Prevalence of Ocular Trauma among Paediatrics and Geriatrics: A Hospital based Study in Abia State Nigeria

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Abstract

Ocular trauma, one of the leading causes of monocular loss of visions especially in children and the elderly, poses a significant public health challenge. This study found the epidemiological characteristics of patients hospitalized in a private eye clinic and a tertiary eye centre in Umuahia, Abia State through a hospital based survey. The study reviewed over 172 injured eyes from 172 patients over a period of 5 years from January 2010 to December 2015. Of the 172 cases of trauma reviewed, 77 (44.8%) closed globe, 39 (19.8%) open globe, 50 (29.1%) lacerations, 5 (2.9%) chemical injuries, 6 (3.5%) thermal injuries were seen. The mean ages of the paediatric and geriatric patients were 9±4.15 and 72±4.27 respectively. The most frequent types of injuries were school-related in paediatrics and domestic-related in geriatrics. The majority (55 cases) of injuries in males and females occurred in the age group of 6-12 in paediatrics and (23 cases) 71-75 in geriatrics respectively. The relationship between final visual acuity (VA) and initial VA was tested using Chi-square test at 5% level of significance ($\alpha = 0.05$), and there was no significant difference in the initial VA and final visual outcome after trauma since ($X^2_{cal} = 137.96$) is greater than ($X^2_{tab} = 28.85$). The study reveals the need for adopting proper prevention measures especially for the age group that is mostly affected by ocular trauma. Also more studies are needed to further investigate the effectiveness of the current ocular trauma preventive or management strategies.

Keywords : Paediatrics, Geriatrics, Trauma, injuries

Introduction

Ocular trauma refers to any injury to the eye. The injury could be due to mechanical trauma (blunt of penetrating), chemical agents, or radiation (ultraviolet or ionizing) (see figure 1)[1] Ocular trauma is the leading cause of preventable vision loss in children and adults. [2]Ocular trauma is a common cause of visual impairment and accounts for a reasonable percentage of all patients presenting as ophthalmic accident and emergency cases to the hospital.[1] It constitutes a major cause of visual morbidity worldwide, with significant socioeconomic impact. Every year, approximately 2 million eye injuries occur in the United States, of which, more than 40 thousand results in permanent visual impairment[3]. Eighteen million people worldwide have monocular blindness from traumatic injury.[4] Injuries occur disproportionally commonly in childhood.

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Every year a quarter of a million children present with serious ocular trauma. For the vast majority the injury is preventable [4]. In same vein, Négrel & Thylefors, 1998 opined that open globe ocular injuries constitute a major cause of visual morbidity worldwide with significant socioeconomic impact[5]. Eye injuries are a significant health problem leading to morbidity and blindness, especially in children[3]. Thirty-five percent of all the cases of ocular trauma occur in children under the age of 17 years in United States[6]. The frequency of hospitalization due to ocular trauma differs between developed and under developed countries; for example, it is 8 per 100,000 people in Scotland and 33 per 100,000 people in Guiana.[6] In children, ocular trauma is the most common cause of decreased vision in one eye or non-congenital blindness[7]. An earlier study conducted by Desai et al, (1996), suggested that in children under the age of 3 years, the most common cause of enucleation is ocular trauma.[8] Ocular trauma in children is different from that in adults[9]. Children with ocular trauma usually have no visual complaints and gradually develop amblyopia[9].

Epidemiologic studies have shown that ocular trauma is a major cause of monocular blindness and potential disability in children worldwide[10]. The mechanisms of injury are quite different and often found under mundane circumstances. Orbital fractures in children are more likely to cause entrapment of orbital contents due to the structure of orbital bones at a developmental age and earlier surgical repair is usually beneficial[10] .Endophthalmitis after ocular trauma has a very poor prognosis, which may be reduced by early referral and intervention[10].

Childhood ocular injuries present as frequent emergencies that require urgent attention[11]. Several activities result to these ocular injuries, ranging from play, fight, and during administration of corporal punishment[11].

The elderly represents a unique, yet neglected ocular trauma population. The pattern of ophthalmic injury and outcome differs greatly between the geriatric and non-geriatric populations[12]. A better understanding of these injuries is necessary to improve prevention and treatment strategies for potentially devastating open globe injuries in this susceptible population[12]. Trauma is a serious and escalating problem for the elderly, and increasing age is a significant risk factor for patient mortality[13].

From the findings of their studies, Levent et al, (2011) asserted that 'the prognosis of open globe injuries is very poor in geriatric patients'.[14] Age-related structural changes and previous history of surgeries contribute to easy development of a rupture. During the treatment process, limited recovery capacity, ocular pathology in patients and low functional capacity in this age group exert negative effects on the prognosis[14]. With aging, the quality of vision worsens due to reasons independent of aging eye diseases. There are many changes significant in the non-diseased eye but the most important changes seem to be reduction in pupil size and loss of accommodation. These changes are associated with falls[15,16].

About one-third of people over age 65 fall each year, and the frequency of falls increases markedly with advancing age15. About 10% of falls result in serio.us injuries such as fractures, soft tissue injuries, and traumatic brain injuries. Complications from falls are the leading

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cause of death from injury in persons over age 65. Hip fractures are common precursors to functional impairment, nursing home placement, and death.[16] Apart from just musculoskeletal problems, reduction in peripheral vision, decrease in transparency of ocular media in geriatrics, age related sclerosis of the lens, constriction of pupil in geriatrics, weakness of extra ocular muscles (resulting in sluggish eye movement), etc. are situations which predisposes the elderly to accidental falls. Falls is very significant as a cause of ocular trauma in geriatrics[16].

There is a notable socioeconomic impact of ocular trauma which includes economic impact, cost of rehabilitation, and cost of loss due to impairment[17,18]. The impact of ocular trauma in terms of need for medical care, loss of income and cost of rehabilitation services clearly points towards enormous economic burden on society as it affects mainly younger age group. Hence public awareness regarding use of protective measures and potential risk factors causing injury should be done on priority basis [17,18]. This study will provide reliable information on the prevalence and pattern of ocular trauma among paediatrics and geriatrics in Umuahia. This study will identify the age group that is most affected and the possible post-traumatic visual outcome. Also, it will reveal the role of sex and age in the incidence of ocular trauma and the effectiveness of current trauma intervention methods and management strategies in Umuahia.

Materials and Methods

The research is a retrospective study based on data from clinic files of ocular trauma patients admitted from 1st January, 2005 to 31st December, 2015 (10 years). All medical records were anonymous and no patient information could be extracted except for research purposes. The procedure was approved by the Ethics Committee of the Federal Medical Centre, Umuahia and Abia State Specialist Hospital Umuahia. This research was carried out in two tertiary eye care institutions in Umuahia the capital of Abia State, located in the south east region of Nigeria. The research was based on data collected from clinic records of the eye departments in the hospitals.

The data collected from the patient's clinic records were tabulated according to age, sex, occupation, VA, nature of injury, causes of injury, clinical diagnosis, primary treatment, secondary treatment and classification based on where the eye injury occurred. Completed records from patients were classified by the standardized international classification of ocular trauma according to Birmingham Eye Trauma Terminologies, BETT[19]. The Ocular Trauma Score (OTS), was used to evaluate the final visual outcome[19]. Data generated from the records of patients was represented in tables and charts. The mean, standard deviations based on OTS was calculated. Percentages were used. Spearman's correlation coefficient was used for inferential statistical analysis.

Results

The following results were obtained on the hospital based survey of ocular trauma in both paediatrics and geriatrics of 172 clinic records of patients, comprising of 104 males and 68 females. The age range of the paediatric patients were between 0-17years while that of the geriatrics were between 65 – 80 years with individual mean ages of 9±4.20 and 72±4.27 years respectively. The distribution of ocular trauma incidence in both paediatrics and geriatrics show that age group 6-11 years had the highest incidence of ocular trauma 55 (31.9)% and age group 76-80 years had the lowest incidence of ocular trauma 17 (9.9)%. Closed globe injury was the highest ocular trauma incidence 77 (44.8) % and chemical injury had the lowest incidence 5 (2.9) %. (See table 4).

But statistically tested using ANOVA at 0.05 significance level, concluded that there was no significant difference

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in the occurrence of ocular injuries among geriatrics and paediatrics (p>0.05).

Table 4 shows the distribution of ocular trauma in geriatrics and paediatrics by gender. Male and Female subjects within the age group 6-11 years had the highest incidence. Male subjects had the highest incidence of Trauma 105 (60.47%) more than female subjects 67 (38.95%). Close globe injury occurred both in male subjects 48 (27.91%) and female subjects 29 (16.86%).Conclusions from the ANOVA test at 0.05 level of significance stated that there was no significant relationship between ocular trauma in paediatrics and geriatrics by gender (p>0.05).

The predisposing factors to ocular injury among paediatrics and geriatrics is shown in table 3. Age group 6-11 years still had the highest incidence of these predisposing factors. Domestic related factors had the highest occurrence 68 (34.9%) while violence/road related as a predisposing factor had the lowest occurrence 20 (11.6%). Statistical analysis using ANOVA at 0.05 significant level shows that significant relationship exists between occurrence of ocular trauma and the predisposing factors to ocular trauma (p<0.05).

The result of the comparison of final visual acuity of subjects at presentation and during the last follow up visit shows that NLP had the highest frequency both at presentation 56 (32.56%), VA$^{19}/_{100}$ - $^{5}/_{200}$ had the lowest at presentation and VA $^{4}/_{200}$ - LP had the lowest at last follow up visit with frequencies 21 (12.21%) and 19 (11.05%) respectively. Similarly, VA≥ $^{20}/_{40}$ had the highest frequency 57 (33.14%) at last follow up. (See Table 4). Statistical conclusions drawn based on the results of Chi-square (x^2) test at 0.05 significance level show that there was significant difference in the final visual outcome (p<0.05).

Discussion

The distribution of ocular trauma is relatively dependent on the source of data. Data from hospitals provides a very relevant source of such information[17]. The results from this study show that the high incidence of hospitalized ocular trauma cases in Umuahia was closed globe injuries 77 (44.8%) followed by open globe injuries 34 (19.8%). This finding is in agreement with the results reported by other studies conducted within and outside Nigeria[17,20,21]. However, the findings of the study differ from the results reported by Cao *et al*, in China, who reported a higher incidence of open globe injuries. This discrepancy could likely be attributed to a higher proportion of occupational injuries from sharp penetrating injuries and involvement of young persons in many plastic industries in China.[17]

The findings of this study show a relationship with age and susceptibility to ocular trauma. However, the mean age for ocular injuries among paedatrics in this study was 8.84 + 4.15 years, which corresponds to the study by Uysal *et al*. This is likely due to the school related injuries which contributed to the largest portion of injuries[22]. The mean age group for geriatrics in this study was 72.95 + 4.27years which is also similar to the mean age reported by Andreoli & Andreoli, who reported 79.8 years[23]. The large population of paediatric ocular trauma in this study may be due to their greater exposure in school, vocational activities and domestic activities. However, there was no significant difference (p>0.05) in the occurrence of ocular trauma among paediatrics and geriatrics. This finding is also in agreement with a similar study carried out by Andreoli & Andreoli[23].

The findings of this study show that there was a higher incidence of ocular trauma in males than in females with a ratio of occurrence of (1.7:1) for paediatrics and (1.23:1) for geriatrics. This is in accordance with the study by Al Wadeai *et al*[24] in Egypt who reported that

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children at a higher risk of trauma are males. This is also in agreement with other similar studies[25,26]. This could be as a result of the more active nature of boys than girls and also because of the aggressive and adventurous nature of boys to girls[26,27]. Several factors accounts for the incidence of ocular trauma.

Most of the factors are subject to environmental predispositions, age tendencies and frequent activities of patients[26]. The findings of this study reveals that the paediatrics ocular trauma cases occur most frequent from school related activities, followed by domestic related injuries. These injuries resulted from corporal punishment.[22] In the same manner, the findings of this study revealed that domestic accidents, especially as a result of accidental fall is the most prevalent cause of ocular trauma in geriatrics. This is in accordance with the findings of Andreoli & Andreoli, who reported fall as the most common mechanism of injury in geriatrics[23]. Also an earlier study of Hannan *et al*, found that the majority of eye trauma cases of patients of 75years and old resulted from low fall[13]. Furthermore, the findings of this work showed that geriatric patients older than 75 years had more incidence of ocular trauma resulting from falls. This could be associated with aging changes that affect balance. This is in agreement with the assertion made by Papadakis *et al*, who mentioned that balancing mechanisms are compromised with age resulting to postural sway[27]

Results from this study show that most patients who presented with visual acuity of less than 4/200 – LP and NLP showed worse prognosis after treatment. The majority of patients that presented with visual acuity of ≥ 20/40 and 20/50 – 20/100 showed better prognosis after treatment. The category of patients with visual acuity of less than 4/200 are in the category of patients with open globe injury which showed poor prognosis after treatment. These findings are consistent with other studies[28,29,30]. This study analyzed the ocular trauma score (OTS) distribution in the two types of globe injuries. The findings showed that those who had open globe injuries had lower Ocular Trauma Score (OTS) level when compared with those that had closed globe injuries. Higher OTS scores tend to indicate a better prognosis. The finding was also in line with the similar studies.study[13,22].

Conclusion

Ocular trauma is a significant cause of visual impairment in paediatrics and geriatrics. The incidence of ocular trauma in paediatrics is relatively higher than the incidence of ocular trauma in geriatrics, this difference however was not statistically significant. The age group 6-11 years and those 75 years and above presented with greater risk of ocular trauma. There is significant difference between ocular trauma and sex in paediatrics and geriatrics. Nature of ocular injury was found to be a strong determining factor of post traumatic visual outcome. The predictive visual prognosis of ocular trauma score is similar to the pattern of final visual acuity in this study. Hence ocular trauma score is a useful tool in predicting prognosis of ocular trauma and counseling patients.

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Table1

Distribution of ocular trauma incidence in both paediatrics (0-17yrs) and geriatrics (65 – 80 yrs)

Age (Yrs)	Close Globe Injury	Open Globe Injury	Laceration	Chemical Injury	Thermal Injury	Total
0-5	13 (7.6)	3 (1.7)	5 (2.9)	0	1 (0.6)	22 (12.8)
6-11	31 (18.0)	10 (5.8)	12 (7.0)	1 (0.6)	1 (0.6)	55 (31.9)
12-17	10 (5.8)	4 (2.3)	10 (5.8)	4 (2.3)	0	28 (16.3)
65-70	9 (5.2)	4 (2.3)	11 (6.4)	0	3 (1.7)	27 (15.7)
71-75	8 (4.7)	7 (4.1)	7 (4.1)	0	1 (0.6)	23 (13.4)
76- 80	6 (3.5)	6 (3.5)	5 (2.9)	0	0	17 (9.9)
TOTAL	**77 (44.8)**	**34 (19.8)**	**50 (29.1)**	**5 (2.9)**	**6 (3.5)**	**172 (100)**

One-way ANOVA Statistics was used for analysis:
F-calculated value = 12.2, F-tabulated value = 33.5. F-tab $_{(0.05,5,59)}$ = 2.83
Since F-calculated value = 12.2 is not greater than the F-tabulated value = 3.35, we accept (H_0) and conclude that there is no significant predisposing factors to Ocular Trauma among the Age Factors. (p>0.05).

Table 2

Distribution of Ocular Trauma Incidence in both Paediatrics and Geriatrics.

Age (Yrs)	Closed Globe Injuries		Open Globe Injury		Laceration		Chemical Injury		Thermal Injury		
	M(%)	F(%)	M(%)	F(%)	M(%)	F(%)	M(%)	F(%)	M(%)	F(%)	Total
0-5	8 (4.7)	5 (2.91)	2 (1.2)	1 (0.6)	3 (1.7)	2 (1.2)	0	0	1 (0.6)	0	22 (12.8)
6-11	20 (11.6)	10 (5.8)	6 (3.5)	4 (2.3)	7 (4.1)	6 (3.5)	1 (0.6)	0	0	1 (0.6)	55 (31.9)
12-17	7 (4.1)	3 (1.7)	3 (1.7)	1 (0.6)	6 (3.5)	4 (2.3)	3 (1.7)	1 (0.6)	0	0	28 (16.3)
65-70	6 (3.5)	4 (2.3)	3 (1.7)	1 (0.6)	8 (4.7)	4 (2.3)	0	0	0	1 (0.6)	27 (15.7)
71-75	4 (2.3)	4 (2.3)	4 (2.3)	3 (1.7)	4 (2.3)	4 (2.3)	0	0	0	0	23 (13.4)
76- 80	3 (1.7)	3 (1.7)	2 (1.2)	4 (2.3)	3 (1.7)	2 (1.2)	0	0	0	0	17 (9.9)
TOTAL	**48 (27.9)**	**29 (16.8)**	**20 (11.6)**	**14 (8.1)**	**31 (18.0)**	**22 (12.8)**	**4 (2.3)**	**1 (0.6)**	**1 (0.6)**	**2 (1.2)**	**172 (100)**

F-calculated value = 13.7, F-tabulated value = 2.83. F-tab$_{(0.05,5,59)}$ = 2.83
Since F-calculated value = 13.7 is greater than the F-tabulated value = 2.83, we reject (H_0) and conclude that there is significant relationship between Ocular Trauma among sex in Paediatrics and Geriatrics.

Table 3

Predisposing Factors to Ocular Injury among Paediatrics and Geriatrics.

Age (Yrs)	School Related Injury	Domestic Related Injury	Vocational Related Injury	Violence/ Road Traffic Injury	Total
0 – 5	5 (8.3)	12 (6.98)	1 (0.67)	4 (2.3)	22 (12.8)
6 – 11	30 (17.4)	9 (5.2)	11 (6.4)	5 (8.3)	55 (31.9)
12 – 17	10 (5.8)	5 (8.3)	10 (5.8)	3 (1.7)	28 (16.3)
65 – 70	7 (4.1)	15 (8.7)	2 (1.2)	3 (1.7)	27 (15.7)
71 – 75	6 (3.5)	13 (7.6)	-	4 (2.3)	23 (13.4)
76 – 80	2 (1.2)	14 (8.1)	-	1 (0.6)	17 (9.9)
Total	**60 (34.9)**	**68(39.5)**	**24(14.0)**	**20(11.6)**	**172(100)**

One-way ANOVA Statistics was used for analysis:

F-calculated value = 12.2, F-tabulated value = 33.5. F-tab $_{(0.05,5,59)}$ = 2.83

Since F-calculated value = 12.2 is not greater than the F-tabulated value = 3.35, we accept (H_0) and conclude that there is no significant predisposing factors to Ocular Trauma among the Age Factors (p>0.05).

Table 4

Comparison of Final Visual Acuity after treatment with Presenting Visual Acuity.

Visual Acuity	At Presentation		At Last Follow Up	
	Frequency	(%)	Frequency	(%)
NLP	56	32.56	34	19.77
$^{4}/_{200}$ - LP	30	17.44	19	11.05
$^{19}/_{100}$ - $^{5}/_{200}$	21	12.21	22	12.79
$^{20}/_{50}$ - $^{20}/_{100}$	37	21.57	40	23.26
≥ $^{20}/_{40}$	28	16.27	57	33.14
TOTAL	**172**	**100**	**172**	**100**

Review of folders from 2005 – 2015 (10 years)

The above research hypothesis was analyzed using Chi-square test of significance at 0.05 degree of freedom. Level of significance = 0.05. Degree of freedom = 16. x^2 Calculated=137.96

x^2 tabulated=28.85. If x^2-calculated value is greater than the x^2-tabulated value. Otherwise, Accept(H_o).
Since x^2-calculated value = 137.96 is greater than the x^2-tabulated value =28.85, we reject (H_o) and conclude that there is significant difference in the Final Visual Outcome.