

PATTERNS OF OCULAR TRAUMA AT A TERTIARY CARE HOSPITAL IN KARACHI: A PROSPECTIVE CROSS-SECTIONAL STUDY

¹Obaidullah Ansari, ²Rabia Khawar Chaudhry, ³Muhammad Nasar Qamar Khan,
⁴Muhammad Nauman Ahsun, ⁵Miss Shafaq Siddiqui

¹Post Graduate Resident Ophthalmology at Jinnah Post Graduate Medical center Karachi

² Assistant Professor, Jinnah Post Graduate Medical Centre Karachi

³Consultant Ophthalmologist, Hashmani hospital

⁴MBBS .House Officer JPMC

⁵Final Year MBBS KMDC

DOI: <https://doi.org/10.5281/zenodo.23284711>

Keywords:

ocular trauma; eye injury; tertiary care; mechanical injury; occupational injury; Karachi

Article History

Received on 20 Feb, 2026

Accepted on 17 March, 2026

Published on 19 March, 2026

Copyright @Author

Corresponding Author: *

Abstract

Background: Ocular trauma creates a diverse workload of emergency cases that requires local data on the nature of the injury, the causative material and the anatomical involvement to guide prevention and service planning. The aim of this study was to describe the pattern of ocular trauma attending the tertiary care hospital and to look at the associations of the injury source and the demographic characteristics of the patients. Twenty-seven eight patients (3-80 years old) consecutively attending the Ophthalmology and Emergency Departments of Jinnah Post Graduate Medical Centre, Karachi were included in the study. A structured proforma recording demographic characteristics, source of injury, duration since injury, injury inflicting material, trauma pattern and ocular structure involved was completed. Frequencies and percentages were presented, and categorical associations were analyzed by the prespecified categorical statistical procedures outlined in the Methods section. **Results:** There were 190 males (68.3%) and 88 females (31.7%). The 16-30 age group had the highest number of patients (92, 33.1%). The most common injuries were those sustained in the workplace (82, 29.5%), at home (58, 20.9%) and in road traffic accidents (52, 18.7%). The material that caused the most injuries (54; 19.4%) was metal. Mechanical trauma was the most common cause (212 cases, 76.3%) and the cornea was the most commonly recorded structure (78 cases, 28.1%). A total of 96 patients (34.5%) had presentation <6 hours, and 36 (12.9%) had presentation >3 days. Source reported p-values of 0.041, 0.032 and 0.028 for the three association analyses, which must be correlated with the tabled contingency tables. **Conclusions:** A descriptive analysis is provided that demonstrates a predominance of males, young adults, workplace exposures, mechanical injuries and corneal involvement. They contribute to the planning of prevention and emergency services at a local level. Conclusions drawn from inferences are tentative due to incomplete congruence between the source tables and statistical reporting

Introduction

Ocular trauma is a significant ophthalmic emergency because injury to a small and complex organ can impact vision, independence and daily functioning. The clinical spectrum ranges from eyelid and ocular surface damage to lens, retinal, optic nerve or globe damage. Thus, the assessment and treatment need for patients with seemingly identical histories may differ significantly. These presentations described in a hospital setting can help highlight common clinical needs and serve as a practical foundation for prevention. The published tertiary care literature on ocular trauma makes it clear that the study of the demographic profile, nature of the injury, and the anatomical involvement should be studied together (Bhaskar & Gupta, 2024).

An approach based on injury is particularly helpful since ocular trauma can occur in a variety of settings. Different combinations of exposures, materials and force are involved in workplace incidents, domestic accidents, road traffic collisions, sport and school activity, and interpersonal violence. The prevention of mechanical, chemical, thermal and radiation-related injuries are thus different and must be addressed separately. It is not possible to assume the relative contribution is equal in all hospitals or communities. Comparisons of ocular-trauma presentations across phases of social engagement show that the case mix observed may differ across different times of social engagement when mobility, workplace attendance, and time spent at home vary (Pande et al., 2022). Even when there are consistent patterns across studies, local surveillance is still required.

The questions answered by global evidence and hospital evidence are complementary. The Global Burden of Disease analysis evaluates the incidence and disability in populations and situates eye injury

in a comprehensive public-health perspective (C. Li et al., 2023). A tertiary-care series is one that refers to patients who have reached a specific type of service, and the conditions that that service is expected to address. Access, referral patterns, perceived severity and availability of alternative care are factors that affect hospital frequencies. They are not risk estimates for the community or for exposure, but should not be interpreted as such. However, they can support clinical and administrative decision makers to be aware of repeated situations and focus on common injuries. The material used supplements the information provided by the location of injuries. Metals, glass, wood, stones, chemicals and sports items can be found in multiple situations and can cause varying damage patterns. The opposite can also be true, however, in that the same site can be a source of exposure to several agents. Record source/material will help to differentiate source exposure from the injuring object. Open-globe injuries have been documented in the clinical literature to have significant consequences despite having a small external wound (Pelletier et al., 2023). The significance of a material thus will rely not only on its frequency in a table, but also on the mechanism and anatomical injury.

Another key dimension is anatomical involvement. Ocular-surface and anterior-segment injuries can account for a lot of the day-to-day emergency department work, while less common posterior-segment or optic-nerve injuries can have significant functional impact. The literature of traumatic optic neuropathy and vitreoretinal surgery following open-globe injury is a good example of the inadequacy of a numerical ranking of structures affected for clinical planning purposes (Chen et al., 2022). The ASCOT study also shows the unique research and management questions that present

in eyes following open globe injury that require vitreoretinal surgery (Casswell et al, 2024). These categories can be summarized in a broad trauma survey without the intent to measure prognosis or effectiveness of treatment.

The time from injury to hospital presentation is also important in relation to service organisation. It is a representation of the point of an injured individual's entry into the observed care path but not necessarily the decisions made and occurrences of delays in care prior to that point. Time to first hospital presentation (McMaster et al., 2025) cannot be directly compared with evidence relating to timing of primary open-globe repair. These are correlated but distinct intervals. Recording presentation time is useful, as it can signal a group that needs to be further investigated for barriers to referral and access. However, a descriptive study would not be able to conclude the effect of delay on visual loss if there were no data on initial severity, treatment timing, or subsequent outcomes. Age and sex give easy-to-obtain measures of case mix; however, they have to be used carefully. Preponderance of males or younger adults may be due to exposure opportunities, occupation, activity and healthcare use and not necessarily due to a biological explanation. A paediatric open-globe study also demonstrates that injury circumstances vary according to the clinical population among a narrow population (Kabakci et al., 2024). Therefore, considerations for eligibility criteria, age bands, definition of trauma, and severity of referral should be included in the comparison. These differences are important to consider when making preventive implications from a sample that covers the entire range from childhood to older adulthood.

The aim of the present study was to describe the nature of ocular trauma which presented to the

Ophthalmology and Emergency Departments of Jinnah Postgraduate Medical Centre, Karachi. Its main aim was to ascertain the distribution of injury source, duration since injury, injury-inflicting material, trauma pattern and ocular structure involved among eligible patients. Secondary analyses included age group and gender with respect to trauma pattern and injury source with respect to anatomical involvement. The purpose of the study was to generate local descriptive evidence for prevention and emergency preparedness. Its contribution is hence restricted to the characterisation of a tertiary care case mix, and can be limited to inferential interpretation within the frame of information and reporting quality available in the reported study analyses.

Methods

Study design and setting

A cross sectional observational study was conducted in Ophthalmology and Emergency Departments (ED) of Jinnah Postgraduate Medical Centre (JPMC) in Karachi. A prospective cross sectional observational study was conducted in Ophthalmology and Emergency Departments (ED) of Jinnah Postgraduate Medical Centre (JPMC) Karachi. Patients underwent evaluation at the time of presentation for ocular trauma and demographic and injury data were collected during this episode of care. There was no design that included an intervention, comparison of treatment groups or longitudinal follow-up. There was no intermingling between routine clinical care and research. The reported method of recruitment and documentation is called prospective, and the analysis is concerned with characteristics that are seen at presentation. The dates of the recruitment and the total recruitment period were not indicated in the documentation of the study

available and must be confirmed by the author before submission.

The two departments combined as the recruitment setting, as patients with ocular trauma could be admitted to care either via specialist ophthalmology or the emergency service. This was done to include a variety of injury mechanisms and clinical presentations in the hospital. It is not representative of population-based surveillance – individuals receiving treatment elsewhere, those who did not seek treatment and individuals outside of eligibility were not included. No denominator was provided for the surrounding community, or for all emergency attendances. Therefore, the study presents the composition of the enrolled trauma cases sample, not the incidence or prevalence of the ocular trauma cases in Karachi.

Participants and sampling

The study was conducted on male and female patients aged 3-80 years with a history of ocular trauma who were eligible. Exclusion criteria used were the refusal of consent and mentally incompetent patients. Informed consent was obtained from the adult, and the children's was obtained from their parents or legal guardians. The number screened is not reported by the source, neither is the number excluded for each reason nor is a record of refusals provided. Such missing data reduce assessment of the completeness of recruitment and potential selection effects. The denominator for the descriptive results was 278 patients.

Consecutive sampling (non-probability sampling) employed. Patients who met the inclusion criteria were enrolled as they came in to the hospital until the number of patients was reached. While consecutive recruitment is a good way of enrolling emergency presentations, representativeness

beyond the hospital cannot be guaranteed. Patterns of referrals and access to care may continue to affect inclusion. The unit of analysis was the patient, as indicated in the tables reported. The incidence of laterality and injured eyes, as well as the treatment of bilateral injuries, were not documented. As a result, the categories listed at the patient level must not be restated as numbers of injured eyes or numbers of individual anatomical lesions.

Sample size

The sample size was determined as per the World Health Organization sample-size calculator with a 95% confidence level, absolute precision of 5%, and an assumed proportion in the population of 23.7%. This target was reported to be 278 patients, and 278 participants were included. These were the parameters that were reported and the final study sample size. The calculator's output, rounding rules, and supporting evidence for the forecasted percentage was not included. The former should be confirmed and the latter developed from the approved protocol, not during the manuscript preparation.

The sample size argument was focused on estimating a proportion and not to provide power for all cross-classified comparisons. This distinction is important because the number of patients in trauma categories (including radiation related and residual other) was relatively small. When the overall sample size is sufficiently large for common categories of observations, but is sparse when divided into age (or source) groups, the cells may be sparse. The overall sample size should not be considered a validation that all suggested association studies meet their statistical assumptions. There is no recruitment or post hoc power analysis stated on this manuscript.

Variables and operational definitions

Each predesigned structured proforma documented age, gender, source of injury, length of time since injury, injury-causing material, trauma pattern and eye structure involved. Age was recorded in years and presented in five groups: 3–15, 16–30, 31–45, 46–60, and 61–80 years. Gender – Male or Female. Injury source defined the situation or environment where the injury occurred and was categorized as: Workplace, Home, Road traffic accident, Sports, School, Assault, Others. These categories are not measurements of the amount of time involved in the occupation or the frequency of involved activities, but are reported as is.

The duration since injury was defined as the time from injury to hospital presentation. The reported time categories were: < 6 hours, 6 to 24 hours, 1 – 3 days, and > 3 days. No details were provided about how the boundaries are managed at 6 and 24 hours. The types of injury causing material were metal, stone/brick, wood, glass, stick, chemical agent, ball/sports object, thermal agent or others. Trauma pattern was defined as mechanical, chemical, thermal, radiation, and others. Material and pattern were two recorded variables and an agreement between these can't be assumed without a cross-tabulation at patient level.

Involvement of the cornea, conjunctiva, eyelids, lens, retina, globe/open globe injury, multiple structures, or optic nerve was presented. This classification consists of a named anatomical structure and a category for multiple structures and a globe-integrity category. The classification system does not indicate a priority order for who receives the classification if they were classified in more than one classification. Therefore, these labels should be considered as the patient categories as reported, rather than as an anatomical list. This is

particularly the case for the corneal count, which should not be used to give a picture of the total number of patients by category with any corneal involvement. This restriction also applies to other buildings.

Data collection and clinical assessment

After screening for eligibility and obtaining consent, demographic and injury data were gathered based on clinical history and ocular exam. History was provided with information about the events, and the timing, of the injury and the material used. The proforma used was structured, providing a common format to capture the same key variables from each participant. Checks for completeness, consistency and coding errors prior to data entry are described in the source. It also includes expert opinion regarding the proforma and the application of standard ophthalmic examination procedure. It does not have pilot-testing results, examiner numbers, estimates of interobserver agreement, or a formal statistic of validation, so no claims are made here.

The clinical evaluation was defined as visual acuity, slit-lamp examination, pupillary reactions, fundoscopy (if possible) and intraocular pressure measurement (if suitable). If the injury is suspected to be an open globe, the source indicates pressure was not measured. When clinically indicated, investigations like B-scan ultrasonography, optical coherence tomography, orbital radiography or computed tomography were described as available. This manuscript does not assert that all participants were tested for all procedures due to several being dependent on clinical indications and the use of some procedures not being reported. The outcomes of diagnostic accuracy and comparative imaging performance were not part of the study goals.

For the assessment process a visual acuity was described as well as possible investigations, but the outcome of these investigations was not tabled in the reported study findings. Likewise, there was no participant-level treatment, surgical procedure, complication or follow-up dataset. These elements cannot be recovered from anatomical category. The analysis is thus focused on the presentation characteristics and the presented categorical associations. The reference to prognosis, complications and need of resources in the discourse is an interpretation based on the published literature on the subject, not a measure of the prognosis, complications and need of resources of the 278 participants.

Statistical analysis

The data were typed in and analyzed using SPSS (version not stated). The descriptive plan outlined normality testing via the Shapiro-Wilk test and presentation of continuous variables as mean and standard deviation or as median and interquartile range as appropriate. Results provided, however, have age and duration in categories without continuous summaries. Hence, the descriptive measure in this paper is retained as frequencies and percentages. The grouped information has been used to create no mean age, median delay, confidence interval, effect size, or missing data estimate.

Associations among categorical variables were tested using chi-square tests, and when expected counts were small, Fisher's exact tests, and p values < 0.05 were considered statistically significant. The reported comparisons were age group to trauma pattern, gender to trauma pattern, and injury source to ocular structure involved. Other procedures mentioned in the broader methodology were not provided with outputs and/or these analyses are not described as completed. In this,

stratification is not mentioned as an adequate adjustment for confounding. Available tables are unadjusted categorical comparisons, and there was no reported multivariable model.

All original values for the results in the results tables, totals of the categories, percentages, and reported p-values have been preserved. Some discrepancies were found between the numbers in the displays and the inferential numbers reported during the verification. These are revealed in the results and in an author-only verification note. Reported p-values (the source p-values) are used to identify them and are not considered as independently verified evidence of association. Due to the lack of the underlying data set and SPSS output, no patient-level reanalysis was possible. Alas, hypotheses (material versus trauma type; presentation delay versus severity) were also part of the study objectives, but not reported for inferential results.

Ethics

The ethical review was reported as being done before data collection and that the study was in compliance with the Declaration of Helsinki and Good Clinical Practice. Informed consent was stated to be voluntary, refusal of participation to data collection did not compromise the clinical care, confidentiality was ensured using coded information and data collection was not prioritized over emergency clinical care. Adults and children's parents/guardians informed consent was obtained in writing. The approving committee, its approval number, and its approval date were not provided. These and any appropriate assent procedure should be provided on institutional records prior to journal submission.

Results

Demographic characteristics

Patients consisted of 278 patients. Males accounted for 190 cases (68.3%) and females for 88 (31.7%), as shown in Table 1. The largest age group was 16–30 years, with 92 patients (33.1%), followed by 31–

45 years, with 70 (25.2%). There were 48 patients aged 3–15 years (17.3%), 42 aged 46–60 years (15.1%), and 26 aged 61–80 years (9.3%) (Table 2). For the purposes of the following demographic table and analysis, age group boundaries of 46–60 years are consistently used.

Table 1. Gender distribution of ocular trauma patients

Gender	Frequency (n)	Percentage (%)
Male	190	68.3
Female	88	31.7
Total	278	100.0

Table 2. Age distribution of ocular trauma patients

Age Group	Frequency (n)	Percentage (%)
3–15 years	48	17.3
16–30 years	92	33.1
31–45 years	70	25.2
46–60 years	42	15.1
61–80 years	26	9.3
Total	278	100.0

The frequencies are measures of the enrolled patients. They do not measure the probability of an eye injury in males, females or specific age groups in the source population. Age-specific or gender-specific population denominators and exposure measurements were not provided, nor were occupational distributions. No report of continuous age summary. Interpretation, therefore, is limited to the fact that in this hospital sample, males and patients in the age group 16 – 30 years comprised the largest corresponding age groups.

Injury source and presentation interval

The highest rate was for work-related injury (82 patients, 29.5%). Fifty-eight (20.9%) were home injuries and 52 (18.7%) were road traffic accidents. Sports-related injury was reported in 34 patients (12.2%), school injury in 24 (8.6%), assault in 18 (6.5%), and other sources in 10 (3.6%) (Table 3). The most common source was the workplace, although jobs that occurred in various non-work areas also resulted in injuries. Specific occupations, road user categories, sports and domestic activities in these source groups were not provided.

Table 3. Source of ocular injury

Source of Injury	Frequency (n)	Percentage (%)
Workplace	82	29.5
Home	58	20.9
Road traffic accident	52	18.7
Sports	34	12.2
School	24	8.6
Assault	18	6.5
Others	10	3.6
Total	278	100.0

Presentation occurred within 6 hours in 96 patients (34.5%), between 6 and 24 hours in 84 (30.2%), between 1 and 3 days in 62 (22.3%), and after more than 3 days in 36 (12.9%) (Table 4). Most participants were in the two oldest age groups. Also documented in the results is the significant

group that comes in after the first day. The reasons for delay, time spent attending to first care elsewhere, referral time and time from hospital admission to definitive treatment were not reported and so could not be distinguished within the observed distribution.

Table 4. Duration since injury at hospital presentation

Duration Since Injury	Frequency (n)	Percentage (%)
Within 6 hours	96	34.5
6-24 hours	84	30.2
1-3 days	62	22.3
More than 3 days	36	12.9
Total	278	100.0

Injury-inflicting materials and trauma pattern

Fifty-four injuries were recorded as being caused by metals (19.4%). Stone/brick accounted for 42 (15.1%), wood for 36 (12.9%), glass for 32 (11.5%), and sticks for 30 (10.8%). Chemical agents were recorded in 28 patients (10.1%), ball/sports objects

in 26 (9.4%), thermal agents in 18 (6.5%), and other materials in 12 (4.3%) (Table 5). These classifications refer to the content of the recordings of the cases and no content specific analysis of the severity of the injuries or of the visual impact of the injury is provided.

Table 5. Injury-inflicting material

Injury-Inflicting Material	Frequency (n)	Percentage (%)
Metal	54	19.4
Stone/brick	42	15.1
Wood	36	12.9
Glass	32	11.5
Stick	30	10.8
Chemical agent	28	10.1
Ball/sports object	26	9.4
Thermal agent	18	6.5
Others	12	4.3
Total	278	100.0

Mechanical injury was the most common (212 patients, 76.3%). Chemical injury occurred in 28 (10.1%), thermal injury in 22 (7.9%), radiation-related injury in 10 (3.6%), and other injury patterns in 6 (2.2%) (Table 6). The reported distribution did not include further details into blunting or penetrating injuries within mechanical

cases. There were 18 thermal agents listed in the material table and 22 materials were listed as having thermal injuries in the trauma-pattern table. The two are retained as both are reported separately and their relationship is to be clarified from the original coding

Table 6. Pattern of ocular trauma

Pattern of Ocular Trauma	Frequency (n)	Percentage (%)
Mechanical injury	212	76.3
Chemical injury	28	10.1
Thermal injury	22	7.9
Radiation-related injury	10	3.6
Others	6	2.2
Total	278	100.0

Ocular structure involved

The most common was cornea (78 patients, 28.1%), conjunctiva (52 patients, 18.7%) and

eyelids (40 patients, 14.4%). Lens involvement was noted in 32 patients (11.5%), retinal involvement in 24 (8.6%) and globe/open globe injury in 22

(7.9%). Multiple structures were noted in 20 (7.2%) of the cases and the optic nerve was involved in 10 (3.6%) (Table 7). The categories reported do not

Table 7. Ocular structure involved

Ocular Structure Involved	Frequency (n)	Percentage (%)
Cornea	78	28.1
Conjunctiva	52	18.7
Eyelids	40	14.4
Lens	32	11.5
Retina	24	8.6
Globe/open globe injury	22	7.9
Multiple structures	20	7.2
Optic nerve	10	3.6
Total	278	100.0

Reported association analyses

In all age groups, mechanical injury was the most common pattern of trauma. There were 30 mechanical injuries reported among those aged 3 – 15 years, 72 among those aged 16 – 30 years, 54 among those aged 31 – 45 years, 30 among those

Table 8. Age group and pattern of ocular trauma

Age Group	Mechanical	Chemical	Thermal	Radiation	Others	Total
3-15 years	38	4	3	1	2	48
16-30 years	72	8	7	3	2	92
31-45 years	54	8	5	2	1	70
46-60 years	30	5	4	2	1	42
61-80 years	18	3	3	2	0	26
Total	212	28	22	10	6	278

Reported chi-square $p = 0.041$. Reported analysis value; not reproduced by the displayed counts.

add up to the study total as the allocation rule for combined injuries was not identified.

aged 46 – 60 years and 18 among those aged 61 – 80 years. This comparison was analyzed and reported a chi-square p -value of 0.041 (Table 8). Mechanical injuries were noted in 152 males and 60 females and analysis revealed $p = 0.032$ (Table 9), for gender and trauma pattern.

Table 9. Gender and pattern of ocular trauma

Gender	Mechanical	Chemical	Thermal	Radiation	Others	Total
Male	152	16	14	6	2	190
Female	60	12	8	4	4	88
Total	212	28	22	10	6	278

Reported chi-square $p = 0.032$. Reported analysis value; not reproduced by the displayed counts

There were 30 corneal and 14 conjunctival work-related injuries recorded in the source-by-structure comparison. In addition to the other categories of the road traffic row, there were 12 cases with eyelids, 8 with lenses, 8 with retinas, 6 with globes and 4 with optic nerves. The source reported $p =$

0.028 (Table 10). The cells in that row add up to 60 but it was printed as 52, and the multiple-structures column adds up to 28 but it was printed as 20. The original entries are left unchanged and the note to the table indicates this.

Table 10. Source of injury and ocular structure involved

Source of Injury	Cornea	Conjunctiva	Eyelids	Lens	Retina	Globe	Optic Nerve	Multiple	Total
Workplace	30	14	8	8	6	8	2	6	82
Home	14	12	10	8	4	4	2	4	58
Road traffic accident	10	8	12	8	8	6	4	4	52
Sports	8	6	4	4	4	2	1	5	34
School	8	6	2	2	1	1	0	4	24
Assault	6	4	3	2	1	1	1	0	18
Others	2	2	1	0	0	0	0	5	10
Total	78	52	40	32	24	22	10	20	278

Also, the significance levels of chi-square tests reported in the age and gender tables did not match the ones that could be obtained from the checks. Therefore, the three original p-values are kept as source reported statistics until validated and the present manuscript does not support the claimed statistical significance. The association results were not provided for injury-inflicting

material and trauma pattern, nor were results provided for interval between trauma and presentation and severity. No visual outcome, no complication rate or treatment effect were reported. The fact being that the descriptive distributions are the main and meaningful findings and are constrained by the categories and source data

limitations stated above, the above-mentioned findings and limitations should be kept in mind.

Discussion

Principal findings and contribution

This study is descriptive and presents the diversity of workload of ocular trauma in a tertiary eye hospital in Karachi. The overall descriptive results include a male predominance, a high number of young workers (16-30 years), injury in the workplace as the most common single source, metal as the most commonly reported material, mechanical injury as the most common pattern, and cornea as the most common structure recorded. Appreciable contributions also came from home and road traffic injuries, and presentation-time distribution also covered patients arriving after the first day. These observations in combination create the documented case mix and provide some directions for prevention and/or service review. They are not a measure of community relative risk or effectiveness of any proposed response.

The significance of the study is to review a number of aspects of presentation in one service population. Demographic data would tell us who came to the meeting, but would not narrow our focus to prevent. The source alone, without an obvious space or anatomical change, would find the event. The combination of these descriptors can offer a more clinically meaningful picture, but maintains their analytical separation. However, the remaining contingency-table and p-value discrepancies do restrict the secondary association results. The paper should then primarily be descriptive in nature, therefore. Such tentative linkages made as if they were proven ones would overstate the support that can be gained from the source and diminish the defensibility of the conclusions.

Demographic pattern in context

This male predominance is in general agreement with the results reported by the published literature of the third degree and tertiary care in the world (Bhaskar & Gupta, 2024). Eye injury is also located in demographic and cause-specific patterns in the Global Burden of Disease analysis (C. Li et al., 2023). There was consensus about the direction of study, across various settings, which lends credibility to the value of studying gender in the context of ocular-trauma surveillance. It does not indicate that the same mechanism is responsible for each series, however. Currently no data were collected on measures of occupation, hours of hazardous activities, participation in sport, road exposure or likelihood of specialist care following an injury.

Gender should then only be used as a descriptor and a potential indicator of different exposures, not as a complete explanation. If all the male injuries were attributed to occupational hazards or all the female injuries to domestic activity, then assumptions would be made that would not be supported by the reported cross tabulations. However, prevention planning can acknowledge the distribution without excluding those who are exposed to the same hazards in other capacities. A follow-up study might investigate if differences between groups are the result of specific activities and protective practices. The gender totals would not be enough to conduct such analysis, which would need directly measured exposure variables and an appropriate design, not them being the only ones.

The concentration in the younger and middle adult age groups is also consistent with the occupational activity, or source, interpretation

established in the source literature. The largest age group was 16–30 years, but there were children and older adults as well. These are rates of hospital attendance and not incidence rates by age. The distribution observed may be influenced by differences in the size of the underlying age populations, the width of the age bands and access to the centre. The inferential age comparison should always be verified and the descriptive pattern should not be expressed as a statement of age alone determining trauma mechanism.

The evidence on paediatric ocular trauma highlights the need for the definition of the comparison population. Kabakci et al. (2024) studied a smaller and more specific subcategory of OGs, paediatric ones, which is a more severe subset of those studied in the present all-pattern sample. Their findings can be used to start a discussion regarding the circumstances and clinical consequences of childhood injuries but not the percentages should be expected to reflect those of a mixed age trauma service. Likewise, the assumption that the oldest age group in the present study would have suffered injuries related mostly to falls would be incorrect without supporting data. Age sensitive prevention makes sense as a planning goal but the specific hazards must be identified not just based on age.

Workplace, domestic, and road exposure

The largest single source category is workplace injury and is one of the most obvious areas for local review of injury prevention. This is consistent with the occupational focus of the similar tertiary care literature (Bhaskar & Gupta, 2024). Also, the most common material was metal, suggesting a possible association with particle or tool-related activities. The present tables, however, do not show that metal injuries were primarily work-related since no source by material table was reported. The

two marginal distributions must be considered complementary signals for further investigation—not as evidence of a particular causal pathway amongst these participants.

It would be helpful to identify the task being performed at the time of injury, the equipment being used and the availability and use of eye protection in an occupational response. A generic label for workplaces will not identify poor guarding, use of inappropriate equipment, poor maintenance, lack of training, or lack of use of protective equipment. These options raise issues of responsibility and are indicative of ways to prevent. The current data may be sufficient to warrant more specific questions and access to the services or workplaces appropriate to the local case mix. They are unable to specify the dominant failure, to assess the percentage of injuries that could have been prevented by a specific device, or show that any one failure was the major cause of the injury.

Addressing domestic injuries should be taken care of in addition to occupational injuries. A published study of ocular trauma during lockdown has demonstrated that the presentation of injuries can alter based on different exposure environments (Pande et al, 2022). Its relevance is conceptual: The distribution of cases relies in part on the distribution of activities. This study did not address the type of home tasks performed, the use of sharp objects or chemicals or whether injuries occurred to children or adults. Recommendations for assessing hazards at home and teaching children about home safety thus emerged from the findings, rather than from the conclusion that certain home behaviors were responsible for the injuries seen.

The third largest source category was road traffic accidents. Road-related injury is one of the key components of the burden of eye injury, as identified in the global eye-injury literature (C. Li

et al., 2023). Locally, road incidents can include a range of possible combinations for ocular and other trauma, which cannot be distinguished in this data set, and are not broken down by energy of the collision, vehicle type, protective equipment, or if the incident involves a driver or passenger, or neither. Arithmetic discrepancies between the source by structure table must be addressed before a reliable comparative anatomical pattern can be built. The analyses reported here do not warrant the assumption that road traffic injury could, in itself, be more severe, or more extensive, in causing damage to the eyes.

Prevention doesn't happen just at school, in the athletic setting, at the park or in sports - it works everywhere. The present study provides only general ranges for engagement routes for each group, but more specific walks may be necessary. For instance, a school source cannot be used for a specific sports mechanism, and an assault source doesn't give any information about the relationship between the parties involved. The literature quoted on facial injuries is specific to a particular context of interpersonal violence and cannot be considered as a general description of assault injury (Gujrathi et al., 2022). The central point is to make sure future records will be more specific, without making too many generalisations about personal situations.

Materials, mechanism, and anatomical involvement

One of the most consistent descriptive findings is the predominance of mechanical trauma. It is consistent with incidents involving solid objects in the work place, residential environment, road and recreational settings. However, injuries in the mechanical category can have potentially large and quite divergent anatomical consequences. If there is no distinction of blunt and penetrating injuries,

ruptures or foreign bodies then the observed proportion cannot be used to define the severity distribution. Clinical reviews of open globe injury would justify the importance of mechanism and globe integrity in assessment (Pelletier et al., 2023). They offer context for the survey but don't make classifications that are not included in the survey.

It seems that in future, the material information of a case should be maintained rather than just mechanical trauma, as is the case with the metals, stone/brick, wood, glass and sticks. Material may be used to aid determination of the context and activity to which contamination is related, but it is not used to rank inherent danger based upon frequency. Many presentations can be made out of a common material as exposure is so common, a less common agent can still cause substantial damage. Focus on prevention of corneal blindness and the burden on the ocular surface due to avoidable exposures is warranted (Kate & Basu, 2024). The present results give a baseline distribution, but not a distribution of the risk or of the degree of visual disability which is attributable to the material.

Other less prominent categories of disease, such as chemical injury and thermal injury, still have relevance to emergency preparedness. The research cited deals with the biological and therapeutic complexity of chemical damage of the eye (Yang et al., 2023). This work cannot provide frequencies, concentrations or composition of chemicals found in this hospital. The lack of an acid-alkali distinction and the lack of information on initial decontamination give more scope for interpretation. Similarly, the disparity in the totals for thermal-agent or thermal-pattern needs to be analyzed based on the coding.

Anatomical distribution is with corneal and conjunctival categories being the prominent areas,

consistent with the anterior ocular involvement that was reported in the similar tertiary-care literature (Bhaskar & Gupta, 2024). This is helpful for planning for assessment workload but combined injuries must be allocated. Patients with more than one structure or globe open globe injury may also have corneal injury. The table is consequently not valid for determining the prevalence of all types of corneal involvement without knowledge of the rules for classification. Neither should the numbers of categories in the front of the list be interpreted as defining the overall level of severity; nor should the overall population be termed mild because of the high numbers of anterior categories.

Fewer categories occur, and should be interpreted with regard to the potential functional consequence. Lens and retinal entries, globe, multiple-structure, and optic-nerve, suggest more than superficial damage. Traumatic optic neuropathy and surgery following open-globe injury are complex conditions, as reflected in literature (Chen et al., 2022). The ASCOT study is for a specific surgical population and intervention, but not a broad survey of the prognosis of all patients (Casswell et al., 2024). The present findings would not be sufficient to determine which patients required surgery, the extent of change in vision or the number of patients who did become permanently impaired. These questions can't be answered without intentional outcome collection.

Presentation interval and access to care

Most of the patients were documented in the first 24 hours, and some between 1-3 days or longer. The pattern applies to the organization of referral and public information; but in the case of the latter, as for the first, the meaning of the presentation is not uniform. This may have been a

hospital presentation following earlier assessment elsewhere, or the first time they sought the care of the hospital. These pathways have not been broken down in the study. The recorded interval should not, therefore, be presented as an indication of the extent of neglect, unawareness, financial problems, or transport problems of the individual participants.

The systematic review on timing of primary open-globe repair is beneficial for explaining the importance of the timing of the research question (McMaster et al., 2025). But the timing of repairs does not necessarily correspond to the timing of arrivals, and the evidence applies to only open-globe injuries, not all trauma types that are part of this group. Its findings would be applied directly to all late presenters, which would be a conflation of population, exposure and outcome. This study did not include a duration by severity analysis and a duration by visual outcome analysis. It thus is not possible to claim that later presentation led to any increase in complications or to visual loss in this sample, though this is a clinically relevant question for future research.

A more informative follow up design would include the time of injury, first exposure to anyone, referral decision, arrival at tertiary centre, and definitive treatment. It would also gather explanations for breaks in the way along the trail as well as a preliminary assessment of the extent of the harm. This would help to distinguish access barriers in the community from the process of transfer and hospital processes. It is important to note that there is a difference and that this may mean that public communication, referral coordination or service capacity is needed. The present categorical timing data serve only to find an appropriate track to investigate, and not to provide any indication of the relative priority to be

given to it or the amount of benefit to be derived from it.

Clinical and service implications

The case mix allows for the review of the following presentations: readiness for common mechanical and ocular-surface presentations and capacity to recognise and refer complex injuries. Considerations for relevant planning questions include the presence of trained assessment staff, the availability of appropriate examination equipment, access to specialist review, and pathways for patients with suspected globe or posterior-segment involvement. These are only reported implications of the injuries experienced rather than quantifiable shortcomings at the Jinnah Postgraduate Medical Centre. The source did not assess staffing, equipment, waiting times, referral performance. The hospital is not known to have been under-resourced or a service change tested. Conversely, the process of planning prevention can start with what is actually being seen in the following environments and materials – but must be proportionate to the evidence. All of these areas of workplace engagement, household safety information, and road and recreational injury prevention may apply. The published literature puts prevention in the larger context of eye-care practice, as in the prevention context of corneal blindness (Kate & Basu, 2024). It is not possible to evaluate efficacy or cost-effectiveness of these approaches using the present study. There needs to be a clear set of goals, a hazard-specific intervention and potential assessment of the impact of the intervention in a local programme. If access/referral patterns changed during implementation, careful interpretation of attendance counts would be warranted.

Strengths, limitations, and future research

One strength of this study is that it reports on prospective recruitment in both the emergency and ophthalmology setting, which is facilitated by a common documentation framework. It outlines a number of dimensions of injury over a wide age range that are eligible to be measured, rather than a demographic summary. The use of source, material, mechanism, anatomy and presentation interval allows the identification of different questions for future research. These strengths should not be viewed as evidence of measurement validity or evidence of representation, as there was no evidence of the examiner agreement, participation flow or source-data verification.

The sample is not random and generalisability is restricted by the single centre. Referrals to a tertiary hospital may be different than those that were managed in primary care or not attended to, or the distribution may be affected by the severity of the referral. The lack of recruitment dates means the observation period cannot be assessed, thus, limiting the ability to examine the seasonality and/or context of the period. There are no laterality information and explicit rules for combined injuries, which hinder reproducibility of the anatomical categories. There is also some uncertainty due to unknown boundary handling for presentation intervals and lack of quantified missingness. They are reporting and design constraints that need to be openly stated, and not solved by making assumptions in the interpretation process.

The inconsistencies in the statistics are very significant. Association p-values are not consistent with simple verifications of tables displayed and the source-by-structure table is inconsistent with counts and totals displayed. The few numbers of expected cells also call into question the validity of the reported chi-square approach. These analyses are

not used to make statements of statistical association between the reported outcome categories and demographic characteristics or injury source prior to reconciliation of the underlying data and original output. In order to report the results of the study, these data in the table should be preserved, and responsible interpretation also should involve disclosure that their inferential meaning has not been demonstrated.

Future research should adopt a clear classification system, document dates of enrollment and attrition, and correlate baseline injury with treatment and visual follow-up. Case mix differences by access and referral setting might be explored in a multicentre recruitment. The occupational and domestic categories would be better understood if exposure information was available. In addition to anatomical finding, patient-reported functioning could provide information and align with the eye-disease quality of life literature (Kandel et al., 2022). This was not measured for such results. The next step in the analysis is to verify the current dataset followed by a study of prognosis, access, or prevention that is discussed.

Conclusion

Twenty-seven males and 16 to 30-year-old patients constituted the largest categories of patients who presented to Jinnah Postgraduate Medical Centre with ocular trauma. The top single cause was workplace injuries, with home injuries and road traffic accidents following. Metal was the most common material causing the injuries, mechanical trauma the most common type of injury, and the cornea most common anatomical category. Majority had presented within the first 24 hours, though some had been presented later. These descriptive results can be used as a local benchmark

to guide the review of prevention priorities and the variety of emergency ophthalmic services needed.

This study does not set a population incidence, exposure-specific risk, effectiveness of treatment, or visual prognosis. Original counts and percentages are retained and the reported p-values are retained, however, inconsistencies in the cross tabulations and statistical reporting make firm inferential conclusions not possible. Prior to submission, verification with original data set and completion of study and ethics details are required. Once these problems are addressed, the study can provide a focused description of the pattern of presentation of ocular trauma, and can inform future research into the classification of the trauma, access to care, and patient outcome.

References

- Ahluwalia, R., Grainger, C., Coffey, D., Malhotra, P.-S., Sommerville, C., Tan, P. S., Johal, K., Sivaprakasam, M., Almousa, O., & Janakan, G. (2023). The e-scooter pandemic at a UK Major Trauma Centre: a cost-based cohort analysis of injury presentation and treatment. *The Surgeon*, 21(4), 256-262.
- Ali, M., Naeem, Q., Zafar, U., Abbas, A., Muhammad, F., Naqash, M., Ghouri, N., Khan, M. A., Ali, A., & Memon, M. (2024). Outcomes and complications of percutaneous nephrolithotomy (PCNL): a single-center experience. *Cureus*, 16(9).
- Alrawashdeh, H. M., Naser, A. Y., Alwafi, H., AbuAlhommos, A. K., Jalal, Z., Paudyal, V., Abdulmannan, D. M., Hassanin, F. F., Hemmo, S. I., & Al Sarireh, F. (2022). Trends in hospital admission due to diseases of the eye and adnexa in the past two decades in England and Wales: an ecological study. *International Journal of General Medicine*, 1097-1110.

- Ang, T., Cameron, C., Tong, J. Y., Wilcsek, G., Tan, J., Patel, S., & Selva, D. (2023). Methicillin-resistant *Staphylococcus aureus*-associated orbital cellulitis: a case series. *International Ophthalmology*, 43(8), 2925-2933.
- Baudin, F., Benzenine, E., Mariet, A.-S., Ghezala, I. B., Bron, A. M., Daien, V., Korobelnik, J. F., Quantin, C., & Creuzot-Garcher, C. (2022). Epidemiology of acute endophthalmitis after intraocular procedures: a national database study. *Ophthalmology Retina*, 6(6), 442-449.
- Bhaskar, D. A., & Gupta, R. K. (2024). Clinical Profile of Ocular Trauma at a Tertiary Care Hospital. *Ophthalmology Research: An International Journal*, 19(4), 10.9734.
- Bitirgen, G., Korkmaz, C., Zamani, A., Ozkagnici, A., Zengin, N., Ponirakis, G., & Malik, R. A. (2022). Corneal confocal microscopy identifies corneal nerve fibre loss and increased dendritic cells in patients with long COVID. *British Journal of Ophthalmology*, 106(12), 1635-1641.
- Brown, L., Kamwiziku, G., Oladele, R. O., Burton, M. J., Prajna, N. V., Leitman, T. M., & Denning, D. W. (2022). The case for fungal keratitis to be accepted as a neglected tropical disease. *Journal of Fungi*, 8(10), 1047.
- Casswell, E. J., Cro, S., Cornelius, V. R., Banerjee, P. J., Zvobgo, T. M., Tudor Edwards, R., Ezeofor, V., Anthony, B., Shahid, S. M., & Bunce, C. (2024). Randomised controlled trial of adjunctive triamcinolone acetonide in eyes undergoing vitreoretinal surgery following open globe trauma: The ASCOT study. *British Journal of Ophthalmology*, 108(3), 440-448.
- Chaloulis, S. K., Moustakis, G., & Tsaousis, K. T. (2022). Incidence and risk factors of bilateral herpetic keratitis: 2022 update. *Tropical Medicine and Infectious Disease*, 7(6), 92.
- Chen, B., Zhang, H., Zhai, Q., Li, H., Wang, C., & Wang, Y. (2022). Traumatic optic neuropathy: a review of current studies. *Neurosurgical Review*, 45(3), 1895-1913.
- Galanakos, S. P., Bablekos, G. D., Tzavara, C., Karakousis, N. D., Sigalos, E., & Bablekos, G. (2023). Primary health care: our experience from an urban primary health care center in Greece. *Cureus*, 15(2).
- Garg, P. M., Paschal, J. L., Zhang, M., Pippins, M., Matthews, A., Adams, K., Taylor, C., Reddy, K., Inder, T. E., & Hillegass, W. B. (2022). Brain injury in preterm infants with surgical necrotizing enterocolitis: clinical and bowel pathological correlates. *Pediatric research*, 91(5), 1182-1195.
- Gedde, S. J., Feuer, W. J., Lim, K. S., Barton, K., Goyal, S., Ahmed, I. I., Brandt, J. D., Banitt, M., Budenz, D., & Lee, R. (2022). Treatment outcomes in the primary tube versus trabeculectomy study after 5 years of follow-up. *Ophthalmology*, 129(12), 1344-1356.
- Gomes, J. A., Rodrigues, P. F., & Lamazales, L. L. (2022). Keratoconus epidemiology: A review. *Saudi Journal of Ophthalmology*, 36(1), 3-6.
- Gu, C., Wang, Y., Jiang, Y., Xu, F., Wang, S., Liu, R., Yuan, W., Abudureyimu, N., Wang, Y., & Lu, Y. (2024). Application of artificial intelligence system for screening multiple fundus diseases in Chinese primary healthcare settings: a real-world, multicentre and cross-sectional study of 4795 cases. *British Journal of Ophthalmology*, 108(3), 424-431.
- Gujrathi, R., Tang, A., Thomas, R., Park, H., Gosangi, B., Stoklosa, H. M., Lewis-O'Connor, A., Seltzer, S. E., Boland, G. W., & Rexrode, K. M. (2022). Facial injury patterns in victims of intimate partner violence. *Emergency radiology*, 29(4), 697-707.

- Haile, Z., Mengist, H. M., & Dilnessa, T. (2022). Bacterial isolates, their antimicrobial susceptibility pattern, and associated factors of external ocular infections among patients attending eye clinic at Debre Markos Comprehensive Specialized Hospital, Northwest Ethiopia. *PLoS One*, 17(11), e0277230.
- Huang, X., Li, L., Chen, Z., Yu, H., You, X., Kong, N., Tao, W., Zhou, X., & Huang, J. (2023). Nanomedicine for the detection and treatment of ocular bacterial infections. *Advanced Materials*, 35(46), 2302431.
- Husain, K. A., Alaali, H., Alarayedh, G. G., & Alarayedh, G. (2024). Prevalence and Characteristics of Glaucoma Among Patients Presenting to Ophthalmology Clinics in a Tertiary Hospital in the Kingdom of Bahrain. *Cureus*, 16(2).
- Iskandar, K., Marchin, L., Kodjikian, L., Rocher, M., & Roques, C. (2022). Highlighting the microbial contamination of the dropper tip and cap of in-use eye drops, the associated contributory factors, and the risk of infection: a past-30-years literature review. *Pharmaceutics*, 14(10), 2176.
- Kabakci, A. K., Atik, B. K., Livan, E. H., Ocak, S. Y., & Elcioglu, M. N. (2024). Pediatric open-globe injuries: clinical characteristics and outcomes of repair in a tertiary center in Istanbul, Turkey. *Beyoglu Eye Journal*, 9(4), 213.
- Kandel, H., Nguyen, V., Piermarocchi, S., Ceklic, L., Teo, K., Arnalich-Montiel, F., Miotto, S., Daïen, V., Gillies, M. C., & Watson, S. L. (2022). Quality of life impact of eye diseases: a Save Sight Registries study. *Clinical & experimental ophthalmology*, 50(4), 386-397.
- Kappagant, V., Sinha, T. P., Agrawal, D., Jamshed, N., Kumar, A., Kumar, A., Pandey, R., Gopinath, B., Bhushan, V., & Tiwari, A. K. (2023). Diagnostic accuracy of ocular ultrasonography in identifying raised intracranial pressure among pediatric population. *Pediatric Neurosurgery*, 58(3), 142-149.
- Kate, A., & Basu, S. (2024). Corneal blindness in the developing world: The role of prevention strategies. *F1000Research*, 12, 1309.
- Kendall-Tackett, K., & Beck, C. T. (2022). Secondary traumatic stress and moral injury in maternity care providers: a narrative and exploratory review. *Frontiers in Global Women's Health*, 3, 835811.
- Kumar, N. R., Praveen, M., Narasimhan, R., Khamar, P., D'Souza, S., Sinha-Roy, A., Sethu, S., Shetty, R., & Ghosh, A. (2023). Tear biomarkers in dry eye disease: Progress in the last decade. *Indian Journal of Ophthalmology*, 71(4), 1190-1202.
- Lapp, T., Wacker, K., Heinz, C., Maier, P., Eberwein, P., & Reinhard, T. (2023). Cataract surgery—indications, techniques, and intraocular lens selection. *Deutsches Ärzteblatt International*, 120(21-22), 377.
- Li, C., Fu, Y., Liu, S., Yu, H., Yang, X., Zhang, M., & Liu, L. (2023). The global incidence and disability of eye injury: an analysis from the Global Burden of Disease Study 2019. *EClinicalMedicine*, 62.
- Li, S., Li, R., Li, M., Cui, Q., Zhang, X., Ma, T., Wang, D., Zeng, M., Li, H., & Bao, Z. (2023). Dexmedetomidine administration during brain tumour resection for prevention of postoperative delirium: a randomised trial. *British journal of anaesthesia*, 130(2), e307-e316.
- Liu, B., Zhou, X., Yue, L., Hou, B., Yu, Q., Fan, B., Wei, X., Qiu, L., Huang, Z., & Xia, W. (2023). Experts consensus on the procedure of dental

- operative microscope in endodontics and operative dentistry. *International journal of oral science*, 15(1), 43.
- McMaster, D., Bapty, J., Bush, L., Serra, G., Kempapidis, T., McClellan, S. F., Woreta, F. A., Justin, G. A., Agrawal, R., & Hoskin, A. K. (2025). Early versus delayed timing of primary repair after open-globe injury: a systematic review and meta-analysis. *Ophthalmology*, 132(4), 431-441.
- Meer, E., Grob, S., Antonsen, E. L., & Sawyer, A. (2023). Ocular conditions and injuries, detection and management in spaceflight. *npj Microgravity*, 9(1), 37.
- Moghadam, S., Zarrinfar, H., Naseri, A., Sadeghi, J., Najafzadeh, M. J., Zhou, Y. B., & Houbaken, J. (2024). Causative agents of fungal keratitis in northeastern Iran: A 3-year tertiary care hospital study. *The American Journal of Tropical Medicine and Hygiene*, 112(3), 553.
- Monesi, A., Imbriaco, G., Mazzoli, C. A., Giugni, A., & Ferrari, P. (2022). In-situ simulation for intensive care nurses during the COVID-19 pandemic in Italy: advantages and challenges. *Clinical simulation in nursing*, 62, 52-56.
- Motloch, L. J., Jirak, P., Gareeva, D., Davtyan, P., Gumerov, R., Lakman, I., Tataurov, A., Zulkarneev, R., Kabirov, I., & Cai, B. (2022). Cardiovascular biomarkers for prediction of in-hospital and 1-year post-discharge mortality in patients with COVID-19 pneumonia. *Frontiers in Medicine*, 9, 906665.
- Ngaruiya, C., Bernstein, R., Leff, R., Wallace, L., Agrawal, P., Selvam, A., Hersey, D., & Hayward, A. (2022). Systematic review on chronic non-communicable disease in disaster settings. *BMC Public Health*, 22(1), 1234.
- Organization, W. H. (2022). *Package of eye care interventions*. World Health Organization.
- Pande, R., Mohod, S. S., V, P., Shanbhag, S., & Kumar, N. S. (2022). Impact of the COVID-19-induced lockdown on the incidence of ocular trauma presenting to a tertiary care hospital. *BMJ open ophthalmology*, 7(1), e000861.
- Patel, M., Shrestha, M. K., Manandhar, A., Gurung, R., Sadhra, S., Cusack, R., Chaudhary, N., Ruit, S., Ayres, J., & Kurmi, O. P. (2022). Effect of exposure to biomass smoke from cooking fuel types and eye disorders in women from hilly and plain regions of Nepal. *British Journal of Ophthalmology*, 106(1), 141-148.
- Pelletier, J., Koyfman, A., & Long, B. (2023). High risk and low prevalence diseases: Open globe injury. *The American Journal of Emergency Medicine*, 64, 113-120.
- Privitera, C. M., Neerukonda, S. V., Aiyagari, V., Yokobori, S., Puccio, A. M., Schneider, N. J., Stutzman, S. E., Olson, D. M., & Stefan, E. P. I. H. M. D. J. A. F. B. A. X. D. K. J. K. J. S. (2022). A differential of the left eye and right eye neurological pupil index is associated with discharge modified Rankin scores in neurologically injured patients. *Bmc Neurology*, 22(1), 273.
- Rayamajhee, B., Sharma, S., Willcox, M., Henriquez, F. L., Rajagopal, R. N., Shrestha, G. S., Subedi, D., Bagga, B., & Carnt, N. (2022). Assessment of genotypes, endosymbionts and clinical characteristics of *Acanthamoeba* recovered from ocular infection. *BMC infectious diseases*, 22(1), 757.
- Richardson-May, J., Alnuaimi, R., Elbably, A., Walker, L., Thulasidharan, S., Dacombe, R., Jacob, A., & Dacombe, R. A. (2023). Our

- experience of deep sclerectomy at a tertiary center in the United Kingdom over 14 years. *Cureus*, 15(8).
- Sachdeva, J., Yang, S. N., Gopalan, P., Worley, L. L., Mittal, L., Shirvani, N., Spada, M., Albertini, E., Shenai, N., & Simas, T. A. M. (2022). Trauma informed care in the obstetric setting and role of the perinatal psychiatrist: a comprehensive review of the literature. *Journal of the Academy of Consultation-Liaison Psychiatry*, 63(5), 485-496.
- Shah, S. Z., Rehman, S. T., Khan, A., Hussain, M. M., Ali, M., Sarwar, S., & Abid, S. (2022). Ergonomics of gastrointestinal endoscopies: Musculoskeletal injury among endoscopy physicians, nurses, and technicians. *World Journal of Gastrointestinal Endoscopy*, 14(3), 142.
- Singh, G. K., Mitra, D., Kumar, S., Raman, N., Das, P., & Sharma, P. (2022). A clinico-epidemiological study of cases of herpes zoster in a tertiary care hospital.
- Stapleton, F., Shrestha, G. S., Vijay, A. K., & Carnt, N. (2022). Epidemiology, microbiology, and genetics of contact lens-related and non-contact lens-related infectious keratitis. *Eye & Contact Lens*, 48(3), 127-133.
- Tălăpan, D., Sandu, A.-M., & Rafila, A. (2023). Antimicrobial resistance of *Staphylococcus aureus* isolated between 2017 and 2022 from infections at a tertiary care hospital in Romania. *Antibiotics*, 12(6), 974.
- Tervo-Heikkinen, T. A., Heikkilä, A., Koivunen, M., Kortteisto, T. R., Peltokoski, J., Salmela, S., Sankelo, M., Ylitörmänen, T. S., & Junntila, K. (2022). Pressure injury prevalence and incidence in acute inpatient care and related risk factors: a cross-sectional national study. *International wound journal*, 19(4), 919-931.
- Treurniet, S., Burger, P., Ghyczy, E. A., Verbraak, F. D., Curro-Tafili, K. R., Micha, D., Bravenboer, N., Ralston, S. H., de Vries, R., & Moll, A. C. (2022). Ocular characteristics and complications in patients with osteogenesis imperfecta: a systematic review. *Acta ophthalmologica*, 100(1), e16-e28.
- Yang, C. J., Nguyen, D. D., & Lai, J. Y. (2023). Poly (l-Histidine)-mediated on-demand therapeutic delivery of roughened ceria nanocages for treatment of chemical eye injury. *Advanced Science*, 10(26), 2302174.
- Yu, F., Gong, D., Yan, D., Wang, H., Witman, N., Lu, Y., Fu, W., & Fu, Y. (2023). Enhanced adipose-derived stem cells with IGF-1-modified mRNA promote wound healing following corneal injury. *Molecular Therapy*, 31(8), 2454-2471.
- Zafar, S., Dun, C., Srikumaran, D., Wang, P., Schein, O. D., Makary, M., & Woreta, F. (2022). Endophthalmitis rates among Medicare beneficiaries undergoing cataract surgery between 2011 and 2019. *Ophthalmology*, 129(3), 250-257.
- Zegeye, A. F., Temachu, Y. Z., & Mekonnen, C. K. (2023). Prevalence and factors associated with Diabetes retinopathy among type 2 diabetic patients at Northwest Amhara Comprehensive Specialized Hospitals, Northwest Ethiopia 2021. *BMC ophthalmology*, 23(1), 9.
- Zhao, X., & Jia, Q. (2023). Effectiveness of rb-bFGF eye drops for post-cataract surgery dry eye and observation of changes in tear secretion and corneal damage in patients. *Alternative Therapies in Health and Medicine*, 29(8), 489-495.