refractive errors,50eyes (40.6%), pterygium 32eyes(26.0%),cataract, 14eyes(11.4%) and glaucoma,10eyes (8.1%), Neuro-ophthalmic diseases such as ptosis,3eyes, strabismus,2eyes and non glaucomatous optic atrophy,3eyes seen in four patients representing 6.5% of the eye diseases and others were rarer cases.

The distributions of visual acuity in the better eye of fall fracture patients before and after ophthalmic treatment are as shown in Table 4. All were visually impaired in at least one eye according to the American criteria at presentation. Sixty–two (79.5%) had bilateral moderate visual impairment (i.e. VA 6/18-6/60 WHO), 13 (16.7%) had normal vision (VA better than 6/18) in the better eye at initial examination. A 59years old man with bilateral cataract undiagnosed tripped in the compound was the only one (1.3%) that was blind (uncorrected visual acuity < 3/60 in the better eye at presentation). After ophthalmic review and individualized specific treatment there was no FFP that was blind, FFP visual acuity improved to normal vision were 24 (30.7%) in the better eye. The proportion of those with moderate visual impairment dropped by 23(29.5%).These post ophthalmic treatment visual acuity outcomes were significant ($p<0.05$).

Table 2 shows the radiological confirmed fracture types seen in 78 fall fracture patients with visual impairment. Majority 94 (88.7%) sustained long bone fractures of the limbs. A total of 74(69.8%) fractures occurred in males and 32(30.2%) was found among females. The circumstances of fall among fall fracture patients with visual impairment are shown in table 3. Majority 42 (53.8%) fell from a height greater than 3meters from the ground. About 14.1% fell while climbing stairs and another 5.1 % tripped off on a plane surface.

Figure 2

Table 2: 106 Fall Fracture distribution seen in 78 FFP with visual impairment

Fracture types	Males (%)	Females (%)	Total (n=106)
Femoral neck	8 (7.6)	10 (9.4)	18 (17.0)
Ankle	9 (8.5)	8 (7.6)	17 (16.1)
Open Tibia/ Fibular	12 (11.3)	3(2.8)	15 (14.2)
Colles' fracture	10 (9.4)	4(3.8)	14(13.2)
Clavicle	9 (8.5)	2(1.9)	11 (10.4)
Humeral	8 (7.6)	2 (1.9)	10 (9.4)
Femoral shaft	8 (7.6)	1(0.9)	9 (8.5)
Pelvic	3 (2.8)	2(1.9)	5 (4.7)
Lumbar spine	3(2.8)	0 (0.0)	3(2.8)
Cervical spine	1(0.9)	0(0.0)	1 (0.9)
Calcaneal	2(1.9)	0(0.0)	2(1.9)
Scapular	1(0.9)	0(0.0)	1(0.9)

*An individual FFP may be diagnosed with multiple fractures

Figure 3

Table 3: Circumstances of fall among trauma FFP with visual impairment

Circumstances	Male (%)	Female (%)	Total (%)
From a tree	38 (48.7)	0(0.0)	38 (48.7)
From the top of an electric pole	4 (5.1)	0(0.0	4 (5.1)
Coming off a packed vehicle	6 (7.7)	2 (2.6)	8 (10.3)
A fall by the road side	5 (6.4)	8 (10.3)	13 (16.7)
Stair case	4(5.1)	7 (9.0)	11 (14.1)
Tripping	1 (1.3)	3 (3.8)	4 (5.1)
Total	**58 (74.4)**	**20 (25.6)**	**78(100.0)**

Figure 4

Table 4: Distribution of Visual Acuity in the better eye of fall fracture patients before and after ophthalmic Treatment (Rx)

Visual Acuity (VA)	Ophthalmic	Treatment
WHO Classification	Before Rx (%)	After Rx (%)
Normal Vision >/=6/18	13 (16.7)	37 (47.4)
Moderate VI <6/18-6/60	62(79.5)	39 (50.0)
Severe VI <6/60-3/60	2 (2.5)	2 (2.6)
Blind <3/60-PL	1(1.3)	0 (0.0)
Total	**78 (100.0)**	**78 (100.0)**

High level falls were commoner in the younger patients and VI among them was mainly due to refractive errors (7.7%), advanced pterygium (3.9%) and monocular post traumatic cataract (1.3%). High level fall fractures in all the age groups were associated with multiple or bilateral ophthalmic pathologies. They included bilateral cataract (1.3%), bilateral glaucoma (2.6%), glaucoma /advanced bilateral pterygium (5.1%), bilateral optic disc atrophy (1.3%) and bilateral immature cataract / refractive error (3.9%). The high level fall fractures were mostly open 23(29.5%) and were associated with multiple injuries which are commonly seen among the males. The synchronous multiple visual disorders were not specific for the skilled (electrical technician, petroleum oil rig engineer) and unskilled occupations (farming, bricklaying, carpentry). Major orthopedic surgeries (internal fixation of fractures) were required as main treatment in 34 FFP (43.6%). A total of 44 FFP (56.4%) had conservative orthopedic care.

Figure 1 shows the frequency of other associated injuries in fall fracture patients. Sprain / Strain 41(52.5%), Bruises and abrasions 19 (24.3%), Lacerations and haematomas 15 (19.2%) were associated injuries commonly found. Figure 3: 81year old woman with fall fracture clavicle associated with pterygium and cataract .Figure 4 shows 72year old woman with fall fractured of right open Tibia/Fibula who required change of her glasses. Figure 5 shows a 29 year old with advanced pterygium and right femur fall fracture. Figure 6 shows the comparative height of a three stories building with typical palm trees and electrical poles in Nigeria that are been climbed.

Figure 5

Figure 1: Frequency of associated injuries in fall fracture patients

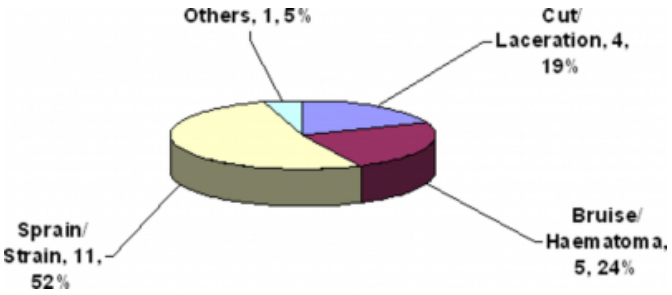

Figure 6

Figure 2: Etiology of 123 of eye diseases in 78 Fall Fracture patients

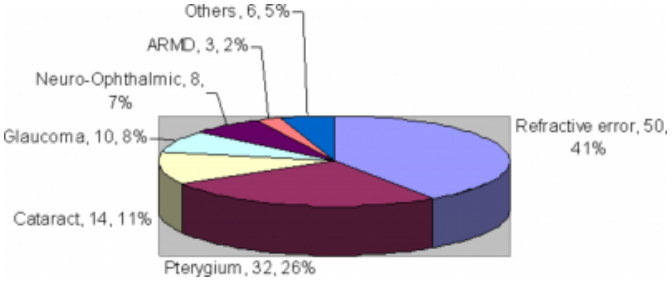

Figure 7

Figure 3: 81year old woman with clavicle fracture associated with pterygium and cataract

Figure 8

Figure 4: 72year old woman with FFP of Right open Tibia/Fibula who required a glasses change

DISCUSSION

In Nigeria, persons with visual impairment, despite knowing about their lowered eyesight, will engage in risky activities due to the socio-economic conditions they experience. Young fellows who go about with visual impairment were usually reluctant to seek for necessary help because of apparent fear of being relieved of their job once they are found to have visual ailments. The most common injury resulting from a fall is a fracture, of which the proximal femur, a distal forearm, pelvis and proximal humerus are the most frequently involved sites [14]. Of these, fractured neck of femur and pelvis has the greatest impact on both the patient and the health Service. [14]This study examined visual impairment in relation to all forms of fractures and in adults age groups in contrast to most studies published before which reported visual risk factors in relation to hip fractures mostly in elderly.

The majority of fall fracture patients had VA of 6/18 or worse in at least one eye and significant proportions were bilaterally visually impaired using the United state criteria. It was similar to those quoted in other studies. Visual impairment has been shown to be associated with falls in several studies.[13,15,16] In the UK, 33% of those patients who sustained proximal hip fracture after a simple fall were found to be visually impaired using the United State criteria while 58% had a distance visual acuity of 6/18 or worse in at least one eye.[17]

A study which examined the association between visual impairment and falls in people 49 years of age or older in the Blue mountains west of Sydney, Australia [18] revealed that visual impairment is strongly associated with two or more falls in older adults. Poor visual acuity, reduced visual fields, impaired contrast sensitivity, poor depth perception, and the presence of cataract were found to be visual risk factors responsible for this association[15, 16] In a hospital-based case-control study, Grisso et al [17]found that self-reported visual impairment was strongly associated with increased risk of hip fracture. Our study emphasized on the effect of poor visual acuity mainly and stereopsis because we could not use standardize method of automated visual field assessment.

The prevalence of visual impairment is higher in those who were 50years and above .Comparing these results with previous report in which the authors examined associations between impaired vision and risk of hip fracture study in patients admitted to hospital [14, 19]. There was a particularly high prevalence in those elderly patients who were admitted with falls (76%, $p < 0.0003$).

Majority of visual impairment is caused by just four conditions, refractive errors, glaucoma, pterygium and cataract. About 0ne- fifth of those who present with visual impairment could have their vision improved with the correct glasses. Early diagnosis and treatment are important to control glaucoma and protect sight. None of those with glaucoma were diagnosed before the fall fracture and therefore untreated. This may be due to insidious non life threatening onset of glaucoma symptoms associated with early treatment seeking neglect

Advanced pterygium which was associated with high level fall fracture in this study has not been reported in literature. Poor health seeking practices of these patients may be due to poverty, ignorance and lack of accessibility to the available health services. Inadequate number of ophthalmologist to cover the large population and provide affordable services may be a contributory factor. A relative high level of unawareness among orthopedic surgeons about the relationship of poor vision and fall fracture could be the reason for not identifying the at risk group of patients for ophthalmic care. Simple surgical excision biopsy with conjunctiva auto graft was curative and restores patient's vision to normal.

High level fall fractures in all the age groups were associated with multiple or bilateral ophthalmic pathologies. They included bilateral cataract, bilateral glaucoma, glaucoma /advanced bilateral pterygium, bilateral optic disc atrophy and bilateral immature cataract / refractive error. The fractures were more severe and multiple injuries commonly seen among these patients. The synchronous multiple visual disorders were not specific for the skilled and unskilled occupations. The male sex was predominantly involved possibly due to their job nature exposure to health hazard, personal visual health care neglect and inadequate time from socioeconomic pressure. Refractions, ophthalmic surgeries and orthopedic internal fixation of fractures were their main treatment offered. The elderly men in Nigeria do climb commercial tree top without awareness of their visual health status. All occupations that require climbing such as piping engineers at petroleum oil rigs, electrical installations, farming of cash crops should have a regular pre and on the job two yearly visual assessment. This will identify ophthalmic risk factor for fall fractures early and then prevent associated morbidity and mortality.

In Nigeria there still abound culturally old tall cash crops in the farm and job related high poles that are still been climbed without modern tools by young and the old as shown in figure 6.This is still peculiar to this population and probably other poor developing countries with their large population not having assess to affordable, accessible machineries for 21st century agriculture practice. The electric poles in Nigeria is very high above the ground level which is been climbed by the workers in the electrical authority company using belt and ladder. This mode of electrification is not found in the modern cities of developed country where underground piping of the wires is regularly seen. The source of fall fracture in Nigeria is culture unique when compared with other advanced countries .This has been documented to be related to spinal cord injuries, limb amputation and severe electrical injuries. In a study at the National Orthopaedic Hospital Enugu which is sub serving the entire old Eastern Nigeria and parts of the South-South and North-Eastern regions reported injury sustained were work related in 58% and non work related in 42% of the cases of severe electrical injuries .85% of the high voltage injuries were work related with66.7% of them being workers with Power Holding Company of Nigeria PLC (PHCN) formerly NEPA [20]. The figure of 42% for non work related cases was high when compared to western studies but comparable to figures quoted in a developing country which could be due to unrecognized visual impairments among the workers. The commonest cause of fractures in Nigerian children living in the country was falls accounting for about 75% of the cases. Falls which occurred from heights were associated with more severe injuries [21]. Fall from height such as top of the palm tree, kola nut tree, bread fruit tree, and orange tree among traumatized patients that requires limb amputation range between 6.1-25.9% [22, 23]. Fall from palm tree and kola nut trees was the leading cause of spinal injury in Nigeria accounting for 42.9% of the total 68% from falls. Those who fell from kola nut trees were older (45-70 years) than those who fell from palm trees (20-37 years) [24].This is unlike in the highly urbanized areas of developed country where road traffic accidents are the leading causes. Although, short breeds of palm tree have been developed by the Agricultural Institutes it has not replaced the very tall ones that abound abundantly in the peasant farms. The campaign for this substitution needs to be intensified in Nigeria.

There are a substantial number of fall fracture patients who have uncorrected refractive error that a change in eyeglasses would improve; this finding is in agreement with reports from the Blue Mountains Eye Study (17).A survey of visual acuity and the causes of visual loss in Australia found that a substantial number of elderly people living in the community had uncorrected refractive error.[18]

We found that about 70 percent of fractures in our study were due to poor visual acuity. The risk was 22 percent due to poor visual acuity alone—comparable to the Framingham Study, which found an attributable risk of 18 percent for poor visual acuity in that population[25]. It is likely that correcting refractive error would improve stereopsis, although there have been no studies that have demonstrated the extent to which this would occur.

The prevalence of refractive errors increases with age in this study, while none of those who had refractive errors has had test.

The clinical implication of Information obtained from this study was necessary in providing Intervention strategies, such as, simple pterygium excision, a change of glasses or cataract extraction with the aim of improving visual function and there by preventing further falls and fractures. The elderly and individuals whose job involves climbing should have their eyes tested at least once every 2 years and have any refractive error corrected.

CONCLUSION

The hospital prevalence rate of visual impairment in fall fracture patients is high. High level fall fractures had multiple ophthalmic pathologies. Screening for visual impairment in all patients with a history of fall fracture is justified. Visual impairment in about 70% of the FFP is remediable with simple intervention such as, change of glasses, correcting refractive errors, pterygium excision and cataract surgery. In Nigeria, persons with visual impairment, despite knowing about their lowered eyesight, will engage in risky activities due to the socio-economic conditions they experience. We therefore recommend that simple eye test should be incorporated into the assessment of all patients requiring rehabilitation after sustaining fracture from a fall and all individuals whose job involve climbing to prevent sustaining fracture from fall.

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