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ORIGINAL RESEARCH

Ocular injuries from exploding glass-bottled Coca-Cola® drinks in Port Harcourt, Nigeria

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Background: Eye injuries and subsequent loss of vision from the glass and caps of exploding pressurized bottled drinks have been well reported, and as a result most developed countries now use mainly plastic bottles. In Nigeria, however, most drinks are still sold in glass bottles and ocular injuries from this source are therefore not uncommon.

Aim: To retrospectively analyze ocular injuries resulting from exploding glass-bottled Coca-Cola® and propose ways of eliminating such injuries in future.

Setting: Eye Clinic, University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria.

Materials and methods: The medical records of all cases of ocular injury that presented at the Eye Clinic of the University of Port Harcourt Teaching Hospital over a 5-year period (January 2006 to December 2010) were retrieved and relevant data including age, sex, occupation, events surrounding bottle explosion, and type of ocular injury sustained were extracted.

Results: A total of 426 cases of ocular injuries was seen during the period under review. There were 335 (78.6%) males and 91 (21.4%) females. Six patients had ocular injury from exploding glass-bottled Coca-Cola®, giving an incidence of 1.4%. The presenting visual acuities (VA) were light perception (2 cases), counting fingers (2 cases), and 1 VA of 6/24 and 1 VA of 6/12. There were 4 (66.7%) cases of corneoscleral laceration with uveal prolapse and 1 case of total hyphema.

Conclusion: Because pressurized glass-bottles can explode with normal handling, legislation to ban the use of glass containers for bottling carbonated drinks will go a long way to reducing ocular morbidity from this source. Plastic bottles should be introduced as an alternative.

Keywords: ocular injuries, exploding glass-bottled drink

Introduction

Exploding glass-bottled drinks can cause serious ocular injuries and sometimes even loss of vision. Cases of such injuries have been well reported.[1–6] In India, Gupta and Moraos reported severe unilateral loss of vision in 6 cases of ocular injuries resulting from soda-water glass-bottled drinks.[1] In the same vein, Mondino and colleagues in Pittsburgh, USA also reported severe loss of vision following explosion of bottled drinks.[2] There have also been reports of ocular injuries from bottle caps.[6,7] The incidence of open globe injuries resulting from exploding bottles was reported at 2% to 2.4% of all cases of ocular injuries in 3 University Teaching Hospitals in Germany.[3,6] In some other studies, the incidence was put at between 1.2% and 15%.[8–10] Spang and colleagues, in their retrospective study of ocular injuries, reported that flying bottle caps were responsible for most ocular injuries (76%) compared with only 2% resulting from bottle explosion.[6] Kuhn and colleagues[4]

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reported a combined incidence of 0.7% for both bottle caps and glass splinters but this, however, varied between 0.23% in the US to 0.5% in Mexico and 0.9% in Hungary. The agent of ocular injury also varied between countries, injuries from bottle caps being commoner in some countries than others.[4] In a related study in Nigeria, bottled Coca-Cola® drinks were found to be responsible for 50% of all cases of ocular injuries from exploding bottled drinks; this was closely followed by exploding beer bottles which were reported in 25% of cases.[5]

Materials and methods

Medical records of all cases of ocular injury-related to Coca-Cola® glass bottles that presented at the Eye Clinic of the University of Port Harcourt Teaching Hospital over a 5-year period (January 2006 to December 2010) were retrieved and relevant data including age, sex, and occupation were extracted. Data on the events surrounding bottle explosion and the type and extent of ocular injury were also retrieved from the case files. All patients with complete case records were included in the study while those with incomplete records were excluded.

Results

A total of 426 cases of ocular injuries was seen in the Eye Clinic of the University of Port Harcourt Teaching Hospital during the period under review. There were 335 (78.6%) males and 91 (21.4%) females, giving a male:female ratio of 3.7:1. There were 6 cases of ocular injury from exploding glass-bottled Coca-Cola (5 females and 1 male with age ranges of 17 to 42 years), giving an incidence of 1.4%. In 5 cases the injury was caused by flying glass splinters, while in 1 patient injury was caused by a bottle cap. All ocular injuries were uniocular, both eyes being equally affected. Two patients presented with visual acuities (VA) of light perception, 2 had VAs of counting fingers at 1 m, 1 patient had a visual acuity of 6/24 and 1 had a VA of 6/12. There were 4 (66.7%) cases of corneoscleral laceration with uveal prolapse, 1 case of corneoscleral laceration with hyphema, and 1 case of total hyphema. The patient with total hyphema also had elevated intraocular pressure (47 mmHg).

Discussion

Many cases have been reported of ocular injuries resulting from accidental explosion of pressurized glass-bottled beverages.[1–10] The incidence of ocular injury from exploding glass-bottled Coca-Cola® bottles in our study was 1.4%, lower than the incidence reported by Viestenz and Kuchle (1.8%),[7] Spang and colleagues (2.0%),[6] and Schrader and Gramer (2.4%)[3] in Germany, but higher than those of Kuhn and colleagues in the US and Mexico.[4] The reason for this higher incidence in Germany compared with the US is not immediately apparent as both are developed countries.

The material used for packaging pressurized fluids determines the injury risk. Glass is breakable, especially after wall thinning,[12] and is responsible for the most severe cases of ocular injury. In this study, over 80% of the ocular injuries were caused by flying glass splinters. Only 1 case was caused by a bottle cap. This finding is much higher than the 31.3% obtained in Ibadan, south-west Nigeria,[5] 38% in the US,[4] 24% in Germany,[6] and 20% in Israel[13] but similar to the findings in India (83.3%)[1] and in Kuwait (87%).[14] In India, of 6 cases of ocular injury, 5 were caused by glass splinters, while 1 was due to a bottle cap. This result is not unexpected as most soft drinks in developed countries are bottled in plastic containers rather than glass containers, which are still widely used in developing countries. The proportion of trauma caused by cork/cap versus glass therefore varies by country and the rate of injury from glass splinters tends to be higher in countries that still use largely glass containers to bottle carbonated drinks.

All our cases had unilateral involvement, both eyes being equally affected. Most of the patients (66.7%) had severe visual loss, with VAs that ranged from light perception to counting fingers. This is higher than the combined figure of 26% of legal blindness recorded by Kuhn et al[4] in their study in the US, Hungary, and Mexico. In their study, these injuries were however not limited to the persons handling the drinks but also included bystanders. This was not the case in our study, as all those injured were the handlers of the drinks. Gupta and Moraos[1] also reported severe visual loss in their series.

Various factors have been attributed to the hazards posed by beverage bottles.[11] It is said that bottles containing carbonated drinks are more likely to explode than those containing noncarbonated beverages because of the internal pressure generated by carbon dioxide.[11] If any bottle is dropped it may break, but the internal pressure generated by carbonated bottled drinks increases the hazard of flying glass fragments. It has also been noted that subjecting carbonated bottled drinks to heat and agitation releases dissolved carbon dioxide and can increase the internal pressure

Table 1 Ocular findings and events surrounding ocular injury

Age (years)	Sex	Presenting VA	Ocular finding	Occupation	Event surrounding ocular injury
17	F	RE = CF	Total hyphema	Student	Attempt to open bottled Coca-Cola®; exploded, injury from bottle cap
20	M	LE = CF	Corneoscleral laceration with uveal prolapse	Bartender	Explosion of bottled Coca-Cola® on attempting to bring it out from fridge; injury from glass splinters
32	F	LE = LP	Corneoscleral laceration with hyphema	Provision trader	Explosion of bottled Coca-Cola® on attempting to bring it out from fridge; injury from glass splinters
42	F	LE = LP	Corneoscleral laceration with uveal prolapse	Provision trader	Explosion of bottled Coca-Cola® on attempting to bring it out from fridge; injury from glass splinters
42	F	RE = 6/24	Corneoscleral laceration with uveal prolapse	Nurse	Coca-Cola® bottle exploded in her hands; Injury from glass splinters
36	F	RE = 6/12	Corneoscleral laceration with uveal prolapse	Provision trader	Coca-Cola® bottle exploded in her hands; injury from glass splinters

Abbreviations: RE, right eye; LE, left eye; LP, light perception; CF, counting fingers.

within the bottle to dangerous levels. Negligent handling of bottles such as shaking, dropping, or jostling may therefore trigger explosion. This may have been the situation in 3 of our cases as those affected were traders (selling provisions including crates of soft drinks). Most of the time, the crated soft drinks are stored outside under the sun and the drinks are brought in only for refrigeration. During this period, there is a lot of agitation of the drinks, which could be responsible for the explosion. This could also explain the case of the bartender (Table 1).

Although these factors may be important in some cases, there are many incidents in which undue heat and agitation cannot be implicated, as in some of the cases reported in the present series. Explosions have been known to occur without provocation, which suggests defects in the bottle or bottling process. It has been suggested that the glass of soft drink bottles is gradually dissolved by the containing liquid so that the bottle is progressively weakened and may explode if the drink has been bottled for a long time. For the other two patients where the bottles shattered without provocation, there may have been an inherent defect in the bottles. There was no way of knowing the age of the bottled drinks, since it was a retrospective study.

Conclusion

Because beverage bottles may explode with normal handling and without provocation, manufacturing standards must be put in place to help eliminate defective bottles. In addition, introducing plastic sleeves to beverage bottles and the use of plastic shatterproof bottles can reduce the hazard of explosions and high velocity fragments with its attendant complication of severe visual impairment or blindness. There should be a legislation to ban the use of glass containers for bottling pressurized soft drinks. Rather, plastic bottles should be introduced as an alternative. It is also advisable to avoid subjecting beverage bottles to undue heat by storing in a cool place, avoiding excessive agitation such as jostling or hitting bottles together, and directing the cap away from the face when opening the bottle.

Disclosure

The authors declare no conflicts of interest.

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