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Al-Shifa Journal of Ophthalmology

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The purpose of this study was to assess and compare the stereopsis in keratoconus subjects with and without glasses and to compare the stereoacuity in different levels of keratoconus. A total of 30 subjects from both genders with ages ranging between 12-25 years were included through a non-probability purposive sampling technique. Corneal topography was performed for diagnosis of keratoconus. Stereopsis was tested by TNO chart both with and without glasses. Data was analyzed by using paired sampling T-test and chi-square in SPSS 20 software.

Thirty-seven eyes presenting with rhegmatogenous retinal detachment (RRD) associated macular hole underwent pars plana vitrectomy (PPV) combined with internal limiting membrane (ILM) peeling and perfluropropane (C3F8) internal tamponade. The anatomical outcomes were assessed by the fundus photographs and optical coherence tomography (OCT). The preoperative and postoperative best-corrected visual acuities (BCVAs) were compared as the functional outcome.

In this comparative interventional case series, 50 eyes from 25 patients with bilateral diabetic macular edema were selected and randomly allocated to either intravitreal diclofenac or bevacizumab with exclusion and inclusion criteria devised for the study participants. The participants were observed for 24 weeks

(6 months) for any improvement in best corrected visual acuity (BCVA) in logMAR and central macular thickness by spectral domain OCT.

Screen time and Refractive error: An Inevitable Nuisance **78**
Syed Barkat Islam, Midhet Nasim, Mutahir Shah, Rabia Sharif, Muhammad Rashid, Saad Alam Khan

A cross sectional study was conducted in 2019 for four months on all children with age of 4-16 years and correctable refractive error. Refractive error was determined after complete objective and subjective refraction. Daily screen exposure time (hours) was determined by asking the patients about average hours / day for which the child was having screen exposure.

Effect of Covid-19 Pandemic On Postgraduate Resident Training in Ophthalmology: An Aspect to Be Pondered **86**
Ayesha Hanif, Amna Anam, Irfan Qayyum

This study was conducted to report the impact of the pandemic on postgraduate training of ophthalmology residents. A cross-sectional study was conducted on 42 post graduate residents of ophthalmology departments in various tertiary care hospitals of Punjab using an online 19-point questionnaire. The questionnaire included four sections that were clinical work skills, online classes, exams and mental health.

Prevalence of Amblyopia in School Going Pediatric Population of Four Districts in Azad Jammu and Kashmir **93**
Waseem Ahmed Khan, Saba Haider Tarar, Shazia Siddiq, Muhammad Irfan Sadiq, Khansa Sohrab, Nimra Rafique

A community based study was carried out in both private as well as public sector schools of 4 districts of AJK. Children diagnosed having uncorrected refractive errors with Snellen chart and auto-refractokeratometer underwent complete retinoscopy by an optometrist. Then the patients who had 6/12 vision in any eye with best possible correction and whose vision is did not improve by pin hole were selected. All the observations along with demographic information of patients were recorded.

EDITORIAL

Tele Education During COVID-19 Pandemic and Beyond

Hassan Mansoor

Merely four months into 2020, the world confronts a monumental health crisis in the form of the breakout of a novel coronavirus–induced infectious respiratory disease (COVID-19). The COVID-19 lockdown has detrimentally impacted the medical and education system throughout the world as the educational institutions have also seen a forced shutdown in most of the high-risk countries. Such a disturbance could be critical for the professional development of future health workforce, especially in the developing resource-limited countries like Pakistan.

With remote learning, continuing medical education during the current lockdown has become a possibility. Studies have shown that the online teaching programs helped to maintain the pre-lockdown clinical and academic activities to a reasonable extent. [1] This may be acceptable especially when the educational institutions worldwide have seen a forced shutdown due to the COVID-19 pandemic. The online video-lectures and video-demonstrations are also gaining popularity in Pakistan due to the recent developments in information technology and communication networks (e.g. 4G/5G services). Further remote learning opportunities must be explored to offer online education that might give access to specialized degree courses, in an inexpensive and a flexible manner, which may not be accessible in the current lockdown.

The usability of digital services for medical education and for training of doctors, paramedics and other health professional cadre increases the general acceptance of such technologies in the future.[2] "A crisis provides an opportunity", the pandemic too provides an opportunity to harness the potential of digital technology to maintain academic activities in times of crisis. Effective utilization of digital initiatives to combat this colossal global health challenge would increase the general acceptance of such technologies in the future.

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ORIGINAL ARTICLE

Assessment of Stereopsis with and without Spectacles in Patients with Keratoconus

Shakila Abbas[1], Rabia Saeed[2], Iqra Iqbal[2], Syed Barkat Islam[2], Nimra Gul[1], Ayesha Kiran[1], Sadaf Qayyum[3]

Abstract:

Purpose: The purpose of this study was to assess and compare the stereopsis in keratoconus subjects with and without glasses and to compare the stereoacuity in different levels of keratoconus.

Methods: A Descriptive cross-sectional study was conducted from August 2018 to May 2019 in the Ophthalmology department, Madinah Teaching Hospital, Faisalabad. A total of 30 subjects from both genders with ages ranging between 12-25 years were included through a non-probability purposive sampling technique. Corneal topography was performed for diagnosis of keratoconus. Stereopsis was tested by TNO chart both with and without glasses. The test was performed after taking complete ocular, medical, surgical and drug history. The Stereopsis test was applied binocularly. Data were analyzed by using paired sampling T-test and chi-square in SPSS 20 software.

Results: Stereopsis was found significantly reduced in cases with severe keratoconus ($P<0.05$). When Paired sample t-test was applied the result was found to be non-significant ($P>0.05$) for the comparison with and without their glasses.

Conclusion: There was no significant difference between the results of stereopsis in keratoconus both with and without glasses. The stereopsis gets reduced in keratoconus both with and without glasses. However, stereopsis was found more reduced in severe type of keratoconus as compared to mild and moderate type. *Al-Shifa Journal of Ophthalmology 2020; 16(2): 57-62. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.*

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Introduction:

Keratoconus is characterized by non-infective progressive thinning and steepening of the cornea and bulging outward in a cone shape. Keratoconus progress over time. It's caused by a combination of genetics along with environmental factors[1.] Thinning and steeping of the cornea often leads to high myopia and irregular astigmatism and decrease the vision-related quality of life in keratoconus. Keratoconus usually present in teenage years with complaints of progressive vision blur and distortion[2].

Keratoconus is classified on the basis of curvature and shape of the cornea. Based on the severity of curvature, keratoconus may be classified as mild less than 48D, moderate (48 to 54D) and severe more than

54D. Based on the shape of the cornea, such as, nipple cone lies in the center towards inferior nasal quadrant and with a diameter less than 5mm. Oval and globus cones have a diameter more than 5mm. Keratoconus subjects show pathological signs such as deposition of iron in the basal epithelial cells, forming the Fleishcher ring, Ophthalmoscopy shows an oil droplet and Keratometric reading shows irregular astigmatism. Other signs include as Vogt Striae, Munson sign and acute hydrops caused by the rupture in the Descemet membrane of cornea[3]. Binocular single vision is the function of two eyes in which an individual simultaneously perceives single three-dimensional images from one's surroundings[4]. Due to the positions of the two eyes of individuals that are located laterally on the head, both retina receives two slightly different images from two eyes. These differences are mostly horizontal in the position of the image perceived. These differences are remarked as horizontal disparities or binocular disparities. Information obtained by the retina is two dimensional in nature. These positional disparities are processed in a part of the brain known as visual cortex which in turn results in the perception of depth and three-dimensional images. Hence the term stereopsis is specifically referred to the perception of depth in relation to binocular single vision which makes basics for seeing three-dimensional images. There are mainly three grades ofbinocular single vision. First is a simultaneous perception of the image by two eyes second is the fusion of those images by brain and stereopsis and depth perception is the third grade ofbinocular single vision. [5]

Gross stereopsis and fine stereopsis are two main aspects of depth perception. Gross stereopsis (also known as qualitative) is used to detect stereoscopic motion which is changes in binocular disparities in a real-life three-dimensional scene over time in ones surrounding[6]. Fine stereopsis (quantitative stereopsis) enables an individual to perceive the depth of an object in the central visual area (pannum'sfusional area). Fine stereopsis is essential to perform fine motor tasks[7]. For testing stereopsis, two slightly different images are shown to both eyes, one offset to the right eye and other to the left eye. These two-dimensional images are then processed by the brain to achieve a perception of three-dimensional images[8]. Stereo testing can be achieved with the help of Vectograph (seen through polarized glasses), Anaglyphs (seen through red-green glasses), Lenticular lenses (seen with bared eye) or head mounted display technology. To measure stereopsis, two types of tests are mainly performed, random dot stereo test and Contour stereo test [9].

Stereopsis is measured in seconds of arc. As the stereoacuity value decreases the better willbe stereoacuity. Normal stereoacuity is 60 seconds of arc or 1 minute of arc. A variety of tests based on different principles is used to assess the stereoacuity. TNO test givesthe most conclusive confirmation on high grade binocular single vision. TNO stereoacuity test consists of seven plates formed by randomly placed red and green dots and is viewed with red-green spectacles. It is performed at 40cm and measures stereopsis in the range of 480 to 60 seconds of arc. The dots of one color in each plate forms the target shape by displacing horizontally as compared to dots of other colors that can only be seen by red-green spectacles. There are also control shapes that are visible without spectacle. Anisometropia disturbs binocularity which in turnaffects the stereopsis[10]. A keratoconus patient has less degree of the stereopsis depending upon asymmetry of disease[11].

Materials and Methods:

A descriptive cross-sectional study was conducted from August 2018 to May 2019 at the department of ophthalmology, Madinah Teaching Hospital, Faisalabad. The total number of subjects included in the

study was 30. Both genders were included, ages ranged from 12 to 25 years and informed consent was taken from all subjects. The TNO test was performed after taking complete ocular, medical, surgical and drug history. All cases with previous surgical procedures including, corneal transplantation strabismus surgeries, intrastromal ring, contact lens users, CXL and subjects with other ocular pathologies were excluded from the study. Non-Probability purposive sampling technique was used. The TNO test for stereopsis was used to measure the stereopsis with and without the best corrected visual acuity of the subjects, binocularly. TNO test includes 7 plates which are categorized for different levels of stereopsis, qualitative and quantitative. Red and green glasses known as anaglyphs was used through which these plates can be seen stereoscopically at 40cm parallel to the visual axis. First three plates are used to measure gross stereopsis for screening purpose to evaluate whether stereopsis is present or absent which is the qualitative assessment of stereopsis. The fourth plate used to assess if any eye of the subject is suppressed. Plate five and six are used to measure the stereopsis of the subject quantitatively.

The measurements were obtained binocularly from each subject with and without glasses. After the collection of data, Chi-square and paired sample T-test was used with the help of IBM SPSS-20 to get a statistical result.

Results:

A total number of 30subjects having keratoconus were included in this study for qualitative assessment of stereopsis. Out of 30 subjects, 11 had mild keratoconus, 13 subjects had moderate and 6 had severe keratoconus. On evaluation and analysis of data, out of 11(36.7%) subjects of mild keratoconus, 10(33.3%) were able to perceive all 4 plates of TNO without glasses and 1(3.3%) was able to perceive first 3 plate of TNO. Out of 13(43.3%) subjects of moderate keratoconus, 7(23.3%) perceived all 4 plates of TNO:1(3.3%) was able to perceive first 3 plates and remaining 5(16.7%) perceived only 1st plate. Out of 6(20%) subjects of severe keratoconus, 1(3.3%) perceived the all 4 plates of TNO and 5(16.7%) perceived only 1st plate of TNO. More subjects from mild keratoconus perceived all 4 plates of TNO as compared to the moderate and severe keratoconus as described in (Figure 1). The results are significant against the chi-square test value of 0.014.

Out of 11(36.7%) subjects of mild keratoconus, 10(33.3%) were able to perceived the all 4 plates of TNO with glasses and 1(3.3%) was able to perceived first 3 plates of TNO. Out of 13(43.3%) subjects of moderate keratoconus, 8(26.67%) perceived all 4 plates of TNO: 1(3.3%) was able to perceived first 3 plates, 1(3.3%) was able to perceived first 2 plates and 3 (10%) were able to perceived only 1st plate of TNO. Out of 6(20%) subjects of severe keratoconus, 1(3.3%) perceived all 4 plates of TNO and 5(16.7%) were perceived only 1st plate of TNO as described in (Figure 2). The results are significant against the chi-square test value of 0.017.

The mean value of stereopsis without glasses in mild keratoconus was 246.0 and for with glasses was 198.00. The mean value of stereopsis without glasses in moderate keratoconus was 324.0 and for with glasses was 288.00, which is less than that of normal value for stereopsis which is 60sec of arc. Only mild and moderate keratoconus subjects perceived quantitative plates of TNO. Table (1) shows non-significant difference of mean of mild Keratoconus both with and without glasses is 48.000 that ($P>0.05$). The difference of mean of moderate Keratoconus both with and without glasses is 60.000, it was not significantly different and the results support our objectives of the study.

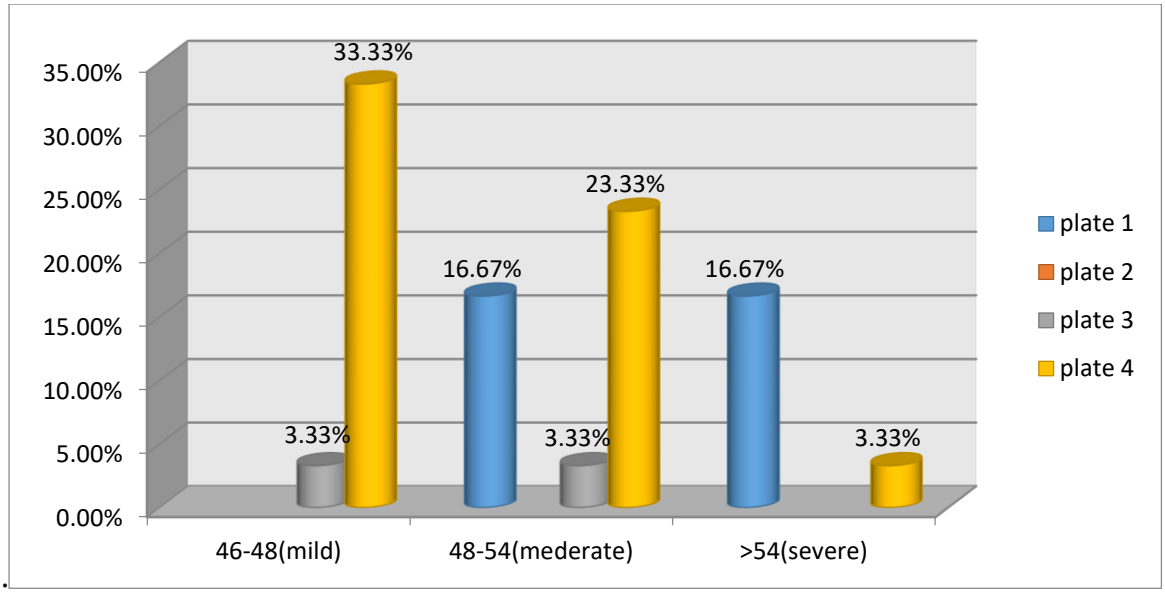

Figure 1: Qualitative assessment of stereopsis in keratoconus patient without glasses

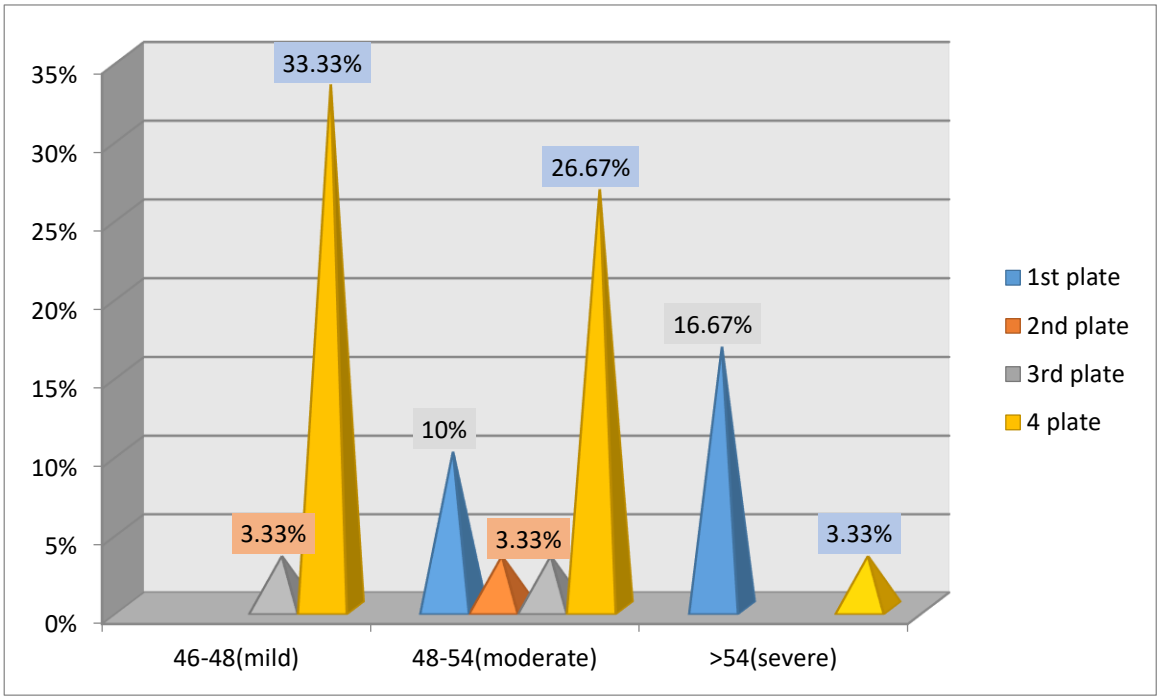

Figure 2: Qualitative assessment of stereopsis in keratoconus patients with glasses

Table 1: Paired sample t-test of comparison of stereopsis of Mild and Moderate keratoconus with and without glasses

Severity of keratoconus		Mean	Sig.(2-tailed)
Stereopsis in mild Keratoconus	Without glasses	246.00	0.168
	With glasses	198.00	
Stereopsis in moderate Keratoconus	Without glasses	324.00	0.193
	With glasses	288.00	

Discussion:

Keratoconus is progressive thinning and steepening of the cornea. Thinning and steeping of the cornea often leads to high myopia and irregular astigmatism which causes the reduction of visual functions such as stereopsis along with defocusing of vision to cause it to blur. Despite clear vision, good levels of stereopsis are essential to measure for a better quality of life.

In the present study, the main objective was to assess the stereopsis in keratoconus patients with and without glasses and also to compare the stereoacuity in different levels of keratoconus. This study describes 30 subjects with keratoconus who all showed a reduced level of stereopsis.

This study result showed that in mild keratoconus the stereopsis score is greater as compared to moderate and severe keratoconus both with and without glasses e.g. gross stereopsis was present in mild keratoconus among 33.33%, in moderate 23.3% and severe only 3.3% without glasses. The results are significant against the chi-square test value to be 0.014. Gross stereopsis is present in mild keratoconus among 33.3%, in moderate 26.67% and severe only 3.3% with glasses. The results are significant against the chi-square test value to be 0.017. Other study conducted by Sherafat in 2001, agree to these results that keratoconus had much adverse effects on stereopsis[12].

Paired sample t - test applied to find the relationship between Keratoconus and stereopsis mean for the stereopsis in mild Keratoconus with glasses found to be 198 and in without glasses 246. The stereopsis in moderate Keratoconus with glasses found to be 288 and in without glasses was 324. P value>0.05 showed that there is no significant difference between stereopsis with and without glasses in Keratoconus. Results obtained in the research study carried out by Antunes in 2018 completely agree to the present study that keratoconus patient shows a decreased level of stereopsis. P value is >0.05 i.e. (P 0.48)[13].

Conclusion:

The result concluded that stereopsis gets reduced in keratoconus both with and without glasses. Stereopsis is more reduced in severe type of keratoconus as compared to mild and moderate type. Keratoconus has worse effects on stereopsis in both with and without correction. Previous studies have also suggested that in keratoconus reduced stereopsis caused worse effects on the quality of life of patients. This study suggests making stereopsis an integral part of routine examination. Training of patients with decreased stereo acuity can be done through Marsden ball used in vision therapy, this helps patients learn to eye hand coordination and help to improve stereopsis. Early diagnosis of keratoconus is necessary for improvement of stereopsis as well as better understands the factors associated with stereoscopic impairment.

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ORIGINAL ARTICLE

Internal Limiting Membrane Peeling in Rhegmatogenous Retinal Detachment Associated Macular Holes

Hussain Ahmad Khaqan[1], Kashif Jahangir[2], Hasnain Muhammad Baksh[1], Hafiz Ateeq Ur Rehman[1], Raheela Naz[1]

ABSTRACT:

Purpose: To evaluate anatomical and visual outcomes in patients with retinal detachment associated macular hole with pars plana vitrectomy (PPV) and internal limiting membrane (ILM) peeling.

Methods: Thirty-seven eyes presented with rhegmatogenous retinal detachment associated macular hole and underwent pars plana vitrectomy (PPV) combined with internal limiting membrane (ILM) peeling and perfluropropane (C3F8) internal tamponade. The anatomical outcomes were assessed by the fundus photographs and optical coherence tomography (OCT). The preoperative and postoperative best-corrected visual acuities (BCVAs) were compared as the functional outcome.

Results: This study included 33 females and 4 males with mean age of presentation at 55±06 years. Macular hole was closed and retina was flat in 35(94.5%) eyes. In 02(5.4%) eyes retina was attached but unclosed hole was found during the follow up period. The surgery significantly improved the best corrected visual acuity (BCVA) in all 37 patients (mean 2 Snellen lines) at 3 and 6 months and at the last visit after surgery.

Conclusions: Pars plana vitrectomy (PPV) combined with internal limiting membrane (ILM) peeling has high success rate both in closure of macular hole and visual acuity improvement in retinal detachment associated macular hole. *Al-Shifa Journal of Ophthalmology 2020; 16(2): 63-67. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.*

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Introduction:

Several approaches have been attempted such as macular buckling, scleral shortening, pars plana vitrectomy, and combinations thereof for the treatment of rhegmatogenous retinal detachment associated macular holes.[1] Macular buckling technique was the standard surgical treatment for rhegmatogenous retinal detachment associated macular hole before the introduction of pars plana vitrectomy in 1982.[2] Recently, Michalewska et al[3] have reported the efficacy of the internal limiting membrane flap technique for large macular holes. Kuriyama and Michalewska et al also found that the inverted internal limiting membrane flap technique resulted in a high macular hole closure rate in highly myopic eyes. The internal limiting membrane peeling provides complete removal of the

posterior vitreous cortex, extracellular matrix, or cellular migration.[4] Also, internal limiting membrane peeling during vitrectomy drastically increases the closure rate of macular holes[5] and is now widely performed to treat various vitreoretinal diseases, such as rhegmatogenous retinal detachment or proliferative vitreoretinopathy.[6] In rhegmatogenous retinal detachment repair, internal limiting membrane peeling reduces postoperative macular pucker formation.[7]

A coexistent macular hole is seen in approximately 1% to 4% of cases of rhegmatogenous retinal detachment.[8] In recent years, the use of internal limiting membrane peeling as an adjunct for surgical repair of idiopathic macular holes has improved closure rates.[9]

We undertook a review of all patients in our practice who had rhegmatogenous retinal detachment associated macular hole to look at anatomic and visual outcomes, and to examine whether internal limiting membrane peeling increased macular hole closure rates. Rhegmatogenous retinal detachment associated macular hole is one of the most vision-threatening complications associated with highly myopic eyes, and it is highly prevalent in east Asia.[10] Among them, vitrectomy and gas fluid exchange with internal limiting membrane removal followed by face-down positioning was most popular for the treatment of rhegmatogenous retinal detachment associated macular hole.[11]

Participants and Methods:

A retrospective, interventional case series conducted at the ophthalmology department, Lahore General Hospital, Lahore between April 2013 to June 2016. Thirty-seven eyes presented with rhegmatogenous retinal detachment associated macular hole and underwent pars plana vitrectomy combined with internal limiting membrane peeling and perfluoropropane (C3F8) internal tamponade by a single surgeon. The ethical board committee of the hospital approved this study. This study included only the patients with rhegmatogenous retinal detachment associated macular hole. Patients with a history of retinal detachment or proliferative vitreoretinopathy, any kind of retinal surgery, diabetic retinopathy, vitreous hemorrhage, retinal vascular occlusion, uveitis, trauma, optic atrophy, ocular tumors, glaucoma, corneal opacity, or incomplete chart records were excluded. The patient's age, gender, ocular history, initial best-corrected visual acuity (BCVA), preoperative and postoperative clinical manifestations, optical coherence tomography results and final BCVA were collected. The standard surgical procedure for the rhegmatogenous retinal detachment (RRD) associated macular hole included 23-gauge 3-port pars plana vitrectomy combined with internal limiting membrane peeling and C3F8 internal tamponade. Briefly, after the core vitrectomy, the posterior vitreous cortex was identified with 20% diluted triamcinolone acetonide (40 mg/ml) and the vitreous cortex was lifted. Then, internal limiting membrane peeling was facilitated by staining with brilliant blue green (BBG) for 05 minutes. The peripheral vitreous was removed as much as possible, and the peripheral retina was checked circumferentially to detect any retinal tears or lattice. Air-fluid exchange was performed with gas tamponade by 15% perfluoropropane (C3F8) at the end of surgery. The patients were asked to remain in a prone position for 1 day and to avoid the supine position afterward during the follow-up period until the gas was absorbed. SPSS software version 17.0 was used to perform statistical analyses of the data. P <0.05 was considered to be statistically significant.

Results:

This study included 33 females and 04 males with mean age of presentation at 55+-06 years. In terms of the anatomic outcomes after the surgery, the retina was

attached in all the cases (100%), and the macular hole was closed in 35 eyes (94.5%) while in 02 eyes (5.4%) the hole was not closed.

With respect to the functional outcomes, the BCVA was improved in all 37 patients (mean 2 Snellen lines) at the final follow-up examination. In general, there was a significant improvement in BCVA after the surgery at 3 and 6 months and at the last visit, but not during the first month.
The proliferative changes such as postoperative panretinal membrane, macular pucker, and proliferative vitreoretinopathy were not noted after internal limiting membrane (ILM) peeling throughout the observational period.

Discussion:

Rhegmatogenous retinal detachments attributable to a peripheral break (or break) with a concomitant no causal macular hole occurs in approximately 1% to 3% of spontaneous rhegmatogenous retinal detachments.[12]

Until the 1980s, the primary surgical goal for rhegmatogenous retinal detachment associated macular hole was to repair the RD by closing the peripheral breaks, with no attempt made to repair the macular hole.[13] Later, pars plana vitrectomy was combined with scleral buckle and gas injection, but again no specific attempt was made to repair the macular hole.[14]

After the initial reports of successful closure of idiopathic macular holes, [15] interests developed in the postoperative status of the macular hole in surgically treated RRD associated macular hole. Several different treatment modalities like gas tamponade, vitrectomy, macular buckling, or combination approaches have been applied for the treatment of RRD associated macular hole.[16] Among these approaches, vitrectomy for RRD associated macular hole plus intraocular gas or silicone oil tamponade and internal limiting membrane peeling are the most popular procedures for RRD associated macular hole.[17]

Internal limiting membrane peeling as an adjunct to macular hole repair became popular in the 1990s as reports indicated its improved success rates.[18] Campochiaro and associates found that the internal limiting membrane affects the vitreoretinal interface, contributing to tractional forces and the formation of macular holes.[19] In 2000, Brooks reported that patients undergoing internal limiting membrane peeling had better closure rates: 100% in 116 eyes with internal limiting membrane peeling vs 82% in 44 eyes without internal limiting membrane removal.[20] Reopening of the macular hole was observed in 25% of cases surgically repaired but without ILM peeling while the peeling of ILM resulted in 100% closure rate with no reopening of the hole. Yoshida and Kishi also found that internal limiting membrane peeling reduces MH recurrence, possibly because it likely prevents formation and contraction of epiretinal membranes.[21]

Kiné and associates published that 7 of their patients had RD with macular hole, and 6 of 7 (85.7%) had closure of the hole after the first surgery.[22] Singh in his small prospective series found that either combined or sequential surgery could be successful for RRD associated macular hole.[23]

The RRD associated macular hole may occur when the traction force or other mechanisms overcome a so-called point of no return in normal retinal tissue. These factors exert traction which leads to the detachment of the retina, which is treated by vitrectomy and internal limiting membrane peeling.[24] Furthermore, internal limiting membrane peeling also may remove the scaffold for cellular proliferation or any other traction components that can affect the rigidity of retina. Thus, the increased flexibility of the

retina facilitates the closure of the macular hole through the proliferation of glial cells after internal limiting membrane peeling procedure.[22-23]

In the current study, we demonstrated that the primary macular hole closure and reattachment rates after pars plana vitrectomy with the internal limiting membrane peeling technique reached 100% (anatomic success rates) compared with patients who underwent pars plana vitrectomy alone. In anatomical success rates, the statistical analysis differences were not determined, but patients who underwent the internal limiting membrane peeling technique tended to achieve high anatomical success rates. Several groups reported the efficacy of internal limiting membrane peeling as the initial procedure for RRD associated macular hole.[25] In this procedure, the macular hole closure and reattachment rates were 10–91% and 70–92.3%, respectively. Our results showed higher anatomic success rates after pars plana vitrectomy with the internal limiting membrane peeling technique compared with previous reports.

In terms of postoperative visual prognosis, the postoperative BCVA at 6 months after surgery significantly improved in all 37 patients. These results suggest that the proliferation of glial cells produces an environment conducive to the repositioning of photoreceptors in direct proximity to the fovea.

Our study has certain limitations. The number of eyes is relatively small the study is retrospective with shorter follow-up period. Hence, further studies are needed to confirm the results of our study.

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ORIGINAL ARTICLE

Comparative Analysis of the Efficacy of Intravitreal Diclofenac Versus Intravitreal Bevacizumab in the Treatment of Diabetic Macular Edema

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ABSTRACT

Aim: The aim of the study was to compare the efficacy of intravitreal Diclofenac (IV-D) with bevacizumab (IV-B) in the treatment of diabetic macular edema (DME).

Material and Methods: In this comparative case series interventional study, 50 eyes from 25 patients with bilateral diabetic macular edema were selected and randomly allocated to either intravitreal diclofenac or bevacizumab with exclusion and inclusion criteria devised for the study participants. The participants were observed for 24weeks (6 months) for any improvement in best corrected visual acuity (BCVA) in logMAR and central macular thickness by spectral domain OCT (CMT-OCT), the patients were also evaluated for intraocular pressure (IOP).

Results: Fifty eyes of 25 patients were analyzed. 25 eyes were given intravitreal diclofenac 500µg/0.1ml, while 25 eyes received 1.25mg/0.05ml bevacizumab. After 6 months of follow up, there was improvement in the visual acuity from 0.54 ± 0.11 in IV-B and 0.56 ± 0.13 LogMAR in IV-D before injections to 0.24 ± 0.13 and 0.28 ± 0.10 respectively. In both groups marked reduction in CMT from baseline was observed but there was no statistically significant difference noted between the groups. Interestingly in IV-D, but not IV-B, decreased intraocular pressure (IOP) was noted, achieving statically significant level. No, adverse injections related side effects were observed. (Endophthalmitis, intra-ocular inflammation and cataract).

Conclusion: This study showed that intravitreal diclofenac (IV-D) by virtue of its anti-inflammatory properties showed improvement both in terms of visual acuity as well as reduction of the central macular thickness almost similar to bevacizumab but without any side effects of steroids *Al-Shifa Journal of Ophthalmology 2020; 16(2):68-77.*

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Introduction

One of the sight threatening complication of long standing uncontrolled diabetes is diabetic macular edema (DME)[1.] Various kind of therapies evolved for the management of DME with the passage of time and one of them was the intra-vitreal injection of anti-vascular endothelial growth factor (VEGF) drugs that achieved significant success. Different trails have explored the effectiveness of ranibizumab and bevacizumab on diabetic retinopathies, especially diabetic macular edema[2, 3]. Steroids are also utilized in the form of intra-vitreal injections for the management

of DME[4]. DME results from a complex array of various pathological pathways that ultimately culminates in angiogenesis and production of prostaglandin and other inflammatory and pro-inflammatory mediators which is the hallmark of diabetic maculopathy [5, 6]. Anti-VEGF agents such as ranibizumab and bevacizumab are used to block the production of VEGF, and steroid (triamcinolone) is used to inhibit the prostaglandin-induced inflammatory cascade. Non-steroidal anti-inflammatory drugs (NSAIDs) prevent the production of prostaglandins and leukotriene and has evolved as a new treatment modality in the management of DME [7, 8]. The inflammatory cascade leading to the development DME liberates arachidonic acid from the cell membrane phospholipids. Arachidonic acid is converted into prostaglandin (PG) and thromboxane (TXA2) by cyclooxygenases (COX1 and COX2) and into leukotriene with the help of 5-lypoxygenases. Prostaglandins are potent stimulators for angiogenesis. It was revealed in one study on cultured Müller cells that PG enhances the production of VEGFs. NSAIDs, are powerful COX inhibitors and hence potent anti-inflammatory agents, and has both anti-proliferative and anti-angiogenic effects[9] Other possible explanation for the role of NSADs as anti-angiogenic agents is the inhibition of COX pathway, which blocks the production of PGE-1 and PGE-2. This inhibitory action of NSAIDs is responsible for suppression of angiogenesis in chronic inflammatory conditions[10, 11].

Although steroids are considered to be potent anti-inflammatory agents by inhibiting two pathways at the same time (the cyclooxygenase and 5-lypoxygenase pathway), but NSAIDs have minimal deleterious effects than steroids. These adverse effects include raised intra-ocular pressure (IOP) and lens opacification. Diabetic patients are more prone to these complications[12, 13]. Also, intra- vitreal injection of steroids needs to be repeated quickly because of the short lived effects, which may increase the possibility of adverse effects [14, 15]. Another beneficial property of NSAID is tumor necrosis factor (TNF)-alpha inhibition, which may prevent early diabetic retinopathy progression[7]. Topical use of NSAID is ineffective due to inadequate supply of drug to the vitreous because of the blood–aqueous barrier. Intra-vitreal injection of NSAIDs could possibly maximize the drug concentration in the vitreous, particularly in inflammatory conditions like DME and age-related macular degeneration (ARMD) [16]. Diclofenac sodium is a member of the NSAIDs family that inhibits both the cyclooxygenase and 5-lipoxygenase pathway, making it a powerful agent than steroid, with the added benefit of less serious adverse effects [17]. Intravitreal injection of diclofenac sodium (IV-D) is efficacious in inflammatory retinal conditions such as macular edema due to occlusive retinopathies, ARMD, uveitis induced CME, and DME [18, 19]. In the literature few studies are conducted on the effectiveness of IV-D on DME. However, in recent past, the number of studies have increased and in one randomized trial conducted upon patients with DME revealed that IV-D has almost similar efficacy to intra-vitreal triamcinolone[17]. Ketorolac is another class of the NSAID family that has shown convincing outcomes in DME management in some interventional case series studies[20, 21].

The rationale of this interventional trail was to compare the efficacy of IV-D Vs IV-B in terms of visual acuity (functional) and central macular thickness (anatomical) improvement. IV-D is a cheap yet safe alternative for intra-vitreal injection without having the deleterious side effects of steroids and relatively cost effective which may adhere compliance for patients with repeated injections which unlike in bevacizumab are lost to follow up. This study to our knowledge and existing literature is 1st of its kind conducted locally

to investigate its effect in patients with DME.

Materials and Methods:

Fifty eyes from 25 patients with bilateral DME were enrolled in this interventional case series study at an Eye Dept. of Qazi Hussain Ahmad Medical Complex, Nowshera from Sep. 2019 to March 2020.The study was conducted under the guidelines of good clinical practice (GCP) and was adherent to the tenets of declaration of Helsinki. All subjects who participated in the study signed an informed consent form before enrollment. Another written consent was acquired from the participants regarding the possible adverse reaction of intra-vitreal injections before the start of study. We included patients based upon the criteria devised by Early Treatment Diabetic Retinopathy Study (ETDRS) for clinically significant macular edema[22].We excluded patients who underwent pan-retinal or focal/Grid laser photocoagulation, intra-ocular procedures or any sort of intra-ocular injections 6 months before study, glaucomatous patients, visual acuity (VA) of 6/12 or better, VA of 6/120 or worse, rubeosis irides, vitreo-macular tractional abnormalities or any intra-ocular inflammatory disorders, proliferative diabetic retinopathy, severe ischemic maculopathy (based upon FFA findings), macular edema of any other etiology, media haze sufficient to preclude fundus view and any other inherited/acquired macular degenerations. All included eyes underwent a complete baseline ocular assessment including best-corrected visual acuity (BCVA), applanation tonometry, slit lamp examination, and retinal photographs. Measurement of central macular thickness (CMT) was done by using spectral-domain optical coherence tomography (OCT) (Heidelberg Engineering). BCVA was assessed by Snellen charts and was converted into log. of the minimum angle of resolution (logMAR) scale. Each eye of a patient was randomly allocated to one of two study groups: in the IV-D group, each eye received 500 µg/0.1 mL of diclofenac sodium (Inj. Voren ®, Asian Continental, Pak.) Diclofenac is available in 75 mg/3 ml. After aspiration of 1 ml (containing 25 mg), 4 ml of balanced salt solution was added. Therefore, each I ml contains5 mg diclofenac. Then 0.1 cc containing 500 µg of diclofenac was injected intra-vitreally with a 27-gauge needle through the supero-temporal quadrant; in the IV-B group, each eye received 1.25 mg/0.05 mL of bevacizumab (Avastin; Genentech Inc. Roche, Ltd., Basel, Switzerland)), which was injected through the supero-temporal quadrant with a 27-gauge needle. Procedures were performed under strict aseptic environment using Povidone Iodine 5% sol. followed by proparacain 1% (topical anesthetic) eye drops after insertion of an eyelid speculum. The intra-vitreal agents were given at baseline and then every monthly unless 6/6 visual acuity attained or there wasn't any betterment or worsening in response to the previous 02 injections. After injections two quick ophthalmic assessments were conducted at 1st day and after a week to ensure the safety of interventions and to look for any dreadful complications associated with it. Complete ophthalmic assessments were conducted at 1st, 3rd and 6th month after injections along with OCT for measurement of central retinal thickness in a circle of 3000µm in dm. The main outcome parameter was the change in best-corrected logMAR VA. CMT measurement changes as displayed in OCT prints were the secondary outcome measures. There wasn't any serious side effect observed with injections throughout the study duration.

Statistical analysis of data was done with SPSS version 20. Continuous and discrete variables were represented as Mean and standard deviation (SD), while the descriptive/qualitative variables were expressed as frequency and percentages. Within group analysis of variables were

done by utilizing student t test and Wilcoxon signed rank test was used for comparing the variables with the baseline and within each treatment group. Mann–Whitney and paired sample t-test were used for comparing variables between groups. P value less than 0.05 was considered as statistically significant.

Results:

50 eyes of 25 patients (25 OD and 25 OS) with DME OU were analyzed. The mean age of the pts. was 58.4 yrs. (range 52 to 68 yrs.) 20 were male and 30 females. 14 pts. had moderate non-proliferative diabetic retinopathy (NPDR) and 36 pts. had severe NPDR. Tab. 1 depicts the baseline characteristics of groups. Tab. 2 compares visual acuity and CMT on OCT scan between the IV-B and IV-D groups. No, significant difference was observed between both groups at baseline.

Before injections, the BCVA in the IV-B group was 0.54 ± 0.11 logMAR. The BCVA in the IV-D group. was 0.56 ± 0.13log MAR, the difference between groups. was not statistically significant (p = 0.531). After 6 months follow up, the BCVA improved in both groups (Fig. 1); it was 0.24 ± 0.13 in the IV-B group. and 0.28 ± 0.10in the IV-D group, achieving a statistically significant level. At 1st, 3rd, and 6th month of follow-up, there was no significant difference between BCVA of both groups (p > 0.05) (Tab. 3). At 6th month of follow-up, 10 eyes (20%) had received 02 injections, 30 eyes (60%) had received 03 injections, and further 10 eyes (20%) had received 04 injections; there was no significant difference between the IV-B and IV-D groups in terms of no. of injections (Fig. 2).

The mean baseline CMT in the IV-B group. was 410.4 ± 105.3 μm and 426.5 ± 96.6 μm in the IV-D group. There was no significant difference between both groups (p = 0.512). After 1 month, the CMT decreased to 390.2 ± 110.3 μm in the IV-B group. and 402.4 ± 88.9 μm in the IV-D group. After 3rdmonths, the CMT was 361.8 ± 88.6μm in the IV-B group and 392.8 ± 85.5μm in the IV-D group. After 6th months, it was 352.4 ± 96.6μm in the IV-B and 358.2 ± 85.4μm in the IV-D group. (Fig. 3). Again the difference was not statistically significant between the groups (Tab. 3).

At 6thmonth, the macular thickness difference to baseline was -58.0 ± 96.2μm in the IV-B group and -68.3 ± 80.4μm in the IV-D group. (p = 0.05 for the IV-B groups and p = 0.01 for the IV-D group.) (Tab. 4). The IOP was measured in both groups at baseline and 07 days post injection. The IOP was lower in the IV-D group. from 16.4mmHg to 14.4mmHg (p = 0.030) (Tab. 5 and Fig. 4). The IOP was higher in the IV-B group. from 15.9 mmHg to 16.2 mmHg, however such difference didn't achieve statistical significance (p = 0.322).

Table 1. Patients' characteristics and stage of retinopathy at baseline

Characteristics	Value
Age (yrs.), Mean ± SD	58.4 ± 7.1
Gender n (%)	
Men	20 (40%)
Women	30 (60%)
Fundoscopic evaluation n (%)	
Moderate NPDR	14 (28%)
Severe NPDR	36 (72%)

Table 2. BCVA and central macular thickness on OCT at baseline

Variables	IV-B (N = 25)	IV-D (N = 25)	p-value÷
BCVA (log MAR)	0.54 ± 0.11	0.56 ± 0.13	0.531
Central macular thickness (μm)	410.4 ± 105.3	426.5 ± 96.6	0.512

÷ Based on a student, t-test

Table 3. Log MAR BCVA at different phases in the study between the groups

Data values	IV-B (N = 25)	IV-D (N = 25)	p-value÷
Baseline BCVA (logMAR)	0.54 ± 0.11	0.56 ± 0.13	0.531
BCVA at 1st mon. (logMAR)	0.44 ± 0.06	0.46 ± 0.11	0.798
BCVA at 3rd mon. (log MAR)	0.27 ± 0.10	0.33 ± 0.15	0.458
BCVA at the 6th mon. (logMAR)	0.24 ± 0.13	0.28 ± 0.10	0.439

÷Based on a student

Table 4. Central Macular thickness on OCT at different phases in the study between the groups

Data values	IV-B (N = 25)	IV-D (N = 25)	p-value÷
Central macular thickness (μm) at baseline	410.4 ± 105.3	426.5 ± 96.6	0.512
Central macular thickness at 1st month (μm)	390.2 ± 110.3	402.4 ± 88.9	0.752
Central macular thickness at the 3rd month (μm)	361.8 ± 88.6	392.8 ± 85.5	0.458
Central macular thickness at the 6th month (μm)	352.4 ± 96.6	358.2 ± 85.4	0.652
Central macular thickness difference at 6th month to baseline value	-58.0 ± 96.2	-68.3 ± 80.4	
p-value within group º	0.05	0.01	

÷ Based on a student, t-test, º based on a paired sample t-test

Table 5. Intraocular Pressure (IOP) before and 01-week post injection between groups.

Groups	Before	01 wk. post injection	p-value÷
IVD	16.4 ± 2.9 mmHg	14.4 ± 2.8 mmHg	0.030
IVB	15.9 ± 3.0 mmHg	16.2 ± 4.2 mmHg	0.322

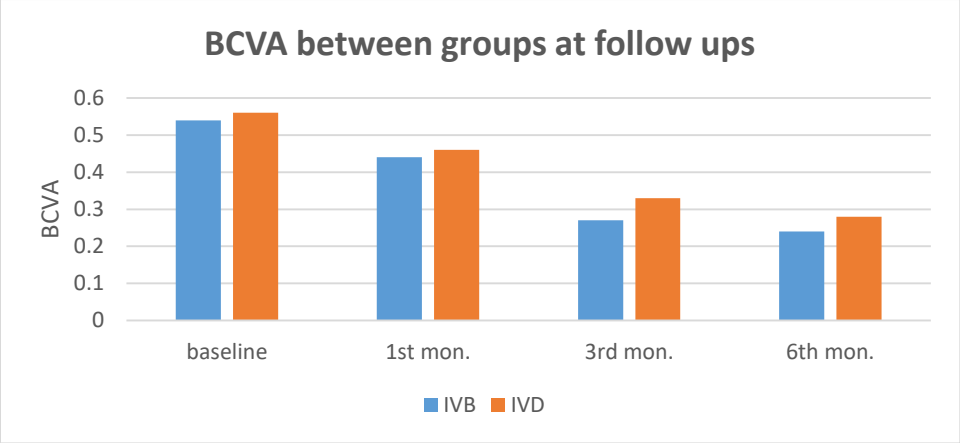

Fig. 1 BCVA between groups at baseline and various follow up visits with successive improvement at the end of 6th month period

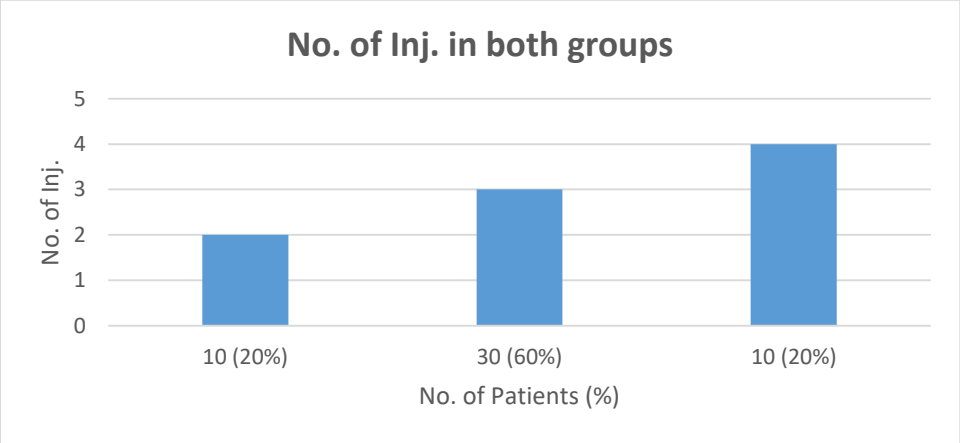

Fig. 2 Number of intra-vitreal injections given in both groups

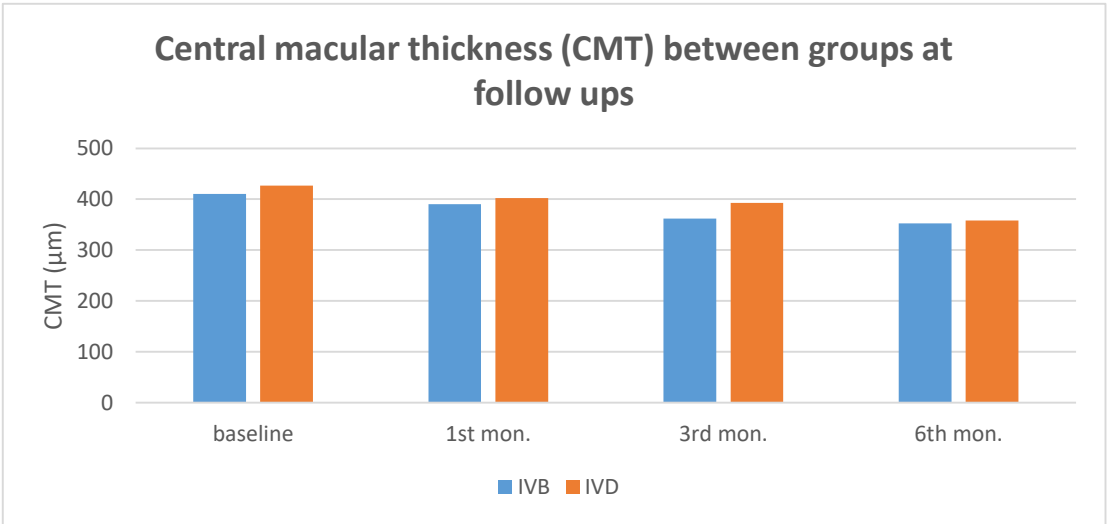

Fig. 3 Central macular thickness (CMT) at baseline and different follow up visits between groups, with successive decrease in thickness till the end of 6th month.

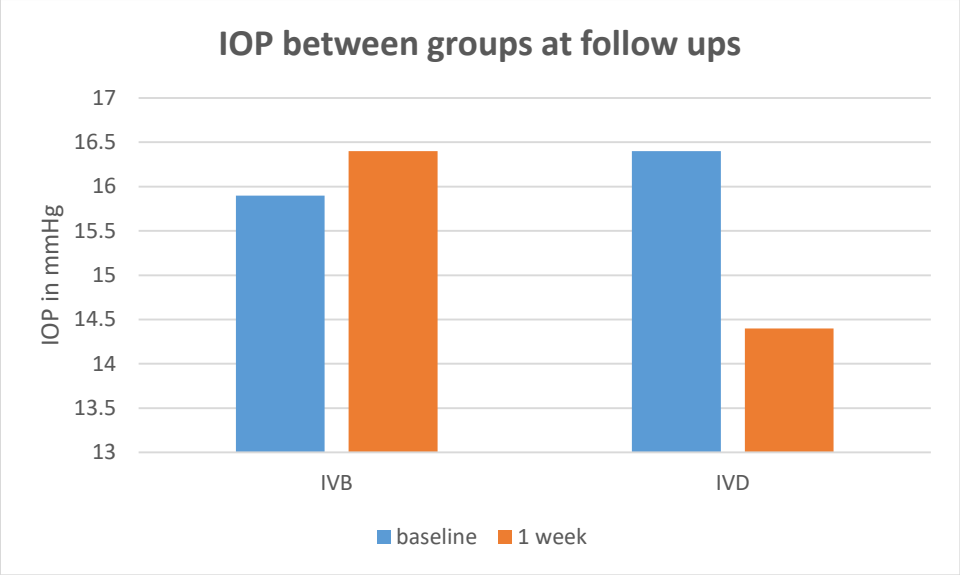

Fig. 4 Baseline and 1-week post injection comparison between the groups show significantly low IOP in IVD group.

Discussion:

Intra-vitreal injections use is now common for quite some time in the management of diabetic retinopathy especially maculopathy i.e. DME as well as macular edema due to various etiologies. A number of studies have shown their better efficacy as compared to conventional treatment modalities[23]. Various types of intra-vitreal agents are available than can halt the progressive diabetic retinopathy / maculopathy. Underlying pathophysiologic mechanism of diabetic retinopathy is vital for appropriate selection of intra-vitreal agents to be used. Numerous studies have shown the beneficial effects of anti-VEGFs in the treatment of DME [3, 24] Another conceptual step in the management of diabetic retinopathy involves the use of steroids for inhibiting the inflammatory cascades involved in the progression of disease particularly DME [25-27]. Steroids blocks both cyclooxygenase and 5-lypoxygenase pathways but are associated with cataract formation and glaucoma[13, 14]. In this interventional case series trail, we opted for NSAIDs. One trail has shown the potency of Diclofenac-Na to inhibit the 5-lipoxygenases pathway. This property of Diclofenac-Na makes it identical to steroids to be used as an anti-inflammatory agent[28]. There are lot of studies conducted on the topical form of NSAIDs i.e. nepafenac 0.1% in the management of post cataract macular edema as well as DME with promising results[29]. Some studies revealed the beneficial effect of topical bromofenac (NSAID) in the prevention of cystoid macular edema (CME) in post cataract diabetic patients[30]. In our study, we explored the intra-vitreal route of delivery for enhanced absorption of NSAIDs to retinal tissues. The intra-vitreal route basically increases the pharmacological efficacy of NSAIDs and prevents its degradation by various enzymes in different ocular tissues thus prolonging its half-life. Our study results have shown that both bevacizumab and Diclofenac-Na improved the visual acuity and reduced the CMT after intra-vitreal injection to a significant extent, but the difference between the two groups didn't achieve statistical significance. Interestingly we observed lowering of IOP in the Diclofenac-Na group 01-week post injection, while there was a rise in IOP noted in the bevacizumab group, however this increase was not statistically significant. Our study had a follow-up of 6 months duration and the results have shown similarity to previous studies by Soheilian

et al., who observed an improvement in visual acuity in DME as well as reduction in edema due to other etiologies[18, 31]. Elbendary et al. findings also supported our study results by showing the efficacy of intra-vitreal diclofenac-Na in visual improvement as well as reduction of macular thickness in patients with diabetic macular edema by comparing it with steroids. Reduction in IOP was also observed in Diclofenac-Na group[17]. Some studies even reported the efficacy of intra-vitreal Diclofenac-Na in refractory/resistant DME[20, 21]. In diabetic patients, lowering of IOP was achieved with topical diclofenac in post cataract extraction cases[32]. The same effect was observed in our study via intra-vitreal route in patients with DME. The long-term follow-up of our study (06 months) has overcome the shortcomings in the previous studies with small sample size and limited follow-up period because of the short half-life of IV-D (approximately 3h) [33]. It was observed in one trail that combination of intra-vitreal Diclofenac-Na with intra-vitreal bevacizumab was efficacious to bevacizumab only[34]. Intra-vitreal Diclofenac-Na has been tried in macular edema due to branch retinal vein occlusion and the results have shown its efficacy and safety in improving visual acuity and reduction of CMT[35]. However, due to short half-life of intra-vitreal Diclofenac-Na, it needs to be repeated for maintaining its therapeutic efficacy. In the recent era anti-VEGFs, are the superior option available for the treatment of DME based upon multiple studies, however NSAIDs may well replace them due to their efficacy and safety in improving the visual acuity and reducing central macular thickness to similar extent, with the added benefit of IOP reduction. Further double blinded randomized control clinical trials are required with longer follow up duration and large sample size to better delineate the efficacy and safety of intra-vitreal Diclofenac-Na and to explore the added advantage of using it in combination with anti-VEGFs for better outcomes and reducing the frequency of injections. Due to widespread availability of Diclofenac-Na and its low price, it will be a paradigm shift in the management of diabetic patients with DME, as anti-VEGFs are costly which puts the patient in financial burden due to prolong treatment course resulting in non-compliance and unfortunately leading to debilitating visual impairment.

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ORIGINAL ARTICLE

Screen time and Refractive error: An Inevitable Nuisance

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Abstract

Objectives: The study aimed at determining relationship of different refractive error with screen exposure time in paediatric population.

Materials and Methods: A cross sectional study was conducted in 2019 for four months on all children with age of 4-16 years and correctable refractive error and a sample was selected by non random consecutive sampling. Final refractive error was determined after complete objective and subjective refraction. Daily screen exposure time (hours) was determined by asking the patients about average hours/day for which the child was having screen exposure. For inferential analysis, independent samples t-test and one-way independent samples ANOVA was applied.

Results: On average, study participants had a daily screen exposure time of 2.6 ± 1.4 hours. Participants with myopia had higher screen exposure time (2.7 hours) than hypermetopic patients (2.2 hours) and results were statistically significant (p-value= 0.01). Independent samples ANOVA showed that individuals with oblique astigmatism had higher screen exposure time (2.8 hours) than with the rule (2.7) and against the rule astigmatism (1.6) and statistical significance was achieved (p-value= <0.01).

Conclusion: It is concluded that there is a relationship between screen exposure time and different types of refractive error. Further long term studies are required to explain this association. *Al-Shifa Journal of Ophthalmology 2020; 16(2): 78-85. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.*

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Introduction

Visual display units (VDUs) are important part of today's life whether its leisure activities, work or for study purposes. In addition to increasing small-screen preference, the lockdown due to COVID-19 pandemic has enhanced the duration of its use in all the age groups. Exposure to VDUs for exhausting hours is already an established global public health concern due to its detrimental physical, physiological, psychosocial, and developmental affects particularly on children's health[1]. According to UNICEF, up-to 30% of the children below 18 years of age worldwide are regular internet users with more users accessing the internet at an increasingly younger age[2]. In UK, 42% children with age ranging between 5-7 years has a gadget like tablet or PC [3], with an average child having a screen time of 44

hours a week[4]. A recent study from Pakistan reported that one in every three children (31%) was using cell phones for more than 2 hours a day[5]. This all posed not only other physical and mental health related issues in children but also highly affects the ocular health and functioning. A large number of studies have highlighted its side effects in the form of ocular discomfort, foreign body sensation, grittiness and dry eyes etc.

Refractive error is one of the biggest public health issues of the 21st century, being one of the principal causes of global visual impairment[6]. In addition to its burden in the adult population, refractive error is affecting a huge proportion of children as well. According to recent global estimates, 12 million children are suffering from visual impairment attributed to paediatric refractive error[7]. Furthermore, the uncorrected refractive error also leads to multiple developmental delays leading to reduced productivity in the paediatric population[8]. It has been reported that roughly one in six children is suffering from correctable astigmatism making it the highest prevalent refractive error, which is followed by myopia (11.7%) and Hypermetropia (4.6%). In Pakistan, myopia is the most prevalent paediatric refractive error, followed by astigmatism, while Hypermetropia is the least prevalent in the country[9-10].

Although the development of paediatric refractive error is a complicated multifactorial phenomenon, the influence of genetic and multiple environmental factors have been established[11-12]. The majority of these environmental risk factors are related to screen exposure of children such as the type of screens viewed as well as the duration for which the screen is viewed[13].

With a few exceptions associating screen time with other refractive errors [14], the majority of the literature links it with myopia [15]. These contrasting findings are causing inconvenience in understanding the underlining mechanism linking VDU exposure to refractive error. Moreover, studies have not been successful in highlighting the association of excessive use of VDUs with different refractive errors particularly in paediatric population. Therefore, comprehensive studies describing the relative relationship of screen time with different refractive errors in particular age groups are required. Although a few studies have been done regarding this, no major study has been done in developing country like Pakistan to the best of our knowledge. In light of all these facts, the objectives of this study were to determine the proportion of different refractive errors in the paediatric population and to establish the association of screen exposure time to different refractive errors.

Materials and Methods:

A cross-sectional study was conducted for the duration of 6 months from January to June 2019 at the Ophthalmology department of tertiary health care facility, Islamabad. Study was initiated after ethical approval was granted from the Ethical review board of the hospital.

All the children with age ranging between 4-16 years and a correctable refractive error (0.25DS or more) were included in the study and the study sample was collected by utilizing consecutive non-random sampling such that all the children fulfilling the inclusion criteria of study were included in the final sample. However, children with any history of ocular surgery or disease were excluded. All the children underwent a detailed ophthalmic examination by principal researcher. Initially, visual acuity was measured using the log MAR visual acuity chart. Afterward, all the children underwent cycloplegic retinoscopy and post cycloplegic subjective refraction. A complete slit lamp examination of anterior and posterior segment was also conducted. Informed consent was taken from parents/guardians of all children while

assent was also obtained by the respondents themselves.

The main outcome variable was the daily digital screen exposure time (hours) which was measured by interviewing the parents about the average daily time during which children were involved in screen viewing (cell phones, tablets, computer screens, television, and other visual display units). The measurement of refractive error was obtained from the eye with higher refractive error in complete spherocylindrical form. All the analysis was done in SPSS version 20. After thorough data cleaning, a descriptive analysis was conducted. For categorical variables, frequencies and percentages were reported while the reported statistic measures for continuous variables were arithmetic mean along with range and standard deviation. For inferential analysis, independent samples t-test and One-way independent samples ANOVA was applied. F-test was used to determine the association of screen exposure time with different types of astigmatism (With the rule, against the rule and Oblique) on the other hand; t-test was used for determining the difference in screen exposure time between myopia and hypermetropia.

Results:

A total of 248 participants were included in the study which showed symmetrical gender distribution for males (n=124, 50.0%) and females. The mean age of respondents was 10.8 ±3.5 years which ranged from 4-16 years of age.

Majority of the patients demonstrated myopia (n=206, 83.1%) while hypermetropia was the least common refractive error (n=42, 16.9%). A total of 115 (46.4%) respondents had astigmatism with the highest proportion (n=92, 80.0%) having with the rule astigmatism(WTR), followed by against the rule astigmatism in only 14 participants (12.2%)Further details are given in table 1.

The mean for daily screen exposure time was told to be 2.6 ± 1.4 hours (1 – 6 hours). On average, hypermetropia (2.4 ± 2.0 diopters) was of higher magnitude than myopia (2.0 ± 1.8 diopters). On the other hand, mean WTR astigmatism was 1.9 ± 1.6 diopters whereas the mean increased to 2.1 ± 1.7 diopters for Oblique astigmatism. (Table 2)

Independent samples t-test showed that there was statistically significant difference of daily screen exposure time between individuals with myopia and hypermetropia (p-value= 0.04) where participants with myopia (2.7 hours) having higher daily screen exposure than those with hypermetropia (2.2 hours). Details of independent samples t-test are explained in table 3.

One way independent samples ANOVA test showed that there was statistically significant difference in daily screen exposure time between different types of astigmatism (p-value < 0.01). It was observed that participants with oblique astigmatism (2.8 hours) has the highest daily screen exposure while cases with ATR astigmatism (1.6 hours) has the lowest value for screen time. (Table 4)

Table1: Distribution of Refractive Errors(n=248)

	Frequency **n (%)**
Spherical refractive error	
Myopia	206 (83.1)
Hypermetropia	42 (16.9)
Astigmatism	
Present	115 (46.4)
Absent	133 (53.6)
Type of Astigmatism*	
With the rule	92 (80.0)
Against the rule	14 (12.2)
Oblique	9 (7.8)

* n= 115

Table 2: Magnitude of refractive errors

Refractive Error	**Arithmetic Mean**	**Standard Deviation**	**Minimum**	**Maximum**
	Diopters			
Myopia	2.0	1.8	0.5	11.0
Hypermetropia	1.9	1.6	0.5	12.0
WTR astigmatism	1.9	1.6	0.5	3.5
ATR astigmatism	1.6	1.4	0.5	3.0
Oblique astigmatism	2.1	1.7	0.5	5.5

Table 3: Screen time and Type of Refractive Errors

Refractive error	**Screen time** **Mean (Standard deviation)**	**t- statistic (df)***	**p-value**
Myopia	2.7 (1.4)	2.5 (72.0)	0.01
Hypermetropia	2.2 (1.1)		

* t-test is reported by assuming variances as not equal

Table 4: Screen time and Type of Astigmatism

Type of astigmatism	Screen time Mean (Standard deviation)	F- statistic (dfB, dfW)[a]	p-value
WTR astigmatism	2.7 (1.3)	5.0 (2, 112)	<0.01
ATR astigmatism	1.6 (0.9)		
Oblique astigmatism	2.8 (1.7)		

[a]dfB= between groups degree of freedom, dfW= within groups degree of freedom

Discussion:

This cross sectional study was done on 248 children with a mean age of 10.8±3.5 years and was aimed at finding out the proportion of Refractive errors in the school going children as well as evaluating the association between the screen time and Refractive errors, respectively.

Three quarter (83.1%) of the patients in the current study presented with myopia. This is alarming, as if only this small sample has such a large proportion of children with myopia; it will increase even further with the whole population. This is in accordance with the global prevalence where 22.9% of the world population was having myopia in 2000 and it is predicted to raise to 49.8% of the global population in 2050 [16]. A review by Andrzej Grzybowski and colleagues this year (2020) has shown that the prevalence of myopia was higher (60%) in Asia using cycloplegic refraction. Moreover, school children in East Asia (73%) had higher myopia prevalence rates as compared to other countries [17].

Almost 17% of the children in this study were having hyperopia. This is in agreement with the review related to clinical management in which it was said that 0.9-12.8% of the school going children had hyperopia [18]. Most of the studies have reported hyperopia as the second common Refractive error after myopia in Pakistan [10, 19-21]. However, the magnitude of myopia was far less than the Hypermetropia.

In a meta-analysis by Victor Delpizzo Castagno et al the prevalence of Hypermetropia was inversely related to the age and urban residence [22]. This may be the reason that the prevalence was relatively low in the current study as the mean age was 10.8±3.5 years in this study and most of the participants were from urban background. Further studies are required to check the factors of residency that contribute to Hypermetropia development.

Most of the children (n=92, 37.09%) had with the rule astigmatism followed by only 14 (5.64%) who showed against the rule astigmatism. This is in contrast to the study in northern Iran where most of the children had shown against the rule astigmatism (18.1%) followed by with the rule astigmatism (11.7%) respectively. However, the study has also shown a significant (p<0.01) association of ATR astigmatism with the age [23]. So less proportion in this small sample current study can be a reason for less age. One more study in china compared some studies of refractive errors in school going children in different countries of Asia and Africa. This study concluded the higher prevalence of astigmatism in younger age but there was a within-country difference of many studies

related to the magnitude and prevalence of astigmatism [24].

Increased screen time due to VDUs has been the need of hour for all the age groups and different studies have reported different health related harms and issues in all the age groups related to it. A systematic review was done in children and adolescents for reporting screen time related health hazards and highlighted problems in QOL like adiposity, unhealthy diet, and depressive symptoms etc[25]. Screen time in the current study was reported to be 2.6±1.4 hours in the participants and was statistically associated with the refractive errors ($p<0.01$). Many studies have reported the association of myopia in agreement with the current study[14, 26, 27]. Blue light and eyes have made a deep association in regard to development of refractive errors [28-29].

Vision display units, increased screen time and blue light have shown to not only increase the risk of developing the refractive errors but also affect the magnitude of the problem. Health promotion strategies to reduce the duration of the screen time and changing the lifestyle from indoor to outdoor can help decrease the intensity of the issue further.

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ORIGINAL ARTICLE

Effect of Covid-19 Pandemic On Postgraduate Resident Training in Ophthalmology: An Aspect to Be Pondered

Ayesha Hanif[1], Amna Anam[1], Irfan Qayyum[1]

Objectives: Postgraduate training program was affected in many ways during covid-19 lockdown regarding patient exposure, working hours, medical and surgical skills of different specialties. In this study we aimed to find out the impact of the pandemic on postgraduate training of ophthalmology residents.
Study design: Cross-sectional study
Place and duration of study: This study was held in different hospitals of Punjab during 15th march to 15th July 2020.
Participants and Methods: A cross-sectional study was conducted including 42 post graduate residents of ophthalmology department in four tertiary care hospitals of Punjab using an online 19-point questionnaire. The questionnaire included four sections that were clinical work skills, online classes, exams and mental health.
Results: Of all the residents, 40 (95.3%) stated that their surgical hands-on training and 36 (85.7%) responded that their clinical exposure was adversely affected by the pandemic. As for online classes, only 14 (35%) trainees favored online teaching. Among all the subjects, 34 (80.9%) were concerned about their exam preparation and delay. About 70% residents were depressed over their training effects.
Conclusion: The unfavorable effects on training amidst the pandemic reduced hands-on and clinical exposure of the ophthalmological residents. Moreover, the situation indicated to explore more efficient methods of learning that can help trainees to continue training positively during pandemic and also psychological monitoring of trainees should be done during their tenure. *Al-Shifa Journal of Ophthalmology 2020; 16(2): 86-92.*

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Introduction

Covid-19 lockdown influenced population in all aspects of life[1]. It affected medical education including both of undergraduates as well as post graduate residents[2, 3]. The closure of outpatient departments and postponement of elective procedures had impact on patients as well as trainees[4].The postgraduate residents faced unpredicted circumstances during the pandemic. Like many other specialties, ophthalmology department also served only emergency patients. The residents did not have many opportunities to deal with routine patients, elective surgeries, lectures and clinical rounds. Some of the trainees also performed duties in covid-19 wards. This also led them away from their subject. Some trainees had

psychological effects of this lockdown[5]. The departments tried to cope up with the crisis with different modalities such as decreasing number of working hours to prevent spread of disease and online classes and case discussions to help out trainees[6]. In some cases, students liked the idea of online classes but some didn't get it helpful [7].

Participants and Methods:

An online survey was conducted among postgraduate trainees of ophthalmology in different hospitals of Punjab to observe the impact of COVID-19 on Postgraduate teaching and learning. The problems and difficult situations dealt by them during the pandemic in terms of their surgical and medical skills, the progress in dissertations, lectures, clinical case discussions, exam preparation and the effect on mental health were enquired and also noted the gap in their training as some of them served in covid-19 wards. The target population for this study were PG students who were pursuing Masters in ophthalmology (MS) and fellowship in ophthalmology (FCPS and FRCS), of all years.

Results:

Majority of the participants were females (Table 1) while the average age of the participants was 28 ± 4 years. About 30% respondents were pursuing MS (Ophthalmology) course, whereas 40% were FCPS trainees (Table 2). All were postgraduate students at the government institutions and the majority respondents (65%) were in their 3rd year of PG course.

Regarding the duties, 71.4% trainees worked in covid-19 ward during this period (Table 3). 50% of students were attending daily postgraduate classes before spread of COVID-19 pandemic, while 50% respondents had classes twice a week at their institutions. During the COVID-19 pandemic, the number of PG classes were significantly reduced to none as reported by 65.81%, attended twice or thrice a week by 9.4% and once a week by 23.9%.

Table 1: Gender distribution Among Participants

Gender	% of candidates
Male	28.6%
Female	71.4%

Table 2: Academic Program of Participants

Program	% of Candidates
MS	30
FRCS	25
FCPS	40
MCPS	05

Table 3: Covid ward duties Performed by The Participants

COVID Ward Duties?	**Percentage of Trainees**
Yes	71.4%
No	28.6%

Table 4: Effect of Covid on different aspects of Training

Overall Training affected	85.7%
Surgical Training affected	95.5%
Medical training affected	85.7%
Theoretical knowledge affected	71.5%

Table 5: Opinion of Trainees Regarding Digital learning

Candidates thought that Online Classes were helpful in case of theoretical knowledge.	80.9%
Telemedicine was helpful in their clinical assessment skills.	47.6%

According to 18 (48%) respondents, outpatient department was closed for 3 months on average, while rest had on average 2.5 months closure of outpatient department. Indoor was open only for emergency patients. Operation Theater was closed for elective lists for 4 months as told by 50% candidates but open for emergency patients in all hospitals.

According to PG trainees, 85.7% thought that covid-19 had affected their training a lot. Regarding surgical skills, 95.5% postgraduates believed that it was being impaired whereas 85.7% trainees felt that medical training was lagging. Among all trainees 71.5% considered harm to their theoretical knowledge (Table 4). Clinic pathological conferences affected as per 71.5% candidate's response.

Exam preparation and schedule was also hindered due to covid-19 lockdown as 76.1% felt that exam preparation was hampered and exam schedule was delayed of 95.2% pupils. Online classes were organized in some institutes as responded by 57.3% candidates. Among these 80.9% thought that these were helpful in case of theoretical knowledge (Table 5). But none

of them favored online classes in surgical training. Telemedicine was arranged in all departments. 47.6% thought it was helpful in their clinical assessment skills.

Compared to the senior residents, 90.5% juniors felt that their seniors were better trained surgically and 95% better in clinical assessment. Overall 90.5% thought that their training was lagging behind.70% were depressed over this lagging of training.

Discussion:

This was an online questionnaire based cross sectional study done on the ophthalmology residents of different public teaching hospitals. Questionnaire comprised 13 questions regarding the surgical training, clinical knowledge and examination preparation.

Out of all the participants, 71.4% were females and 28.6% were males with average age 28 ± 4 years. Data of our study showed that according to post graduate trainees, 85.7% thought that covid-19 had affected their training a lot. Regarding surgical skills, 95.5% postgraduates believed that it had been impaired whereas 85.7% trainees felt that medical training was lagging. Among all trainees 71.5% considered harm to their theoretical knowledge.
76.1% felt that exam preparation was hampered and exam schedule was delayed of 95.2% pupils.

Online classes were organized in some institutes as responded by 57.3% candidates. Among these 80.9% thought that these were helpful in case of theoretical knowledge. But none of them favored online classes in surgical training. Telemedicine was arranged in all departments. 47.6% thought it was helpful in their clinical assessment skills.

WHO published different reports regarding the spread and incidence of cases at different times since December 2019. The number of confirmed cases was 581 as per WHO report on 23rd January 2020 worldwide[8]. Another report published on 18th February 2020 showed increase in number of confirmed new cases up to 73,332 and the number of countries affected by Covid-19[9]. While in Pakistan as per report, on 10th April 2020, suspected cases were 10,54706. Among these 4695 cases tested positive[10].

The previous pandemics in the world like Plague, Cholera, and small pox did not significantly affected domain of ophthalmology. But different studies showed how overall medical fraternity got affected in this pandemic. Feroze et al did a study on surgical residents concluding that their surgical as well as academic activities were affected [11]. A similar study showed the effects on ophthalmology field and as no treatment is available so far, quarantining can help reducing the virus spread [12]. Bakshi et al highlighted on the ophthalmology training in the year of Covid-19 that how the clinical experience and the undergraduate medical education suffered and that the virtual conferencing will be helpful in continuation of the education [13].

A similar study done in India by Mishra et al showed how most of the trainees responded that their surgical training was negatively affected. Their stress levels were raised and their families showed concern regarding their well-being. Also the trainees positively responded to online classes [14].

As outpatient department was closed and no direct dealing of patients was done, clinical approach was invariably compromised. Wong et al emphasized on the changes in ophthalmology training during the pandemic that how the outpatient and surgical volumes reduced to urgent care only. Also the lectures as well as the international conferences moved online. An article wrote on how patients got

postponed or being rescheduled for their follow ups [15].

Covid-19 also affected mental health of medical care providers which is concern able. So it is important to take measures for the psychological wellbeing of health professions. Khanna et al carried out a study in India reporting that the mental health of a greater number of ophthalmologists affected and personalized help should be provided [16].

Qiao et al did a survey in February 2020 reporting 28 eye professional from 10 hospitals contracted Covid-19 pulmonary symptoms[17]. Jo et al emphasized on the importance of early detection Covid-19 as well as viral conjunctivitis as a possible presentation. He also suggested the studies on tears and conjunctival secretions in this regard[18]. Some researchers speculated that SARS Cov-2 might be detected in tears and conjunctival secretions in patients with conjunctivitis[19]. However, other researchers did not agree on the ocular manifestation in SARS patients[20].

As per 27th February 2020, an ophthalmologist Dr. LI Wen Liang suffered from Covid-19 and passed away. Different studies were done on the safety measures for both public and doctors as well [21]. APAO presentation guideline for ophthalmic practice showed that how the early screening should be done and the safety measures i.e. no touch policy, frequent hand washing general public education cleaning of Operation Theater and consultation rooms and wearing of PPE could reduce the transmission [22]. As no treatment is available at present, prevention is the ultimate cure. Wearing N 95 mask, face shields, use of PPE and not reusing the gowns could help reducing the spread [23].

Conclusion:

As doctors were unable to attend the patients physically so telemedicine emerged as a new tool. The use of artificial intelligence as well as telemedicine with video conversations could be useful to combat this pandemic.

The limitations of study are a smaller sample size and shorter time duration. It is suggested that further studies should be done including the private sector hospitals as well.

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ORIGINAL ARTICLE

Prevalence of Amblyopia in School Going Pediatric Population of Four Districts in Azad Jammu and Kashmir

Waseem Ahmed Khan[1], Saba Haider Tarar[1], Shazia Siddiq[2], Muhammad Irfan Sadiq[1], Khansa Sohrab[3], Nimra Rafique[3]

Abstract:
Objective: To assess prevalence of Amblyopia in School going Pediatric Population in District Mirpur, Bhimber, Kotli and Pallandri, AJK.
Study Design: Cross-sectional Descriptive Study
Study Place and Duration: Participants included school going Pediatric Population in District Mirpur, Bhimber, Kotli and Pallandri, AJK from 1st March ,2016 to 30th June,2020.
Materials and Methods: A community based study was carried out in both private as well as public sector schools of 4 districts of AJK. Children diagnosed having uncorrected refractive errors with Snellen chart and auto-refractokeratometer went through complete retinoscopy by an optometrist. Then the patients who had 6/12 vision in any eye with best possible correction and whose vision is did not improve by pin hole were selected. All the observations along with demographic information of patients were recorded on a pre-designed proforma and data analysis was done by SPSS version 21.
Results: Out of total 155,776 children, 6043 children (03.87%) were diagnosed having refractive errors. Out of these 6043 children with different refractive errors, Amblyopia was diagnosed in 118 using a visual criterion of 20/30 or less on Snellen charts. Amblyopia prevalence was found to be 01.95% (95% confidence interval) with significant variation ($p<0.001$) across age groups.
Conclusion: School eye health and school screening programs should be established and included as an essential part in primary health care. *Al-Shifa Journal of Ophthalmology 2020; 16(2): 93-97. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.*

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Introduction:

Amblyopia is an ocular disorder with a deficiency of form or spatial vision sense resulting in the reduced visual acuity of greater than two lines between the eyes or an absolute reduction in visual acuity less than 6/9 either eye in Snellen's Vision Chart. This disorder is not correctable by refraction and cannot be attributed to any structural abnormality as well as central visual pathway defects.[1]

The Global Amblyopia prevalence varies greatly across various regions due to age groups studied, racial differences, cultural differences, literacy rate, geographical factors and frequency of visual screening programs.[2] Literature reveals Amblyopia prevalence from as low as 0.7% to as high

as 5-7%, the reasons being characteristics of study population, visual acuity criteria and measurement methods. Amblyopia remains quite a common ocular condition diagnosed in Pediatric population. Early management can lead to significant improvement in Amblyopia. Amblyopia develops due to defective development of the visual axis in Pediatric age. Continuous, clear and focused visual impulses are required by visual cortex to develop normally. Children with Amblyopia predisposing factors, if not diagnosed and treated early, are vulnerable to Amblyopia as well as blindness.[3]

It is observed that age of Amblyopia development is Pediatric age from early childhood to the age of 7 to 8 years. Amblyopia can be effectively treated if diagnosed and managed before the age of 9 to 10 years. Left untreated, Amblyopia can lead to permanent lifelong visual impairment.[4]

Although significant research has been done for school-going Pediatric population, but there is a lack of consensus upon the ideal age and frequency of visual screening. In United States, a mandatory vision screening is recommended for children between 3-5 years of age by the US Preventive Services Task Force. Whereas, the European countries start vision screening as early as 3-4 years of age.[5]

Materials & Methods:

Study design: Cross-sectional Descriptive Study

Sample size: Total 6043 students had refractive error and were referred to our hospital for diagnosis of Amblyopia.

Place and Duration of Study: The study was conducted in school going children in District Mirpur, Bhimber, Kotli and Pallandri, AJK, Pakistan from 1st March, 2016 to 30th June, 2020

After taking permission from hospital ethics committee, a community based study was carried out in both private as well as public sector schools of 04 districts including Mirpur, Bhimber, Kotli and Pallandri, AJK after informed consent. Out of a total of 155,776 children, 6043 children (03.87%) were diagnosed having uncorrected refractive errors with Snellen chart and auto-refractokeratometer. These children went through complete retinoscopy by an optometrist in DHQ Bhimber, Kotli, Pallandri and Divisional Headquarters Teaching Hospital, Mirpur. Then the patients who had 6/12 vision in any eye with best possible correction whose vision is not even improved by pinhole were selected for the study. The children with squint, prior eye surgery and other ocular diseases were excluded. All the observations along with demographic information of patients were noted on a pre-designed Proforma. Data was analyzed by using SPSS version 21.

Results:

Out of total 155,776 children, 6043 children (03.87%) were diagnosed having refractive errors. Out of these 6043 children with different refractive errors, Amblyopia was diagnosed in 118 out of 6043 children, using a visual criterion of 20/30 or less on Snellen charts (Table n. 1). The Amblyopia prevalence was 01.95% (95% confidence interval) with significant variation ($p<0.001$) across various age groups. There were 54(45.76%) males and 64(54.23%) were females (Table No. 2). Age distribution revealed that maximum cases of Amblyopia were seen in 13-16 years age group 59(50.0%), followed by 9-12 years age group 54(45.76%) and 5(4.23%) in 5-8 years age group (Table No. 3).

Table No. 1: Percentage of amblyopia in various age groups

Age in Years	Amblyopia	Percentage
5-8 yrs.	5	4.23%
9-12 yrs.	54	45.76%
13-16 yrs.	59	50.0%
Total	118	100.0%

Table No. 2: Percentage of amblyopia in both genders

Gender	Amblyopia	Percent	Valid Percent	Cumulative Percent
Male	54	45.76	45.76	45.76
Female	64	54.23	54.24	54.24

Table No. 3: Percentage of amblyopia in various age groups among both genders

Gender	Age	Amblyopia	Percentage
Male	5-8 yrs.	5	9.25%
	9-12 yrs.	24	44.44%
	13-16 yrs.	25	43.85%
Total		54	100.0%
Female	5-8 yrs.	0	0%
	9-12 yrs.	30	46.87%
	13-16 yrs.	34	53.12%
Total		64	100.0%

Discussion:

Out of total 155,776 children, 6043 children (03.87%) were diagnosed having refractive errors. These results are comparable with a study done by Kalikivayi et al. who reported 3.1% undiagnosed refractive errors.[6] The results of our study are much lower as compared to Padhye AS et al. whose cluster-weighted prevalence of uncorrected refractive error in urban and rural children was 5.46% (95% CI, 5.44-5.48) and 2.63% (95% CI, 2.62-2.64), respectively.[7]

The prevalence of Amblyopia in our study was 01.95% (95% confidence interval: 0.64%-0.83%) with significant variation ($p<0.001$) across age groups. This is comparable to a study done in Northern Mexico where prevalence of Amblyopia was found to be 2.5%., Gupta et al. who showed a prevalence of 1.39% of participants and 1.1% by Jarwal et al.[3,8, 9] This Prevalence is higher as compared to 0.41% depicted by Singh et al. and 0.74% (95% confidence interval, 0.64-0.83) shown by Xiao O et al.[10, 11] However, there are certain studies which have shown a higher prevalence of Amblyopia including 12.9% in Nigeria, 5.97% shown by Karki, 8.6% by Gupta et al and 7.53% in

Malaysia.5 [1,2,5, 12] This may be attributed to ethnic variation in Amblyopia prevalence. Amblyopia was more prevalent in females in our study i.e. 54.23% as compared to 45.76% males. Similar results with female pre dominance was observed in Iran and Minia County.[13,14]This is in contrast to Karki et al who showed Amblyopia more in males 57.14% as compared to and 42.86% females1 and Gupta et al Male 66.66% was more amblyopic than female 33.33%.3 In 2 studies, Amblyopia had no association with age or gender. [4,9]

Age distribution revealed that maximum cases of Amblyopia were seen in 13-16 years age group (50.0%), followed by 9-12 years age group (45.76%) and (4.23%) in 5-8 years age group. These results are comparable with another study in which the mean age was 11 (±3.16) years.[3] Similarly in another study by Cherian et al Amblyopia was commonly observed in Pediatric Population between the group of 11 – 13 years.[15] In contrast a younger age was shown by Gupta M where, 51.61% cases presented between 5-10 years2 and Malaysian study showed a mean age of 5.03 years (SD:0.77).[5]

Conclusion:

Significant prevalence of amblyopia in school going pediatric population with refractive errors show inadequacy of present school screening programs in Azad Kashmir, Pakistan. Initiation and regular implementation of such programs in pediatric population will lead to early detection as well as management of amblyopia.

Recommendations:

A preschool and school screening program in children must be implemented to detect amblyopia during initial development and treat them promptly, by optical correction and Amblyopia therapy in an effective manner.

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Competing interests: The authors declare that they have no competing interests.

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