ISSN 1990-3863

A
S
J
O

Al-Shifa
Journal of Ophthalmology

Vol. 18, No. 2, April – June 2022

QUARTERLY PUBLISHED

Logo

Abstracts available at http://www.alshifa-eye.org.pk/Journal.php and
http://www.pakmedinet.com/ASJO
Manuscript submission through online platform ejmanager.com

Indexed in Index Medicus -EMR

Recognized by Pakistan Medical & Dental Council – IP/033

Al-Shifa Journal of Ophthalmology

A Journal of
Al-Shifa Trust Eye Hospital, Rawalpindi

Aims and Scope: ASJO, the official journal of Al-Shifa Trust Eye Hospital, Rawalpindi, publishes original reports of research in Ophthalmology mostly in the form of clinical studies. Topics may include new diagnostic and surgical techniques, treatment methods, atypical case reports, major and mini-reviews, preventive ophthalmology including health economics and applied research findings.

Inquiries or comments regarding the journal may be directed to the editorial board, anonymously if so desired. Addresses of board members may be obtained from the editorial office or official website of Al-Shifa Trust; www.**alshifaeye**.org

Information for Authors

Authors are required to enclose the following statement, properly signed, with the manuscript at the time of submission.

"In consideration of the Al-Shifa Journal of Ophthalmology's taking action in reviewing and editing my (our) submission, the author(s) undersigned hereby transfer(s), assign(s), or otherwise convey(s) all copyright ownership to the Al-Shifa Journal of Ophthalmology in the event that such work is published by the Al-Shifa Journal of Ophthalmology".

Type **DOUBLE-SPACE** on 8½ x 11- inch white sheets, leaving ONE INCH margin on ALL SIDES. Arrange contents as follows:

1. **TITLE PAGE** should be numbered as page 1 and should have on it only (a) the title, (b) name(s) of author(s), (c) the institution(s), (d) address for reprints and inquiries, and (e) the name(s) of sponsoring organization(s) - NOTHING ELSE.
2. **ABSTRACT** should be the only material on page 2. It should be no more than 250 words. Give here the author's OWN exact data, amount, percentages, etc., as presented in the paper and the conclusions drawn there from. Use "active voice" in writing.
3. **TEXT** of the articles should be divided in sections of**:** (A) INTRODUCTION**,** (B) PARTICIPANTS AND METHODS (or CASE REPORT), (C) RESULTS and (D) DISCUSSION. Write the whole paper in "active voice" and avoid "passive voice".
4. **ACKNOWLEDGEMENT:** Keep these to an absolute minimum, and be specific, e.g., "thanks are due to Mr. …for Fig.2".
5. **REFERENCES** should be consecutively cited in the body of the paper and listed at the end in the same order following Vancouver citation style [For Journal Articles; Author(s)-Family name and initials. Title of article. Title of journal –abbreviated Publication year, month, day (month & day only if available); volume(issue):pages]

Each listed reference must give full title of the paper or book and the names of ALL the authors and don't use 'et al'. Adhere to the following style in typing them.

FOR ARTICLES:

1. Afghani T, Qureshi N, Chaudhry KSA. Screening for Diabetic Retinopathy: a comparative study between hospital and community-based screening and between paying and non-paying. J Ayub Med Coll Abbottabad. 2007; 19; 16-22.
2. Cochereau I, Goldschmidt P, Goepogui A, Afghani T, Delval L, Pouliquen P, Bourcier T, Robert PY. Efficacy and safety of short duration azithromycin eye drops versus azithromycin single oral dose for the treatment of trachoma in children - a randomised, controlled, double-masked clinical trial. Br J Ophthalmol. 2007; 91:667-72.

(Reconfirm the spelling of names, Vol. pages, year, title, etc.).

FOR BOOKS

1. Newell FW: Ophthalmology: Principles and Concepts. 6th ed., St. Louis. C.V. Mosby Company, 1986, p.73.
2. Duke- Elder S, and Leigh AG: Diseases of the Outer Eye. Cornea and Sclera. In Duke-Elder S (ed): System of Ophthalmology, Vol. 8, Part 2. St. Louis C.V. Mosby Company, 1965, pp.110-114.

(Recheck publisher, City, etc.).

FOR CITING FROM INTERNET SOURCES

Step 1: Name the author, last name first. If no author is listed, then skip this step.
Step 2: Put the title of the work next. This is not the title of the website but the title of the page within the website that you are accessing. Put this information in quotation marks.
Step 3: Place the title of the overall website next and underline it. Look at the web address or find the link to the homepage in order to find the title.

Step 4: List the publication information. Most articles (or web pages) have a “last updated” date if you can’t find an actual date for the specific article you are quoting.
Step 5: Include the date of access. This is the date you accessed the Internet source.
Step 6: Place the URL (the website address) at the end of the citation. Copy and paste the URL so that you ensure you have it down accurately.
Step 7: Check your Internet citation for accuracy. The final Internet source citation should look like this:
Structure:
Author or originator. Title of item. Title of website [Online] Date of document or download (day, month, year). URL <http://address/filename>
Example:
U.S. Census Bureau. "American Fact Finder: Facts About My Community." [Online] 17 Aug 2001. <http://factfinder.census.gov/servlet/BasicFactsServlet>.

6. **FIGURES** should be numbered in order of appearance in the text. Each figure should have pasted on its back a label with (1) figure’s number, (2) the last names of authors, and (3) an arrow indicating the top of the figure. Nothing else should be written or pasted on the back of the figure or a photograph. Legends of the figure should be typed DOUBLE-SPACED on a SEPARATE SHEET, and should include description of features shown, name of author, name of structures, kind of stain, magnification, etc. Example

Figure 1 (Haq, Afghani, and Qadir). Right eye. Histologic section of tumor, spindle-B type malignant epithelioid cells at the right upper corner, (Hematoxyline and eosin x 400).

7. **TABLES:** should be typed DOUBLE-SPACED, with NOTHING underlined TRIPLE-CHECK all numbers and percentages.

Previously published material and figures should include permission to reproduce from original publication and original author. Photographs with faces should be accompanied by permission to publish from the subject of the photograph or by a parent in case of minor. Photographs should be color printed.

THE JOURNAL only accepts manuscripts in ENGLISH

Type EVERYTHING double-spaced, and underline nothing. An abbreviated title of four or less words, the last names of the authors and the page number should be provided in the upper right-hand corner of all pages. DON’T use abbreviations. DOUBLE-CHECK the number and percentages in tables. Incomplete manuscripts will not be acknowledged, and those received without duplicate will be returned to the authors. Papers will be accepted on the understanding that these are not simultaneously being submitted to any journal or publication, and that these have not been previously published. All papers will be subject to reviews by referees and, if necessary, to revisions. THE JOURNAL will also consider for publication, letters, short notes, useful diagnostic and therapeutic tips, announcements, and interesting photographic documentation.

Al-Shifa Journal of Ophthalmology accepts manuscript submissions through ejmanager.com online submission platform. For submission of manuscripts authors should register an account using the link http://www.ejmanager.com/my/ajo/

Al-Shifa Journal of Ophthalmology

Editorial inquiries should be addressed to Prof. Dr. Tayyab Afghani, Department of Orbit and Oculoplastics, Al-Shifa Trust Eye Hospital, Jhelum Road Rawalpindi, Pakistan.
Tel: 0092 51 5487820-25, Fax: 0092 51 5487827: Email:aqrcpio@yahoo.com ;
Web site: www.alshifaeye.org.pk

EDITORIAL

Minimally Invasive Glaucoma Surgery (MIGS)- Choices and Challenges

Mahmood Ali

Although medicines are usually considered the first line of therapy to treat glaucoma, there are several barriers that may limit their long-term utility despite of achievement of an initial favorable response. These barriers include noncompliance, intolerance due to medication side effects, financial constraints limiting access to medications, or physical inability to properly administer eye drops.[1] However, with the advent of minimally invasive glaucoma surgery (MIGS), the unmet need for alternate safe treatment options is expected to be fulfilled.

The term MIGS encompasses a variety of procedures that work in numerous of ways to help aqueous drain from the eye using a variety of devices. Various factors may be involved in decision making regarding the choice of MIGS devices for a particular case. Specific devices work for various stages of glaucoma which needs to be considered while selecting the device.

For early to moderate glaucoma iStent a silicon tube is inserted into the subconjunctival space or Hydrus Microstent which stents the Schlemm's canal are used. There are other devices that help to improve suprachoroidal outflow like CyPass which has now been withdrawn by the manufacturer.

The PreserFlo is an ab-externo micro shunt that can be used on its own or in conjunction with phacoemulsification and produces a bleb under the conjunctiva and Tenon. The design of the PreserFlo implant has a fin that helps to prevent migration of the implant into the anterior chamber as well as reduce any risks of peri-implant leak. It is very rare to encounter persistent hypotony after this surgery while the sub-tenon placement of the device and its length ensures that the bleb is posterior, and patients are less likely to complain of bleb dysesthesia compared with trabeculectomy blebs. PreserFlo micro shunt may be offered to patients with moderate to severe medically uncontrolled glaucoma. The device may also be paired with cataract surgery though the risk of subconjunctival scarring may be high in such cases.

The XEN gel implant is a 6-mm hydrophilic flexible tube with a 45-micron lumen made of porcine collagen-derived gelatin cross-linked with glutaraldehyde, which is noninflammatory[1] and causes minimal extraocular fibrotic response to the implant material. The implant decreases IOP by creating a permanent drainage shunt from the anterior chamber to the subconjunctival space through a scleral channel. The flexibility of the device mitigates many of the issues seen with synthetic materials such as migration, erosion and corneal endothelial damage.

The MINIject implant is shown to deliver safe, meaningful and sustained control of intraocular pressure by creating an alternate drainage pathway from the anterior chamber to the supraciliary space. Supraciliary drainage is associated with a higher risk of complications, including hypotony so should be reserved for the patients suffering from advanced glaucoma.

A novel, valveless glaucoma drainage device, the Paul Glaucoma Implant has

been developed to reduce complications seen in some other drainage devices like endothelial cell loss, hypotony, and tube erosions. The implant has shown to significantly reduce the IOP with a better safety profile as compared to conventional drainage devices.[2]

There are certainly some technical challenges involved with implanting some MIGS devices. The surgeon has to master the skills of intraoperative gonioscopy and learn to adjust the microscope which needs to be tilted by a certain angle to view the angle structure. Moreover, results of implants like MINIject which direct the aqueous to supraciliary space might be affected due to scarring in the subconjunctival space since wound healing may not be reduced in such cases with anti-metabolites. Longer follow-up periods will be needed to assess the durability and long-term safety of these MIGS devices in comparison with existing traditional glaucoma surgeries.[2] Additionally availability of these costly devices to the glaucoma patients in developing countries is a major issue of concern which definitely needs a collaborative effort between government and non-governmental organizations.

References:

1. Saheb H, Ahmed IIK. Micro-invasive glaucoma surgery: current perspectives and future directions. *Curr Opin Ophthalmol*. 2012;23:96–104.

2. Kerr NM, Wang J, Barton K. Minimally invasive glaucoma surgery as primary stand-alone surgery for glaucoma. *Clin Exp Ophthalmol*. 2017;45(4):393-400.

ORIGINAL ARTICLE

Topography Patterns In Keratoconus Observed at Al-Shifa Trust Eye Hospital Rawalpindi

Warda Ali[1], Rabia Sharif[1], Faheem Ullah Khan[1], Shama Khan[1]

ABSTRACT

PURPOSE: To determine the frequency of the patterns of topography in keratoconus in Pakistani population

Methods: A retrospective observational study carried out in Al-Shifa Trust Eye Hospital Rawalpindi included 452 eyes of 226 patients with diagnosed bilateral keratoconus without any treatment, from January 2018 to December 2021. There were 114 (25.2%) female and 112 (24.8%) males with mean age 12.6 ± 8.3 years. For all eyes, topographic patterns of the axial power maps, anterior and posterior elevation maps and pachymetry maps were obtained using Galilei G4.

RESULTS: Out of 452 eyes there were 40.3% with symmetric patterns and 59.6% with asymmetric patterns. Oval pattern cone was commonly observed pattern (28.8%) and irregular was the least observed 2.2%. SRAX was observed in 5.7 % of eyes.

CONCLUSION: The distribution of topographical patterns in keratoconus are almost like Iranian population. Patterns with SRAX were 5.7% which showed that keratoconus prevalence may be high in our population. *Al-Shifa Journal of Ophthalmology 2022; 18(2): 55-59 .*

Introduction:

Corneal topographic patterns were investigated in literature in healthy individuals to find out distribution in various populations. Elevation based techniques (slit beam scanning in Orbscan and Scheimpflug camera in pentacam) and corneal topography methods have been used widely for refractive correction and diagnosis of corneal ectatic disorders.[1–4] Keratoconus is corneal ectasia in which there is progressive corneal protrusion and thinning resulting in irregular astigmatism. Incidence of keratoconus in Caucasians is 4.4:1 and it is 7.5 times higher in Asian population. [5] The classification of patterns of topographic maps was proposed by Rabinowitz et al. The patterns includes round, oval, superior steep (SS), inferior steep (IS), asymmetric bowtie (AB) with SS, AB with IS, AB with skewed radial axis (SRAX), symmetric bowtie (SB), SB with SRAX and irregular. [2] These patterns have been widely discussed in literature and some are considered as normal. Classification gained importance in differentiating diseases like keratoconus and pellucid marginal degeneration from normal and help in planning corneal surgeries like refractive based procedures and other treatments for ectatic disorders. When frequency of normal pattern in specific population is known then the probability of being abnormal in individual patient can be estimated. [6]

1. Al-Shifa Trust Eye Hospital Rawalpindi

Originally Received: 8 January 2022
Revised: 15 February 2022
Accepted: 27 February 2022

Correspondence to:
Dr. Warda Ali
Senior Registrar
Al-Shifa Trust Eye Hospital Rawalpindi

There are several studies in literature that have assessed the corneal topographic patterns (CTP) in healthy adults.[3,4,7–12] Little is known about distribution of patterns in children. Considering the importance of topography in detection of patterns in keratoconus, our aim was to utilize it in evaluation of patterns in Pakistani population which are diagnosed with delay and most commonly children have advanced disease when diagnosed that rapidly progresses as compared to adults[13]. This study will also guide us about rigid gas permeable contact lens fitting[14].

Materials and Methods:

A retrospective observational study was conducted in cornea department of Al-Shifa Trust eye Hospital Rawalpindi from January 2018 to December 2021. The study sample included 452 eyes of 226 patients with age 6 to 35 years. All patients were diagnosed cases of bilateral keratoconus without any treatment in either eye. Exclusion criteria were history of cataracts, glaucoma, use of contact lenses, Axial maps with no clear central 6 mm zone of cornea and trauma cases. Corneal topography was done with Galilei (G4) and classification of patterns suggested by Rabinowitz was used including symmetric (round, oval, symmetric bow tie) and asymmetric patterns (SS, IS, irregular, SB-SRAX, AB-SS, AB-IS, and AB-SRAX). Ethical committee of Al-Shifa Trust Eye Hospital approved the study.

Descriptive results were reported for 452 eyes. Data was analyzed for age (mean and standard deviation) and gender (frequency and percentages). Corneal topographic patterns were analyzed for frequency and percentages.

Results:

Out of the 226 patients with 452 eyes there were 112 (24.8%) males, and 114 (25.2%) females. Mean age was 12.6±8.2 years. There were 40.3% with symmetric patterns and 59.6% with asymmetric patterns. The most common CTP was oval cone whereas AB with SRAX and irregular patterns were least. Among asymmetric patterns bow tie were less common as compared to non-bow tie patterns. Inferior steep was in higher percentage as compared to superior steep. Among bow-tie patterns AB with IS has high percentage and AB with SS, SRAX with SB and AB were less common. (Table1). The percentages of patterns are represented in bar chart.

Figure 1: Bar chart showing valid percentage of each pattern

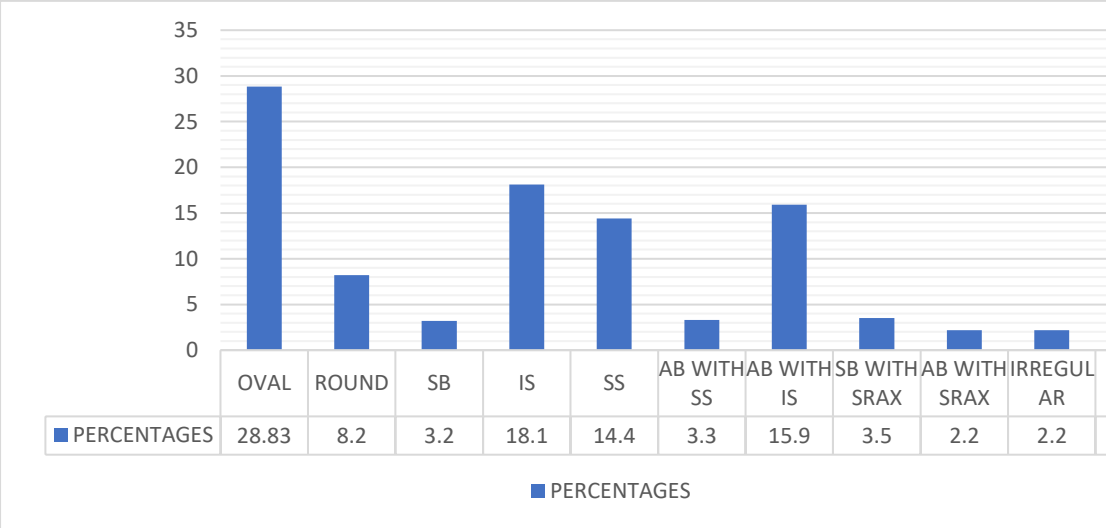


Table 1: Patterns of topography

Topographic pattern	Frequency	Percentage %
Symmetric		
Oval	130	28.8
Round	37	8.2
Symmetric bow tie	15	3.3
Asymmetric		
Superior steep	65	14.4
Inferior steep	82	18.1
AB with SS	15	3.3
AB with IS	72	15.9
SB with SRAX	16	3.5
AB with SRAX	10	2.2
Irregular	10	2.2

Discussion:

With the evolution and widespread use of refractive surgical techniques like astigmatic keratotomy, photorefractive keratectomy, there is a need for precise and detailed information regarding corneal surface mapping. Detailed analysis of normal and keratoconus topography helps in better understanding the corneal surface abnormality and further helps in timely treatment. Early diagnosis of abnormal corneas is possible when CTP is known. It will help clinicians in identifying children who are susceptible to keratoconus.[8]

In this study we look for patterns of topography in keratoconus in Pakistani population to see which pattern is most common by using Galilei (G4). The results of the current study provide ophthalmologists with thorough information regarding the distribution of CTPs in our Pakistani population, which can be utilized for better interpretation of the corneal topographic results[16]. The problem arises when comparing results of different studies because different instruments were used for determination of CTPs and leads to variation in results [8].

In general, oval patterns (28.8%) were dominant in Pakistani population. Next to the oval pattern was inferior steep (18.1%) followed by AB with IS (15.9%), superior steep (14.4%), round (8.2), SB with SRAX (3.5%), AB with SRAX and irregular were the rare patterns found (2.2%).

In our study Bow tie patterns with SRAX was high that was obvious for these rare patterns as Rabinowitz et al reported only 2% of these patterns.[2] Also shown by results of Hassan Hashemi in Tehran that

SRAX patterns were more than 12% of studied population(1). In study by Kadhum et al the asymmetric bowtie with SRAX and asymmetric bowtie with inferior steep (24.4 % and 15.9%) were the most common topographic patterns followed by round and irregular (15.9% and 11.7%) respectively in Iraqi population[16].

Study by Hassan Hashemi in Tehran also concludes that commonest pattern were oval (32.7%) followed by asymmetric bowtie with superior steepening (AB-SS) (14.5%) whereas the rarest patterns were AB with skewed radial axis (AB-SRAX) (0.1%) [1]. Fatemi Alipour evaluated topographic patterns in Iranian population and investigated its correlation with refractive error. The most frequent topographic patterns were symmetric bowtie (SB) (34%), SB with inferior steepening (SB-IS) (14.1%), and round (10.5%). The most frequent pattern for the (emmetropia, myopia, and hyperopia) was SB with frequencies 32.7%, 35.8%, and 22.5%, respectively. None of the studied participants had keratoconus. This concludes that patterns might be related to refractive status of the eye. [6].

Bogan and coworkers tested American population for both ametropic and emmetropic eyes by using videokeratography that depends on color coded topographic maps. The common patterns in their study was asymmetric bowtie (32%), followed by round (22%), oval (21%) symmetric bow tie (18%) and irregular (7%) pattern[3]. H C Kim studied 200 normal corneas and found that symmetric and asymmetric bow tie patterns were the most common (33.0%, and 32.5%, respectively) in Korean population, followed by oval (14.5%), irregular (12.5%), and round (7.5%) patterns. And also compared it with astigmatism and p value was <0.01. [17]

In general, prevalence of different CTPs varies in different populations. The reported prevalence for most common CTPs are SB(8,18) ,AB(3) and round(10). So, this information provides standards of topographical patterns in keratoconus in Pakistani population and up to my knowledge it is the first study in Pakistan.

Limitations of this study are data was not stratified for age and gender. Relationship of CTP with corneal pachymetry and astigmatism and frequency of refractive errors were not considered.

Conclusion:

The distribution of topographical patterns in keratoconus are almost like Iranian population. Patterns with SRAX were 5.7% which showed that keratoconus prevalence may be high in our population. More profound regional studies are needed to establish the reliable prevalence rate of keratoconus and its etiologic background.

References:

1. Hashemi H, Beiranvand A, Khabazkhoob M, Fotouhi A. Corneal Topography Patterns in the Tehran Eye Study: Warning About the High Prevalence of Patterns with A Skewed Radial Axis. Middle East Afr J Ophthalmol. 2014;21(1):72–6.
2. Rabinowitz YS, Yang H, Brickman Y, Akkina J, Riley C, Rotter JI, et al. Videokeratography database of normal human corneas. Br J Ophthalmol. 1996 Jul;80(7):610–6.
3. Bogan SJ, Waring GO, Ibrahim O, Drews C, Curtis L. Classification of normal corneal topography based on computer-assisted videokeratography. Arch Ophthalmol Chic Ill 1960. 1990 Jul;108(7):945–9.
4. Kanpolat A, Simşek T, Alp NM. The evaluation of normal corneal topography in emmetropic eyes with computer-assisted videokeratography. CLAO J Off Publ Contact Lens Assoc Ophthalmol Inc. 1997 Jul;23(3):168–71.

5. Naz S. The incidence of keratoconus and its association with ocular disorders in Lahore population. Pure Appl Biol. 2019 Mar 10;8.
6. Alipour F, Bazvand F, Jafari F, Abdi P, Samet B, Kabir A, Poustchi H. Correlation between Corneal Topographic Patterns and Refractive Status of the Eye in an Adult Iranian Population: Tehran Study. J Curr Ophthalmol. 2020 Dec 12;32(4):349-354.
7. Topuz H, Ozdemir M, Cinal A, Gumusalan Y. Age-related differences in normal corneal topography. Ophthalmic Surg Lasers Imaging Off J Int Soc Imaging Eye. 2004 Aug;35(4):298–303.
8. Alvi NP, McMahon TT, Devulapally J, Chen TC, Vianna MA. Characteristics of normal corneal topography using the EyeSys corneal analysis system. J Cataract Refract Surg. 1997 Aug;23(6):849–55.
9. Buehren T, Collins MJ, Loughridge J, Carney LG, Iskander DR. Corneal topography and accommodation. Cornea. 2003 May;22(4):311–6.
10. Fuchihata M, Maeda N, Toda R, Koh S, Fujikado T, Nishida K. Characteristics of corneal topographic and pachymetric patterns in patients with pellucid marginal corneal degeneration. Jpn J Ophthalmol. 2014 Mar;58(2):131–8.
11. Goto T, Klyce SD, Zheng X, Maeda N, Kuroda T, Ide C. Gender- and age-related differences in corneal topography. Cornea. 2001 Apr;20(3):270–6.
12. Liu Z, Xie Y, Zhang M. [Corneal topography and pachymetry in normal eyes]. Zhonghua Yan Ke Za Zhi Chin J Ophthalmol. 2001 Mar;37(2):125–8.
13. Sonmez B, Doan MP, Hamilton DR. Identification of scanning slit-beam topographic parameters important in distinguishing normal from keratoconic corneal morphologic features. Am J Ophthalmol. 2007 Mar;143(3):401–8.
14. Bufidis T, Konstas A, Mamtziou E. The role of computerized corneal topography in rigid gas permeable contact lens fitting. CLAO J Off Publ Contact Lens Assoc Ophthalmol Inc. 1998 Oct 1;24:206–9.
15. Padmanabhan P, Radhakrishnan A, Venkataraman AP, Gupta N, Srinivasan B. Corneal changes following collagen cross linking and simultaneous topography guided photoablation with collagen cross linking for keratoconus. Indian J Ophthalmol. 2014 Feb;62(2):229–35.
16. Kadhum A, Layikh H, Attar H. Topographical Patterns of Keratoconus in Iraq. Ann Trop Med Public Health. 2020 Jan 1;23.
17. Kim HC, Chang SD. Relationship between topographic patterns and corneal astigmatism in Korean adults. Korean J Ophthalmol. 2003 Dec 30;17(2):91–6.
18. Liu Z, Huang AJ, Pflugfelder SC. Evaluation of corneal thickness and topography in normal eyes using the Orbscan corneal topography system. Br J Ophthalmol. 1999 Jul;83(7):774–8.

Authors Contribution

Concept and Design: Warda Ali
Data Collection / Assembly: Warda Ali, Rabia Sharif
Drafting: Warda Ali, Rabia Sharif
Statistical expertise: Faheem Ullah Khan
Critical Revision: Shama Khan

ORIGINAL ARTICLE

Oculosystemic Associations and Surgical Complications of Congenital Cataracts: A Four-Year Review

Aamna Jabran[1], Zeeshan Hameed[2], Usama Iqbal[2], Muhammad Rizwan Khan[3], Fuad Ahmad Khan Niazi[3], Muhammad Sharjeel[4]

Abstract:

Purpose: To study the ocular and systemic associations as well as complications related to congenital cataracts presenting in a tertiary care setup of Punjab.

Study Design: Cross-sectional study

Place and Duration: Department of Ophthalmology, Holy Family Hospital, Rawalpindi from 1st January 2011 to 31st December 2014.

Material and Methods: A retrospective review, of all the patients who were operated for congenital cataracts, was performed. A total of 167 patients with all types of congenital cataracts were included in this study with particular emphasis on oculosystemic associations and complications of cataracts. All patients were subjected to meticulous history taking, ocular and systemic examination, investigations and pediatrician consults. Data readings were analyzed using SPSS v. 25.0.

Results: Out of 167 patients 92 (55.08%) were males and 75 (44.92%) were females. Most common age of presentation was between 6 to 10 years. Most cataracts were bilateral in 135 (80.83%) patients. Nystagmus was noted in 10 (5.98%), strabismus in 6 (3.58%), microphthalmia in 4 (2.39%) and raised IOP in 2 (1.19%) each. Most commonly noted complication of congenital cataract surgery was posterior capsular opacification (PCO) in 30 (17.96%) cases followed by posterior synechiae formation in 8 (4.79%).

Conclusion: Nystagmus and strabismus are most common ocular while mental retardation is most likely systemic association of congenital cataract and posterior capsular opacification is the most common complication of congenital cataract surgery. *Al-Shifa Journal of Ophthalmology 2022; 18(2): 60-67.*

1. *Ameer ud din Medical College / Lahore General Hospital, Lahore.*
2. *Gujranwala Medical College / DHQ Teaching Hospital, Gujranwala.*
3. *Holy Family Hospital, Rawalpindi.*
4. *Gomal Medical College / Mufti Mehmood Teaching Hospital, Dera Ismail Khan.*

Originally Received: 19 January 2022
Revised: 23 February 2022
Accepted: 8 March 2022

Correspondence to:
Dr. Muhammad Sharjeel
Department of Ophthalmology,
Gomal Medical College / Mufti Mehmood Teaching Hospital, Dera Ismail Khan,

Introduction:

Congenital cataract is one of the major causes of preventable blindness in children across the world, roughly accounting for about 5-20% of total cases.[1] Worldwide demographic studies show that around 1.4 million children are suffering from blindness due to various reasons and among them, 0.19 million have cataract as the main culprit for blindness.[2] The prevalence of pediatric cataracts is estimated to be 3 in 10,000 live births but these numbers vary in different Asian regions.[3] Generally speaking, cataracts in children can be congenital, developmental or traumatic.[4]

Congenital cataracts usually present at or shortly after birth, developmental cataracts generally manifest themselves after age of

2 years and traumatic cataracts can present at any age. Early diagnosis and treatment are essential for the visual rehabilitation of children because if left untreated, it leads to physical, social, psychological and economical limitations.

There seem to be multiple factors involved in development of congenital cataract although a complete understanding of these mechanisms is still unknown. Among most important factors is Genetics. Up to one half of pediatric cataracts seem to be genetic and one third being familial in origin.[5] These types of cataracts originate from genetically altered mechanisms in crystalline lens and its surrounding tissues. Other causes of pediatric cataracts include sporadic, intrauterine infections and enzyme deficiencies.[6] The identification of cause directly affects treatment of cataract. Ocular and systemic associations of congenital cataracts are very important in determining management plans as well as long term prognosis of disease. Other worth mentioning parameters are type of cataract, its laterality and complications both related to cataract itself as well as surgical procedure performed to extract it, although recent advances in surgical techniques in pediatric ophthalmology has reduced postoperative complications to a great extent.[7]

In this study, we are demonstrating ocular and systemic associations as well as postoperative complications of congenital cataracts presenting to our ophthalmology department.

Materials and Methods:

Our cross-sectional study included patients with congenital/infantile cataracts who presented to department of Ophthalmology at Holy Family Hospital, Rawalpindi from 1st January 2011 to 31st December 2014 (4 years duration). A total of 167 patients were included in this study ranging in age from 1 month to 34 years. The sample size was estimated using 95% confidence interval and 80% power of test using WHO sample size calculator. Non-probability purposive sampling technique was followed. All the patients with visually significant cataracts without previous history of trauma were enrolled in this study while patients who had any prior history of trauma, active ocular infection, pre-operative raised IOP or corneal opacities were excluded from this study. All patients had to undergo detailed history taking, complete ocular examination including visual acuity or torch examination for fixation/following and pupillary responses (according to age), direct ophthalmoscopy for red fundus reflex, slit-lamp examination for morphological details/type of cataracts, fundoscopy and posterior segment evaluation, B-scans, retinoscopy and other investigations which were necessary for some like biometry. Systemic examination was also carried out to rule out any systemic disease as a part of study as well as for general anesthesia fitness. Informed consent was taken using standard questionnaires.

All patients underwent Irrigation and Aspiration of cataract with or without intra-ocular lens implantation followed by aphakic/ pseudophakic correction (when required). All patients were called for pre-operative work up 1 day before surgery and postoperative follow-up was done on 1st post-op day, 1 week after surgery and 1 month after surgery. Ocular and systemic associations and postoperative complications were noted and analyzed. Data readings were saved on Excel Sheet and analysis was performed using Statistical Package for Social Sciences Version 25.0.

Results:

Total number of patients included in this study were 167 (n=167, 100%), out of which 92 (55.08%) were male and 75(44.92%) female. (Table 1) All patients were divided into different age groups as well. Patients with age less than 1 year were

37 (22.15%) out of which male=20 and female=17. Patients with age between 1 and 5 years were 37 (22.15%) among which male=28 and female=9. Patients in age group 6-10 were 40 (23.95%) male=21 and female=19, age group 11-15 were 28 (16.76) male=11 and female=17, age 16-20 were 13 (7.765) male=7, female=6 and in age group more than 20 were 12 (7.18%) male=5 and female=7. Most common age of presentation was between 6-10 year group. (Table 2) Out of 167, intra-ocular lens (IOL) was implanted in 118 (70.65%) patients while 49 (29.35%) patients were left aphakic.

While looking at the ocular associations of congenital cataracts in our study group, bilateral cataract was found to be in 135 (80.83%) patients. Other notable associations were contralateral pseudophakia and aphakia in 39 (23.35%) and 24 (14.37%) respectively, nystagmus in 10 (5.98%), exotropia and esotropias in 5 (2.99%) and 1 (0.59%), microphthalmos in 4 (2.39%), keratoconus, iris atrophy, tilted disc and raised IOP each in 2 patients (1.19%) while 134 (80.23%) patients had no significant ocular association. (Figure 1)

25 (14.97%) out of 167 patients had delayed milestones, patients with Down's syndrome, hearing disability and vitiligo/poliosis were 2 (1.19%) each. 2 (1.19%) patients had sound history of TORCH infections and no systemic association was found in 134 (80.23%) patients. (Figure 2)

Postoperative complications were noted more in pseudophakic patients than in aphakics. These included posterior capsular opacification (PCO) in 30 (17.96%), posterior synechiae formations in 8 (4.79%), raised IOP in 4 (2.39%), IOL capture in 3 (1.79%), retinal detachment in 2 (1.19%), corneal decompensation and anterior synechiae formation in 1 (0.59%) each. 118 (70.65%) patients reported no postoperative complications. (Figure 3)

Table 1: Frequency Distribution of Gender

Gender	**Frequency** (n=167)	**Percentage** (%)
Male	92	55.08
Female	75	44.92
Total	**167**	**100**

Table 2: Frequency Distribution of Age

Gender	**Age of Patient (**years**)**						**Total**
	<1	**1-5**	**6-10**	**11-15**	**16-20**	**>20**	
Male	20	28	21	11	07	05	**92**
Female	17	09	19	17	06	07	**75**
Total	**37**	**37**	**40**	**28**	**13**	**12**	**167**

Figure 1: ***Ocular Associations of Congenital Cataract***

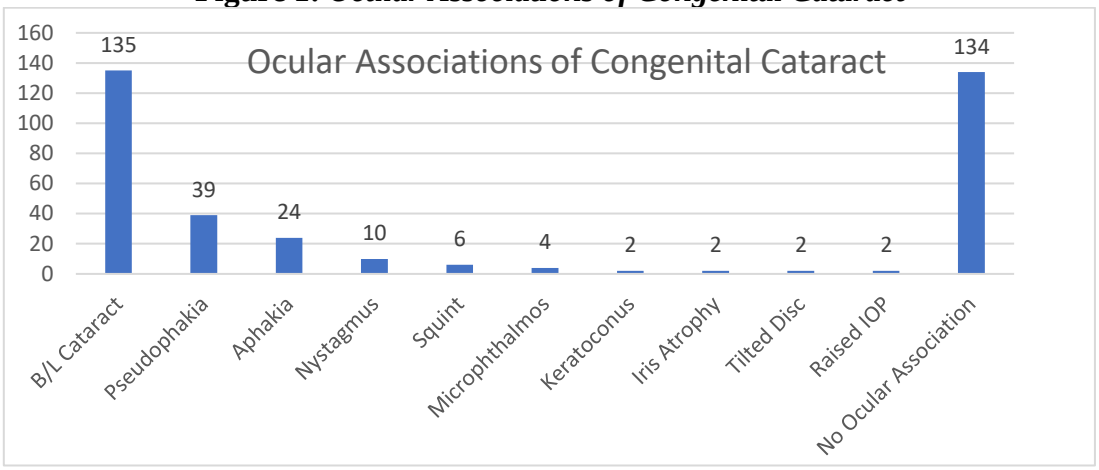


Figure 2: ***Systemic Associations of Congenital Cataract***

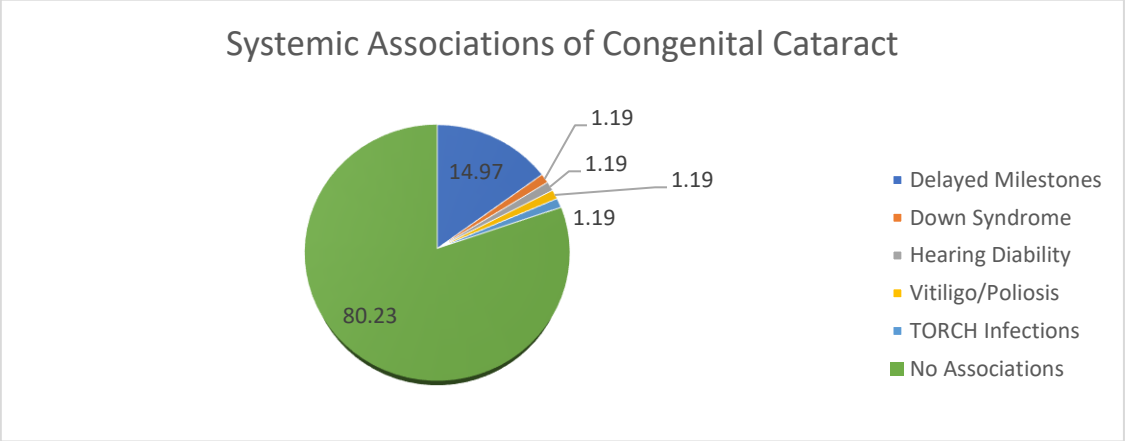
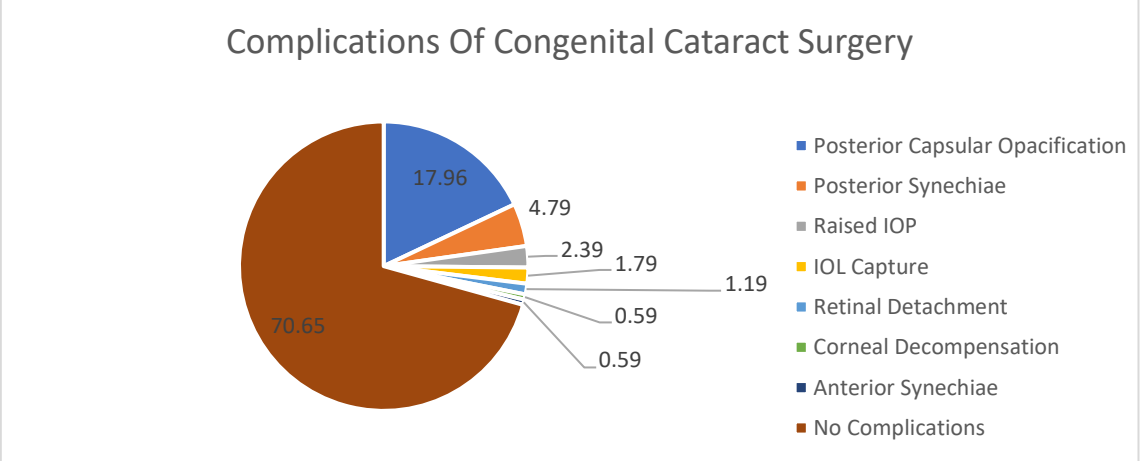


Figure 3: ***Complications of Congenital Cataract Surgery***



Discussion:

Congenital cataract is one of the major causes of childhood blindness. Morphologically, congenital cataracts range from visually insignificant blue dots to fully mature cataracts. Visually significant cataracts can affect visual pathways so much as to lead deprivation amblyopia. Although among all the diseases than can affect human body, cataract is not that common but still it strikes a significant number of individuals both in developed and developing countries. The reason behind most of the cataracts formation is still unknown although different theories have been

postulated. By 2020, early diagnosis and treatment of congenital cataract was major component of eliminating global blindness initiative by WHO.[8]

So far, in the entire world, surgical removal of cataractous lens is the only definitive treatment available for congenital cataract. Ideally, congenital cataracts should be operated before the age of 3 months.[9] This early intervention is very important regarding final visual prognosis. Early the surgical intervention, the less is the risk of development of sensory deprivation amblyopia. The outcome of congenital cataract surgery is already 20 times worse than that of developmental cataract especially if surgery is performed after 1 years of age.[10] This is specifically more important in bilateral than unilateral cataracts.

In our study, there were 92 males (55.08%) and 75 females (44.92%). Male to female ratio of 55:45 was parallel to study of Mwende J et al, who had 55% (n=99) males and 45% (n=81) females.[11] In our study, bilateral cataracts were 135 (80.83%) and unilateral were 32 (19.17%). These results were similar to Afia Matloob Rana et al at 80.4% bilateral and 19.6% unilateral cataracts but Mwende J et al reported 66% bilateral and 34% unilateral cataracts. Rahi JS et al also wrote 66% bilateral and 34% unilateral cases.[12,13] These differences were because of different sample sizes and age groups too as our study population consisted of patients ranging from 1 month to 34 years of age. Afia et al study group was 3 months to 26 years while Mwende J et al and Rahi JS et al had all children around 1 years of age.

Apart from laterality, an important ocular association of congenital cataract is nystagmus which basically occurs due to light signals deprivation and is more common in bilateral than unilateral cataracts.[14] In our study, the incidence of nystagmus was found to be 5.98% (n=10). Shagufta et al reported nystagmus in children with cataract as high as 42.2% in 180 study population.[15] Similar study was conducted by Rajavi et al who found nystagmus in 6 (14.2%) patients in his 42-patients study project.[16] Difference in all these results was mainly due to sample size and definitely depended on age of presentation.

Another strong ocular association of congenital cataract in our study was strabismus in 6 (3.58%) patients. Hwang et al reported incidence of strabismus preoperatively at 6 (10.3%) and an additional of 11 (19.0%) patients developed squint postoperatively in a 12 years study of 116 eyes.[17] In our study no patient developed postoperative strabismus but this maybe objected to lack of long term follow up. Out of other associations, mental retardation/ delayed milestones were most frequent systemic associations in our study, found in 25 (14.97%) patients. Onua et al documented frequency of mental retardation in 84 (12.2%) out of his 694 patients (1388 eyes).[18] He also reported Down syndrome associated with congenital cataract in 156 (22.5%) while our study only showed Down syndrome in 2 (1.19%) patients.

Postoperative complications are unwanted sequelae of any surgical procedure. Similarly, ocular surgeries have also a long list of postoperative complications. As written above that the outcome of congenital cataract surgeries is already 20 times worse than that of developmental cataracts but rate of complications is significantly dependent on multiple factors. Generally speaking, good surgical technique, experienced hands and early intervention limit these complications. In our study, 118 (70.68%) out of 167 patients did not record any postoperative complication over 1 month follow-up. Another point worth mentioning is that no patient developed complications that required 2nd surgeries like broken sutures,

iris prolapse, posterior capsular rent or IOL tilt (decentration).

Most common complication of pediatric cataract surgery is posterior capsular opacification (PCO) which is virtually 100% if posterior capsulotomy is not done. This is attributed to highly active lens epithelial cells and proliferation of residual lens cells onto the posterior capsule.[19] To eliminate/ reduce its incidence, posterior capsulotomy and anterior vitrectomy in almost all congenital cataracts is performed simultaneously along with cataract extraction and if PCO develops, Nd; YAG laser or surgical capsulotomy can be done. Incidence of PCO in our study was 17.96% (30 eyes), while Louison et al also documented PCO as primary postoperative complication in his study; 60% in unilateral and 46.3% in bilateral cataract surgeries.[20] In a similar study, Kim et al reported rate of PCO as only 4.0% in his 37-patients study.[21]

Postoperative rise in IOP was observed in 4 (2.39%) patients in our study in 1 month follow-up period. This reading was mismatched with Gouda et al who reported postoperative rise in IOP> 18 mmHg in 23 out of 206 (11%) patients who completed 1 year follow-up and in 9 (13%) out of 86 patients who completed 2 years follow-up.[22] These contrasting results were highly dependent on long term follow up which was lacking in our study. Synechiae formation is another complication of cataract surgery. We observed anterior synechiae in 1 (0.59%) and posterior synechiae in 8 (4.79%) patients. Ding Chen et al noted anterior synechiae in 5 (12.5%) and posterior synechiae in 2 (5%) patients in his 40-patient study population.[23]

IOL capture was noted in 3 (1.79%) patients in our study while Vasavada et al noted that in 5 (16.1%) eyes in his study.[24] Retinal Detachment (RD) was noted in 2 (1.19%) patients in this study. Sumita Agarkar et al described risk of RD at 5.5% at 10 years after congenital cataract surgery in her 11-years study of 481 eyes.[25] The variations in these results need further evaluation and long-term follow-up. Among early postoperative complications corneal edema was noted only in 1 (0.59%) patient in our study.

To determine the oculosystemic associations of congenital cataracts is more like an observational study but complications related to congenital cataract surgery can be reduced to a minimum by applying latest surgical techniques for example, minimal handling can reduce postoperative corneal edema and adding posterior capsulotomy and anterior vitrectomy to cataractous lens extraction can significantly decrease posterior capsular opacification. The less are the surgical complications, the more well is the final visual prognosis.

This study aims to identify similar associations and complications related to congenital cataracts so as to enhance the final vision prognosis. The most important limitation to this study includes overlooking the final visual prognosis of all study population, attributed mainly to lack of regular and long term follow up of the patient. As serial monitoring of IOP and repeated refractions (which are necessary after congenital cataract surgery) are only possible when there's regular follow-up, so this loss of follow-up is responsible for masking of many late postoperative complications like secondary glaucoma as well as rendering some of the interventions impractical like amblyopia therapy.

Conclusion:

Congenital cataracts most commonly present as bilateral rather than unilateral condition. Nystagmus and strabismus are likely to accompany congenital cataracts owing to visual deprivation. Mental retardation is the most common systemic association of congenital cataract and posterior capsular opacification is the most

common complication of congenital cataract surgery.

References:

1. Halilbašić M, Zvorničanin J, Jusufović V, Čabrić E, Halilbašić A, Mušanović Z, Međedović A. Pediatric cataract in Tuzla Canton, Bosnia and herzegovina. Med Glas (Zenica). 2014 Feb 1;11(1):127-31.
2. Randrianotahina HC, Nkumbe HE. Pediatric cataract surgery in Madagascar. Nigerian journal of clinical practice. 2014;17(1):14-7.
3. Sana N, Muhammad A, Humaira F. Congenital Cataract: Morphology and Management Pak J Ophthalmol. 2013; 29: 151-55.
4. Nkumbe HE, Randrianotahina HC. Meeting the need for childhood cataract surgical services in Madagascar. African Journal of Paediatric Surgery. 2011 May 1;8(2):182.
5. Haiba KS. Amer R, Mariam S, Samra K, Nadeem HB, Ahmed UZ. Autosomal recessive congenital cataract linked to EPHA2 in a consanguineous Pakistani family. Mol Vis. 2010; 16: 511-17.
6. Surve A, Dhull C, Khokhar SK. Metabolic Cataract. InAtlas of Pediatric Cataract 2019 (pp. 35-40). Springer, Singapore.
7. Bremond-Gignac D, Daruich A, Robert MP, Valleix S. Recent developments in the management of congenital cataract. Annals of Translational Medicine. 2020 Nov;8(22).
8. Haargaard B, Wohlfahrt J, Fledelius HC, Rosenberg T, Melbye M. A nationwide Danish study of 1027 cases of congenital/infantile cataracts: etiological and clinical classifications. Ophthalmology. 2004 Dec 1;111(12):2292-8.
9. Yorston D. Surgery for congenital cataract. Community eye health. 2004;17(50):23.
10. Khanna RC, Foster A, Krishnaiah S, Mehta MK, Gogate PM. Visual outcomes of bilateral congenital and developmental cataracts in young children in south India and causes of poor outcome. Indian journal of ophthalmology. 2013 Feb;61(2):65.
11. Mwende J, Bronsard A, Mosha M, Bowman R, Geneau R, Courtright P. Delay in presentation to hospital for surgery for congenital and developmental cataract in Tanzania. Br J Ophthalmol. 2005; 89: 1478–82.
12. Rana AM, Raza A, Akhter W. Congenital Cataracts; Its Laterality and Association with Consanguinity. Pakistan Journal of Ophthalmology. 2014 Dec 31;30(4).
13. Rahi JS, Dezateux C. Congenital and Infantile Cataract in the United Kingdom: Underlying or Associated Factors. Invest. Ophthalmol. Vis. Sci. 2000; 41: 2108-14.
14. Nagamoto T, Oshika T, Fujikado T, Ishibashi T, Sato M, Kondo M, Kurosaka D, Azuma N. Clinical characteristics of congenital and developmental cataract undergoing surgical treatment. Japanese journal of ophthalmology. 2015 May 1;59(3):148-56.
15. Naz S. Incidence of Blindness and Nystagmus in Children from Lahore Affected with Congenital Cataract. LGUJLS. 2020 Mar 11;4(01):1-8.
16. Rajavi Z, Mokhtari S, Sabbaghi H, Yaseri M. Long-term visual outcome of congenital cataract at a Tertiary Referral Center from 2004 to 2014. Journal of Current Ophthalmology. 2015 Sep 1;27(3-4):103-9.
17. Hwang SS, Kim WS, Lee SJ. Clinical features of strabismus and nystagmus in bilateral congenital cataracts. International journal of ophthalmology. 2018;11(5):813.
18. Onua AA, Fiebai B, Abu SO. Ocular and Systemic Abnormalities Associated with Paediatric Cataract at Evangelical Church of West Africa Eye Hospital, Kano. International Journal of TROPICAL DISEASE & Health. 2018 Oct 31:1-6.

19. Aldghaimy AH, Hamed MA, Eta WE. Prevention of posterior capsular opacity after pediatric cataract surgery. Delta Journal of Ophthalmology. 2018 Oct 1;19(4):246.
20. Louison S, Blanc J, Pallot C, Alassane S, Praudel A, Bron AM, Creuzot-Garcher C. Visual outcomes and complications of congenital cataract surgery. Journal francais d'ophtalmologie. 2019 Apr 1;42(4):368-74.
21. Kim DH, Kim JH, Kim SJ, Yu YS. Long-term results of bilateral congenital cataract treated with early cataract surgery, aphakic glasses and secondary IOL implantation. Acta ophthalmologica. 2012 May;90(3):231-6.
22. Gouda J, Tomairek RH, Elhusseiny AM, El-Fayoumi D, Awadein A, Gawdat G, Elhilali H. Changes in intraocular pressure and anterior chamber angle after congenital cataract extraction. Journal of Glaucoma. 2021 Jan 16;30(1):61-4.
23. Chen D, Gong XH, Xie H, Zhu XN, Li J, Zhao YE. The long-term anterior segment configuration after pediatric cataract surgery and the association with secondary glaucoma. Scientific reports. 2017 Feb 21;7(1):1-9.
24. Vasavada AR, Vasavada V, Shah SK, Trivedi RH, Vasavada VA, Vasavada SA, Srivastava S, Sudhalkar A. Postoperative outcomes of intraocular lens implantation in the bag versus posterior optic capture in pediatric cataract surgery. Journal of Cataract & Refractive Surgery. 2017 Sep 1;43(9):1177-83.
25. Agarkar S, Gokhale VV, Raman R, Bhende M, Swaminathan G, Jain M. Incidence, risk factors, and outcomes of retinal detachment after pediatric cataract surgery. Ophthalmology. 2018 Jan 1;125(1):36-42.

Authors Contribution

Concept and Design: Aamna Jabran, Zeeshan Hameed, Usama Iqbal
Data Collection / Assembly: Muhammad Rizwan Khan
Drafting: Aamna Jabran, Zeeshan Hameed
Statistical expertise: Muhammad Sharjeel
Critical Revision: Muhammad Sharjeel, Fuad Ahmad Khan Niazi

ORIGINAL ARTICLE

Comparison of High Versus Low Energy Used In Neodymium-Yttrium Aluminum Garnet Laser Capsulotomy

Muhammad Azam Khan[1] , Sehrish Sohail Shuja[1] , Irfan Aslam Khattak[1] , Zaheeruddin Babar[2], Muhammad Tariq Khan[3] , Asif Mehmood[4]

Abstract:
Objective: To compare the frequency of intraocular pressure spike in high versus low energy used in Nd-YAG Laser Posterior Capsulotomy in pseudophakic patients.
Study design: Randomized controlled trial.
Study duration: 6 months (20-03-2021 to 20-09-2021).
Study settings: Department of Ophthalmology, PAF hospital E-9 Islamabad
Material and Methods: A sample size of 160 patients was calculated using WHO calculator. Patients were recruited through non probability consecutive sampling. Nd YAG capsulotomy was performed on patients randomly divided into two group using lottery method; Group A underwent high laser energy >100mj while group B underwent low energy laser 21-100 mj. Tonometry was performed after 4 hours of procedure. Data was analyzed using SPSS version 20. Post stratification chi square test was applied. P value ≤ 0.05 was considered significant.
Results: Total 160 (80 in each group) patients were included in study. There were 98(61.3%) male and 62(38.3%) female. Mean age of patients was 51.9±9.0SD years. Among all the patients in low energy group 11.9% showed IOP spike while 38.1% did not show IOP spike. Among all the patients in high energy group, 28.1% showed IOP spike while 21.9% did not show IOP spike (p=0.000).
Conclusion: Nd YAG Capsulotomy had significant association with intraocular pressure spike. Patients treated with high energy are more prone to have elevated intraocular pressure as compared to patients treated with low energy Nd YAG. *Al-Shifa Journal of Ophthalmology 2022; 18(2): 68-75 .*

1. *PAF Hospital, Unit 2, Islamabad*
2. *CMH Kharian, Kharian Cantt*
3. *Hayatabad Medical Complex, Peshawar*
4. *Rehman Medical Institute, Hayatabad, Peshawar*

Originally Received: 13 February 2022
Revised: 11 April 2022
Accepted: 9 May2022

Correspondence to:
Muhammad Tariq Khan
doctormarwat@yahoo.com
Associate Professor, Department of Ophthalmology, Hayatabad Medical Complex, Peshawar

Introduction:

Posterior capsular opacity (PCO) is the most common complication arising from corrective surgery to treat cataracts. In 2018, the World Health Organization [WHO] estimated that 90 million people worldwide still live with cataract-associated blindness.[1] Each year, an additional 1–2 million people become blind, of which 75% are treatable. This number is only expected to rise due to an increasingly expanding and aging global population. The Royal National Institute of Blind People (RNIB) estimated that by 2020, 695,000 people would be living with cataracts in the United Kingdom, a number that would increase by 30% between 2020

and 2030.[2] In England alone, 330,000 cataract surgeries are performed per year. Whilst in the UK cataract surgery is a routine, outpatient surgical procedure, a number of complications can occur for a subsection of patients. Approximately 20–50% of patients develop PCO and require further corrective treatment. PCO presents as a secondary cataract, an agglomeration of cells over the visual axis causing a loss of acuity. During surgery, the surgeon will create an opening in the capsular bag, known as capsulorrhexis, and use phacoemulsification to remove the diseased, opaque lens and lens epithelial cells (LEC) from the capsular bag before implanting an artificial intraocular lens (IOL). The extent of LEC removal influences the propensity towards PCO development. The initial inflammation caused by the surgical trauma may incite the hyper-proliferation, trans differentiation, and migration of residual LECs. The transformed LECs migrate along the posterior capsule towards the anterior chamber to accumulate over the visual axis, forming a secondary cataract.

The wound healing response of LECs post-cataract surgery is believed to be the first key developmental stage of PCO. The increased ECM leads to capsule wrinkling and thickening of the posterior capsule. The presentation of PCO can differ between individuals, depending on patient specific risk factors affecting the patients.[3]
PCO typically develops in the first 2–5 years post-surgery. There are several risk factors that can make patients more susceptible to developing PCO. These are patient-associated risk, surgical-associated risk, and IOL-associated risk, as discussed. Studies show that patient age alters the propensity of the LECs to proliferate. The younger the patient, the more LECs are within the capsular bag with greater proliferative potential. Children undergoing cataract surgery can expect a 100% risk of developing PCO. Pre-existing ocular diseases in patients such as dry-eye disease and uveitis can lead to an increased rate of PCO development and a greater likelihood of experiencing vision-threatening PCO. The outcome of cataract surgery can influence the propensity towards PCO development. Polishing of the posterior capsule showed a reduction in PCO development as shown by Paikwho. He found that the surgeon who routinely polished the posterior capsule had a 20% PCO rate, in comparison to 30% for the surgeon who did not.[4] Nevertheless, the impact of polishing is highly controversial and application relies on the surgeon's preference.

Improvement in visual acuity after Nd:YAG laser capsulotomy in patients with significant PCO has been well documented. Although Nd:YAG laser capsulotomy is accepted as standard treatment for PCO and has been found to be safe and effective, it is not without complications, some of which can be sight-threatening such as retinal edema and detachment. Some recent studies have been concentrated on the influence of capsulotomy size and total energy level on complications after Nd:YAG laser capsulotomy.[5] We planned to conduct this study to assess if using high energy during Nd:YAG capsulotomy leads to higher spikes in intraocular pressure rise post laser or not.

Materials and Methods:

Study design**:**
Randomized Controlled Trial
Setting**:**
Department of Ophthalmology, PAF hospital E-9 Islamabad
Duration of study**:**
Six months after approval of synopsis (20-03-2021 to 20-09-2021).
Sample size**:**
Sample size of 160 cases; 80 in each group is calculated with 80% power of study, 5% significance level and expected percentage of intraocular pressure spike i.e., 50%[11] in exposed patients and 30.3%[11] in unexposed patients.

Sampling technique**:**
Non-probability, consecutive sampling
Sample selection**:**
*Inclusion criteria***:**
All patients aged 40-80 years with visual impairment due to significant posterior capsular opacity (as per operational definition) following uneventful cataract extraction
Exclusion criteria:

1. Glaucoma (intraocular pressure>21mmHg before procedure)
2. Trabeculectomy, Posterior segment disease, any active inflammatory eye disease (uveitis), PCO in aphakic eyes, Corneal eye disease (on medical record)
3. Uncooperative patients with physical/mental limitations
4. Uncontrolled Diabetes (HbA1c > 8%)

Operational Definitions:
Posterior Capsular Opacification (PCO): a cloudy layer of scar tissue behind the intraocular lens implant, which is significant enough to cause blurry vision (Visual acuity of 6/9 to 6/24)
Intraocular pressure spike: post-procedure elevation in intraocular pressure of treated eye i.e., ≥ 5mm of Hg rise after 4hours as compared to baseline pre-laser intraocular pressure assessed on tonometry.

One hundred and sixty patients presented to Eye department fulfilling inclusion criteria were included in the study. Informed written consent were taken from all patients. Demographics like name, age, gender, side of eye involved, duration of PCO and type of PCO were noted. Then tonometry was applied to determine the intraocular pressure before ND:YAG posterior capsulotomy. Then Nd:YAG capsulotomy was performed. Patients were randomly divided in two groups by using lottery method. In group A, high laser energy >100 mj was applied. In group B, low laser energy 21-100 mj was applied. Total energy used would be noted. All procedures were performed by researcher under supervision of consultant ophthalmologist having at least 4 years of experience in ophthalmology. Duration of procedure was noted. After procedure patient were shifted post-surgical wards and followed-up there for 4 hours. After 4 hours, tonometry was applied to determine the intraocular pressure. Tonometry was performed by researcher. If there was > 5mmHg risk in intraocular pressure, then it was noted (as per operational definition). Patients with intraocular pressure spike were managed as per standard protocol. All the data was recorded in a proforma.

Data was entered and analyzed in SPSS version 20. Chi-square test was applied to compare both groups for intraocular pressure spike. Data was stratified for age, gender, side of eye involved, type of PCO, duration of PCO and duration of procedure. Post-stratification, Chi-square test was applied to compare both groups for intraocular pressure spike for each strata. P-value ≤0.05 was taken as significant.

Results:

Total 160 (80 in each group) patients were included in study. There were 98(61.3%) male and 62(38.3%) female. Eyes were left in 82(51.2%) patients and right in 78(48.8%) patients. PCO type was vacuolated (pearl type) in 81(50.6%), fibrosis in 53(33.1%) and soemmering in 26(16.3%) patients. Intraocular spike was observed in 64(40%) patients while no IOP spike in 96(60%) as shown in table 1.
Among all the patients with duration of PCO ≤3 months, low energy group patients showed 10.7% IOP spike while high energy group patients showed 20.2% IOP spike (p=0.012). Among all the patients with duration of PCO >3 months, low energy group patients showed 13.2% IOP spike and high energy group patients showed 36.8% IOP spike (p=0.001) as shown in table 2.
Among all the patients with vacuolated PCO , low energy group patients showed 12.3% IOP spike while high energy group patients showed 17.3% IOP spike (p=0.06).

Among all the patients with fibrosis PCO, low energy group patients showed 13.2% IOP spike and high energy group patients showed 39.6% IOP spike (p=0.001). Among all the patients with soemmering VZ PCO, low energy group showed 7.7% IOP spike while patients in high energy group showed 38.5% IOP spike (p=0.007) as shown in table 3.

Table 1: Demographic characteristics

Demographic characteristics	**Frequency (N=160)**	**Percentage**
Gender		
Male	98	61.3%
Female	62	38.3%
Eye		
Left	82	51.2%
Right	78	48.8%
PCO type		
Vacuolated (pearl type)	81	50.6%
Fibrosis	53	33.1%
Soemmering ring	26	16.3%
Intraocular spike		
No	96	60%
Yes	64	40%

Table 2: Stratification of IOP spike in both groups with respect to duration of PCO

Duration of PCO	**Groups**	**IOP spike**		**total**	**P value**
		No	Yes		
≤ 3 months	Lowe energy	37(44%)	9(10.7%)	46(54.8%)	0.012
	High energy	21(25%)	17(20.2%)	38(45.2%)	
	Total	58(69%)	26(31%)	84(100%)	
>3 months	Low energy	24(31.6%)	10(13.2%)	34(44.7%)	0.001
	High energy	14(18.4%)	28(36.8%)	42(55.3%)	
	Total	38(50%)	38(50%)	76(100%)	

Table 3: Stratification of IOP spike in both groups with respect to PCO type

PCO type	Groups	IOP spike		Total	P value
		No	Yes		
Vacuolated	Lowe energy	36(44.4%)	10(12.3%)	46(56.8%)	0.06
	High energy	21(25.9%)	14(17.3%)	35(43.2%)	
	Total	57(70.4%)	24(29.6%)	81(100%)	
Fibrosis	Low energy	15(28.3%)	7(13.2%)	22(41.5%)	0.010
	High energy	10(18.9%)	21(39.6%)	31(58.5%)	
	Total	25(47.2%)	28(52.8%)	53(100%)	
Soemmerring ring	Low energy	10(38.5%)	2(7.7%)	12(46.2%)	0.007
	High energy	4(15.4%)	10(38.5%)	14(53.8%)	
	Total	14(53.8%)	12(46.2%)	26(100%)	

Discussion:

Nd: YAG laser capsulotomy is the mainstay of treatment for PCO[6]. There has been a reduction in the overall rate of complications following Nd: YAG laser capsulotomy. This could be attributed to better understanding of the mechanisms of laser induced damage and recognition of the fact that one should limit the total amount of laser energy delivered to the treatment site[7].

In our study Intraocular pressure spike was significantly associated with high energy laser. The most common complication of posterior capsulotomy is increased IOP. Different explanations which have been given for the pressure rise following Nd: YAG laser treatment include the deposition of debris in the trabecular meshwork, pupillary block, and inflammatory swelling of the ciliary body or iris root associated with angle closure[8, 9, 10]. Despite the prophylactic treatment, increased IOP was reported in 15% to 30% of patients in several studies[11]. Keates et al.[12] found elevation of IOP in 0.6% of his patients, whereas Stark et al.[13] reported that the elevation of IOP was 1.0% after Nd:YAG capsulotomy. Ge et al. [14] found that the rise in IOP was more pronounced in patients with glaucoma in those who experienced a higher rise of IOP within an hour of capsulotomy. However, Shani et al.[15] could not find any elevation of IOP and postulated that healthy pseudophakic eyes do not show elevation of IOP after Nd: YAG laser capsulotomy.

Nd: YAG capsulotomy is associated with significant anterior and posterior segment complications. Some studies recommend that side effects are more pronounced when higher single pulse energy levels are used rather than higher total laser energy[16].

Hood *et al* described the use of Nd: YAG laser to lyse residual cortex after phacoemulsification with mean pulse energy of 1.7 ± 0.5 mJ and total energy of 159 ± 114 mJ[17]. The incidence of IOP rise was significantly more in the group with higher total energy levels (226 ± 233 mJ) [18]. In a series of 30 patients with PCO, Ari *et*

al evaluated the effect of energy levels for Nd: YAG laser capsulotomy on IOP and macular thickness and found that the severity and duration of IOP rise was less when the total energy was less than 80 mJ[19]. In another study, Karahan *et al* evaluated the effect of capsulotomy size on IOP and macular thickness. IOP rise was significantly greater in the large capsulotomy group (with higher laser energy), i.e. 3.4 ± 0.3 versus 4.6 ± 0.5 mmHg[20]. The results of these studies further substantiate the observations of the present study.

Another similar study suggests that neither age nor the type of IOL (silicone, hydrophobic acrylic, hydrophilic acrylic and PMMA) have a significant effect on the total laser energy required to create a capsulotomy. However, different IOL materials had different damage thresholds and consequent pitting and cracks (PMMA > acrylic > silicone). IOL damage following capsulotomy has been attributed to faulty focusing of laser beam, close proximity of the IOL to the posterior capsule and inherent properties of IOL materials. However, laser energy *per se* also had a significant effect on IOL damage. This was evident by the fact that total laser energy was significantly higher ($P < 0.001$) in the group of eyes in which pitting was seen[21]. A similar observation was made by Saffra *et al* in an *in-vitro* analysis of Nd: YAG laser damage to hydrophilic IOLs. Thus, we advise focusing the laser beam posterior to the posterior capsule, and setting the laser beam to the minimum possible energy level[22]. Auffarth *et al* analysed energy levels of Nd: YAG laser capsulotomy for secondary cataracts in a series of 172 patients and found that the total laser energy was significantly higher with sulcus fixated IOL's[23]. This observation was similar to the results of the present study.

Alimanović-Halilović analysed complications in the posterior segment after Nd: YAG laser capsulotomy and found a significant association between total laser energy levels and complications such as RD and CME, and the collative connections were positive and strong[24]. It appears that high total laser energy may be an independent risk factor for RD following laser capsulotomy. However, studies on a larger sample size may be required to further substantiate this observation. It is advisable to avoid large size capsulotomies in patients with high axial length.

Limitation:
Conduction of study at single center limits generalizability of study

Conclusion:

Nd:YAG Capsulotomy had significant association with intraocular pressure spike. Patients treated with high energy are more prone to have elevated intraocular pressure as compared to patients treated with low energy Nd:YAG laser. It is recommended that using less total energy and performing smaller capsulotomies are practical choices to decrease complications after Nd: YAG capsulotomy.

References:

1. Ursell P.G, Dhariwal M, Majirska K, Ender F, Klason-Ray S, Venerus A et al. Three-year incidence of Nd:YAG capsulotomy and posterior capsule opacification and its relationship to monofocal acrylic IOL biomaterial: A UK real world evidence study. Eye. 2018;32(2):1579–1589.
2. Vasavada A. Cataract and surgery for cataract. *Br. Med. J.* 2006;333(25):128–132.
3. Mohammadpour M., Jafarinasab M.R., Javadi M.A. Outcomes of acute postoperative inflammation after cataract surgery. Eur. J. Ophthalmol. 2007;17(1):20–28.
4. Boureau C., Lafuma A., Jeanbat V., Berdeaux G., Smith A.F. Incidence of Nd:YAG laser capsulotomies after cataract surgery: Comparison of 3

square-edged lenses of different composition. Can. J. Ophthalmol. 2009;44(2):165–170.
5. Billotte C, Berdeaux G. Adverse clinical consequences of neodymium:YAG laser treatment of posterior capsule opacification. J Cataract Refract Surg. 2004;30(10):2064–71.
6. Aslam TM, Devlin H, Dhillon B. Use of Nd: YAG laser capsulotomy. *Surv Ophthalmol.* 2003;48(2):594–612
7. Awan MT, Khan MA, Al-Khairy S, Malik S. Improvement of visual acuity in diabetic and nondiabetic patients after Nd: YAG laser capsulotomy. *Clin Ophthalmol.* 2013;7(3):2011–2017
8. Kraff MC, Sanders DR, Lieberman HL. Intraocular pressure and the corneal endothelium after neodymium-YAG laser posterior capsulotomy Relative effects of aphakia and pseudophakia. *Arch Ophthalmol.* 1980;103(4):511–4.
9. Parker MD, Clofeine GS, Stocklin RD. Marked intraocular prressure rise following Nd-YAG laser capsulotomy. *Ophthalmic Surg.* 1984;15(2):103–4
10. Ruderman JM, Mitchell PG, Kraff M. Pupillary block following Nd-YAG laser capsulotomy. *Ophthalmic Surg.* 1983;14(5):418–9
11. Minello AAP, Prata JA, de Arruda Mello PA. Efficacy of topic ocular hipotensive agents after posterior capsulotomy. *Arquivos Brasileiros de Oftalmologia.* 2008;5(3):706–710.
12. Keates RH, Steinert RF, Puliafito CA, Maxwell SK. Long-term follow-up of Nd:YAG laser posterior capsulotomy. *J Am Intraocul Implant Soc.* 1984;10(2):164–8.
13. Stark WJ, Worthen D, Holladay JT, Murray G. Neodymium:YAG lasers An FDA report. *Ophthalmology.* 1985;92(2):209–12
14. Lin JC, Katz LJ, Spaeth GL, Klancnik JM. Intraocular pressure control after Nd: YAG laser posterior capsulotomy in eyes with glaucoma. *Arq Bras Oftalmol.* 2008;71(5):706–10.
15. Ge J, Wand M, Chiang R, Paranhos A, Shields B. Long termeffect of Nd : YAG laser posterior capsulotomy on intraocular pressure. *Arch Ophthalmol.* 2000;118(10):1334–7.
16. Aslam TM, Patton N. Methods of assessment of patients for Nd: YAG laser capsulotomy that correlate with final visual improvement. *BMC Ophthalmol.* 2004;4(4):13
17. Hood CT, Shtein RM, Mian SI, Sugar A. Neodymium-yttrium-aluminum-garnet laser lysis of retained cortex after phacoemulsification cataract surgery. *Am J Ophthalmol.* 2012;154(33):808–813.e1
18. Ari S, Cingü AK, Sahin A, Çinar Y, Çaça I. The effects of Nd: YAG laser posterior capsulotomy on macular thickness, intraocular pressure, and visual acuity. *Ophthalmic Surg Lasers Imaging.* 2012;43(2):395–400
19. Ari S, Cingü AK, Sahin A, Çinar Y, Çaça I. The effects of Nd: YAG laser posterior capsulotomy on macular thickness, intraocular pressure, and visual acuity. *Ophthalmic Surg Lasers Imaging.* 2012;43(3):395–400
20. Karahan E, Tuncer I, Zengin MO. The effect of ND: YAG laser posterior capsulotomy size on refraction, intraocular pressure, and macular thickness. *J Ophthalmol 2014.* 20(3): 846385
21. Saffra N, Agarwal S, Enin J, Werner L, Mamalis N. *In vitro* analysis of Nd: YAG laser damage to hydrophilic intraocular lenses. *Ophthalmic Surg Lasers Imaging.* 2012;43(3):45–49.
22. Saffra N, Agarwal S, Enin J, Werner L, Mamalis N. *In vitro* analysis of Nd: YAG laser damage to hydrophilic intraocular lenses. *Ophthalmic Surg Lasers Imaging.* 2012;43(3):45–49.
23. Auffarth GU, Nimsgern C, Tetz MR, Völcker HE. Analysis of energy levels for Nd: YAG laser capsulotomy in

secondary cataract. Ophthalmology. 2000;97(3):1–4.
24. Alimanović - Halilović E. Complications in the posterior eye segment after Nd-YAG laser capsulotomy. *Med Arh.* 2014;58(1):7–9.

Authors Contribution

Concept and Design: Muhammad Azam Khan, Sehrish Sohail Shuja
Data Collection / Assembly: Irfan Aslam Khattak, Zaheeruddin Babar
Drafting: Muhammad Tariq Khan
Statistical expertise: Asif Mehmood
Critical Revision: Muhammad Azam Khan, Muhammad Tariq Khan

ORIGINAL ARTICLE

Awareness of Diabetic Retinopathy in Diabetic Patients at a Private Vision Care Centre in Islamabad

Muhammad Zubair Nazar[1], Afresh Maqbool[1], Muhammad Basit[2]

Abstract:
Objective: To determine the awareness of Diabetic Retinopathy in Diabetic Patients.
Materials and Methods: After taking consent and recording demographic details, an interviewer-based questionnaire was used to assess patients' awareness about ocular complications of diabetes on a 10 points questionnaire before their fundus examination using Ophthalmoscope and slit lamp microscope with +90 Diopter lens in the eye OPD.
Results: Among the enrolled 300 patients, 146 (48.7%) were male and 154 (51.3%) patients were female. As far as the age of the patients was concerned, 5% were from less than 20 years, 29% from 21-40 years, 43% from 41-60 years and 22.3% were more than 60 years. The mean age of the participants was 49 + SD 10.01 years. Maximum number was seen in 41-60 years age group i-e 131 patients. There were 44(14.7%) patients with newly diagnosed Diabetes. 124(41.3%) patients with less than 5 years diabetes durations and 132(44.00%) patients had diabetes for more than 5 years. 118(64.49%) were responded that diabetic retinopathy is corrected with glasses. 162(88.52%) were responded only good control of diabetes is sufficient for control of blindness with diabetic retinopathy.
Conclusion: The knowledge about diabetic retinopathy and its treatment was inadequate along with poor compliance with annual fundus examination. This is directly related to the educational level of the patient and the duration of diabetes. *Al-Shifa Journal of Ophthalmology 2022; 18(2): 76-80 .*

1. *Amer Eye Hospital Network Fetah Jang*
2. *University of Lahore Islamabad campus*

Originally Received: 2 April 2022
Revised: 17 May 2022
Accepted: 2 June 2022

Correspondence to:
Muhammad Zubair Nazar
zubairnazar5@gmail.com
Amer Eye Hospital Network
Fateh Jang

Introduction:

Diabetes Mellitus is a common metabolic disorder characterized by sustained hyperglycemia of variable severity. Diabetes mellitus is a disorder of blood glucose regulation, usually caused by insufficiency or relative ineffectiveness of insulin [1]. There are various health hazards/disorders associated with diabetes mellitus**.** It affects the metabolism of fat and protein. In its advance stages, rapid loss of body weight and ketosis are observed. Other complications include diabetic coma, diabetic retinopathy, peripheral neuropathy, diabetic nephropathy, atherosclerosis and possibly skin infection [2].

Type 1 diabetes (autoimmune) was previously termed 'insulin-dependent diabetes mellitus' (IDDM) and is invariably associated with profound insulin deficiency

requiring replacement therapy. Type 2 diabetes was previously termed 'non-insulin-dependent diabetes mellitus' (NIDDM) because patients retain the capacity to secrete some insulin but exhibit impaired sensitivity to insulin (insulin resistance) and can usually be treated without insulin replacement therapy [3,4].
In the United States, the incidence of type 1 diabetes in non-Hispanic white children and adolescents is 23.6 per 100,000 annually, and the prevalence is 2.0 per 1000. Rates are substantially lower in other racial or ethnic groups. Parts of Canada, such as Newfoundland, have a higher incidence (36 per 100,000) than the United States, whereas the incidence in Quebec is lower, at 15 per 100,000 in children younger than 15 years of age.[5]

Patients with type 1 diabetes are somewhat more likely to present with ketoacidosis, due to insufficient insulin production, but this presentation is not uncommon in type 2 diabetes. Type 1 diabetes is suggested by the presence of pancreatic (islet) autoantibodies. These include insulin autoantibodies (IAA), islet cell cytoplasmic antibodies (ICA) or glutamic acid decarboxylase (GAD) antibodies. Type 1 also is usually suggested by reduced insulin and c-peptide levels. On occasion it is difficult to classify diabetes in patients with mixed features [6, 7, 8, 9]. The pathophysiologic features of both types of diabetes may coexist in the same patient, particularly if the patient has obesity.

Retinopathy is one of the major complications of diabetes and attributes to a large number of patients who are visually impaired globally. The awareness of retinopathy among the diabetic patients has been a topic of interest for the past few decades and various studies and surveys have been conducted in the last two decades to address this issue which reported variable results.[10, 11, 12, 13, 14] The current study was conducted to assess the awareness of retinopathy among the local population.

Material and Methods:

The cross-sectional study design was used for this study. The convenient sampling technique was used for data collection. It was a six-month study duration study conducted at Nazar Vision Care Ghori Town from Jan 2021 to June 2021. The research and data collection procedure was ethically approved from the PIRS research ethical committee. 300 diabetic retinopathy patients were included in this study. After collecting that from patients 183 were educated patients and 117 were illiterate. Data was collected from the patients visiting the Nazar vision care through the specially designed questionnaire. Self-Response questionnaire was used for data collection.

Inclusion Criteria

1. Patients they have diabetic.
2. Both genders were included

Exclusion Criteria

1. Diabetic retinopathy patients with mental issues
2. Those who were not willing to participate

Statistical Analysis:

All results are presented in the form of frequency and percentage. The latest version of SPSS 23 was used for data analysis.

Results:

Among the enrolled 300 patients, 146 (48.7%) were male and 154 (51.3%) patients were female. In terms of age, 5% were from less than 20 years, 29% from 21-40 years, 43% from 41-60 years and 22.3% were more than 60 years. The mean age of the participants was 49 ± SD 10.01 years. Maximum number was seen in 41-60 years age group with 131 patients.

Out of 300 patients 170 (92.89%) educated patients know about the normal range of blood sugar level, 155(84.69%) educated patients know about information about

diabetic eye disease, 108(59.01%) patients vision affected by diabetes, 113(61.74%) patients know about diabetes can cause Blindness, 104(56.83%) patients know about early cataract development due to diabetes, 162(88.52%) patients know about good control of diabetes is sufficient for control of blindness with diabetic retinopathy (table-1).

Table 1: Education and knowledge about diabetic retinopathy

Question	**Response** **Group A (Illiterate) n= 117**	**Group B (Educated) n= 183**
Do you know about the normal range of blood sugar level? Yes/No	Yes :82(70.08%) No: 35(29.91%)	170 (92.89%) 13(7.10%)
Do you have any information about diabetic eye disease?	Yes:90(76.92%) No: 27(23.08%0	155(84.69%) 28(15.31%)
Is your vision affected by diabetes?	Yes:87(74.35%) No30(25.65%)	108(59.01%) 74(40.99%)
Do you know if diabetes can cause Blindness?	Yes: 68(58.11%) No: 49(41.89%)	113(61.74%) 70(38.26%)
Has any doctor ever recommended you the regular eye examination?	Yes: 28(23.93%) No. 89(76.07%)	63(34.42%) 120(65.58%)
Do you go for regular eye examination?	Yes: 13(11.11%) No: 104(88.89%)	37(20.21%) 146(79.79%)
Have you any information about early cataract develop -ment due to diabetes?	Yes: 61(52.13%) No: 56(47.87%)	104(56.83%) 79(43.17%)
According to you, is diabetic retinopathy is corrected with glasses?	Yes: 25(21.36%) No:92(78.64%)	118(64.49%) 65(35.51%)
Do you have any idea about the laser and injection treatment of Diabetic retinopathy?	Yes:18(15.38%) No: 99(84.62%)	39(21.31%) 144(78.69%)
Do you think that only good control of diabetes is sufficient for control of blindness with diabetic retinopathy?	Yes: 97(82.90%) No:20(17.10%)	162(88.52%) 21(11.48%)

Discussion:

Diabetic retinopathy is a common cause of blindness and most of the patients are unaware of the risk factors and complications of diabetic retinopathy. Lack of knowledge lead to misconception that

DR will cause symptoms and after that they will seek ophthalmological advice and treatment.[15]

In this study, most of the patients were knowing the normal range of blood glucose level regardless of the fact that they were illiterate(70.08%) or literate(92.89%).This is in contrast to aa Asian study where (49.9%) had knowledge of DM [15].Most of the patients were aware about diabetic eye disease (84.69%) as well as effect of diabetes on vision. this is in comparison with a study done in Nigeria where 84.3% patients were aware of diabetic retinopathy and 80.5% knew it could lead to blindness [14].

Awareness of patients regarding regular fundus examination (11-20%) as well as treatment of DR(15-21%) was significantly lacking. This is comparable with another study in which 53%of known diabetic patients had never had their eyes examined [16]. Screening was not recommended by physicians to most of the patients (65-76%), This is comparable with a study where only 24% of physicians correctly referred patients with type 1 diabetes to an ophthalmologist. however, majority of the patients knew that uncontrolled diabetes will lead to cataract formation (52-56%) [16,17].

In this study, there was a significant association between duration of disease and awareness of DR, its complications . Other studies demonstrated that awareness was significantly associated with duration of diabetes, educational status and age of the patient [18, 19, 20].

Conclusion

There is a need for awareness of DR among Diabetic patients to minimize ocular complications. The diabetic patients in Pakistan, although aware of the fact that diabetes affects the eye, have poor knowledge about diabetic retinopathy. The diabetic patients in Pakistan need more counseling regarding diabetes as well as diabetic retinopathy.

References:

1. Porwal P, Pachade S, Kamble R, Kokare M, Deshmukh G, Sahasrabuddhe V, Meriaudeau F. Indian diabetic retinopathy image dataset (IDRiD): a database for diabetic retinopathy screening research. Data. 2018 Sep;3(3):25.
2. Alrashedi MJ, Alshaban JA, Dakhalallah T, Alshamdin MN, Morsi OS, Alharby M. The incidence of diabetic retinopathy in diabetic patients attending the ophthalmic clinic in Khayber General Hospital, Madinah region. Age. 2019;51:47-7.
3. Simó-Servat O, Hernández C, Simó R. Diabetic retinopathy in the context of patients with diabetes. Ophthalmic research. 2019;62(4):211-7.
4. Wong TY, Sabanayagam C. The war on diabetic retinopathy: where are we now?. Asia-pacific Journal of Ophthalmology (Philadelphia, Pa.). 2019 Nov;8(6):448.
5. Fulmer IS, Li J. Compensation, Benefits, and Total Rewards: A Bird's-Eye (Re) View. Annual Review of Organizational Psychology and Organizational Behavior. 2021 Nov 2;9.
6. Cheloni R, Denniss J. Depth-resolved variations in visibility of retinal nerve fibre bundles across the retina in enface OCT images of healthy eyes. Ophthalmic and Physiological Optics. 2021 Jan;41(1):179-91.
7. Adnan M, Aasim M. Prevalence of type 2 diabetes mellitus in adult population of Pakistan: A meta-analysis of prospective cross-sectional surveys. Annals of global health. 2020;86(1).
8. Jiang L, Shi K, Guo YK, Ren Y, Li ZL, Xia CC, Li L, Liu X, Xie LJ, Gao Y, Shen MT. The additive effects of obesity on myocardial microcirculation in diabetic individuals: a cardiac magnetic resonance first-pass perfusion

study. Cardiovascular diabetology. 2020 Dec;19(1):1-3.
9. Juhas U, Ryba-Stanisławowska M, Brandt-Varma A, Myśliwiec M, Myśliwska J. Monocytes of newly diagnosed juvenile DM1 patients are prone to differentiate into regulatory IL-10+ M2 macrophages. Immunologic research. 2019 Feb;67(1):58-69.
10. Tsoli M, Boutzios G, Kaltsas G. Immune system effects on the endocrine system. Endotext [Internet]. 2019 Nov 16.
11. Nishioka Y, Noda T, Okada S, Myojin T, Kubo S, Higashino T, Ishii H, Imamura T. Incidence and seasonality of type 1 diabetes: a population-based 3-year cohort study using the National Database in Japan. BMJ Open Diabetes Research and Care. 2020 Sep 1;8(1):e001262.
12. Gallagher E, Siu HY. Diabetic ketoacidosis as first presentation of type 1 diabetes mellitus in a young child: Important differential diagnosis for respiratory distress. Canadian Family Physician. 2020 Jun 1;66(6):425-6.
13. Gallagher E, Siu HY. Diabetic ketoacidosis as first presentation of type 1 diabetes mellitus in a young child: Important differential diagnosis for respiratory distress. Canadian Family Physician. 2020 Jun 1;66(6):425-6.
14. Etim BA, Nkanga DG, Agweye CT, Enang OE, Ibanga AA, Udoh MM, Utam UA. Knowledge, beliefs, and practices regarding diabetic eye disease among patients with diabetes at the lions diabetic centre, university of calabar teaching hospital, Nigeria. Nigerian Journal of Ophthalmology. 2018 Jul 1;26(2):99.
15. Thapa R, Bajimaya S, Paudyal G, Khanal S, Tan S, Thapa SS, Van Rens GH. Prevalence and causes of low vision and blindness in an elderly population in Nepal: the Bhaktapur retina study. BMC ophthalmology. 2018 Dec;18(1):1-0.
16. Leasher JL, Bourne RR, Flaxman SR, Jonas JB, Keeffe J, Naidoo K, Pesudovs K, Price H, White RA, Wong TY, Resnikoff S. Global estimates on the number of people blind or visually impaired by diabetic retinopathy: a meta-analysis from 1990 to 2010. Diabetes care. 2016 Sep 1;39(9):1643-9.
17. Zhou B, Lu Y, Hajifathalian K, Bentham J, Di Cesare M, Danaei G, Bixby H, Cowan MJ, Ali MK, Taddei C, Lo WC. Worldwide trends in diabetes since 1980: a pooled analysis of 751 population-based studies with 4· 4 million participants. The Lancet. 2016 Apr 9;387(10027):1513-30.
18. Ting DS, Cheung GC, Wong TY. Diabetic retinopathy: global prevalence, major risk factors, screening practices and public health challenges: a review. Clinical & experimental ophthalmology. 2016 May;44(4):260-77.
19. Sabanayagam C, Yip W, Ting DS, Tan G, Wong TY. Ten emerging trends in the epidemiology of diabetic retinopathy. Ophthalmic epidemiology. 2016 Jul 3;23(4):209-22.
20. Sivaprasad S, Gupta B, Crosby-Nwaobi R, Evans J. Prevalence of diabetic retinopathy in various ethnic groups: a worldwide perspective. Survey of ophthalmology. 2012 Jul 1;57(4):347-70.

Authors Contribution

Concept and Design: Muhammad Zubair Nazar, Afresh Maqbool
Data Collection / Assembly: Muhammad Zubair Nazar, Afresh Maqbool
Drafting: Muhammad Zubair Nazar
Statistical expertise: Muhammad Basit
Critical Revision: Muhammad Zubair Nazar

ORIGINAL ARTICLE

Prevalence of Myopia and its Associated Risk Factors Amongst Fifth Year Medical Students of Islamabad and Rawalpindi

Fizza Najeeb[1], Tatheer Zahra[1], Rameen Iftikhar[1], Fatima-tu-Zahra[1], Maira Syed[1], Maryam Atif Chohan[1], Nihal Fatima[1], Nimrah Iqbal[1]

Objectives: To determine and compare the prevalence of pre-admission and post-admission myopia along with their associated risk factors in final year students enrolled in MBBS in Shifa College of Medicine, Rawalpindi Medical College, Federal Medical and Dental College, Fazaia Medical College, Foundation University Medical College, Islamabad Medical and Dental College, Hazrat Bari Imam Sarkar Medical College.

Methodology: A cross-sectional study was conducted amongst the final year students admitted in the medical universities mentioned above. The data was collected by hard copies of questionnaire for students of Shifa College of Medicine. For the students of remaining medical universities, the same questionnaire was provided online on google forms.

Results: Out of a total of 394 participants, 230 (58.4%) individuals reported myopia while the remaining 164 (41.6%) people had no myopia. Of the 230 people that had myopia, 183 (79.6%) participants reported myopia before admission into medical college while the remaining 47(20.4%) students had acquired myopia after admission into medical college. Of 183 pre-admission myopes, 82% had family history of myopia, 38.8% had low vitamin D levels, 44.8% were non-compliant with glasses, 50.3% neglected healthy diet, 42.6% neglected sleep, 74.8% had excessive screen time, 64.5% had depression. Of 47 post-admission myopes, 70.2% had family history of myopia, 85.1% were non-compliant with glasses, 40.4% had low vitamin A levels, 53.2% neglected healthy diet, 38.3% neglected sleep, 44.7% studied in dim light, 72.3% had excessive screen time.

Conclusion: A large proportion of the target sample suffered from myopia of which most acquired it before admission into medical universities. *Al-Shifa Journal of Ophthalmology 2022; 18(2): 81-91 .*

1. Shifa College of Medicine, Islamabad

Originally Received: 19 February 2022
Revised: 13 June 2022
Accepted: 29 June 2022

Correspondence to:
Dr. Fizza Najeeb
Shifa College of Medicine
H-8, Islamabad, Islamabad Capital Territory 46000

Introduction

Myopia has always been reported as one of the most widespread refractive error. Be it the young or the elderly, myopia is seen to affect all age groups due to its multiple risk factors that begin to manifest at an early stage of life. Despite the extensive amount of research done to develop effective interventions against myopia, the prevalence of myopia has only increased. The increasing trend of this refractive error is due to the fact that the lifestyle of this era demands a higher level of education.

Many of the researches carried out in the last 10 to 15 years have reported a greater prevalence of myopia in the elderly.[1,2] In most of these studies, any participating individual with an age greater than 40 years was included in the category of the elderly.[2,3,4] While the main aim of these projects was to calculate the prevalence of various refractive errors, they provide a useful insight towards the trend of myopia in the old, especially how it is increasing in the more aged.[2,3,4] This significant increase in the incidence of myopia among adults is associated with higher education and demanding occupations.[5,6]

Recently, however, it has been observed that the occurrence of myopia has increased considerably among young people, particularly between the ages of 19 to 25 years.[7] It has also been noted that young individuals pursuing higher education are more prone to acquiring myopia.[8,9] While all the fields of education are equally important in the diverse world of today, certain disciplines of knowledge are more physically taxing and demanding, thereby increasing the risk of myopia in the individuals that are enrolled in these degrees. It is interesting to note that engineering students have a high incidence of myopia since a large amount of time is spent on near-work activities.[10] However, many studies have reported an even higher incidence of myopia among medical students enrolled in the Bachelor of Medicine and Bachelor of Surgery Program (MBBS).[11] This difference in prevalence stems from the fact that students of this course are exposed to more risk factors for the development of myopia.[12]

The rising frequency of myopia in medical students is the core incentive behind this study. By determining the various risk factors of this refractive error, it will be easier to classify the causes into modifiable and non-modifiable factors. It is also essential to track the advancement of myopia since many complications like retinal detachment, macular atrophy etc. can develop because of high myopia i.e. > -6 diopters. This knowledge is imperative as it will allow medical students to better understand the measures to combat myopia. Furthermore, new and innovative ways can be introduced at various levels of education which will not only decrease the prevalence but also reduce the progression of myopia.

Materials and Methods:

A cross-sectional study was conducted amongst the final year students admitted to colleges of Islamabad and Rawalpindi including Shifa College of Medicine, Rawalpindi Medical College, Federal Medical and Dental College, Fazaia Medical College, Foundation University Medical College, Islamabad Medical and Dental College, Hazrat Bari Imam Sarkar Medical College. The data collection procedure began after acquiring approval from IRB&EC Shifa International Hospital Islamabad on 31st October, 2020 (Reference no. IRB#378-1198-202). Participants were selected through selective sampling which consisted of final year medical students for the reason that they had greater exposure of the various risk factors that lead to myopia. Furthermore, our target consisted of only the fifth year medical students instead of medical students of other years as it was our objective to determine the prevalence of myopia acquired before and after admission into medical universities. This allowed us to gather more accurate data since the final year medical students would be more vulnerable to the risk factors of myopia. Since many researchers reported a high incidence of myopia in medical students[13-15], the sample size was calculated to be 385 by using the WHO sample size calculator with a confidence level of 95% and 5% margin of error. This was further increased to 400 so that any missing data of a particular sample could be compensated. However, despite the 400 questionnaires collected, six of them had missing data and so the total number of complete forms

collected were 394.The statistical power set for this research was calculated by setting the power criterion at 0.8 and effect size at 0.5 after which the sample size required was 65.

- Inclusion criteria:- Final year medical students enrolled in the MBBS course of the aforementioned universities
- Exclusion criteria:- Final year medical students enrolled in MBBS course, not willing to consent.
- Data were collected in two ways:

1. Online questionnaire provided to students through google forms. The link of the form was shared to various department heads of the medical universities and required a student ID number to avoid external responses.
2. Questionnaire filled by students in Shifa International Students. This consisted of arranging meetings with final year students that are group representatives of each clinical rotation, setting an appropriate time for the forms to be filled by students after acquiring permission from clerkship directors.

The data acquired was analyzed using IBM SPSS Statistics v26 2019. The data entered was of two groups i.e. one group of medical students that had myopia before admission and the other group consisted of students that acquired myopia after admission into medical universities. Finally, the prevalence of myopia in both categories along with the prevalence of the risk factors was calculated by descriptive statistics in the form of tables. This test not only provided with the frequency but also the percentage which we decided to include in our results for better understanding. Furthermore, the frequency and percentages for the risk factors common in both groups were grouped together in the form of tables to determine which had greater occurrence in the two groups.

The parameters taken as risk factors in this study were studied for their prevalence in both groups to determine if they have a direct causative effect on myopia. Since many studies expressed a high incidence of the risk factors understudy to have a strong correlation with myopia, if any of these factors were present in 50% or more of the students of each group, they were considered as a positive finding[9,12,14,16-19]. If a risk factor was labelled as a positive finding, it entailed that as this particular element is found to be common amongst the medical students it has a strong association with myopia as one of its causative agent.

Results

- Out of a total of 394 participants, 230 (58.4%) individuals reported myopia while the remaining 164 (41.6%) people reported no myopia.
- Of the 230 people that had myopia, 183 (79.6%) participants reported myopia before admission into medical college while the remaining 47(20.4%) students reported myopia that was acquired after admission into medical college.
- Of the 183 students who contracted myopia before admission, 74(40.4%) were males and 109(59.6%) were females.
- Of the 47 students who had myopia after admission, 14(29.8%) were males and 33(70.2%) were females.

The prevalence and frequency of myopia and its associated risk factors for students with myopia before admission are given in Table 1 while those of students with myopia after admission are given Table 2. Out of the total 183 pre-admission myopes, 150(82.0%) reported that they had family history of myopia which included that either one or both of their parents had myopia (Table 1). 82 (44.8%) of the pre-admission myopic students reported that while they had prescription glasses, they were non-compliant with their use (Table 1). 105 (57.3%) of the students reported progression of myopia because their current value of spherical diopter had increased from the value of spherical diopter that they had at their first visual acuity examination (Table 1). We considered it progression only if the increase was reported to be two

values or more than the first value of spherical diopter. For example, one individual reported that their myopia was -2 SD at the first visual acuity examination but it had increased to -5 SD before admission. 92 (50.3%) of the students reported that they had clear neglect of maintaining a healthy diet during the period they prepared for their admission (Table 1). 137(74.8%) students reported an excessive use of electronic devices which entailed continuous exposure to such gadgets for three or more hours with no breaks (Table 1). 118 (64.5%) of the students reported symptoms of depression before their entrance exam for medical universities (Table 1.1). 160 (87.6%) of the students also reported that they felt extremely stressed in the period before their entrance exam which caused them persistent insomnia for 2 weeks or more , panic attacks only resolved by medication or diarrhea for three or more days with two or more episodes per day (Table 1). The various cause of their stress and their percentages have been given in the Figure 1.

Out of the total 47 post-admission myopes, 33 (70.2%) reported that they had family history of myopia which included that either one or both of their parents had myopia (Table 2). 40 (85.1%) of the post admission myopic students reported that while they had prescription glasses, they were non-compliant with their use (Table 2). 36 (76.6%) of the students reported progression of myopia because their current value of spherical diopter had increased from the value of spherical diopter that they had at the time of admission into medical university (Table 2). We considered it progression only if the increase was reported to be two values or more than the first value of spherical diopter. For example, one individual reported that their myopia was -3 SD at the time of admission into medical university but it had increased to -5 SD after admission. 25 (53.2%) of the students reported that they had clear neglect of maintaining a healthy diet during the period they had exams after admission into medical universities (Table 2). 34 (72.3%) students reported an excessive use of electronic devices which entailed continuous exposure to such gadgets for three or more hours with no breaks (Table 2). 23 (49.0%) of the students reported that they perform outdoor activities for one hour or more after admission into medical universities meanwhile the remaining 24(51%) of the students reported no such habit (Table 2). 18 (38.3%) of the students reported symptoms of depression during their academic year after admission into medical universities (Table 2). The various cause of their stress and their percentages have been given in the Figure 2.

The risk factors with a prevalence of 50% or more in any one of the two groups were considered to have a stronger association with myopia and hence considered to be positive findings. Figure 3 shows a comparison between such risk factors and their prevalence between the students with myopia before admission and the students with myopia acquired after admission.

Table 1: Frequency and Percentage of Risk Factors in Students with Myopia before Admission

Risk Factors	Before Admission (total=183)
Family History Of Myopia	150(82.0%)
Epilepsy	0(0.0%)
Smoking	28(15.3%)
Headaches	72(39.3%)
Non-Continuous Use of Glasses	82(44.8%)
Low Levels of Vitamin D	71(38.8%)
Low Levels of Vitamin A	40(21.9%)
Use of Eye Contacts	33(18%)
Obesity	48(26.2%)
Progression of Myopia	105(57.3%)
Healthy Diet Neglection	92(50.3%)
Neglection of Sleep	78(42.6%)
Continuous Study	62 (33.9%)
Study in Dim Light	47(25.7%)
Squinting of Eyes during study	47(25.7%)
Excessive Use of E-devices	137(74.8%)
Absence of Outdoor Activities	127(69.3%)
Depression	118(64.5%)
Stress	160(87.6%)

Table 2: Frequency and Percentage of Risk Factors in Students with Myopia after Admission

Risk Factors	After Admission (total=47)
Family History Of Myopia	33(70.2%)
Epilepsy	0(0.0%)
Smoking	0(0.0%)
Headaches	17(36.2%)
Non-Continuous Use of Glasses	40(85.1%)
Low Levels of Vitamin D	13(27.7%)
Low Levels of Vitamin A	19(40.4%)
Use of Eye Contacts	10(21.3%)
Obesity	13(27.7%)
Progression of Myopia	36(76.6%)
Healthy Diet Neglection	25(53.2%)
Neglection of Sleep	18(38.3%)
Continuous Study	14(29.8%)
Study in Dim Light	21(44.7%)
Squinting of Eyes during study	21(44.7%)
Excessive Use of E-devices	34(72.3%)
Absence of Outdoor Activities	24(51.0%)
Depression	18(38.3%)
Stress	8(17%)

Fig. no. 1: Causes of Stress in Medical Students with Myopia before Admission

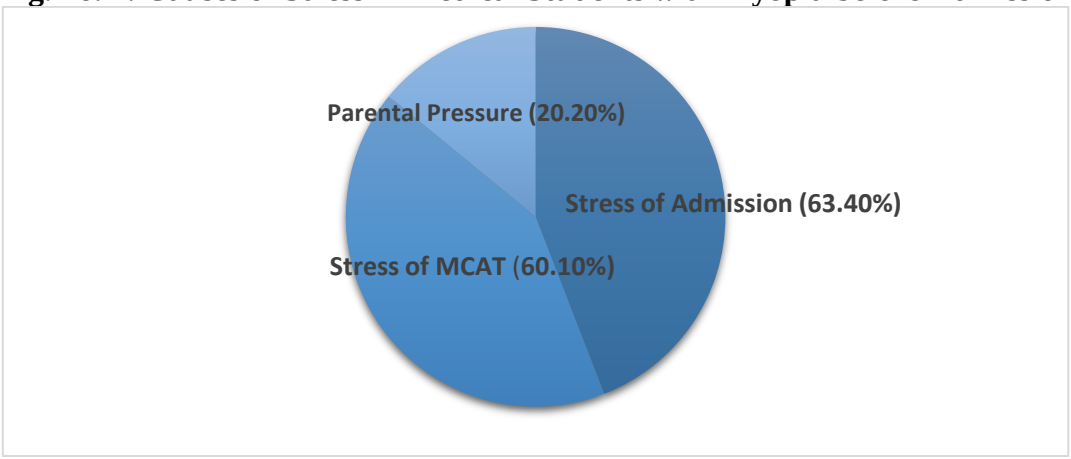


Fig. No. 2: Causes of Stress in Medical Students with Myopia After Admission

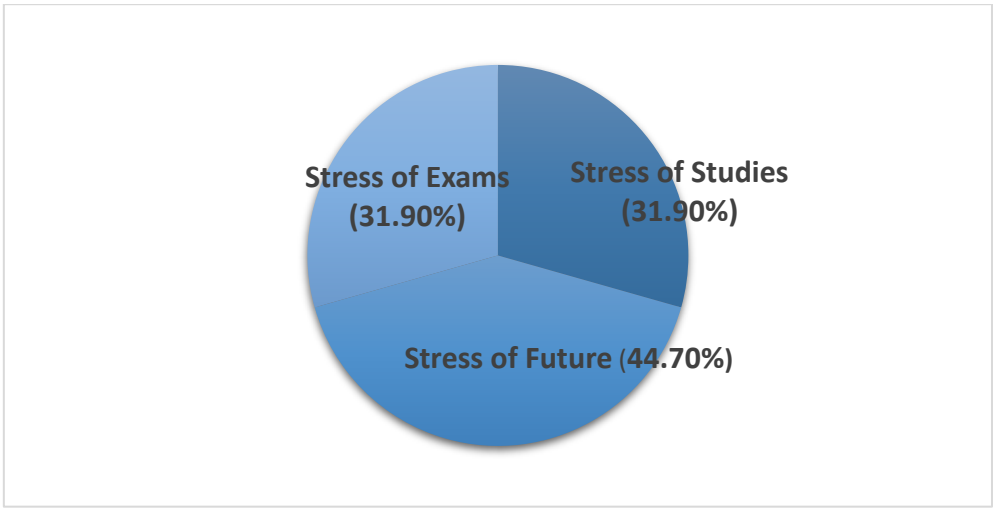
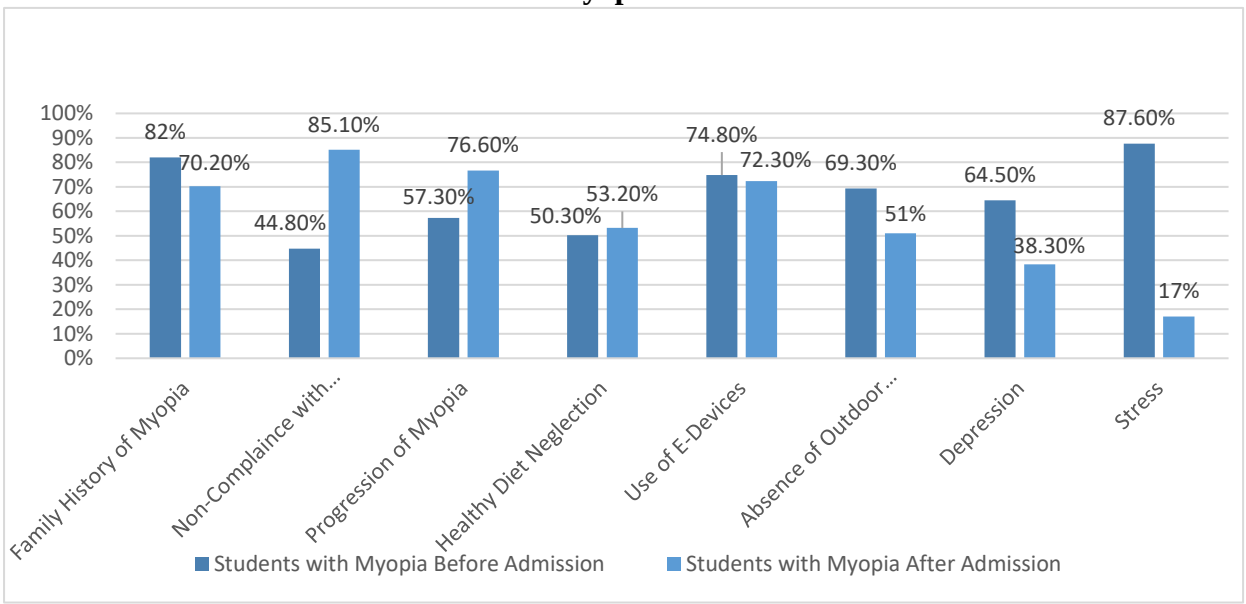


Fig. No. 3: Comparison of Risk Factors between Pre-admission and Post-admission Myopes



Discussion:

Myopia is a complex disease with a wide range of risk factors. Even with extensive research, we are yet to understand and identify all the predisposing elements of this ocular disease. Furthermore, it is important to note that not all the risk factors studied in this research are causative; certain determinants play a more aggravating role. In our study, more than half of the targeted sample reported myopia (58.4%), which is slightly less as reported by studies in which the prevalence was determined to be 73.8%, 69.5% but certain studies showed a prevalence of myopia at 17.2% and 50.3%.[11,12,20,21] A greater portion (79.6%) of the students had acquired myopia before admission into their respective medical universities which corresponds with the findings of another study in which 64% of the students had already been diagnosed with myopia before admission into medical university.[11] Of the total 230 students with myopia, 61.7% were females while the remaining minority were male. 79.5% of the total 230 students with myopia reported that one or both of their parents also had myopia, which highlights the fact that a genetic factor is also involved in the development of myopia as suggested by another study that reported 90.2% prevalence of myopia if both the parents had myopia and 78.5% if only one parent had myopia.[12]. Only 12.1% of students with myopia reported that also smoked, indicating that there is no strong association of myopia with smoking which is also corroborated by two other studies of which one reported that the prevalence of myopia in children did not increase as a result of parental smoking and another study in which only 35% of the sample with myopia smoked.[22,23] 38.7% of the students with myopia suffered from headaches which is a significant finding as one study reports 50% prevalence of headache in the individuals with myopia.[16]36.5% of the 230 students involved in our study reported low levels of vitamin D before they acquired myopia, which can be classified as a causative factor of myopia as reported by one study in which 55% of the participants with myopia had a low level of vitamin D (17 ng/ml on average), a study reported that their sample had 81% of myopia in which the blood level of vitamin D was 16.3 ng/ml on average and another study stated that they had a 70% prevalence of myopia in which the blood levels of vitamin D were 14.4 ng/ml on average.[17,24,25] A very small percentage, 25.6% of the total 230 students with myopia had low levels of vitamin A before they acquired myopia which is supported by another study that states that only 27% of their sample with myopia had low levels of vitamin A.[26] Furthermore, a small fraction, 26.5% reported obesity before myopia which is an important observation for increased BMI has been linked with myopia in a study that reports that the prevalence of myopia in obese participants was 33%.[18]

Half of the students with myopia exhibited negligence towards their diet and chose to structure their intake around processed foods, which portrays poor nutrition to be another cause of myopia as reported by another study in which 89.5% of the myopic individuals had excessive intake of processed foods.[27] Almost half of the students, 41.7% of the total students with myopia reported that they had a sleep duration of six hours or less, almost double of which has been stated by another study in which the average prevalence of myopia was 82.58% in 29.7% of the individuals that slept six hours or less.[28] A huge portion of the student body, 74.3%, reported use of electronic devices like computers, cellphones etc. for three hours or more without taking breaks which serves as a causative factor for myopia and this has also been stated by another study in which 69% of the individuals with myopia had more than three hour use of computers.[12]65.6% of the total students with myopia had no habit of carrying out any sort of outdoor activity for an hour or more which can also be another cause of myopia as stated by another study in which

the myopic group with a prevalence of 30.9% had less time spent outdoors (on average 3.95 vs 4.52 hours per week)as compared to the non-myopic group.[29] In both the categories of pre-admission myopes and post-admission myopes, almost every student reported stress regarding various parts of their lives, the details of which are mentioned in Figure 1.1 and Figure 1.2. Stressful conditions, irrespective of their triggers, result in anxiety as well, both of which contribute significantly to the development of myopia as one study reports the prevalence of anxiety in their myopia sample (83.1%) to be 44.4% and another study stated that the participants with self-reported severe myopia(16.1%) had high levels of psychological stress (e.g. stress, anxiety etc.).[30,31] More than half of the participating students also reported that they suffered from depression, before, during, and even after their myopia, which can be considered as a causative factor of this refractive error as depicted by another study in which out of the 356 participants with depression, 35.1% reported myopia.[19]

Limitations:

- In both the groups, the prevalence of myopia in the female gender was greater which is a biased finding as we had more females than males in our total sample size.
- The risk factors measured under this study are more structured according to our targeted population which is medical students. Hence their association with myopia cannot be applied definitely when studying other population groups.
- Most of the data collected from students is based on the questionnaire with no clinical evidence which can lead to false information thereby interfering with results.

Conclusion:

Myopia is one of the most common refractive errors in medical students. The students that acquired myopia before admission into medical universities are greater in number than the students that had myopia after admission. The most notable risk factors include family history, unhealthy diet, and excessive use of electronic devices, stress, depression and limited outdoor activities.

It is essential that medical students take proper measures against the most common threats. Considering the findings of this study and the previous related researches, a positive association between myopia and an unhealthy diet, obesity, decreased sleep, excessive use of electronic devices, decreased exposure to the outside environment, stress, and mental health issues like depression is possible. Furthermore, myopia can be regarded as a multifactorial disease since it also has a genetic factor involved.

References:

1. Yekta AA, Fotouhi A, Khabazkhoob M, Hashemi H, Ostadimoghaddam H, Heravian J, Mehravaran S. The prevalence of refractive errors and its determinants in the elderly population of Mashhad, Iran. Ophthalmic Epidemiol. 2009 May-Jun;16(3):198-203.
2. Wu SY, Nemesure B, Leske MC. Refractive errors in a black adult population: the Barbados eye study. Invest Ophthalmol Vis Sci. 1999 Sep;40(10):2179-84.
3. Sawada A, Tomidokoro A, Araie M, Iwase A, Yamamoto T. Refractive errors in an elderly Japanese population: the Tajimi study. Ophthalmology. 2008 Feb;115(2):363-370.
4. Ziaei H, Katibeh M, Solaimanizad R, Hosseini S, Gilasi HR, Golbafian F, Javadi AM. Prevalence of refractive errors: the Yazd eye study.

J Ophthalmic Vis Res. 2013 Jul;8(3):227-36.
5. Katz J, Tielsch JM, Sommer A. Prevalence and risk factors for refractive errors in an adult inner city population. Invest Ophthalmol Vis Sci. 1997 Feb;38(2):334-40.
6. Wong TY, Foster PJ, Hee J, Ng TP, Tielsch JM, Chew SJ, Johnson GJ, Seah SK. Prevalence and risk factors for refractive errors in adult Chinese in Singapore. Invest Ophthalmol Vis Sci. 2000 Aug;41(9):2486-94.
7. Wong YL, Saw SM. Epidemiology of pathologic myopia in Asia and worldwide. Asia Pac J Ophthalmol (Phila). 2016 Nov-Dec;5(6):394-402.
8. Nickels S, Hopf S, Pfeiffer N, Schuster AK. Myopia is associated with education. PLoS One. 2019 Jan 29;14(1):e0211196.
9. Cooper J, Tkatchenko AV. A review of current concepts of the etiology and treatment of myopia. Eye Contact Lens. 2018 Jul;44(4):231-247.
10. Kinge B, Midelfart A, Jacobsen G, Rystad J. The influence of near-work on development of myopia among university students. A three-year longitudinal study among engineering students in Norway. Acta Ophthalmol Scand. 2000 Feb;78(1):26-9.
11. Grigoraș D, Filimon R, Matei MC. Prevalence of myopia among medical students from "Grigore T. Popa" university of medicine and pharmacy. Rev Med Chir Soc Med Nat Iasi. 2016 Oct-Dec;120(4):892-9.
12. Wang L, Du M, Yi H, Duan S, Guo W, Qin P, Hao Z, Sun J. Prevalence of and factors associated with myopia in inner Mongolia medical students in China: a cross-sectional study. BMC Ophthalmol. 2017 Apr 24;17(1):52.
13. Latif MZ, Khan MA, Afzal S, Gillani SA, Chouhadry MA. Prevalence of refractive errors; an evidence from the public high schools of Lahore, Pakistan. J Pak Med Assoc. 2019 Apr;69(4):464-467.
14. Malik MH, Mohydin M, Saeed A, Arif M, Malik MA, Mohydin S, Sami AM. Prevalence and Risk Factors of Myopia among Medical students. Pakistan journal of medical & health sciences. 2022 Feb;16(2):173-175.
15. Kayani H,Rahman HU, Javed M, Jahangir K, Akbar S. Prevalence of Myopia and Peripheral Retinal Degeneration in Medical Students of Fatima Jinnah Medical University. Journal of Fatima Jinnah Medical College 2016 Jul-Sep;10(3):13-17.
16. Sitaula RK, Khatri A. Knowledge, Attitude and practice of Computer Vision Syndrome among medical students and its impact on ocular morbidity. J Nepal Health Res Counc. 2018 Oct; 16(3):291-296.
17. Jung BJ, Jee D. Association between serum 25-hydroxyvitamin D levels and myopia in general Korean adults. Indian J Ophthalmol. 2020 Jan;68(1):15-22.
18. Chu CH, Wang JH, Jan RH, Huang CH, Cheng CF. Association between health examination items and body mass index among school children in Hualien, Taiwan. *BMC Public Health*. 2013 Oct 19;13:975.
19. Wu Y, Ma Q, Sun HP, Xu Y, Niu ME, Pan CW. Myopia and depressive symptoms among older Chinese adults. PLoS One. 2017 May 12;12(5):e0177613.
20. Bahhawi TA, Makeen AM, Daghreeri HH, Tobaigy MF, Adawi AM, Guhal FM, Akkur MA, Alotayfi MJ, Otayf MM, Bajoned MS, Mahfouz MS. Refractive Error among Male Primary School Students in Jazan, Saudi Arabia: Prevalence and Associated Factors. Open Ophthalmol J. 2018; 12: 264–272.
21. Midelfart A, Aamo B, Sjøhaug KA, Dysthe BE. Myopia among medical students in Norway. Acta Ophthalmol. 1992;70(3):317–322.

22. Saw SM, Chia KS, Lindstrom JM, Tan DT, Stone RA. Childhood myopia and parental smoking. Br J Ophthalmol. 2004 Jul;88(7):934-7.
23. Wang X, He H, Wang X, Shan G, Tao Z, Pan L, Li J, Ren X, Zhao H, Pan Z, Wang M, Zhong Y, Ma j. Prevalence and risk factors of myopia in Han and Yugur older adults in Gansu, China: a cross-sectional study. Sci Rep. 2020 May 19;10(1):8249.
24. Choi JA, Han K, Park YM, La TY. Low serum 25-hydroxyvitamin D is associated with myopia in Korean adolescents. Invest Ophthalmol Vis Sci. 2014 Apr 3;55(4):2041-7.
25. Han SB, Jang J, Yang HK, Hwang JM, Park SK. Prevalence and risk factors of myopia in adult Korean population: Korea national health and nutrition examination survey 2013-2014 (KNHANES VI). PLoS One. 2019 Jan 24;14(1):e0211204.
26. Ng FJ, Mackey DA, O'Sullivan TA, Oddy WH, Yazar S. Is dietary vitamin A associated with myopia from adolescence to young adulthood? Transl Vis Sci Technol. 2020 May 28;9(6):29. Available from: DOI: 10.1167/tvst.9.6.29.
27. Berticat C, Mamouni S, Ciais A, Villain M, Raymond M, Daien V. Probability of myopia in children with high refined carbohydrates consumption in France. BMC Ophthalmol. 2020 Aug 18;20(1):337. Available from: DOI: 10.1186/s12886-020-01602-x.
28. Jee D, Morgan IG, Kim EC. Inverse relationship between sleep duration and myopia. Acta Ophthalmol. 2016 May;94(3):e204-10.
29. Zhou Z, Morgan IG, Chen Q, Jin L, He M, Congdon N. Disordered sleep and myopia risk among Chinese children. PLoS One. 2015 Mar 26;10(3):e0121796
30. Li Q, Yang J, He Y, Wang T, Zhong L, Zhu Z, Wang T, Ling S. Investigation of the psychological health of first-year high school students with myopia in Guangzhou. Brain Behav. 2020 Apr;10(4):e01594.
31. Akuffo KO, Sewpaul R, Darrah S, Dukhi N, Kumah DB, Agyei-Manu E, Addo EK, Asare AK, Duah IO, Reddy P. Vision loss, vision difficulty and psychological distress in South Africa: results from SANHANES-1. BMC Psychol. 2021 Apr 29;9(1):66

Authors Contribution

Concept and Design: Fizza Najeeb, Tatheer Zahra
Data Collection / Assembly: Tatheer Zahra , Rameen Iftikhar, Fatima-tu-Zahra
Drafting: Maira Syed, Maryam Atif Chohan
Statistical expertise: Nihal Fatima, Nimrah Iqbal
Critical Revision: Fizza Najeeb