

ISSN 3006-2543 (Online)
ISSN 1990-3863 (Print)

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Al-Shifa Journal of Ophthalmology

Vol. 19, No. 1, January – March 2023

QUARTERLY PUBLISHED

Logo

- **Editorial: Artificial Intelligence and Glaucoma**
- **Asynchronous Learning and Cognitive Performance**
- **Posterior Subcapsular Opacification After Cataract Surgery**
- **Pediatric Ocular Trauma**
- **Combination Drugs Efficacy in Primary Open Angle Glaucoma**
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Al-Shifa Journal of Ophthalmology

A Journal of Al-Shifa Trust Eye Hospital, Rawalpindi

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The Revolutionary Impact of Artificial Intelligence on Advancing Glaucoma Care

Mahmood Ali

The rapid advancement of artificial intelligence (AI) is transforming the landscape of glaucoma detection, diagnosis, and progression assessment. AI harnesses the power of machine learning algorithms, trained on diverse fundus images, showcasing exceptional proficiency in identifying glaucomatous optic neuropathy. Deep learning algorithms, integrating both fundus and OCT images, exhibit a capability to discern between glaucomatous and healthy eyes comparable to human grading. The incorporation of clinical parameters and data from visual field testing and OCT imaging further elevates the precision of glaucoma identification.¹

Despite these strides, challenges persist. Establishing a definitive ground truth for glaucoma diagnosis and progression proves contentious, marked by variability among experts. The clinical applicability of AI strategies faces hurdles due to diverse clinic settings, variations in input from commercially available devices, and the subjective nature of patient-reported data. Large-scale, population-based algorithm validation becomes imperative for widespread effectiveness.²

Defining glaucoma progression, addressing patient factors, and navigating the ongoing debate on structure-function correlations pose formidable challenges. However, AI contributes by assimilating diverse data sources, delivering more objective conclusions. Emphasizing the importance of validating AI strategies across varied global patient populations is crucial. In the evolving landscape of glaucoma care, AI emerges as a powerful complement to clinical expertise rather than a replacement. The future integration of AI into glaucoma diagnosis promises improved efficiency,

expanded diagnostic capabilities, and elevated patient care standards.³

While AI holds great promise in glaucoma care, its integration into clinical practice demands meticulous consideration. This editorial strongly advocates for AI as a supplementary tool for clinicians, enhancing diagnostic accuracy and decision-making without overshadowing human expertise. AI algorithms could seamlessly serve as referral refinement schemes for community-based screening programs, optimizing diagnostic efficiency and contributing to improved patient outcomes.

In conclusion, the synergy between AI and clinical expertise is poised to revolutionize glaucoma care, offering a pathway towards enhanced efficiency, expanded diagnostic capabilities, and elevated standards of patient care. As we navigate the evolving landscape, the judicious integration of AI promises to redefine the benchmarks of glaucoma diagnosis in the near future.

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The Impact of Asynchronous Learning on Cognitive Performance in the Delivery of Undergraduate Ophthalmology Curriculum

Amena Masrur¹, Ali Tayyab¹, Hassan Naveed Ismail¹

Abstract:

Objective: To determine the impact of asynchronous learning on student performance in the delivery of undergraduate ophthalmology curriculum.

Methods: Randomized controlled crossover study was conducted in the Department of Ophthalmology, Islamabad Medical & Dental College between January 2020 to November 2021. A total of 110 4th year medical students of the Islamabad Medical and Dental College (class of 2021) rotating in the ophthalmology clerkship were recruited in the study. Curricular content in the ophthalmology clerkship is organized into 5 themes, each one representing a specific pattern of patient presentation. Each of the 10 clerkship groups rotating in the ophthalmology department were instructed asynchronously (on line for 2 weeks after which they rotated in the clinic for face-to-face sessions for another 2 weeks.) At the end of each 2-week rotation, the students' performance was assessed via a 70 MCQ paper and their performance in each of the components of asynchronous learning was compared.

Results: A total of 110 (40 male and 70 female) students were recruited in the study. The mean students' score for the themes delivered on line was 34.5 (± 14.7) versus 41.96 (± 16.5) for those taught via face-to-face sessions. This result is statistically significant ($P = 0.000$, $t = 5.079$, $d = 109$). Students who did well on line, also scored better in the themes delivered face to face. (Pearson's correlation 0.55, $p = 0.000$). Comparing genders, female students did better in the assessment for the themes taught on campus (42.95 ± 14.18 vs 39.46 ± 15.70) while male students did better in the assessment of themes taught on-line. (38.11 ± 15.40 vs 34.90 ± 16.70). These results, however, were not statistically significant.

Conclusion: Students tend to do better when taught on-campus, with online learning having a negative impact on their performance. *Al-Shifa Journal of Ophthalmology 2023; 19(1): 8-13.*
© Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.

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Originally Received: 3 Jan 2023

Revised: 19 Jan 2023

Accepted: 21 Jan 2023

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Introduction:

Ophthalmology is a compulsory clinical subject that is taught as a part of the undergraduate curriculum in the medical colleges of Pakistan¹. The Pakistan Medical & Dental Council has developed a curriculum and a set of competencies that 4th year medical student must acquire during their ophthalmology rotation². How this core curriculum is delivered varies across the country, with most medical schools following the traditional didactic lectures for content delivery, while others utilizing the clerkship model. The clerkship model offers students the opportunity to acquire many core competencies in ophthalmic care, these include patient care, medical knowledge, practice-based

learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice³. Live online lectures are a form of synchronous learning as all are present at the same time, so it is interactive. Asynchronous means that they may not be present but learn at their own pace with online resources such as pre-recorded lectures etc, usually not 'live' lectures so interaction is less. Asynchronous learning is a means of curricular delivery that utilises electronic technology that allows a student to access the curricular content outside the traditional classroom. In most cases, it refers to a course delivered on line, via the internet. It is an interactive course that allows the participants to interact with the teacher as well as other participants. Research from the Indian subcontinent indicates that asynchronous learning is well accepted as a medium of instruction by medical students⁴⁻⁵. The development of asynchronous learning as a means of delivering curricular content has the potential to transform medical teaching, especially in the context of undergraduate students^{6,7}. Not only does it connect students and teachers in an efficient as well as economical manner, it also allows students to learn at their own pace^{8,9}. Once an efficient asynchronous learning portal has been developed, it may also reduce the load on the faculty running a busy clinic¹⁰. Research on the impact of asynchronous learning on student performance in our country is still lacking. To the best of our knowledge, the data is lacking from this part of the world.

The purpose of this study was to determine the impact of asynchronous learning on student performance in the delivery of undergraduate ophthalmology curriculum.

Materials and Methods:

After obtaining approval from the institutional review board, 110 4th year medical students rotating in the ophthalmology clerkship of the Islamabad Medical and Dental College (graduating class of 2021) were recruited in this

randomized controlled cross-over study. Those repeating the clerkship or doing an elective rotation were excluded. A full disclosure of the study was made to all the students and a written informed consent obtained from all of them.

In our setup, the ophthalmology clerkship/rotation was organized into 5 themes, each one representing a specific pattern of patient presentation. These themes are included: Gradual Painless Loss of Vision, The Red Eye, Ocular Surface Anomalies, Sudden Painless Loss of Vision, The Deviated Eyes. Each of the 10 clerkship groups rotating in the ophthalmology department were instructed via asynchronous learning for 2 weeks immediately after which they rotated in the eye clinic for another 2 weeks. The first 3 themes were delivered via asynchronous learning and the last 2 via face-to-face sessions in the ophthalmology clinic. A detailed schedule along with learning material in form of presentations, pre-recorded lectures, discussion group for each theme, skill videos and simulated patient recorded interviews were always available to the students either via Online streaming (YouTube) or Cloud stored data. Students who did not have access to reliable internet access or were bandwidth limited were given the option to have the data shipped via a flash drive or if possible, they could personally come to the College to copy the data. Asynchronous learning was monitored by the administration of a short quiz administered at the end of each day with the provision of formative feedback. Student performance during the face-to-face sessions was directly observed by the preceptors. At the end of each 2-week rotation, the students' performance was assessed via a 70 MCQ paper and their performance compared between the 2 teaching methods (40 MCQs for online teaching & 30 MCQs for on-campus teaching).

Student's demographics (number, age & sex) were presented as descriptive statistics. Pearson's Correlation was calculated to

investigate the effect size between the two groups. Paired t test was used to determine any significant difference between the scores of the two teaching methodologies. A p value of <0.05 was taken as significant. Independent sample t-test was applied to see if the difference in scores between genders was statistically significant.

Results:

A total of 110 (40 male and 70 female) students were recruited in this study. Of the 110 students, 36.36% students were males and 63.64% students were females. The mean score of the students for the themes delivered online was 34.5 (± 16.53), versus 41.68 (± 14.77) for those taught via face-to-face sessions (on-campus).

These test results were statistically significant ($P < 0.01$).

Student who did better in on-campus portion of the test also did better in the online portion of the test ($r = 0.566$; $p = 0.000$).

Score by gender is shown in table 1. Overall female students scored better in the on-campus portion of the test (42.95 ± 15.18 versus 39.46 ± 15.70 for male students), while male students performed better in the online portion of the test (38.11 ± 15.40 versus 32.43 ± 16.91 for female students). None of these differences, however, were statistically different ($p = 0.235$ for on-campus and $p = 0.084$ for online portions of the test). The results are summarized in table 1.

Table 1: Summary of results of students & their test scores categorized by gender

Statistic	Male Students		Female Students	
Students (N)	40		70	
Students (%)	36.36		63.64	
Mean Test Scores	Online	On-Campus	Online	On-Campus
	38.11 ± 15.40	39.46 ± 15.70	32.43 ± 16.91	42.95 ± 15.18

Discussion:

With the advent of easier means of communication owing to advancements in technology over the past few years, many individuals and institutions have begun incorporating the use of the internet to provide learning online¹¹. This is something that became a major need due to the unfortunate, recent COVID-19 pandemic that rendered many in-person activities unsafe¹². Our investigations show that students still performed better when instruction was by face-to-face sessions as opposed to online instruction in an asynchronous format. However, taking the entire scenario into context, it must be emphasized that the shift to online asynchronous format was not a planned change; circumstances forced the change

on faculty, students and the community at large. None of the key players had any prior experience in extensive online teaching or learning; it was more or less a learn as you go experience for all. Studying from home was a new experience for most of the students and without any immediate consequences of their performance hanging over their (student's) heads (in the form of attendance, peer pressure, etc.) the seriousness of education, in the online format, was perhaps not present. Our students enter the undergraduate medical program after completing 12 years of schooling, a comparatively younger age as compared to many other countries of the world where the usual entry is after completing 16 years of education (12 years of school plus 4 years of university education)¹³. This relative immaturity is

likely to have an impact as well¹⁴. Further the funding for the education is, in all cases, borne by parents, families or guardians and not the student; there is no direct financial repercussion of his performance on the student. This contrasts with the source of funding in many North American and European schools; where funding is primarily the onus of the student¹⁵.

Planned online learning experiences have generally shown to be at-least as effective as class room teaching (ref 6-10 of A)¹⁶⁻¹⁸. However, this is not universally true¹⁹. Course content, learner proficiency, extent of interactions available for online delivery are some of the factors that may impact usefulness of online learning experiences and subsequent performance of students.

One major factor that influences student performance during online course is adaptation to the learning environment. Since the change was abrupt due to circumstances, not all students may have been equally prepared for online teaching. Connectivity, family, and other issues potentially can influence the learner's ability to adapt to online learning. This has been shown to affect student performance²⁰. The investigators concluded that this change in teaching strategies may temporarily affect student performance in a negative manner.

Students who performed better on the on-campus portion of the test also did better on the online portion of the test. Notwithstanding the overall scores, good students did well irrespective of the teaching strategy. This is also supported by literature²⁰. This, in all likelihood is attributable to the student and not the mode of instruction; good students tend to do well irrespective of the medium of instruction as their drive for learning is generally driven by ambition and not via the mode of instruction.

Studies have taken into account the impact of gender on online courses²¹. Generally speaking, male students tend to demonstrate stronger belief in their competence as compared to female

students²², however this is not always the case²¹. With increasing age, women seem to have greater belief in their competence as compared to male students which might be responsible for inconsistency seen when comparing gender performance with online and computer-based courses. In parts of the world female students do better in online tests as compared to male students. Students in United States of America, Jordan, Malaysia, Netherlands and China exhibited no statistically significant difference in scores between male and female students²³. However, in other countries females did better as compared to males, and the overall result also favoured female students²³. This is in contrast to our own study where male students outperformed female students in the online portion of the test. In both cases there were a majority of female students. The differences could lie in the social setup of our society where females, generally are expected to have a greater input in social activities of the household as compared to males; our medical training is geared towards training doctor brides²⁴. Whereas the majority of under graduate medical students are girls, the number of practicing doctors are mostly males²⁵. This might be a stereotypical view, but contextualization is essential in interpretation of results²⁶. Irrespective it is interesting to find that while female students did better overall, male students performed better in the online portion of the test.

Conclusion:

Students performed better in the portion of the written assessment that was delivered face-to-face. Male students did comparatively better in the portion of the written assessment whose content was delivered online. Over-all female students did better in the written assessment as compared to male students. More research is required to ascertain the utility of asynchronous online teaching in the context of Pakistani medical Colleges.

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Risk Factors for Posterior Capsular Opacification after Cataract Surgery in Dera Ismail Khan, Pakistan

Muhammad Kamran Khalid¹, Muhammad Shoaib Khan¹, Maria Shafiq¹, Muhammad Irfanullah Kakar¹

Abstract:

Objectives: To determine Demographic (Gender, Age, Address, and Place of surgery) and Clinical (Laterality, Procedure of surgery and Type of IOL) variables as risk factors for development of PCO in our location.

Materials & Methods: This was a cross-sectional comparative study conducted at the department of Ophthalmology, Gomal Medical College, Dera Ismail Khan, Pakistan from January 2021 to March 2021. The sample consisted of consecutive patients of Nd:YAG laser procedures during this period at Eye Unit, DHQ Teaching Hospital Dera Ismail Khan, Pakistan. A total of 160 patients with PCO undergoing Nd:YAG laser procedures were included in the study during this period. Demographic (Gender, Age, Address, and Place of surgery) and Clinical (Laterality, Procedure of surgery and Type of IOL) variables were compared with development of PCO (Duration from surgery) using Chi-square test and p-value <0.05 was taken statistically significant.

Results: Among the demographic variables, age of the patients <15 years was statistically significant (p<0.05) risk factor for the development of early PCO (<12 months), whereas gender, urban or rural address and place of surgery in public or private setup were not statistically significant risk factors for development of early PCO (p>0.05). Whereas among the clinical variables, ECCE procedure of surgery and PMMA type of IOL were statistically significant (p<0.05) risk factors for the development of early PCO (<12 months), and laterality i.e. right or left eye was not a statistically significant risk factors for development of early PCO (p>0.05).

Conclusion: Age of the patient <15 years, ECCE procedure of surgery and PMMA type of IOL are significant risk factors for development of early PCO in our setup. *Al-Shifa Journal of Ophthalmology* 2023; 19(1): 14-19. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.

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Originally Received: 1 Feb 2023

Revised: 23 Feb 2023

Accepted: 25 Feb 2023

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Introduction:

Cataract surgery is the most commonly performed ocular surgery as cataract is the most common treatable cause of blindness globally. Conventional extra-capsular cataract extraction (ECCE) with implantation of rigid polymethyl-methacrylate (PMMA) intraocular lens (IOL) has largely been replaced by phacoemulsification and implantation of foldable IOL which gives better visual results. Posterior capsular opacification (PCO) is one of the most common complication after cataract surgery which has been reported to occur in 20%--40% of post-cataract surgery patients over a period of 2--5 years¹.

Formation of PCO has been described to occur due to the proliferation of residual lens epithelial cells (LEC) in the capsular bag after cataract surgery. LECs may undergo transformation from epithelial to mesenchymal type cells under the influence of cytokines, growth factors and extra cellular matrix proteins that leads to the formation of PCO.² Clinically it may take two forms i.e., capsular fibrosis type and pearls type and both can lead to significant visual compromise.

Neodymium: Yatrium-Aluminum-Garnet (Nd:YAG) laser has long been used to treat PCO effectively after cataract surgery. The cumulative incidence of Nd:YAG laser capsulotomy was 10.6%, 14.8%, 21.2% and 28.6% postoperatively after 1, 2, 3 and 4 years respectively³. Although a relatively simple and non-invasive procedure, Nd:YAG laser capsulotomy is not without complications. Mild intraocular inflammation, transient increase in IOP, IOL pitting, corneal injury, vitreous prolapse, IOL dislocation, cystoid macular edema and retinal detachment are among the common reported complications.^{4,5,6} Therefore a lot of effort has been made to prevent the formation of PCO including modifications in IOL materials and design, surgical techniques and pharmacological measures⁷.

A significant effort has also been made to determine the risk factors for the development of PCO including general conditions of the patient, ocular conditions, surgical techniques and type of IOLs. The aim of our study is to determine risk factors for the development of PCO in our location.

Materials & Methods:

This was a cross-sectional comparative study conducted at the department of Ophthalmology, Gomal Medical College, Dera Ismail Khan, Pakistan from January 2021 to March 2021. The sample consisted of consecutive patients of Nd: YAG laser procedures during this period at the Eye Unit, DHQ Teaching Hospital Dera Ismail Khan, Pakistan. Proper approval from the

ethical committee of Gomal Medical College, Dera Ismail Khan was taken before starting the study. Nd: YAG laser procedures were performed with slit-lamp delivery system SuperQ, Ellex, Australia, under topical anesthesia using an Oculus YAG capsulotomy contact lens. The energy level was titrated from case to case to get the desired effect. The sampling technique was consecutive, non-probability technique. A total of 160 patients Nd: YAG laser procedures were included in the study during this period. All patients in whom Nd: YAG laser treatment was not possible due to any reason were excluded. Descriptive statistics were used including frequencies and percentages for categorical data and Mean +/- SD for quantitative data, using SPSS version 20. On the basis of duration from surgery, patients were divided into those presenting within 12 months after surgery (Early PCO) and those presenting after 12 months (Late PCO). Demographic (Gender, Age, Address, and Place of surgery) and Clinical (Laterality, Procedure of surgery and Type of IOL) variables were compared with development of PCO (Duration from surgery) using Chi-square test and p-value <0.05 was taken statistically significant.

Results:

A total of 160 patients with PCO undergoing Nd: YAG laser procedure were included in the study. Out of these 92 (57.5%) were female and 68 (42.5%) were male. 27 (16.9%) were <15 years of age and 133 (83.1%) were >15 years of age. Patients coming urban area of DIKhan were 35 (21.9%) and 125 (78.1%) were from rural areas. Cataract surgery was performed in public setup in 92 (57.5%) patients and 68 (42.5%) were operated in private setup. Nd: YAG laser procedure was performed in right eye in 90(56.3%) and in left eye in 70(43.8%). Frequency distribution of Procedure of surgery, Type of IOL and Duration from surgery is shown in Tables 1.

Table No.1: Procedure of surgery

Procedure	Frequency	Percent
ECCE	42	26.3%
Phaco	118	73.8%
Total	160	100%

Type of IOL	Frequency	Percent
PMMA	34	21.3%
Hydrophilic	126	78.8%
Total	160	100%

Duration	Frequency	Percent
Early PCO(<12 months)	35	21.9%
Late PCO(>12 months)	125	78.1%
Total	160	100%

Comparison between the demographic variables (Gender, Age, Address, and Place of surgery) and Development of PCO is shown in Table No 2.

Table No.2: Development of PCO

Gender	Development of PCO		Chi-Square	p-value
	Early PCO	Late PCO		
Female	19	73	0.189	0.663
	16	52		
Male				

Age	Development of PCO		Chi-Square	p-value
	Early PCO	Late PCO		
<15 years	18	9	38.132	0.000
	17	116		
>15 years				

Address	Development of PCO		Chi-Square	p-value
	Early PCO	Late PCO		
Urban	7	28	0.092	0.761
	28	97		
Rural				

Place of surgery	Development of PCO		Chi-Square	p-value
	Early PCO	Late PCO		
Public setup	21	71	0.115	0.735
	14	54		
Private setup				

This is evident from the above tables that age of the patients <15 years is statistically significant ($p < 0.05$) risk factor for the development of early PCO (<12 months), whereas gender, urban or rural address and place of surgery in public or private setup are not statistically significant risk factors for development of early PCO ($p > 0.05$).

Comparison between the clinical variables (Laterality, Procedure of surgery and Type of IOL) and Development of PCO is shown in Table No. 8—10.

Table No.3: Development of PCO

Laterality	Development of PCO		Chi-Square	p-value
Right	Early PCO	Late PCO	1.073	0.300
	17	73		
Left	18	52		

Procedure	Development of PCO		Chi-Square	p-value
ECCE	Early PCO	Late PCO	4.375	0.036
	14	28		
Phaco	21	97		

Type of IOL	Development of PCO		Chi-Square	p-value
PMMA	Early PCO	Late PCO	9.412	0.002
	14	20		
Hydrophilic	21	105		

It is evident from the above tables that ECCE procedure of surgery and PMMA type of IOL are statistically significant ($p < 0.05$) risk factors for the development of early PCO (<12 months), whereas laterality i.e., right or left eye were not statistically significant risk factors for development of early PCO ($p > 0.05$).

Discussion:

Young age has been reported in a number of studies as a highly significant risk factor for the development of PCO as is also evident from our study⁸. A presumptive explanation may be a larger number of residual LECs in younger patients after cataract surgery and relatively raised levels of cytokines in aqueous humour of young patients leading to active growth of LECs and ultimate PCO⁹.

Many studies have reported phacoemulsification as a mean of reducing

post-operative PCO as compared to ECCE⁸ which is also supported by our study (Table No.3). The reason being less residual LECs in phacoemulsification because of better removal of LECs from the under surface of anterior capsule after capsulorhexis, less damage to the blood- aqueous barrier and less iris pigment dispersion in phacoemulsification as compared to ECCE. Davidson et al have suggested that almost 100% removal of LECs is necessary to prevent formation of PCO¹⁰ which practically looks impossible. The formation of larger incision, more iris manipulation during manual expression of cataract and resulting inflammation has been blamed for early formation of PCO in ECCE cases specially diabetic patients¹¹.

Several studies have reported increased incidence of PCO with PMMA IOLs as compared to both silicone and acrylic IOLs.^{12,13} This is in accordance with our

study (Table No.3) where we have compared PMMA IOLs with acrylic IOLs for the development of early PCO. It has been presumed that due to bulky size of acrylic IOL, it mechanically resists the proliferation of LECs over the capsular surface, supporting the “no space no cells” theory¹⁴. Other studies have reported even more superiority of hydrophobic over hydrophilic acrylic IOLs⁸ in prevention of PCO but such comparison is not done in our study. A number of other factors including IOL design, optic edge design and overall length of the IOL^{15,16} have also been evaluated as risk factors for development of PCO in different studies but these are not included in our study.

Aasuri et al has reported clinically significant PCO in 72% (12) with PMMA IOLs as compared to 21% (4) with acrylic IOLs in pediatric population ($p=0.002$)¹⁷. Our study has shown age <15 years as a significant risk factor (Table-5) for the development of early PCO irrespective of IOL used so if PMMA IOLs are used in children, it may further increase the risk of development of PCO in children. Certain other factors including hardness of lens nucleus, vitreous loss and diabetes have also been reported as significant risk factors for PCO⁸ but these are not evaluated in our study.

Conclusions:

Age of the patient <15 years, conventional ECCE and PMMA type of IOL are significant risk factors for development of early PCO in our setup. Proper addressing of such risk factors in patients undergoing cataract surgery is crucial for delay or prevention of PCO in such patients.

Limitations:

One limitation of this study is that inherently multiple surgeons were involved, each with their techniques to doing both ECCE and Phaco, with variable interop maneuvers which affect PCO, such as rhexis size and polishing techniques. A relatively smaller sample size and a cross-

sectional study design are the factors that are limiting the authenticity of our results. Prospective studies may evaluate such risk factors more precisely.

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Presentation of Pediatric Ocular Trauma to the Ophthalmology Unit of a Tertiary Care Hospital

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Abstract:

Purpose: To determine the frequency of presentation of pediatric ocular trauma presented to emergency department of ophthalmology unit of a tertiary care hospital.

Methodology: Patients were selected from emergency and outdoor patient department. Detailed ocular examination including visual acuity, extra ocular movements, adnexal examination, slit lamp examination of conjunctiva, cornea, anterior segment and posterior segment examination was carried out. Digital Xray orbit (Antero Posterior and Lateral view) was carried out to rule out intra ocular, intra orbital foreign body and orbital fractures.

Results: Total number of patients involve in this study were 101. Eighty one were male and 20 were female. Patient age ranges from 1 year to 16 years with mean age \pm SD = 12 ± 2 . Most of the patients were in age group 11-16 years (55%) and most frequent ocular trauma was open globe injury in 69.3% patients. There was statistically significant difference among age groups in type of Ocular trauma, open globe injury being the most common one in age group 11-16 years (P value = 0.0032).

Conclusion: In pediatric age group most common injury following ocular trauma is open globe injury followed by closed globe injury, chemical injury, thermal injury, orbital wall fracture and eyelid & lacrimal laceration. Majority of eye injuries in pediatric age group are preventable and this cause of visual disability can be greatly reduced by implementation of safety precautions such as keeping sharp objects out of children reach. *Al-Shifa Journal of Ophthalmology 2023; 19(1): 20-25. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.*

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Originally Received: 10 November 2022

Revised: 18 January 2023

Accepted: 21 February 2023

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Introduction:

Ocular trauma is one of the neglected causes for preventable visual disability and avoidable visual morbidity throughout the world specially in young adults and pediatric age group^{1,2}. Almost 75% of all ocular emergencies, trauma is by far the most common reason for ocular damage³. Trauma to eye is the reason for blindness in 1.6 million people throughout the world causing bilateral damage in 2.3 million people and unilateral visual loss in 19 million people; making it most common cause of unilateral visual disability worldwide¹. Therefore, traumatic eyes makes a significant burden on health care system.²

It is estimated that 22–55 percent of all ocular injuries occur in pediatric age group and hence ocular trauma is the main cause of monocular blindness in children⁴. In

Chaoshan, a review of hospitalized patients for orbital and ocular injuries in all age groups found that out of all 23.6% were in the age group of 0–145. Furthermore population-based studies on ocular trauma in children have shown that approximately two-thirds of all injured patients were males⁵.

Ocular trauma has always been a subject of controversy and debate for the experts specially ocular trauma classification and scoring has been challenged and criticized by many authors⁶. Cao H et al⁵ in their study have classified pediatric ocular trauma into open globe injury, closed globe injury, chemical burn, thermal burn to eye, eyelid laceration and orbital wall fractures.⁵ The prevalence of different types of ocular trauma in children has shown in a study conducted in china⁵ in which open globe wound accounted (54.1%), closed globe injuries (38.8%), chemical burn (1.0%), thermal burns (0.8%), lacrimal apparatus and eyelid laceration (7.0%) and orbital wall fractures (0.4%).⁵

Ocular trauma in pediatric age group is increasing in developing countries² and it is of particular concern for ophthalmologists because injured eyes in this age group are prone to amblyopia⁵. Ocular trauma is a particular cause of psychological impacts not only on the child but also on his family members and hence counselling of the victim and his family particularly parents is one of the prime components in management of such patients⁷.

Preventive measures and awareness are particularly required in urban areas of low socioeconomic status in order to avoid this preventable cause of blindness². A well-established and organized epidemiological data regarding ocular trauma analysis is required to plan health care strategies for prevention and management of such injuries particularly in children⁸.

Little has been on record on types of ocular trauma in our region and lots of our new generation is exposed to this problem. We usually mismanage it because of lot of factors like resources, man power and

especially education of parents regarding this problem. In this study we wanted to find out which type is more prevalent, so that we can more focus on that particular area to minimize the damage.

Material and Methods:

Study design: Cross sectional (Descriptive study)

Different types of ocular injuries were defined before starting the study. Open globe injury was defined as a full thickness wound of the corneo-scleral envelope while closed globe injury was referred to blunt trauma where corneo-scleral wall of the globe is intact. Chemical injury is injury due to various chemicals like acids and alkalis. Thermal injury is injury due to direct impact of heat. Lacrimal apparatus and eyelid laceration are partial or full thickness defect in the eyelids and tearing of lacrimal canaliculi and damage to lacrimal sac. Orbital wall fractures are fractures involving orbital margins.

Sample size was calculated using WHO sample size calculator, whereby the prevalence of eyelid laceration is 7%, Absolute precision = 5%, Confidence level = 95%. Sampling Technique used was non probability consecutive sampling.

All patients having age less than 16yrs age i.e., child age group, having history of trauma to the eye/eyes of either gender presented within one week of ocular trauma were included in the study. Patients not willing to provide an informed consent, patients with co morbidities like maxillary fracture, spine injuries and skull fractures and patients whom had already undergone primary intervention elsewhere were excluded from the study.

Patients were selected from emergency and outdoor patient department. The purpose and benefits of the study were explained to the patients and written informed consent obtained from each patient. A data collection Performa was filled for each patient having his/her biodata and detailed record of the injury. A brief history

regarding inciting material, duration of injury and ocular pain noted. Relevant brief general and systemic examination carried out. Detailed ocular examination of all patients was carried out including visual acuity, extra ocular movements, adnexal examination, slit lamp examination of conjunctiva, cornea, anterior segment and posterior segment examination. Digital Xray orbit (Antero Posterior and Lateral view) was done to rule out intra ocular, intra orbital foreign body and orbital fractures. Data was analyzed using SPSS version 20.0. Descriptive statistics were calculated for all variables. Frequencies and percentages were calculated for categorical variables like gender and type of ocular trauma. Mean + Standard Deviation was concluded for numeric variable like Age. Type of ocular trauma was stratified among age and gender to see effect modifiers. Post stratification Chi Square test was applied. AP-value of <0.05 was considered as significant. All the results were presented in the form of tables.

Results:

Total number of patients involve in this study were 101. Eighty one (81.00 %) were male and 20 (20.00%) were female.

Patient age ranges from 1 year to 16 years with mean age \pm SD = 12 ± 2 . Most of the patients were in age group 11-16 years (55%) table No: 1.

Frequency of different types of ocular trauma is shown in table No: 2 with most frequent ocular trauma open globe injury in 69.3% patients followed by closed globe injury (19.8%), chemical injury (1.9%), thermal injury (0.9%), orbital wall fracture (0.9%) and Eyelid & Lacrimal laceration (6.9%)..

Age wise frequency of ocular trauma is shown in table No: 3. There was statistically significant difference among age groups in type of Ocular trauma, open globe injury being the most common one in age group 11-16 years (P value = 0.0032).

Gender wise stratification of ocular trauma is shown in table No: 4. In gender there was no significant statistical difference in type of Ocular trauma (P value = 0.687).

Table No.1 - Age distribution

Age group	Frequency
1-5 years	5 (5%)
6-10 years	40 (40%)
11-16 years	56 (55%)
Total	101 (100%)

Table No.2 - Pediatric ocular trauma

Type of Ocular trauma	Frequency
Open globe injury	70 (69.3%)
Closed Globe injury	20 (19.8%)
Chemical injury	2 (1.9%)
Thermal injury	1 (0.9%)
Orbital wall fractures	1 (0.9%)
Eyelid & Lacrimal laceration	7 (6.9%)
Total	101 (100%)

Table No.3 - Age wise stratification of ocular trauma

Type of Ocular trauma	Age Groups			Total
	1-5 years	6-10 years	11-16 years	
Open globe injury	1(0.9%)	20 (20.04%)	49 (48.37%)	70 (69.31%)
Closed Globe injury	3 (3.03%)	14 (13.74%)	3 (3.03%)	20 (19.8%)
Chemical injury	0 (0%)	1 (0.9%)	1 (0.9%)	2 (1.8%)
Thermal injury	0 (0%)	0 (0%)	1 (0.9%)	1 (0.9%)
Orbital wall fractures	0 (0%)	1 (0.9%)	0 (0%)	1 (0.9%)
Eyelid & Lacrimal laceration	1 (0.9%)	4 (4.42%)	2 (1.8%)	7 (7.29%)
Total	5 (4.83%)	40 (40%)	56 (55%)	101 (100%)

P value = 0.0032.

Table No.4 - Gender wise stratification of ocular trauma

Type of Ocular trauma	Gender		Total
	Male	Female	
Open globe injury	57 56.14 (0.01)	13 13.86 (0.05)	70 (69.3%)
Closed Globe injury	16 16.04 (0.00)	4 3.96 (0.00)	20 (19.8%)
Chemical injury	1 1.60 (0.23)	1 0.40 (0.92)	2 (1.9%)
Thermal injury	1 0.80 (0.05)	0 0.20 (0.20)	1 (0.9%)
Orbital wall fractures	1 0.80 (0.05)	0 0.20 (0.20)	1 (0.9%)
Eyelid & Lacrimal laceration	5 5.61 (0.07)	2 1.39 (0.27)	7 (6.9%)
Total	81 (80%)	20 (20%)	101 (100%)

P value = 0.8424.

Discussion:

Ocular trauma is an important cause of ocular morbidity in pediatric age group. Children and even adolescents are often unaware of the consequences of high-risk behavior, and thus are more vulnerable to ocular trauma than adults. In different studies worldwide the incidence of severe

visual loss or impairment caused by ocular trauma in children varies from 2% to 14%.⁹ In general, children are more prone to ocular trauma because of their natural curiosity, limited common sense, and immature motor skills. The causes of eye injuries, therefore, are highly related to physical and psychosocial development.

The type of injury and its severity are known prognostic factors of final visual outcome following trauma. Madan et.al. showed in their study that the most common cause of ocular trauma was sports related injuries in a closed globe injury and wooden stick in the open globe injury. They also mentioned that uncommon causes of eye trauma in their study were injury caused by a hen's leg, bird beak, dog bite, and cooker blast.¹⁰

In our study majority of patients were boys that are 80% and most of the patients were older than 5 years of age. Similar results are shown in international studies. Al-Mahdi et al in their study showed that majority of victims of ocular trauma were boys (77.4%) with mean age at admission of 6.63 years. They also noted a higher incidence of ocular trauma in children above 5 years of age than those below this age (58.5%).¹⁰

In another study conducted by Rohit Saxena Ret al it was shown that majority of injuries occurred in children of 5 years and older (87.7%) with 133 (65.1%) boys and 71 (34.9%) girls.¹¹ In our study we found that the most common type of ocular trauma was open globe injury that is 69.3% followed by closed globe injury (19.8%), chemical injury (1.9%), thermal injury (0.9%), orbital wall fracture (0.9%) and Eyelid & Lacrimal laceration (6.9%).

Shoja et al also showed in their study that majority of ocular trauma occurred in the age group of 8-12 years (58.3%). There were 40 (66.6%) boys and 20 (33.3%) girls. Majorities of injuries occurred in streets-roads (41.6%), followed by home (25%). Open globe injuries accounted for 51.7% of injuries, closed globe injuries for 35% and chemical injuries for 13.3%.¹²

Strahlman showed that eye injuries in 11 - 15-year old children occurred at more than twice the rate than for younger children. Also male patients were more commonly affected than females measuring a ratio of approximately 4:1. Accidental blows and falls were found to be the most common cause of pediatric ocular trauma accounting 37%. Sports and recreational activities

accounted for 27% and non-penetrating injuries 35 % in 11- 15-year-old children. Other important causes of ocular trauma were burns (9%), firearm injuries (4%) and car crashes (11%).¹³

Rychwalski found in their study that ruptured globe and ocular contusion comprises 57% of all trauma cases in children.¹⁴ While Lie et al showed that in pediatric ocular trauma the ratio of different injuries were as follow: open globe injuries (71.2%), corneal lacerations (40.4%), lens damage (27.6%), hyphema (25.6%), eyelid lacerations (23.7%) and closed globe injuries (10.3%).¹⁵

Pediatric ocular trauma puts a real socioeconomic burden on healthcare system. Therefore it is of paramount importance to develop preventive measures of eye injuries in children.¹⁶ Children should be educated about the dangers and consequences of ocular trauma. Parents should play their role in this respect by following protective measures e.g. wearing protective eyewear while doing tasks risky for the eyes.¹⁷ In this way children need to be encouraged to wear safety goggles under similar circumstances. Majority of eye injuries in children occur in the home setting.¹⁸ So it is important to make homes a safer place by applying protective measures including avoiding sharp corners and edges in furniture and keep all chemicals and dangerous tools and equipments out of the reach of children.¹⁹ Parents should discourage their kids playing with potentially dangerous toys.²⁰

Conclusion:

We concluded that the most common type of ocular trauma in pediatric age group was open globe injury followed by closed globe injury, chemical injury, thermal injury, orbital wall fracture and eyelid & lacrimal laceration.

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To Study the Efficacy of Brinzolamide 1%/Brimonidine 0.2% (Fixed Combination) in Patients of Primary Open-Angle Glaucoma Who were Already on Treatment on Topical Drugs

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Abstract:

Objective: To evaluate the IOP lowering efficacy of combination of Brinzolamide 1% and Brimonidine 0.2% in the treatment of primary open-angle glaucoma (POAG) who were already using one or more topical anti-glaucoma drops (AGT).

Methods: The Prospective therapeutic trial study was conducted at Al Ehsan Welfare Eye Hospital from 2019 to 2020. All patients with POAG with age above 40 years and insufficient IOP control, using either with one or two topical anti-glaucoma drugs (not combination) were enrolled in the study and were followed for 6 months regarding IOP control, after shifting patients on the combination of AGT drops. A detailed history was taken from all enrolled patients and clinical examination was performed. Applanation tonometry by Goldman applanation tonometer, gonioscopy and cup disc ratio were documented. Patients used topical combination eye drop (Brinzolamide 1% and Brimonidine 0.2%) used at 8am \pm 30 minutes and 8pm \pm 30 minutes (12 hourly) in both eyes. Follow-up was done at 1 week, 2 weeks, 4 weeks, 3 months and 6 months. Follow-up visits included IOP measurement and documentation of any side effects noted by patients. Mean IOP lowering and safety profile of BBFC at 6 months follow-up was noted. One sample t-test was performed to see the significance of results.

Results: IOP lowering effect of BBFC (brinzolamide and brimonidine fixed combination) was observed in all 31 patients from baseline IOP. The most common ocular adverse effect was conjunctival hyperemia followed by blurred vision.

Conclusion: Brinzolamide and brimonidine fixed combination, used twice daily, is safe with minimal side effects. It is effective treatment option for patients with POAG in whom IOP is not controlled with mono-therapy and in whom beta-blockers or prostaglandin analogues are contraindicated. *Al-Shifa Journal of Ophthalmology 2023; 19(1): 26-32. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.*

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Originally Received: 8 Feb 2023

Revised: 17 Feb 2023

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Introduction:

Glaucoma as it is the leading cause of irreversible blindness globally. It is estimated that 57.5 million people are suffering from primary open angle glaucoma^{1,2}. Glaucoma is a group of progressive optic neuropathies characterized by degeneration of retinal ganglion cells and retinal nerve fiber layer resulting in damage to the optic nerve head. The primary open-angle glaucoma (POAG) is the most common form of glaucoma³. Intraocular pressure (IOP) is only modifiable factor in glaucoma so reduction of the intraocular pressure is the only

proven treatment to treat the disease so all medical therapies are aimed at reducing IOP. Decrease in IOP in cases of POAG is offered to these patients to decrease progressive optic neuropathy. Treatment of glaucoma is started with topical monotherapy but many patients require more than one anti-glaucoma topical drugs to achieve target IOP. The use of multiple drops is very cumbersome for the patients leading to non-compliance. Fixed-combination (FC) therapies combine two hypotensive agents in a single bottle thus helpful in increasing the compliance and decreasing the eye exposure to harmful preservatives. Carbonic anhydrase inhibitors / beta blockers fixed combination (FC) is available for topical use since a long time. They are useful but there is limitation for its use in patients with respiratory and cardiac problems.

In April 2013, the US Food and Drug Administration (FDA) approved a new fixed-combination topical anti- glaucoma medication containing brinzolamide 1% and brimonidine 0.2% (BBFC). Brinzolamide is a carbonic anhydrase inhibitor which decreases aqueous production and Brimonidine is an alpha 2-agonist which increases aqueous outflow so it has dual action.

Materials and Methods:

This was a prospective therapeutic trial conducted at Al Ehsan Welfare Eye Hospital, Lahore from September, 2019 to September, 2020. The combination drops were launched in August, 2019 in Pakistan. We aimed to conduct this study to see the efficacy and side effects of brinzolamide plus brimonidine combination in our patients at Al Ehsan Welfare Eye Hospital, Lahore. The patients were enrolled in end of September, 2019 and continued follow up for next 6 months. According to the standard medical ethics data was collected from patients fulfilling the inclusion criteria. Adults aged >40 years with primary open angle glaucoma, who had insufficient IOP control with one or two

IOP lowering topical medications were included in the study. Exclusion criteria was angle closure glaucoma, pediatric glaucoma, diabetic retinopathy, uveitis and patients who lost follow up before 6 months. Total 45 patients, adult males and females, who fulfilled inclusion criteria were enrolled and 14 patients lost follow up before 6 months. Thirty-one (31) patients completed follow up of 6 months. The patient's sociodemographic details like age and gender were noted. History of all Patients was taken and all underwent a thorough clinical examination including best corrected visual acuity, IOP by Goldmann applanation tonometer, slit lamp examination, (cornea, iris/anterior chamber, lens, eyelids), dilated fundus examination by 90D lens (vitreous, retina, macula, optic nerve including cup-to-disc ratio), and gonioscopy. Optical coherence tomography (OCT) and visual field were performed for confirmation of glaucoma and the extent of damage. Patients self-administered eye drops at 8a.m \pm 30 and 8p.m \pm 30 minutes (12 hourly) in both eyes during study visits. Follow up was planned at 3 weeks, 3 month and 6 months. Follow up visit included intraocular pressure IOP, cup to disc CD ratio measurements and documentation of any adverse drug reactions, allergic reactions or systemic side effects.

Results:

The total number of patients enrolled were 45 fulfilling inclusion criteria but only 31 completed 6 months follow up, 20 (64.52%) females and 11 (35.48%) males (Figure1: pie chart showing gender distribution). The mean age of patients was 56.78 years. The CD ratio was 0.7 or below in 16 (51.62%) patients and above 0.8 in remaining 15 (48.39%). The mean IOP at presentation was 24.81 mm in patient right eye and 23.96mm in their left eye. The mean IOP measured at end of 6 months, while patient was using combination of Brinzolamide 1% and brimonidine 0.2%, was 13.78mm with standard deviation

10.14mm and 14.26mm in left eye with standard deviation 9.50mm. Figure 2 shows the graphical presentation of IOP at presentation and at end of 6 months.

The ocular hyperemia was noted by 6 (18%) patients and 3 (9%) had complaint of blurred vision. Other known adverse effects like allergic conjunctivitis, irritation, dry mouth and somnolence were not seen in this study.

The t test reveals p value $p < 0.000$ in IOP at presentation and at end of 6 months with 95% confidence interval that is highly significant. (Table 1)

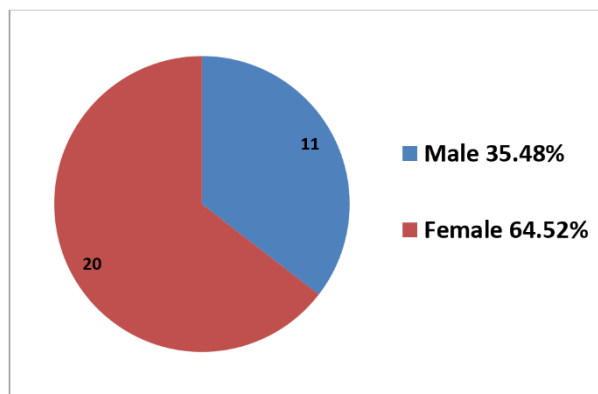


Fig - 1 Gender Distribution

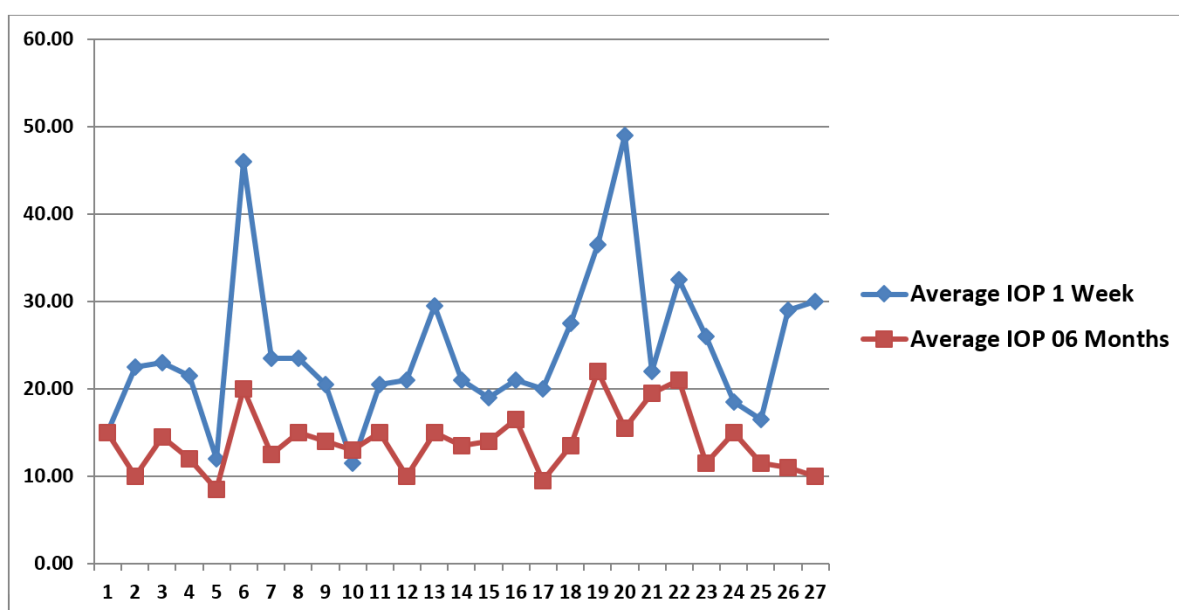


Fig – 2 IOP reduction at six months from initial

	T	Df	Sig (2tailed)	Mean difference	Lower	Upper
IOP at presentation	12.714	26	0.000	24.81481	20.8030	28.8266
IOP at end of 6 months	17.756	26	0.000	13.7778	12.1828	15.3728

Table – 1 One sample Test: 95% confidence interval of the difference

Discussion:

In open angle glaucoma usually monotherapy is started as a first line treatment. The ocular hypertensive treatment study reported that at 5 years, about 40% of patients required two medications to achieve a 20% IOP reduction from baseline, while an additional 9% needed more than three medications⁴⁻⁶.

Each anti-glaucoma medication if used separately will expose the eye to large number of preservatives causing side-effects and eventually non-compliance. Secondly, using multiple drops is cumbersome for patients. In addition, exposure to preservatives of glaucoma drops may lead to conjunctival congestion and ocular surface damage. Therefore, fixed combinations are preferred because of their relative cost and low side effects profile⁷.

In April 2013, the US Food and Drug Administration (FDA) approved a new fixed-combination anti-glaucoma containing brinzolamide 1% and brimonidine 0.2% (BBFC). It is available as eye drops for patient use since August, 2019 in Pakistan.

The results of our study confirm the IOP lowering efficacy of BBFC and its safety profile in our patients over six months time period. The most common ocular adverse effects in our study were ocular hyperemia and blurred vision. Although other local side effects like corneal erosions, photophobia, and conjunctivitis mentioned in different studies^{8,9} were not observed in our study. Systemic adverse effects like alter taste sensation, oral dryness, fatigue, somnolence and decreased alertness were also not observed in our patients¹⁰⁻¹².

The drops contain two active ingredients: a carbonic anhydrase inhibitor (brinzolamide) and α 2-agonist (brimonidine). It exerts its IOP-lowering effect via two mechanisms. Brimonidine decreases aqueous production and brinzolamide decreases aqueous production along with increases aqueous trabecular outflow. The mechanism of action of these two drugs in lowering IOP complement each other. It is combination of two hypotensive anti glaucoma agents in a single bottle thus increasing the compliance and decreasing the total amount of eye exposure to deleterious preservatives of eye drops.

The combination is recommended in cases where beta blockers and prostaglandin analogues are contraindicated as they are reported to cause a number of side effects including conjunctival hyperemia, eyelash growth, hyper-pigmentation of the iris and periocular skin. Beta blockers are generally well tolerated but are contraindicated in patients with conditions, like heart block, asthma, bradycardia, chronic obstructive pulmonary disease and depression¹³⁻¹⁸.

All of the studies present in the literature demonstrated mean diurnal IOP to be significantly lower in the patients group using brimonidine/brinzolamide as compared to control and non-inferior to that with the concomitant group using two separate bottles. A large, multi-center study demonstrated significantly superior 24-hour IOP-lowering efficacy of BBFC versus multiple topical anti glaucoma drops. There are many studies conducted in Turkey, Korea, China and UK showing effective role of BBFC¹⁹⁻²².

To our knowledge, there is no published

study in Pakistan about efficacy of this combination drug as it is introduced here 4 years ago. A study conducted in Peshawar, Pakistan in 2015 has shown the effect of combination of Travoprost and Timolol, found to be effective in patients of POAG²³. But these are not suitable for patients of heart block, respiratory distress, asthmatics and diabetics and combination of BBFC can be given to these safely.

Conclusion:

The combination of 1% Brinzolamide and 0.2% Brimonidine used twice daily is effective treatment for treatment of Primary open angle glaucoma. It is effective in lowering of intra ocular pressure (IOP) and well tolerated by patients. It is safe and effective treatment option for patients with POAG in whom IOP is not controlled with mono-therapy and in whom beta-blockers or prostaglandin analogues are contraindicated. The authors have not received any funding and no conflict of interest to be disclosed. The limitation of study is small sample size.

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Retinopathy of Prematurity: Estimated Burden at Ayub Teaching Hospital

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Abstract:

Background: Retinopathy of prematurity (ROP) is a growing concern in Pakistan, leading to childhood blindness in over 50,000 cases worldwide annually. ROP contributes to 15-35% of childhood blindness in middle-income countries. While improved neonatal care has reduced infant mortality rates, the risk of ROP has significantly increased.

Objective: This study aims to estimate the disease burden of ROP within our setting to facilitate the establishment of an effective screening and rehabilitation program.

Methods: Cross-sectional study with retrospective data collection was carried out. We retrospectively examined records of preterm patients admitted to the NICU at Ayub Teaching Hospital with in the duration of 6 months. We assessed the number of monthly admissions, discharges, and mortalities. Categorical variables were expressed in terms of frequency and percentages.

Results: Total 540 preterm babies were admitted to the NICU at Ayub Teaching Hospital. Out of these, 315 were discharged, while 225 expired during this six-month period. The average mortality rate during this time was 41.6%. The highest admission rate (268) was observed in the weight range of 1 kg to 1.5 kg. 172 preterm babies had a gestational age of 32 to 33 weeks, with a mortality rate of 32%. Assuming an ROP incidence of 21.4%, it is estimated that 115 out of the 540 patients could develop ROP. The confidence interval for an incidence of 20% ranged from 16.7 to 23.3, and for an incidence of 32%, it ranged from 28 to 35.9.

Conclusion: ROP is a preventable cause of childhood blindness. A well-established screening program is crucial to reduce the disease burden on society. It requires proper screening, skilled personnel, and financial resources. Addressing this emerging epidemic is essential for a brighter future. *Al-Shifa Journal of Ophthalmology 2023; 19(1): 33-37. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.*

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Originally Received: 14 Feb 2023

Revised: 26 Feb 2023

Accepted: 29 Feb 2023

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Introduction:

Retinopathy of prematurity (ROP) has become a significant concern in Pakistan, leading to childhood blindness in over 50,000 cases globally each year. ROP accounts for 15-35% of childhood blindness in middle-income countries.^{1,2} Despite improvements in neonatal care services that have reduced infant mortality rates, the risk of ROP has surged significantly. A study by Gilbert et al,² found a negative correlation between the infant mortality rate (IMR) and the development of ROP-related blindness. Effective ROP screening can significantly reduce the incidence of blindness.

Low to middle-income countries, with IMRs ranging from 9 to 60 per thousand

live births, are at the highest risk for ROP development and related blindness, making it a major public health concern. This has been termed as the third epidemic of ROP, as neonatal care has improved, but comprehensive screening facilities for ROP are still lacking in many regions.³ Pakistan's IMR dropped to 55.7 per thousand live births in 2023 from 82.5 per thousand live births in 2000, making it more susceptible to the ROP epidemic.⁴ Several studies have highlighted that timely treatment can significantly reduce the risk of ROP-related blindness.^{5,6,7,8}

However, there remains a lack of awareness about the disease among both medical professionals and the general public in our region. A previous study conducted at Ayub Medical College demonstrated that only 48% of doctors were aware of when ROP screening should commence, and 50% were unaware of treatment modalities.⁹ The lack of proper counseling and delayed or absent treatment are major risk factors for ROP-related blindness.¹⁰

To establish an effective screening program, it is crucial to determine the disease burden in a specific area. With limited resources, understanding the actual burden of the disease is essential to manage financial resources for sustainable screening and rehabilitation programs.

Ayub Teaching Hospital serves as the sole tertiary care hospital in the region, catering to a population spanning from Khunjarab Pass to Hassan Abdal. Therefore, it is vital to determine the expected extent of the

disease in this region to focus efforts on addressing this impending epidemic.

Materials and Methods:

Cross-sectional study with retrospective data collection was carried out. We analyzed data from 540 consecutive babies admitted to the nursery at Ayub Teaching Hospital. We comprehensively examined the records of the 540 consecutive preterm babies admitted to the NICU from November 2022 to April 2023, focusing on the number of admissions per month, expiries, and discharges. Data analysis was performed using SPSS version 10. Categorical variables were presented in terms of frequency and percentages. A confidence interval (20%-35.92%) for ROP was calculated based on national data. Continuous variables were presented as means. Percentages for preterm infants with low birth weight were categorized into three groups based on weight in grams, and the monthly number of patients was calculated in different categories according to gestational age. The total number of expiries in each group was also calculated.

Results:

A total of 540 preterm babies were admitted to the NICU at Ayub Teaching Hospital. Of these, 315 preterm babies were discharged, while 225 expired during this six-month period. The average mortality rate during this time was 41.6%, table 1.

Table 1: Descriptive analysis in context of duration.

MONTH	TOTAL ADMISSIONS	EXPIRIES	DISCHARGE	% EXPIRIES
NOVEMBER	75	30	45	40%
DECEMBER	65	26	39	40%
JANUARY	98	44	54	44%
FEBRUARY	110	50	60	45%
MARCH	105	43	62	40%
APRIL	87	32	55	36%
TOTAL	540	225	315	41.6%

The highest admission rate (268) was observed in the weight range of 1 kg to 1.5 kg. The average mortality rate for preterm babies weighing between 1 kg and 1.5 kg was 39%, compared to 89% for babies

weighing less than 1 kg. A total of 196 preterm babies with a weight greater than 1 kg were admitted, with a mortality rate of 21%, table 2.

Table 2: Descriptive analysis in context of weight.

GESTATIONAL WEIGHT	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	TOTAL ADMISSIONS	TOTAL EXPIRIES
LESS THAN 1 KG	A=14 E=12	A=12 E=10	A=18 E=16	A=14 E=13	A=10 E=9	A=8 E=8	76	68 89%
1.01 - 1.5 KG	A=36 E=10	A=30 E=10	A=45 E=22	A=56 E=26	A=58 E=22	A=43 E=14	268	104 39%
1.51-2.5 KG	A=25 E=8	A=23 E=6	A=35 E=8	A=40 E=11	A=37 E=11	A=36 E=10	196	54 28%

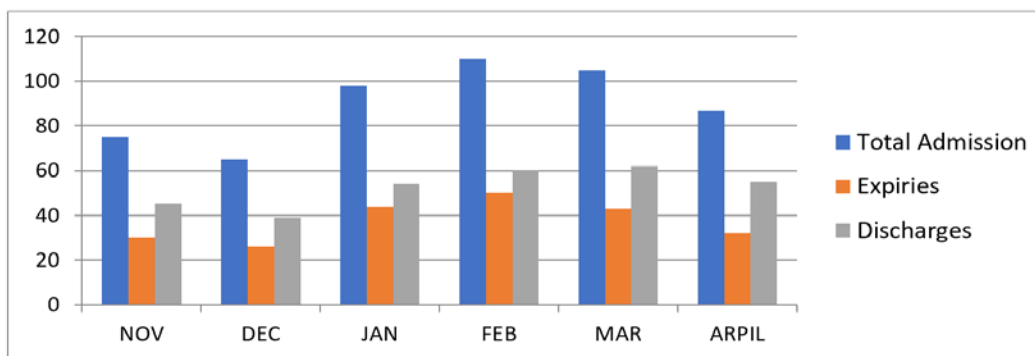


Fig 1: Bar graph month wise report.

Concerning gestational age, the highest number of admissions occurred in the group of preterm babies with a gestational age of 28 to 31 weeks, with an expiry rate of 45%. In contrast, an 88% expiry rate was observed in the group with a gestational age of less than 28 weeks. A total of 172 preterm babies were admitted with a gestational age of 32 to 33 weeks, and they had an expiry rate of 32%.

Assuming an incidence of ROP of 21.4%, it is estimated that 115 out of the 540 patients could develop ROP, fig 2. The confidence interval for an incidence of 20% ranged from 16.7 to 23.3, while the confidence interval for an incidence of 32% ranged from 28 to 35.9.

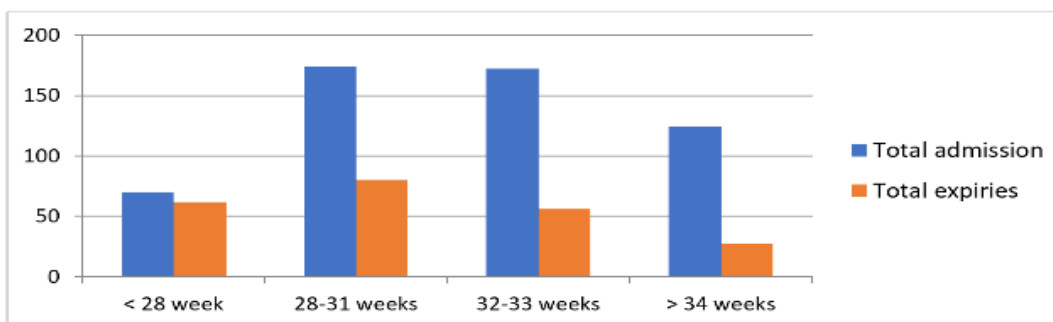


Fig 2: Bar graph gestational age wise report.

Discussion:

ROP is a preventable cause of blindness that predominantly affects the peripheral retina due to immature vessels in preterm infants.^{11,12} Worldwide, approximately 1.4 million blind children exist, with 50% of them attributed to ROP.^{13,14} A substantial 23% of this population resides in low to middle-income countries.

Infants with ROP are at high risk of developing other eye problems later in life, such as retinal detachment, myopia, and visual field defects. Early identification of these conditions allows for effective control and treatment.

While the incidence of ROP in Pakistan is yet to be precisely established, various studies from different centers suggest a range between 10.5% to 32.4%.¹⁵ Assuming an average incidence of 21.4%, our study estimates that 115.5 out of 540 preterm babies could develop ROP in six months. This represents a significant number, considering the financial and social impact on families and society as a whole.

In our study, we observed a high admission rate of preterm babies with a weight between 1 kg and 1.5 kg, with a 39% mortality rate. This group is potentially at higher risk for developing ROP.

High incidence of ROP in low to middle-income countries can be attributed to factors such as preterm birth, lack of awareness among family practitioners and parents, shortage of skilled personnel and financial resources for screening, and a lack of screening programs in most neonatal units.¹⁶

There is a significant correlation between ROP and the degree of prematurity, with more severe disease observed in infants born at an earlier gestational age.¹⁷ Our study found that more than 80% of infants born with a gestational age of less than 28 weeks developed ROP, and 60% of preterm infants born at 28 to 31 weeks had ROP.¹⁸

Notably, infant mortality rates are highly correlated with ROP. The 2023 statistics for

Pakistan indicate a significant decrease in IMR, with 55.7 deaths per thousand live births, down from 67.1 per thousand in 2012 and 88 per thousand in 2000. This is a concerning trend, signaling the potential for an impending ROP epidemic.

Conclusion:

ROP remains a preventable cause of blindness in children. The implementation of a comprehensive screening program can substantially reduce the disease burden on society. However, this endeavor necessitates the availability of proper screening infrastructure, trained personnel, and financial resources. To establish a sustainable screening and rehabilitation program, it is imperative to assess the need based on the actual disease burden. Ayub Teaching Hospital serves as the only tertiary care facility covering the Hazara division, which has a population of more than 4 million according to the 2017 census. Addressing this emerging epidemic requires both short-term and long-term planning for a better and brighter future.

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