Analysis of Uninterrupted Power Supply Battery Explosions: Emerging Trend in Ocular Injuries

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Abstract:- Objective: This study looked into the types of eye injuries, age distribution, and demographic profile of patients receiving ophthalmic evaluation. The main goals were to determine the frequency of ocular injuries across age groups and to identify any possible correlations between age and particular ocular disorders.

Method: A retrospective examination of patient records was conducted as part of the study to look at the ocular damage data and demographics of people who had ophthalmic evaluations. The distribution of gender and age was recorded, and the significance of the relationships between age groups (10–30 years and 31–60 years) and different kinds of ocular injuries was evaluated using the Chi-square test. The following injury types were taken into consideration: Ac cells, hyphema, iris damage, cataract, retinal haemorrhage, vitreous problems, Berlin edema, corneal haze, epithelial defect, corneal abrasion, ocular infection, corneal ulcer, corneal opacity, corneal perforation, and facial and lid injuries.

Result: According to the demographic data, there was a preponderance of men (80.4%), and the majority of people (71.1%) were in the 10–30 age range. The Chi-square tests on ocular injuries that followed showed noteworthy relationships with age groups. Notably, the age range of 10 to 30 years old was more likely to experience facial and lid injuries, corneal haze, epithelial defect, ocular infection, corneal ulcer, and Berlin edema. On the other hand, the age group of 31 to 60 years old was more likely to experience subconjunctival haemorrhage, conjunctival chemosis, corneal abrasion, iris damage, cataract, and symblepharon. The statistical importance of these correlations was shown by the overall Chi-square test results (Df 19, sig.000*, chi-square 243.546).

Conclusion: The study found that patients receiving ophthalmic evaluations were distributed differently by gender and age. In addition, noteworthy correlations were found between age cohorts and particular categories of ocular trauma, emphasizing age-related differences in the incidence of particular visual disorders. These results provide important new information about the clinical and demographic features of patients who present with ocular injuries. This information can be used to develop tailored preventive and treatment plans for various age groups.

***Keywords**:- Ocular Injury, Trauma, Age, Disease, Risk, Surgery, Eye Sight.*

I. INTRODUCTION

Many compounds are commercially available and millions more being patented year, however it is unclear how much of these chemicals are harmful to the human eye. Chemical exposure can happen in many ways, such as by ingestion, transdermal application, or inhalation, but eye exposure is especially risky. Certain chemicals can cause lasting impairment, visual loss, and eye damage even after brief exposure. Over a three-year period, 144,149 eye injuries occurred in a sample of 900 emergency rooms across the United States, and the emergency department alone incurred $106 million in costs[1-2]. While a large number of injuries were tied to the workplace, the majority involved minors or happened in home environments where security issues are not frequently addressed. Historically, the ocular surface has been frequently utilized to examine the potential for chemical compounds to cause injury due to the eyes' susceptibility to chemical damage[3]. The precise modeling of the human reaction to harmful chemicals in vivo is made possible by the use of human cell cultures from the corneal epithelium in several in vitro models. A three-dimensional epithelial model is created by these human corneal cells. Time-to-toxicity measures (ET50) can be used to categorise an object's cytotoxicity by indicating how long it will take for the viability of the cell or tissue to drop by 50% after exposure[4-5]. The only difference between the two RhCE models that have been verified, SkinEthicTM and EpiOcularTM, is the type of cell that is employed. SkinEthicTM uses immortalised human corneal epithelial cells, whereas EpiOcularTM uses primary epidermal keratinocytes produced from human foreskin cultivated in serum-free conditions to resemble corneal epithelium.An in vitro 3D epithelial model called the EpiOcularTM Eye Irritation Test (EIT) is offered for sale by MatTek Corporation. The EIT is dependent on human cells that are normal (non-transformed) and develop into a layered squamous epithelium[6-7]. Globally Harmonised System of Classification and Labelling of Chemicals (GHS) Category 1 (severe, irreversible irritation and substantial eye damage) and GHS Category 2 (reversible eye irritation) are not meant to be distinguished from one another by the EpiOcularTM EIT. Nonetheless, it is capable of differentiating between irritants that need to be classified and non-irritants (no category). The SkinEthicTM Laboratories 3D HCE model is an additional substitute for the Draize test. This system is made up of human corneal epithelial cells that have been immortalized and placed in a chemically defined medium that structurally mimics the human eye's corneal mucosa[8-9]. Notwithstanding this limitation, viability above 60% following exposure to a liquid or a viability exceeding 50% following exposure to a solid is classified as "No Category," or non-irritation[10-12].

II. METHODOLOGY

The Ophthalmology Unit at Mardan Medical Complex hosted the study, which looked into the age-specific distribution of ocular injuries and the demographic profile of those receiving ophthalmic evaluation. The research project ran from January 2023 to December 2023 and involved a thorough review of all patient records during that time frame. Mardan Medical Complex was selected as the study site because it is a well-known medical Centre that treats a wide range of patients in the area. Within the allotted period, patient records were carefully reviewed in order to gather data, with an emphasis on demographic information such age and gender. A variety of conditions were covered by the information extracted about ocular injuries, such as injuries to the face and lids, subconjunctival haemorrhage, conjunctival chemosis, corneal haze, epithelial defect, corneal abrasion, ocular infection, corneal ulcer, corneal opacity, corneal perforation, Ac cells, hyphema, iris damage, cataract, retinal haemorrhage, vitreous problems, Berlin edoema, and symblepharon. Patient privacy and confidentiality were guaranteed by the data gathering procedure's adherence to ethical standards. The research utilized statistical techniques to examine the gathered information, specifically applying Chi-square tests to assess the importance of correlations between age cohorts (10–30 years and 31–60 years) and various categories of eye injuries. A thorough source of patient data, the Ophthalmology Unit at Mardan Medical Complex offered important background for comprehending the frequency and distribution of ocular injuries throughout the designated period.

III. RESULTS

Table: 1 variable with frequencies and percentages

variables		**frequencies**	**percentages**
gender	Male	78	80.4%
	females	19	19.6%
age	10-30 years	69	71.1%
	31-60 years	28	28.9%

Table: 2 **CHI SQUARE TESTS ON PERCENTAGE OF INJURIES ON BASIS OF AGE DISTRIBUTION**
Df 19, sig.000*, chi-square 243.546

		Age Group			
		10-30 Year		31-60 Year	
		Count	Column N %	Count	Column N %
Types of injury	**Facial and Lid injury**	18	26.1%	0	0.0%
	Subconjuctival hemorrhage	58	84.1%	5	17.9%
	Conjuctival chemosis	57	82.6%	24	85.7%
	Conjuctival ischemia	37	53.6%	8	28.6%
	Corneal haze	42	60.9%	0	0.0%
	Epithelial defect	49	71.0%	0	0.0%
	Corneal abrasion	55	79.7%	26	92.9%
	Ocular infection	31	44.9%	0	0.0%
	Corneal ulcer	31	44.9%	0	0.0%
	Corneal opacity	51	73.9%	24	85.7%
	Corneal perforation	62	89.9%	24	85.7%
	Ac cells	27	39.1%	10	35.7%
	Hyphema	28	40.6%	11	39.3%
	Iris damage	42	60.9%	27	96.4%
	Cataract	66	95.7%	24	85.7%
	Retinal hemorrhage	50	72.5%	6	21.4%
	Vitreous	43	62.3%	16	57.1%
	Berlin edema	28	40.6%	0	0.0%
	Symblepharon	63	91.3%	12	42.9%

IV. DISCUSSION

It is commonly known that air pollution has a negative impact on human health and has been connected to higher rates of illness and shorter life spans. Common air pollutants such as ozone, particulate matter, carbon monoxide and carbon dioxide (CO and CO2), and nitrogen oxides (NOx) have been connected to several types of disease outcomes[13-14]. The gender and age distribution of the population under study is shown in the first table. Notably, there is a glaring gender difference: 19.6% of participants are female and 80.4% of participants are male. When it comes to age distribution, 71.1% of people are between the ages of 10 and 30, and 28.9% are between the ages of 31 and 60. This demographic breakdown lays the groundwork for additional analysis by giving a basic grasp of the study population's makeup. Table 2 examines the correlation between ocular injury kinds and age groups, utilizing Chi-square testing to evaluate the significance of the findings. Numerous conditions affecting the surface of the eyes have been associated with it, such as increased production of pro-inflammatory cytokines, conjunctival injection, or swelling of the conjunctival vessels, and conjunctival chemosis, or inflammation of the eye membrane. Because it is a highly active free radical that promotes the production of reactive oxygen species (ROS) on the ocular surface and causes surface inflammation, ozone is hazardous. Overproduction of ROS can overpower antioxidant defenses like glutathione, causing tissue inflammation and oxidative damage to the surface of the eyes. Numerous eye conditions have been linked to this accumulation of oxidative damage, most notably dry eye disease[15-17]. The findings demonstrate significant differences in the injury distribution between the two age groups. Notably, compared to the 31–60 age groups, the 10–30 age groups shows greater percentages across numerous types of injuries. For example, the younger age group is more likely to experience corneal haze, epithelial defect, ocular infection, corneal ulcer, and Berlin edema. On the other hand, injuries including cataract, symblepharon, corneal abrasion, iris damage, subconjunctival haemorrhage, and conjunctival chemosis have larger percentages in the age range of 31 to 60. These age-related differences in the distribution of ocular injuries are statistically significant, as shown by the Chi-square test results (Df 19, sig.000*, chi-square 243.546).The tables that are provided provide an extensive representation of the age-specific distribution of ocular injuries as well as the demographic features of the population under study. The age and gender distribution sets the scene for the analysis that follows, and the Chi-square tests reveal meaningful relationships between age groups and different kinds of ocular injuries, illuminating potential age-related risk factors for particular ocular disorders.

V. CONCLUSION

Important insights have been obtained from a thorough examination of the demographic characteristics and ocular injuries of patients receiving ophthalmic evaluation at the Mardan Medical Complex's Ophthalmology Unit between January 2023 and December 2023. The significant male preponderance and the concentration of people in the 10–30 age range highlight demographic trends that are pertinent to eye health. The results of the Chi-square tests provide light on age-related differences in the occurrence of different disorders by revealing significant relationships between age groups and particular ocular injuries. The distribution of ocular injuries over a given time period is better understood thanks to this study, which also lays the groundwork for targeted therapeutic and preventive interventions based on risk factors unique to a given age group. The analysis's conclusions may have an impact on improving ophthalmic care and guiding public health initiatives meant to lessen the prevalence of eye injuries in the population.

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