

## Original Research Article

### **PENCIL AND PEN EYE INJURY AMONG CHILDREN IN ANAMBRA STATE, SOUTH-EAST, NIGERIA.**

#### **ABSTRACT**

**Background:** Eye injuries constitute a significant portion of most ophthalmologic consultations and ocular emergencies with grave consequences, especially in children, if not managed well early enough. Traumatic eye damage is the leading cause of monocular blindness worldwide. This study aimed to determine the incidence, circumstances and types of ocular injury among children in Anambra state, South- East, Nigeria.

**Materials and Methods:** A ten- year retrospective study of 211 children aged below 18 years who presented with eye trauma in two mission hospitals in Anambra State, Nigeria. Case file of children with ocular trauma were retrieved from the medical records and those with pencil and pen injury isolated. Required information was extracted from the case files and recorded in a pro-forma. The information was analyzed using Statistical Package for Social Science, Version 20 (SPSS-20)

**Results:** The incidence of pencil/pen eye injury was 10.9% (23/211). The injuries were commoner in males (M:F=1.6:1) and in those aged five years and below. Stab injuries constituted 13 (56.5%) of the injuries while eight (34.8%) were missile injuries. Six (46%) of the stab injuries were self-inflicted with two-third of this being in children younger than five years. Corneal laceration followed by anterior uveitis was the commonest form of eye injury.

**Conclusion:** There is a high incidence of pencil and pen injury in South-East, Nigerian children. Although visual prognosis is good with early presentation and treatment, adequate preventive measures should be put in place to forestall the occurrence of this potentially blinding condition in children.

**KEY WORDS:** Pencil, Pen, Eye, Injury, Children, Nigeria, Incidence.

## 1. INTRODUCTION

Eye injuries comprise a significant portion of most ophthalmologic consultations and ocular emergencies. The consequences are usually graver if the involved eye is that of a child especially with delayed presentation.<sup>[1]</sup> Traumatic eye damage, in adults and children, is the leading cause of monocular blindness worldwide.<sup>[2], [3]</sup> School-aged children have been found to be more susceptible to eye trauma than the younger children.<sup>[1], [4]</sup> Various studies have shown that eye injuries are frequently more common in males than females. <sup>[1], [5], [6]</sup>

Pencil lead is made of carbon, clay, and animal fat and is enclosed in a wooden sheath. In the human eye, carbon, the major component, is known to be inert. The toxicity of the other components, however, is controversial.<sup>[7], [8]</sup> Arici et al<sup>[8]</sup> concluded that carbon particles in the cornea are well tolerated in the long run, and that anti-inflammatory medication, preventive antibiotic therapy, and monitoring can help patients with intraocular pencil lead injury have a good prognosis. Pencil injuries, on the other hand, have also been reported to cause severe endophthalmitis.<sup>[7]</sup> The mechanism and circumstances of pencil and pen injury sometimes is difficult to ascertain especially if an older child or an adult is not present at the time of injury.<sup>[9]</sup>

The incidence of pencil and pen injury for all ages in United Kingdom was 1.2%, 1.0% and 0.7% in year 2000, 2001 and 2002 respectively.<sup>[10]</sup> Malik et al however reported a higher

incidence of 2.5% between 2005 and 2010.<sup>[6]</sup> Malik et al's report was however a five year incidence and this, together with possible regional peculiarities, could account for the observed differences in the incidences reported. A ten-year review of penetrating eye injuries in Ibadan, Nigeria, (1998-2008) showed that pencils/pens injuries were responsible for 4.4% of the injuries in patients aged 9 months to 70 years.<sup>[11]</sup> Similarly, Jack- Okereke et al<sup>[4]</sup>, reported that 6% of all domestic injuries in Enugu is due to pencils/pens injuries. Jack-Okereke's subjects were aged 6 months to 81 years.

Majority of injuries from pencil and pen in children occur accidentally while writing, drawing, painting or playing with these writing materials either as a stab/poke injury or missile injury.<sup>[8],[10],[12]</sup> The child may also trip and fall on a pencil held in the hand.<sup>[13], [14]</sup> The injury could be inflicted by a fellow child or could be self- inflicted.<sup>[5],[8],[9]</sup>

Pencil/pen injuries in children could be innocuous with essentially normal visual acuity despite corneal intrastromal deposit of particles from the pencil (usually outside the visual axis).<sup>[8],[12]</sup> There could also be severe visual impairment from these injuries<sup>[8],[9]</sup> the worst acuity being with penetrating/perforating injuries.<sup>[5]</sup> However, with minimal tissue damage and prompt adequate management, good visual acuity could be achieved even when the presenting acuity is poor.<sup>[8]</sup> Orbital penetration could also occur following pencil/pen injury.<sup>[9],[13]</sup> A survey of 36 children with self- inflicted pencil eye injury showed that the right eye is as twice involved as the left eye possibly because most of the children are right handed.<sup>[5]</sup> The superomedial and inferomedial quadrants of the globe were also found to be the most commonly involved sites.<sup>[5]</sup> Pencil injuries were commoner than pen injuries.<sup>[5],[10]</sup> This could be attributed to the fact that pens are usually used by older children and these injuries are commoner in younger school aged children. The mean age of the children in the Iran survey was  $5.6 \pm 2.7$ .<sup>[5]</sup>

This study aims to determine the incidence, circumstances and types of ocular injuries caused by pencils and pens among children in Anambra state, South-East, Nigeria, with a view to instituting proper **counseling** and preventive measures to forestall these injuries and ocular damage in this vulnerable group of individuals.

## **2. MATERIALS AND METHODS**

This was a 10-year retrospective review of pencil and pen injuries in children aged zero to 17 years, seen at St Charles Borromeo Specialist Hospital Onitsha and Regina Caeli Specialist Hospital, Awka, from January, 2012 to December, 2021. These hospitals are two big mission-owned hospitals in Anambra state with established functional Ophthalmology unit. Case files of children who had trauma during this period were retrieved from the medical records and those who had pencil and pen injuries were isolated. Information needed were extracted from the case files and recorded in a proforma which included age, sex, object of injury, place of injury, circumstances of injury, duration before presentation at the hospital, type of injury, presenting visual acuity and visual acuity at six months post injury. The information was analyzed using Statistical Package for Social Science Version 20 (SPSS-20). T-test was used to test associations. All reported p-values are two-tailed and  $p < 0.05$  was accepted as statistically significant.

## **3. RESULTS**

Two hundred and eleven children presented with eye trauma during the ten years period under review. Twenty three out of these 211 injuries were caused by either pencil or pen. This gives an incidence of 10.9% for pencil and pen injuries among these children.

There were 14 males and 9 females giving a M:F of 1.6: 1(  $P < 0.0001$ ). The age range of the patients was 3 – 17 years (mean = 8 years  $\pm$  4.4). The injuries were commonest in children aged five years and below, and least common in those aged ten years and above (Table 1).

**Table 1: Age Distribution of Patients**

Age Range (Years)	Frequency	Percentage
0 – 5	10	43.5
6 – 10	7	30.4
10 – 17	6	26.1
<b>Total</b>	<b>23</b>	<b>100</b>

Thirteen (56.5%) of the eye injuries were caused by pencil while ten (43.5%) were caused by pen; pencil:pen = 1.3:1 ( $P = 0.000$ ). Seventy-seven percent of the pencil injuries occurred in children five years and below. The right eye was more frequently involved (15; 65.2%) than the left eye (8; 34.8%);  $P \leq 0.000$ . Fifteen (65.2%) of the injuries occurred in the school while eight (34.8%) occurred at home

Thirteen (56.5%) of the injuries were stab injuries while eight (34.8%) were missile injuries. The circumstances surrounding two (8.7%) of the injuries were unknown as there was no adult or an older child at the time of injury (Table 2). Six of the stab injuries were self-

inflicted (Table 2). Two-third of the self-inflicted injuries occurred in children younger than 5years.

**Table 2**

**Mechanism of Injury/ Inflicter of Injury Cross-tabulation**

**Count**

		Inflicter of Injury			Total
		Self	Other Persons	Unknow n	
<b>Mechanism of Injury</b>	Stab Injury	6	7	0	13
	Missile Injury	0	8	0	8
	Unknown	0	0	2	2
	<b>Total</b>	6	15	2	23

Majority of the patients (73%) presented within 24 hours of injury while one patient (4.4%) presented more than 72 hours after injury (Table 3). Corneal laceration and anterior uveitis were the commonest form of eye injury accounting for 11(47.8%) of all injuries seen in these patients (Table 4.)

**Table 3: Duration from Injury to Presentation in Hospital**

<b>Duration (hours)</b>	<b>Frequency</b>	<b>Percentage</b>
1-6	11	47.8
7-12	2	8.7
13-24	4	17.4
25-36	2	8.7
37-48	2	8.7
49-72	1	4.4
>72	1	4.4
Total	23	100

**Table 4: Major Forms of Eye Injury**

<b>Form of Injury</b>	<b>Frequency</b>	<b>Percentage</b>
Corneal Laceration ± Uveal prolapsed	6	26.1
Anterior Uveitis	5	21.7
Limbal Laceration ± Uveal prolapsed	3	13.0
Traumatic Conjunctivitis	3	13.0
Scleral Laceration	2	8.7
Lower Lid Laceration	1	4.3
Corneal Laceration/Hyphaema	1	4.3
Corneoscleral Laceration	1	4.3
Intrastromal Foreign Body	1	4.3
Total	23	100

About one-third of the patients had visual acuity better than 6/18 on presentation. However, six months after injury 91.3% (21) of the patients had their vision improved to better than 6/18. Only one patient was blind (VA<3/60) at six months post injury (Table 5).

**Table 5: Presenting Visual Acuity and Visual Acuity at 6 Months Post Injury**

VA Range	Frequency (%)		<b>Key:</b> VA= Visual acuity range PVA= Presenting visual acuity 6Mth VA= Visual acuity at 6 months
	PVA	6Mth VA	
≥6/12	8 (34.8%)	20 (87.0%)	
≤6/12 -6/18	1 (4.3%)	1 (4.3%)	
≤6/18 -6/60	10 (43.5%)	1 (4.3%)	
≤6/60 -3/60	0 (0.0%)	0 (0.0%)	
<3/60	3 (13.1%)	1 (4.3%)	
Unco-operative	1 (4.3%)	0 (0.0%)	
Total	23 (100%)	23 (100%)	

#### 4. DISCUSSION

The incidence of pencil and pen injury in this study was found to be 10.9%. This incidence is higher than most incidences reported in the literature. Kelly et al<sup>[10]</sup> reported an incidence of 0.7% to 1.2 % in the United Kingdom between 2000 and 2002 while Malik et al<sup>[6]</sup> reported an incidence of 2.5% in Lahore, Pakistan between 2005 and 2010. However, no discrimination

was made on the basis of age in both the United Kingdom study and the Pakistan study while the present study included only children. Again racial and geographical differences in eye health awareness could account for the observed differences. A ten-year review of ocular injuries, Ibadan, Nigeria by Oluyemi,<sup>[11]</sup> between 1998 and 2008, reported an incidence of 4.4% for pencil and pen injury. Although about half of Oluyemi's patients were children, the age range was nine months to 70 years and this could account for the observed difference in the incidence compared to the present study in children only. Jack-Okereke et al<sup>[4]</sup> found an incidence of 6% in Enugu, Nigeria. This incidence is also lower than that of present study. Their subjects share similar racial and geographical characteristics with those of the present study. However, their study included all age groups even though a little above one-third were children.

Males are more involved than females in this study with a male: female of 1.6:1. The higher male involvement could be attributed to the male engaging more in aggressive play and activities than females. This ratio is similar to the male: female of 1.77:1 for self inflicted pencil and pen injury in Iran.<sup>[5]</sup> This ratio is also similar to that reported by Malik et al<sup>[6]</sup> (1.6:1) and Jack- Okereke et al<sup>[4]</sup> (1.3: 1) for traumatic eye injuries. Oluyemi<sup>11</sup> in Ibadan, Nigeria reported an even higher male: female of 4:1.

Pencil was the commoner cause of eye injury than pen, (pencil: pen =1.3:1). This is similar to what was reported in United Kingdom<sup>[10]</sup> and Iran<sup>[5]</sup> where pencil was the commoner culprit for eye injury. This could be because pencils have sharper tips and are used by younger children who are more prone to injury with sharp objects especially self harm. This is likely as the present study showed that 77% of the pencil injuries occurred in children aged five years and below with two-third of the self injuries being in those younger than five years.

Corneal injury is the commonest form of injury in this study. This is in agreement with findings of Kelly et al<sup>[10]</sup> in the United Kingdom where they reported three cases of eye injury from writing material all causing corneal laceration. Tabatabaei et al<sup>[5]</sup> had similarly reported that most of the penetrating globe injury from writing material in children occurred in the cornea. There have also been other reports that the cornea is the most frequently involved site in penetrating eye injuries.<sup>[15], [16]</sup>

## 5. CONCLUSION

The incidence of pencil and pen eye injury seems to be high in South-east, Nigerian children. Although the injury has good visual prognosis, especially with early presentation and proper management, it is a potentially blinding condition. Adequate and proper counselling on prevention of this injury should be given to parents, teachers and other child carers at every opportunity so as reduce the incidence of these injuries in children.

## 7. REFERENCES

1. Sharma B, Singh S, Kumar K, Dubey A, Ahirwar K. Epidemiology, clinical profile and factors, predicting final visual outcome of pediatric ocular trauma in a tertiary eye care center of central India. *Indian J Ophthalmol* 2017;65(11):1192-1197.
2. Keel, S. , Xie, J. , Foreman, J., Taylor, H.R. , Dirani, M. (2017). The prevalence of vision loss due to ocular trauma in the Australian National Eye Health Survey. *Injury*, 48(11), 2466-2469. <http://dx.doi.org/10.1016/j.injury.2017.09.020A>.
3. Aghadoost D. Ocular trauma: an overview. *Arch Trauma Res*. 2014;3(2):e21639.

4. Jac-Okereke, C.C., Jac-Okereke, C.A., Ezegwui, I.R. et al. Current pattern of ocular trauma as seen in tertiary institutions in south-eastern Nigeria. *BMC Ophthalmol* 21, 420 (2021). <https://doi.org/10.1186/s12886-021-02162-4>.
5. Tabatabaei SA., Soleimani M., Naderan M., Ahmadraji A., Rajabi MB., Jafari H, et al. A survey of incidental ocular trauma by pencil and pen. *Int J Ophthalmol* 2018;11(10):1668-1673.
6. Malik, IQ., Ali, Z., Rehman, A., Moin, M., Hussein, M. Epidemiology of penetrating ocular trauma. *Pak J Ophthalmol*.2012;28(1):14-16
7. Hamanaka N, Ikeda T, Inokuchi N, Shirai S, Uchihori Y. A case of an intraocular foreign body due to graphite pencil lead complicated by endophthalmitis. *Ophthalmic Surg Lasers*. 1999;30:229-231.
8. Arıcı C., Arslan OS., Görgülü B., Yıldırım R., Onur U., Eye injuries from pencil lead: Three cases. *Turk J Ophthalmol* 2017;47:52-55
9. Laghmari M., Abdellaoui G., Htiti N., Alouane A. A Pencil Eye Injury. *Q J Med* 2015; 108:425–426
10. Kelly, SP., Reeves, GMB. Penetrating eye injuries from writing instruments. *Clin. Ophthalmol*. 2012;6:41-44
11. Oluyemi F. Epidemiology of penetrating eye injury in Ibadan: A 10-year hospital-based review. *Middle East Afr J Ophthalmol* 2011;18:159-63.
12. Philip, SS., John,D., John, SS. Asymptomatic intracorneal graphite deposits following graphite pencil injury. *Case rep. Ophthalmol Med*. 2012;2012:720201
13. Huang T, Ling J, Liu M, Qiu C, Ding G, Huang J, et al. Penetrating transorbital injury by a coloring pencil in a 3-year-old child: A case report. *J Int Med Res*. 2020Mar;48(3)

14. Udoh DO, Osaguona V, Obeta EC. Penetrating orbitocranial injury in a child secondary to fall on a pencil: Operative technique and review of literature. *Arch Int Surg* 2017;7:107-10.
15. Szijártó Z, Gaál V, Kovács B, Kuhn F. Prognosis of penetrating eye injuries with posterior segment intraocular foreign body. *Graefes Arch Clin Exp Ophthalmol* 2008;246(1):161-165.
16. Maneschg OA, Resch M, Papp A, Németh J. Prognostic factors and visual outcome for open globe injuries with intraocular foreign bodies. *Klin Monbl Augenheilkd* 2011;228(9):801-807.

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