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Genetic Testing in Retinal Dystrophies: A Way of Future

Hassan Mansoor

Incredible possibilities are being brought about by recent advances in genetics and technology. These developments bring with them a ray of hope for the management and the potential cure of patients with retinal dystrophies.

Genetic testing has a unique niche. It is a way to look at the genes of interest by using laboratory methods. [1] The prime goal of genetic testing is to detect the variations in the DNA instructions. The DNA samples can be obtained from any tissue of the body including blood, sperm, hair, skin, tumors, saliva, cells swabbed from the oral cavity as well as the fluid surrounding a fetus.

Retinal dystrophies can be inherited as autosomal dominant (AD), autosomal recessive (AR), X-linked (XL), mitochondrial or diagenic traits. Currently, the genes for 75% of the retinal dystrophies are accounted for.[2] Furthermore, more than 200 genes linked with retinal dystrophies have been identified.[3] An additional 50 chromosomal locations intrinsic to retinal dystrophies, have been discovered, but the genes in these chromosomal locations are yet to be cloned.[4]

The Pakistani population has been a dynamic pool of genes known to be causative of retinal dystrophies. In a recent study conducted on Pakistani population with retinal dystrophies, a total of 144 families with a history of consanguineous marriages and multiple members being affected were studied. The disease causing mutations were identified in 62 families while only the locus of the causative gene was discovered in an additional 15 families. The remaining 67 families were found to be linked to "novel" genes and are of interest to geneticists globally.[5]For this purpose, DNA banks are gaining importance and significance worldwide.[1]The pace at which rapid technological advances are being made worldwide, will surely lead to new and ground breaking discoveries in the genetics of retinal dystrophies in the times to come.

Genetic testing may be performed in clinical or research based laboratories but both differ in their approaches. The former examines the DNA specimens with the aim of reaching a diagnosis, prevention and formulating a treatment plan of an individual. In the latter, the individual is not the focus of interest but it is the disease itself which is being studied for a better understanding. The cost of research testing is born by the researcher or some donor agency. However, the results usually surface after a year or two and an official report in this regard may not be issued to an individual. Moreover, research laboratories provide a supplementary route to perform tests not being done by clinical laboratories.

DNA testing is being offered by a number of commercial companies in the western world. However, it is more likely to be relevant and bear fruit if done alongside ocular genetic consultation. A geneticist endeavors to identify a probable abnormal sequence of genes before undertaking a genetic test thus increasing the chances of yielding a positive test result. A detailed history, thorough ocular and systemic examination along with comprehensive clinical/laboratory testing plays an

instrumental role in getting the desired results. [1]

Many retinal dystrophies share the same clinical features, a phenomenon coined as genetic heterogeneity. As it is not feasible to test all genes, an experienced geneticist is able to extract essential information from a detailed history, thorough clinical examination and commonly performed diagnostic tests. It is also worthwhile to mention here that genetic testing methodology varies from one laboratory to the other. Microarray panels of all known mutations, targeted mutation analysis, complete sequencing of a specific gene, or simultaneous sequencing of many exons are some of the modalities used for genetic testing in retinal dystrophies. Thus, not only does the geneticist need to select the genes to be tested but also has to find a laboratory that might perform the required test.[1]

The editorial board is of the view that families dealing with retinal dystrophies are looking to address primarily four fundamental questions which relate to the diagnosis, treatment, prognosis and pre-symptomatic detection of the disease. Consider a case scenario where a 3 months old child presents with nystagmus and roving eye movements. The parents complain of the inability of the child to see. Based on clinical examination, the differential diagnosis in this case could be Leber Congenital Amaurosis (LCA), Achromatopsia or Congenital Stationary Night Blindness (CSNB). Although ERG is an important diagnostic aid yet performing it in this age group is heralded with technical difficulties. Likewise, results may be equivocal and laborious to interpret. Hence, the parents and the clinician are in a diagnostic impasse realizing that LCA, being a progressive visual disease, will severely impair the child. On the contrary, CSNB and achromatopsia being stable disorders, tend to have better prognosis.

The retinal dystrophy may evolve over time, aiding a precise diagnosis, but would require numerous visits, a multitude of tests and time to reach a conclusion. Inter alia, this can cause mental torment to the parents and the family. Genetic testing has caused a paradigm shift in the challenges faced in diagnosing retinal dystrophies and has significantly reduced the time required to make a more specific diagnosis. Identifying mutations in one of the CSNB genes, for instance, can spare the parents, eons of skepticism. None the less, genetic testing results need to be correlated clinically.

As the retinal dystrophy is diagnosed in a child, the next question that baffles the parents' mind is what will eventually happen to their child's vision? Realistic understanding of the prognosis on one hand empowers the patients to deal with their disease condition and on the other hand facilitates the clinician in accurate counseling of the patient regarding the disease and its implications over time. Such awareness can also influence personal decisions like lifestyle, education, employment and family planning. The decision to perform genetic testing is very personal and should be taken after considering all possible outcomes.

The interplay between a gene defect and the resulting phenotype is not simple and can be affected by genetic background, environmental factors and modifier alleles. Considering the above mentioned example of LCA again, a child with a mutation in *CRB1* or *RPE65*tend to have a better visual function and prognosis as compared to a child with LCA having mutation in *RPGRIP* or *AIPL1*.

The possibility of treatment and the suitability for current genetic therapeutic interventions in patients with retinal dystrophies is another important question that needs to be considered. Gene therapy has been successful in both animal and

human trials over the years. Genetic material is introduced into the cells to replace deficient proteins and abnormal genes. In 2001, a dog model, having LCA and a mutated *RPE65* gene, was treated by injecting a subretinal vector carrying a normal copy of *RPE65* gene. The effects of the trials were encouraging and long lasting.[3] Following this, in 2008, multiple human trials with gene therapy followed which showed promising improvement in the visual function.[4-7]

It is important to mention here that genetic testing reports only disease causing mutations and not the disease itself and several factors influence the expression of a disease in patients with a causative mutation. The percentage of individuals, having the causative mutation and showing signs of the disease, is known as penetrance of the disease-causing mutation.

It is important and advisable to have a genetic counseling session before and right after genetic testing in patients with retinal dystrophies. An important aim of having a pre-test counseling session is to make an informed decision regarding whether to go for the genetic testing or not? Also, the counselor can enlighten the individuals and their families about the potential benefits, limitations and the possible implications of the test. Likewise, a post-test counseling session is equally important and recommended for correct interpretation of the test results, testing other family members if and when required and for the provision of guidance and support in making personal and medical decisions.

In a nutshell, there may be technological limitations and ethical concerns associated with genetic testing, it has indeed made an impressive mark on the medicinal horizon and is definitely a ray of hope and a way of future for patients with retinal dystrophies.

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ORIGINAL ARTICLE

Causes of Childhood Blindness in a Tertiary Care Eye Hospital

Shadab Hassan[1], Sorath Noorani Siddiqui[1], Naima Zaheer[1]

Abstract

Objective: To analyze the causes of childhood blindness in a tertiary care eye hospital.

Participants and Methods: A Prospective study in which children of age ≤15 years with vision <6/60 in both eyes were selected and causes of visual impairment were documented.

Results: 205 children with bilaterally impaired vision were selected. 60.4% were male and 39.5% were female. Mean age was 7.96 ± 4.49 years. Based on the anatomical site, the leading causes of severe visual impairment and blindness were retinal diseases in 36.58% children, followed by glaucoma in 23.41%, diseases of cornea in 16.58%, anterior segment dysgenesis in 5.85%, optic nerve diseases in 5.36%, cerebral disorders in 4.87%, globe anomalies in 2.92%, uveal pathologies in 2.43% and lens problems in 1.95%.

Conclusion: Diseases of retina constitute the commonest cause of severe visual impairment and blindness in children in our set up, followed in order of decreasing frequency by glaucoma, diseases of cornea, anterior segment, optic nerve, cerebrum, globe, uvea and lens.

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Introduction:

Childhood blindness is an important problem globally. According to World health organization (WHO), 1.4 million children are blind world-wide.[1] Approximately 73% of these blind children belong to low socio-economic countries[2] and 1 million of these children are Asians.[3] World-wide prevalence of childhood blindness ranges from 0.3/1000 children in developed societies to more than 1.0/1000 children in underdeveloped areas.[2] In Pakistan the prevalence of childhood blindness is estimated to be 1.19 per 1000 children, with the estimated provincial prevalence in Khyber Pakhtun Khwa (KPK, former NWFP), Baluchistan, Sindh and Punjab as 0.97, 1.14, 1.41, 1.58 per 1000 children respectively.[4]

The causes of childhood blindness are variable in different parts of the world and are dependent on the socio-economic status[2] and the accessibility of medical and ophthalmic care facilities in that area.[5] In high socio-economic countries, diseases of optic nerve and higher visual pathways are important causes of childhood blindness. In middle socioeconomic areas major cause of childhood blindness is retinopathy of prematurity. While in low socio-economic countries corneal scarring from measles, vitamin A deficiency, the use of traditional harmful eye medicines and ophthalmia neonatorum are the predominant causes.[6]

Vision plays a critical role in development of a child during first three years of life. Little ones use vision to enhance motor

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function, establish parent child-bonding and build picture perception and gain their balance.[7] Vision problems can lead to behavioral problems like learning disabilities dyslexia attention deficit disorder.[8] Severe visual impairment or blindness affects the child's quality of life including psychological development, education and employment. All these contribute a negative impact on the child's family, society and country.

The control of childhood blindness is given special importance in the World Health Organization's (WHO's) VISION 2020 — The Right to Sight programme.[6] On the average half of the causes of childhood blindness in developing countries are avoidable in which 27% causes are treatable and 19% are preventable.[9] Early diagnosis and treatment of avoidable causes of childhood blindness is important in first few years of life for the proper visual maturation and prevention of amblyopia.

Pakistan is one of the five most populated countries where half of the world's blind reside.[10] Although childhood blindness comprises only a portion 3.2%[11] of the world's total blindness but it has a great influence due to the number of blind years experienced among children is more than that of adult onset vision loss.[12] In this study we studied the different causes of blindness in children visiting the paediatric and low vision clinics of our hospital which is one of the largest paediatric eye care facility in our country.

Participants and Methods:

We conducted a prospective, cross sectional study in which different causes of severe visual impairment and blindness in children visiting our hospital were studied. The study was approved by the Institutional Review board of Al-Shifa Trust Eye Hospital, Pakistan. An informed written consent for the ophthalmic examination and inclusion of children in the study was obtained from the parents or guardians.

Children with bilateral severe visual impairment or blindness were selected by non-randomized purposive sampling technique from the paediatric and low vision clinics of Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan. Binocular severe visual impairment was considered with vision worse than 6/60 or 20/200 and blindness was defined as vision less than 3/60 or 20/400 in the better eye.[13] Inclusion criteria consisted of children ≤15 years of age, with pathology and decrease vision in both eyes. Cases of unilateral severe vision loss were not included. Patients with uncorrected refractive errors, cataracts or other causes of treatable blindness were excluded from study.

Assessment of vision and refraction were performed in all children. Complete ophthalmic examination including anterior segment and dilated fundus examination were performed and intraocular pressure and axial lengths were measured. In patients in whom fundus view was not possible B-scan ultrasound was considered. Examinations of young children were carried out under sedation (with syrup chloral hydrate, 50mg/kg). After detailed examination the main cause of blindness was noted and related clinical findings were documented.

Data analysis was performed using statistical program for social sciences (SPSS, IBM) version 17. Patient demographics like age and gender were observed. Our main outcome measures were different causes of childhood blindness, level of visual impairment and age at the initial diagnosis.

Results:

From January 2014 to July 2014, 205 children with bilaterally impaired vision and fulfilling the inclusion were selected

and the causes of decrease vision in these children were noted.

Out of these 205 children, 60.4% (124) were male and 39.5% (81) were female. Mean age in years was 7.96 ± 4.49 (range 3 months to 15 years).

In our study, based on the anatomical site the leading cause of severe visual impairment and blindness, were retinal diseases in 36.58% children, followed in order of decreasing frequency by glaucoma in 23.41%, diseases of cornea in 16.58%, anterior segment dysgenesis in 5.85%, optic nerve diseases in 5.36%, cerebral disorders in 4.87%, globe anomalies in 2.92%, uveal pathologies in 2.43% and lens problems in 1.95%. (Figure 1 & 2 and Table 1)

Seventy five children (36.58%) had bilateral retinal diseases causing impaired vision. Among the retinal diseases, retinal dysplasias, Leber congenital amourosis, Albinism and retinitis pigmentosa were the most common cause in children <1 year, 1 to 5 year, 5 to 10 year and 10 to 15 year age group respectively(Table 1). Forty eight patients (23.41%) had glaucoma, of which 39 had primary and 9 had secondary glaucoma. Of the glaucoma cases 46 had corneal scarring and 2 had optic disc cupping.

Among the 34 children (16.58%) with corneal problems the most common causative disease was sclerocornea followed by vitamin A deficiency, keratoconus, keratitis, corneal opacity and corneal dystrophy.

Anterior segment dysgenesis was present in 12 children (5.85%). Eleven patients (5.36%) had optic nerve disease. Majority of the cases had primary optic atrophy and only few had secondary optic atrophy, optic nerve hypoplasia and optic neuritis.
Eleven patients (5.36%) had cerebral involvement among which the leading cause was neurodegenerative disorders. Few patients had structural abnormalities (hydrocephalous, agenesis of any part), infectious causes (meningitis) or intracranial tumors. Six patients (2.92%) had globe abnormalities like microphthalmos or anophthalmos.

Five patients (2.43%) had uvea being the etiological anatomical site of which 3 patients had uveal coloboma involving posterior pole and 2 had aniridia with foveal hypoplasia. In four patients (1.95%) the main etiological anatomical site was lens, these patients had uncorrected aphakia (never used aphakic correction with dense amblyopia) or complicated cataracts with roving eye movements (did not regain vision after cataract surgery due to dense amblyopia).

Amongst the male and female patients there was no significant difference in the frequency and percentage of etiological factors. All these children had visited or were referred to low vision clinic and were given aids according to age.

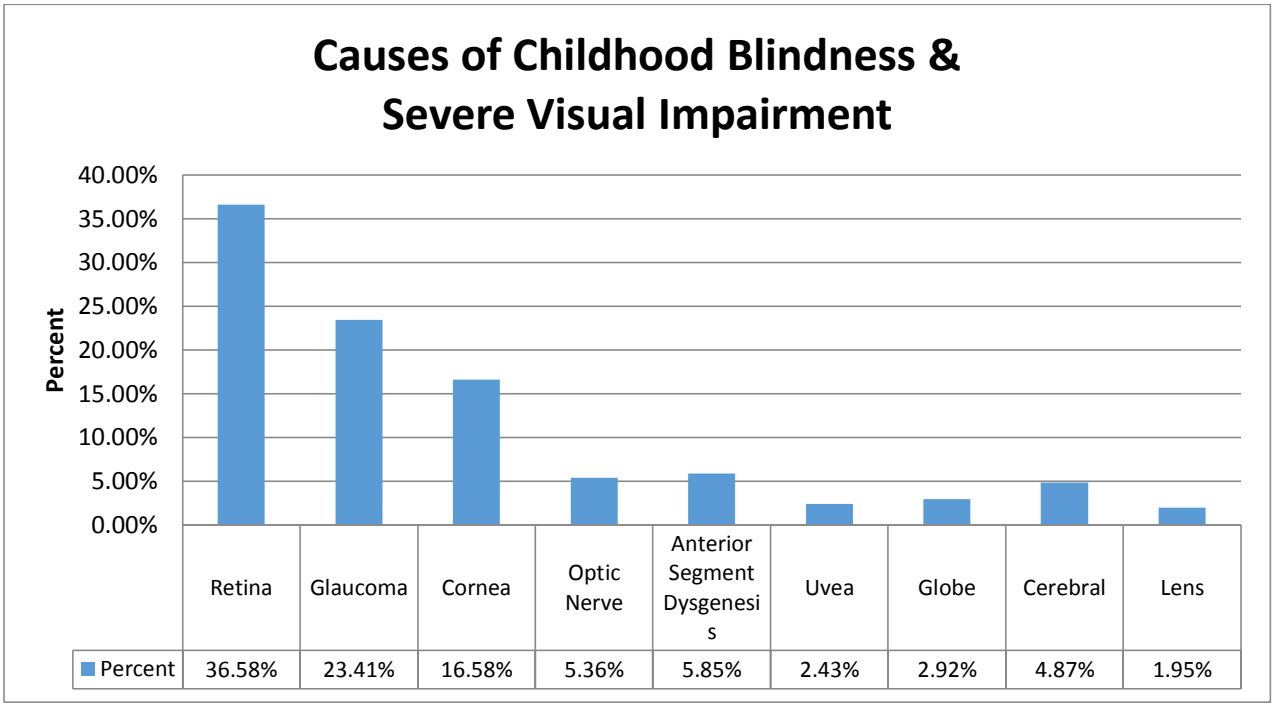

Figure No. 1. Causes of Childhood Blindness and Severe Visual impairment based on the anatomical site.

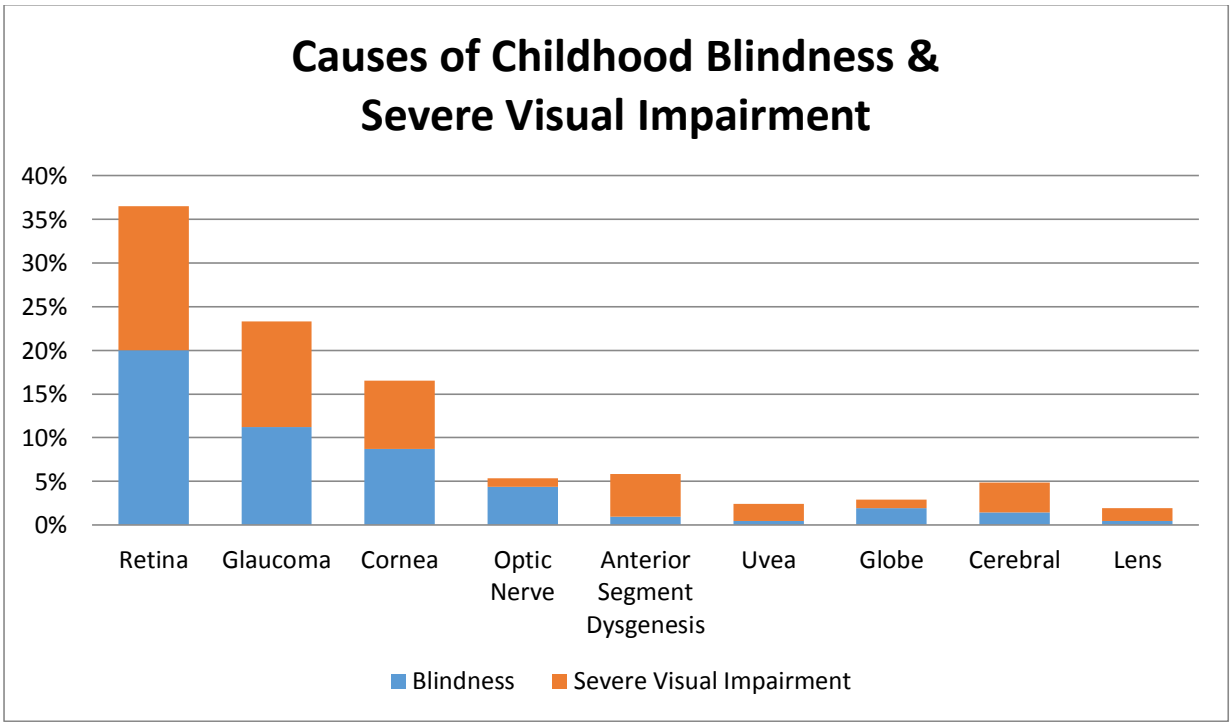

Figure No. 2. Relative percentage of Childhood Blindness and Severe Visual impairment in various paediatric disorders

Table No. 1. Frequency of causes of Childhood Blindness and Severe visual impairment

Causes	**n 205**	**Causes Sub-Types**		**n**	**Visual Status**		**Age Group**			
					Severe visual Impairment	Blind	Newborn To 1 year	1-5 year	5-10 year	10-15 year
Retinal Causes	75	Retinal Dystrophy	RP	21	13	8			2	19
			LCA	11	3	8		9	2	
			Others	5	5				1	4
		RD		3		3	1	2		
		RB		5	2	3		2	2	1
		Dysplasia		11		11	10	1		
		ROP		6		6	6			
		Albinism		9	7	2		1	3	5
		Macular Scar		4	4		1	2		1
Glaucoma	48	Primary		39	18	21	9	14	11	5
		Secondary		9	7	2		5	3	1
Cornea	34	Sclerocornea		15	6	9	3	10	2	
		Vitamin A deficiency		7	2	5	5	1	1	
		Keratoconus		4	4					4
		Corneal Dystrophy		2	2					2
		Keratitis		3	2	1	2	1		
		Opaque Cornea		3		3			3	
Optic Nerve	11	Primary		8		8	6	2		
		Secondary		1	1					1
		Hypoplasia		1		1		1		
		Optic Neuritis		1	1					1
Lens	4	Subluxated / Dislocated		1		1			1	
		Aphakia		3	3					3
Ant. Segment Dysgenesis	12			12	10	2	4	8		
Uvea	5	Aniridia		2	1	1		2		
		Coloboma		3	3			1	2	
Globe	6	Anophthalmos		4		4	1	3		
		Microphthalmos		2	2			2		
Cerebral	10	Neuro-degenerative		7	5	2	2	4	1	
		Structural Abnormality		1		1			1	
		Infective		1	1			1		
		Tumor		1	1				1	

Discussion:

Goal of our study was to identify the causes of blindness in children visiting our hospital. Our study results showed larger number of male patients visiting our hospital than that of females i.e., 60% versus 40%. This shows most common practice in our male dominant society. As nearly same result showed in study conducted at Ida Rieu School of blindness and deaf.[14]

In our study the commonest cause of visual impairment were retinal diseases in 36.5% children. Among the retinal causes retinitis pigmentosa was common in older children while retinal dysplasias and leber congenital amaurosis were more common in young children. Similarly in different Pakistani blind school based studies retinal problems were the major anatomical site of disability and were present in 51.2%[4], 50%,[15] 41%,[14,16] 36.06%[17] and 23%[18] children and were mainly due to retinal dystrophies especially retinitis pigmentosa (20%[19]). Retina is also the most common anatomic site among the causes of childhood blindness in countries of Former social economies (FSE), Latin America and Caribbean (LAC) and Middle Eastern Crescent (MEC).[20] In China and Malaysia it is the second most common site of cause and accounts for 24.5%[21] and 20.8%[22] respectively.

Our six children (2.9%) had blindness due to advanced retinopathy of prematurity (ROP). Similarly ROP was present in 1.4%[14] of blind school children in Karachi. ROP is evolving as a significant cause of childhood blindness in middle income countries[23] because of greater survival of pre-mature babies and improved health service. Countries in Eastern Europe, Latin America, India and China[23] are at maximum risk. It is not considered as a major cause in underprivileged countries of Africa and Asia.[24] The incidence of blinding complications of ROP in our country will decrease in future due to improvements in oxygen protocols and the start of ROP screening programme all over the country within last few years. In addition our 5 children were blind due to retinoblastoma. These children had primary enucleation of one eye and other eye was enucleated due to failure of all conservative treatment modalities. Availability of advanced conservative treatment modalities like intra-arterial chemotherapy can lead to preservation of globe and vision in advanced cases of retinoblastoma and further decrease in this cause of blindness. In one study from Karachi 0.7%[14] blind children had retinoblastoma.

The second most common (23.4%) cause of blindness in our children was glaucoma. It is one of the treatable causes of childhood blindness world-wide. Delay in diagnosis and treatment lead to buphthalmos, corneal scarring, optic atrophy and visual loss. our hospital receives more children with glaucoma as compared to other centres as different other Pakistani studies showed glaucoma in 4.7%[4] and 6%[16] and buphthalmos in 12%,[19] 7.1%,[15] 3.3%[4] blind children.

In our study, 16.8% children had corneal problems out of which majority has sclerocornea followed by vitamin A deficiency. In different Pakistani studies it contributed in blindness in about 19%,[16] 6.3%,[14] 4.9% and 3.7%.[4] Keratoconus affected vision in our cases with cornea scarring after hydrops. In Abottabad blind schools blindness due to corneal scarring and keratoconus was present in 8%[19] and 12%[19] respectively. Corneal scarring caused by vitamin A deficiency, measles, harmful traditional ophthalmic medications and ophthalmia neonatorum are important causes of preventable blindness and can be reduced by supplementations of vitamin A and proper control of infectious diseases These are most common in countries of low socioeconomic status including Africa.[25] In India corneal problems constitute the

second most important cause (24.6%)[20] of blindness in children.

In this study in 2.92% children abnormalities of globe were present. In contrast to this in other Pakistani studies globe is an important cause and contributes in 20-30% children (29.6%,[15] 28.3%,[4] 24%,[16] 22.9%,[17] 22%,[18] 20.1%[14]). In a blind school in Abottabad malformed and traumatic globes are the most frequent (32%[19]) causes of blindness owing to difference in life style and culture of these areas. Likewise in India disorders of globe is also the commonest (33.3%)[20] cause of childhood blindness.

In our study in 5.3% children, disorders of optic Nerve were present. In other National Studies it was present in 13.1%,[17] 12%,[19] 8.3%[14] and 6.1%[4] children. Cerebral causes were present in our 4.87% children. In contrast in high socioeconomic countries disorders of optic nerve and higher visual pathway are an important cause of childhood blindness.[6] Interestingly, in United States, the major causes of childhood blindness are cortical visual impairment, optic nerve hypoplasia, and retinopathy of prematurity.[9] Similarly in United Kingdom the leading causes identified are cerebral visual impairment, retinal disorder and diseases of optic nerve in 48%, 29% and 28% of blind children respectively.[26]

Uveal diseases were present in our 2.43% cases. In another local study uveal disorders contribute a very small portion 0.4%[4] in causes of childhood blindness.
In our children the most infrequent (1.95%) cause of blindness was lens. Cataract is the most treatable cause of decrease vision world-wide. In our study cataract is an infrequent cause because children with cataracts who restore vision after surgery where not included. Among this group blindness was due to intractable amblyopia either due to non treated cataracts or uncorrected aphakic corrections. In another study conducted by our hospital in different areas of Punjab lens was the most frequent (24%[18]) cause of blindness. In another study lens comprised of 10%,[4] 7%[16] and 19.6%[17] in different blind schools of Pakistan, Lahore and KPK (NWFP) respectively. In few other studies Cataract (12.5%,[15] 13.9%[14]) and Aphakia (12.5%,[15] 6.3%[14]) contributes as an important cause. However in Malaysia Lens is the main anatomic site (22.3%) of visual loss in children.[22]
One of the limitations of our study is that the results shown by our study represents the causes of blindness in children visiting our hospital and doesn't represent blindness in our whole children population. In our society because of lack of resources, education of parents and poverty, number of blind children reaching hospital is less. Similarly a very small percentage of our visually impaired children go to blind-school. Therefore a large population based study involving different cities and blind schools is required to analyze the causes of blindness in our children**.**

When there is blindness in the family, the other members also become less productive as they need to give extra time to the child owing to his/her blindness. Restoring his vision also makes a difference in their lives as they become more productive. In order to achieve this objective, a three pronged approach needs to be followed at all levels. For addressing the infectious diseases in pre-natal and perinatal problems early screening is necessary; for detection of systematic problems early treatment is required; broad multidisciplinary approach be followed in rehabilitative services as well as provision of specialised treatment. Besides, genetic counseling plays a pivotal part in all the above stages. Availability of low cost, high quality low vision devices is also important.

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ORIGINAL ARTICLE

Comparison of Endothelial Cell Loss in Diabetics after Phacoemulsification and Extra-Capsular Cataract Extraction

Muhammad Usman Sadiq[1], Muhammad Irfan Sadiq[2], Sara Najeeb[1]

Abstract

Objective: To compare the frequency of endothelial cell loss in diabetics after phacoemulsification and extra-capsular cataract extraction (ECCE).

Study Design: Randomized Clinical Trial

Place and duration of study: Al-Shifa Trust Eye Hospital, Rawalpindi, from 1st May 2013 to 30th April 2014.

Subjects and Method: Patients were allocated into two groups, based on the type of surgery advised. Group 1 contained the patients advised phacoemulsification and Group 2 patients advised ECCE. After informed consent, specular microscopy was done on patients of both groups and endothelial cell count was recorded in each case before surgery. Surgery was done and patients were discharged on next day. On follow up after 1 month of cataract surgery, specular microscopy and endothelial cell count was recorded. All the observations and demographic information were noted on a pre-designed structured Performa. Data was analyzed by using Statistical Package for Social Sciences (SPSS) version 10.

Results: In Group 1, patients who underwent Phacoemulsification, 84.8% patients had endothelial cell loss <15% while 15.2% patient had endothelial cell loss >15%. The mean percentage was 9.39 ± 4.27% while in Group 2, patients who underwent Extra-capsular cataract extraction 21% patients had endothelial cell loss <15% while 79% patient had endothelial cell loss >15%. The mean percentage of endothelial cell loss was 18.40 ± 3.79%.

Conclusion: This study revealed that there was a statistically significant difference in the corneal endothelial cell loss in diabetics after phacoemulsification and extracapsular cataract extraction. Phacoemulsification cause less damage to corneal endothelial cells and hence it should be the treatment of choice in diabetic patients. *Al-Shifa Journal of Ophthalmology 2017; 13(1): 18-24. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.*

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Introduction

Diabetes Mellitus is a common metabolic disorder characterized by sustained hyperglycemia of variable severity[1].

Several structural changes in corneal endothelial cells are observed in patients with Diabetes mellitus[2]. Many clinical evidences have shown that patients with diabetes have functional abnormalities such as lower corneal sensitivity, greater baseline corneal thickness, less endothelial cell density[3]. Cornea is the anterior part of the eye, which is transparent and covers the anterior chamber[1]. Cornea and lens causes the refraction of light rays entering

the eye, with the cornea contributing approximately two-thirds of the total refractive power of the eye[3]. The corneal endothelium consists of a single layer of flattened cells which are polygonal in shape and whose plasma membranes interdigitate with one another[4].

Patients with diabetes have been described to have thicker corneas as compared to the normal population[1]. They may also have a low endothelial cell count, making the endothelium more prone to stress-related injuries and damage like ocular surgeries[5]. Cataract surgery is one of the well-known factors that affects the cornea by causing endothelial cell loss and corneal decompensation[4]. All ocular surgeries that involve entry into the anterior chamber which damages a proportion of the endothelial cells as a result of intraoperative corneal manipulations[5]. After endothelial cell loss, the adjacent cells enlarge and slide over to maintain endothelial cell continuity, which is observed as a change in the endothelial cell density and morphology[6]. Moderate damage to the endothelium during surgery can also lead to a transient increase in the corneal thickness[5].

Endothelial cell density and function can be assessed clinically using specular microscopy and pachymetry[6]. Anatomical stability and physiological integrity are necessary to maintain long-term corneal transparency after cataract surgery[7]. Patients with diabetes have always been exempted from clinical trials assessing the effects of cataract surgery on the endothelium based on the assumption that they are more susceptible to damage during surgery[8]. In recent years, advances have been made in cataract surgery because of improvement in surgical equipment, visco-elastic agents and techniques, expanding the indications for this surgery[9]. After the development of phacoemulsification, corneal endothelial damage was not an absolute contraindication for cataract surgery[10.] Cataract surgery by phacoemulsification procedure and foldable intraocular lenses makes its treatment very comfortable for patients[11]. The patients can resume their normal activity faster as compared to conventional extra capsular extraction (ECCE) cataract eye surgery using sutures[12]. There is very less stress to cornea[13], wound heals faster and more predictable and compared to conventional surgery less follow up visits for checkups are required[14].

There are conflicting results regarding these two procedures[15]. Some studies have shown that there is no mark able difference of corneal endothelial cell loss after ECCE and phacoemulsification[16].

The purpose of this study is to clear this ambiguity by comparing the corneal endothelial cell loss in diabetic patients after extra-capsular cataract extraction and phacoemulsification.

Subjects and Methods:

It was a randomized clinical trial study, carried out in Al-Shifa Trust Eye Hospital, Rawalpindi in the duration of one year. Sample size was calculated by values from another recent study[21,22] with level of significance 5%. In each group, 105 patients were studied through non-probability (Consecutive) Sampling Technique. Diabetic patients of any gender, aged 50 years, who are already diagnosed as having diabetes mellitus of duration more than 5 years and taking treatment were included in this study, while patients with previous ocular surgery or any other pathology were excluded from study.

Patients were allocated into two groups, by random allocation using lottery method, based on the type of surgery advised. Group 1 contained the patients advised phacoemulsification and Group 2 had patients advised ECCE. After taking

informed consent, patients of both groups were advised specular microsco.py before the cataract surgery and endothelial cell count was recorded in each case. Surgery was done and patients were discharged on next day. Post-op medications were prescribed to all of them. For follow up, their address and contact number were noted.

On follow up after 1 month of cataract surgery, specular microscopy was again advised and endothelial cell count was recorded again. All the observations along with demographic information of patients were noted by me on a pre-designed structured Performa.

Data was analyzed using Statistical Package for Social Sciences (SPSS) version 10. Chi-square test will be used to compare the endothelial cell loss after cataract surgery between two groups. p-value of <0.05 will be considered significant.

Results:

The mean pre-op ECC of group 1 patients was 2443.68 ± 321.86 cells/mm^2 (Table 1) and the mean post-op ECC was 2213.70 ± 307.69 cells/mm^2 (Table 2) while the mean pre-op ECC for group 2 patients was 2500.47 ± 384.91 cells/mm^2 (Table 1) and the mean post-op ECC was 2043.63 ± 349.62 cells/mm^2 (Table 2)

Table 3 shows that 84.8% patients in group 1 had endothelial cell loss <15% while 15.2% patient had endothelial cell loss >15% while in group 2, 21% patients had endothelial cell loss <15% while 79% patient had endothelial cell loss >15%. p-value was <.001which means that the difference in the endothelial cell loss between the two groups was significant. (Table 4)

Table 1: Pre-op ECC in each group

Type of Surgery	Mean (cells/mm^2)	Std. Deviation	Maximum	Minimum
Phaco (Group 1)	2443.68	321.861	2989	1910
ECCE (Group 2)	2500.47	384.916	3191	1813

Table 2: Post-op ECC in each group

Type of Surgery	Mean (cells/mm^2)	Std. Deviation	Maximum	Minimum
Phaco (Group 1)	2213.70	307.697	2854	1544
ECCE (Group 2)	2043.63	349.619	2667	1432

Table 3: Endothelial Cell loss in each group

Type of Surgery	Mean (cells/mm^2)	Std. Deviation	Maximum	Minimum
Phaco (Group 1)	229.98	112.780	789	45
ECCE (Group 2)	456.84	104.553	720	220

Table 4: Chi Square Test showing comparison of endothelial cell loss between two groups

Type of Surgery	Endothelial Cell Loss		Total Patients	P Value
	< 15%	**> 15%**		
Phaco (Group 1)	89	16	105	<.001
ECCE (Group 2)	22	83	105	
Total	111	99	210	

Discussion:

Diabetes mellitus affects anatomical and physiological changes in corneal endothelial cells[7] which results in corneal abnormalities in diabetic patients such as higher auto-fluorescence, decreased corneal sensitivity, increased corneal thickness, decreased corneal endothelial cell density and high endothelial permeability[23]. After the cataract surgery, endothelial cell loss is greater as compared to healthy, unoperated corneas[17].

Number of the studies is carried out on the loss of endothelial cells after cataract surgery[22], but there is a lot of variation in endothelial cell loss between the results of various studies even when the type of surgery is same[19]. This is due to various factors including, different inclusion and exclusion criteria[8], different grades of cataract, different methods of nucleus delivery in ECCE[9], different types of irrigating solution and viscoelastics[22]. The

aim of this study was to compare the percentage of endothelial cell loss in diabetics after phacoemulsification and extra-capsular cataract extraction.

George et al[24] in his study compared endothelial cell loss after conventional ECCE and phacoemulsification,186 eyes with cataract, nuclear sclerosis grade 3 or less were included in this study. Keratometry and specular microscopy were performed pre-operatively and 6 weeks after the cataract surgery. The ECC decreased by 4.72% and 5.41%, respectively, with no significant difference between the two groups[23].

In a study by Busted et al[25], CCT was measured in 81 patients with type 1 diabetes which revealed that this was significantly higher as compared with healthy controls.
Schultz et al[5] also studied corneal endothelial changes in type 1 and type 2 diabetes. The results of this study showed a significant higher coefficient of variance and a significant decrease in the percentage of corneal endothelial cells in the diabetic group.

Lee et al[19] investigated the endothelial cell morphology and central corneal thickness in 200 insulin dependent diabetic patients and 100 age-matched healthy subjects The results showed that patients having diabetes had increased central corneal thickness and decreased endothelial cell density and percentage of endothelial cells, as compared with that of the healthy controls.

Morikubo et al[18] also conducted a similar type of study and showed that there is no significant differences in any preoperative measures were noted between the diabetic and nondiabetic groups. The increase in central corneal thickness after 1 month of surgery was significantly higher in the diabetic group as compared to nondiabetic group (P =.03).

In another recent study by Gogate et al[20], the pre and post-op ECC difference at 6 weeks was 543.4 cells/mm^2 after phacoemulsification and 505.9 cells/mm^2 after extracapular cataract extraction. Although this result was not significant but it showed totally opposite results i.e. more endothelial cell loss after phacoemulsification as compared with extracapsular cataract extraction.
Similar study by Jiang et al[21] showed that postoperative corneal endothelial loss was 18.5% in Phaco group and 19% in ECCE group which was not significant.

Some studies showed similar results with present study. Mathew et al[23] in his study showed the percentage of endothelial loss at 6 weeks and 3 months being 9.26 ± 9.55 and 19.24 ± 11.57, respectively, in patients with diabetes and 7.67 ± 9.2 and 16.58 ± 12.9, respectively, in controls. He also compared the central corneal thickness in two groups which showed that it was more in diabetics as compared to the normal population, suggesting corneal damage caused by diabetes mellitis.

Hogod et al[22] studied sixty eyes of 60 patients, and a complete 3-month follow-up was obtained for all the 60 patients. No significant difference was noted between the two groups for age, sex, axial length, IOP, and visual acuity. Preoperative cell density was 2651 (SD: 411) cells per square millimeter in the diabetic group versus 2623 (SD: 335) cells per square millimeter in the control group (P = 0.78).
Inoue et al[26] compared the endothelial structure and thickness of the cornea in diabetic and non diabetic patients, evaluated the systemic and ocular factors that contributed to the damage of endothelial cells in diabetic patients. The corneal endothelial structure and central corneal thickness were recorded in 99 type II diabetic patients (99 eyes) (53 men and 46 women), and in 97 non diabetic patients (97 eyes) (52 men and 45 women).He

showed that there is decrease cell loss in phacoemulsification as compared to extracapsular cataract extraction.

Conclusion:

This study revealed that there was a statistically significant difference in the corneal endothelial cell loss in diabetics after phacoemulsification and extracapsular cataract extraction. Diabetes mellitus itself affects the endothelial cell count and morphology over a period of time. Phacoemulsification cause less damage to corneal endothelial cells as compared to extracapsular cataract extraction and hence it should be the treatment of choice in diabetic patients.

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ORIGINAL ARTICLE

Pattern of Placement of Doctors after Post-Graduation in Ophthalmology

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ABSTRACT

Background: The purpose of this study was to analyze the pattern of placement of doctors in rural areas and smaller cities after completion of training at a tertiary care eye hospital.

Subjects and Methods: Information was gathered about current placement of the qualified ophthalmologists who had received training at Al-Shifa Trust Eye hospital Rawalpindi from 1995 to 2013. We calculated the frequencies, percentages and proportions of ophthalmologists trained by our institute, according to the categories of placement *viz.* (1) ophthalmologists working abroad; (2) ophthalmologists serving in the country's smaller cities/ rural areas; (3) ophthalmologists working in bigger cities within the country.

Results: Update on information regarding the present practice location of 57 out of these 58 doctors was possible. These included 38 (66.66 %) male and 19 (33.33 %) female doctors. Seventeen of 57 (29.82%) were working abroad, while 40 (70.17%) were serving within the country. Most (n=32, 56.14 %) of these ophthalmologists were doing their practice in bigger cities. Only 8 (14.03 %) were working in smaller towns. Seventeen (29.82%) were employed by the training institute. Subspecialty training after fellowship was done by 18 (31.57%) doctors.

Conclusions: During the period of study, more male doctors qualified the fellowship program in ophthalmology. Most of these doctors worked in the country after graduating from the training institute. Although the ratio of rural to urban population is 1.56, only a few doctors served in smaller towns. No female ophthalmologist among the FCPS graduates was serving in rural areas. *Al-Shifa Journal of Ophthalmology 2017; 13(1): 25-29.*

Introduction:

Data about the number of health workers in underserved areas from developing countries is limited.[1] There is a consistent evidence that a doctor from rural background is twice more likely to work in rural area as compared to other doctors.[2] The urban population is 38.8% of total population and the rate of urbanization is 2.81% in our country.[3] Ratio of rural and urban population is 1.56. Specialist doctors practicing in smaller towns and rural areas provide expert consultation to the population residing in these areas. Placement of adequate number of ophthalmologists in the smaller cities commensurate with the population of the catchment area is directly beneficial for the rural patients.

There is a tendency in specialists to choose bigger cities for their practice. Planning at a country wide scale is required for

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provision of the requisite health care facilities to major part of the population residing in the smaller towns and rural areas.

Our study aims to highlight this fact with regards to the trend seen among ophthalmologists. We calculated the frequencies, percentages and proportions of ophthalmologists trained by our institute, according to the categories of placement *viz.* (1) ophthalmologists working abroad; (2) ophthalmologists serving in the country's smaller cities/ rural areas; (3) ophthalmologists working in bigger cities within the country.

Subjects and Methods:

Information was gathered about current placement of the ophthalmologists who had received training at Al-Shifa Trust Eye Hospital (ASTEH) Rawalpindi and qualified as Fellows of College of Physicians and Surgeons (FCPS) Pakistan during the period spread over 1995 to 2013. The doctors who did not complete the requisite training period were not included in the study. The location of the ophthalmologists was verified through telephone contact, internet (email/social media) and personal acquaintances/ colleagues of the ophthalmologists working presently at the place of study. Ten most populous cities as per list provided by the web site of Pakistan Bureau of Statistics were considered as the 'bigger cities' while all other less populous cities were considered as 'smaller cities/rural towns'. [4] Ophthalmologists were divided into categories according to their job placement. Data was entered into the computer soft-ware 'Statistical Package for Social Sciences' (SPSS, Inc., Chicago, IL) to calculate the frequencies and percentages of categories of ophthalmologists according to gender and their placement.

Results:

A total of 58 doctors qualified FCPS exit examination in ophthalmology during the period of study. Update on information regarding the present practice location of 57 out of these 58 doctors was possible. These included 38 (66.66 %) male and 19 (33.33 %) female doctors. Seventeen of 57 (29.82%) were working abroad, while 40 (70.17%) were serving within the country. Most (n=32, 56.14 %) of these ophthalmologists were doing their practice in bigger cities. Only 8 (14.03 %) were working in smaller towns as shown in figure and the table. The ratio of doctors working in bigger cities in the country to those working in smaller cities/rural towns was 4:1. Seventeen (29.82%) were employed by the training institute. Subspecialty training after fellowship was done by 18 (31.57%) doctors.

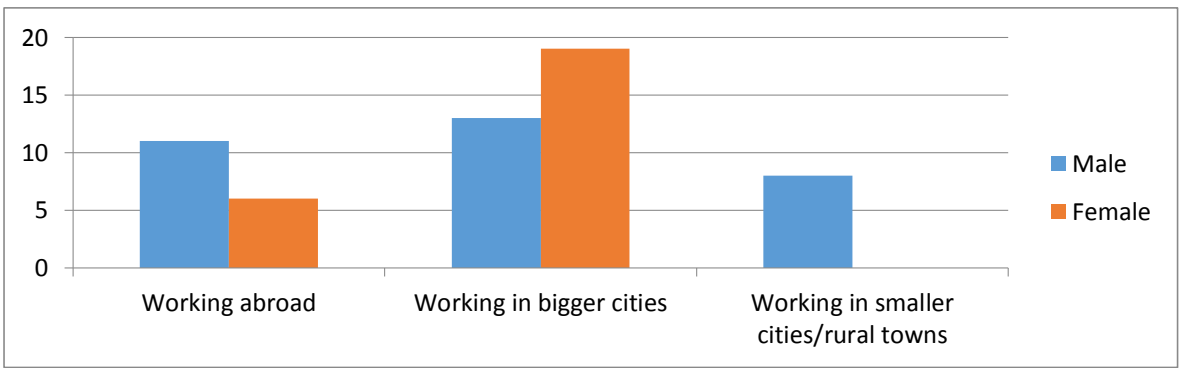

Figure No. 1: Distribution of ophthalmologists according to gender and placement

Table No. 1: Pattern of placement of ophthalmologists outside the country, in bigger cities and smaller cities/rural towns (n=57).

	Categories of placement	**Frequencies and percentages**	
1	Ophthalmologists working abroad	Male: 11 (19.29%)	17 (29.82%)
		Female: 6 (10.52%)	
2	Ophthalmologists serving in bigger cities	Male: 13 (22.80 %)	32 (56.14%)
		Female: 19 (33.33%)	
3	Ophthalmologists serving in small cities/rural towns	Male: 8 (14.03%)	8 (14.03%)
		Female: Nil (0%)	

Discussion:

Nine studies among the 12 reported in a review looked at the association between gender and rural practice. Five of these showed that rural practitioners were more likely to be male.[2] Only a few doctors in our study are serving in smaller cities/rural towns and they were all males. In our study there was no female eye specialist working in the rural setup after completing post graduation training from our institute. This may be due to the social factors or family compulsions in our country and the fact that they belonged to the bigger cities. The data from developed countries also shows this trend of lesser females selecting nonmetropolitan practice.[5]

Pakistan still has about 60% of its population living in rural areas. The ratio of ophthalmologists working in bigger cities to those working in smaller cities/rural towns was 4:1 as compared to the urban to rural population ratio of 0.60. The doctors working in small towns are generally more easily accessible to rural population than doctors in bigger cities. A patient from the rural area may have to travel to a smaller town in one transport and then may have to take another transport again to get to the bigger city. Provision of good quality health services in smaller towns, therefore, directly benefits the rural population.

Physician emigration cannot be fully explained by geography of a physician's medical school Alma mater.[6] A lot of eye specialists (29.82%) in our study preferred to work abroad especially after completing subspecialty fellowship. Efforts made by the government in the form of financial incentives have shown variable success in developed countries. A study showed that higher salary rates were helpful in long term retention of rural physicians.[7] Participants' satisfaction was high where individual preferences of these participants were matched to the underserved areas and continuous interaction was carried out.[2] Motivational factors however, did not influence willingness to practice in rural areas in medical students with high parental professional and educational status in a study.[8]

The uneven distribution of ophthalmologists in urban and rural areas and measures taken in a new postgraduate training program were reported in a large study from Japan.[9] The study showed that the new postgraduate training program did not encourage an imbalance in the geographical distribution of ophthalmologists.[9] This was evident by improvement in the geographical distribution of ophthalmologists which was assessed a decade after the programme was initiated.[9] Urban-rural inequities in other matters related to health have been described from our part of the

world, where majority of the population resides in the rural areas.[10]

Access to continuing professional development has been suggested as a measure to address retention of the rural medical work force in a study.[11] The study also describes 11 strategies for more people to opt for carrier in rural medicine.[11] Rotation in rural areas has a positive association with eventual practice in these locations and has been well documented in the literature, but only for family medicine or general practice. The association for other specialties has been explored to a lesser extent .[12] Compulsory rural service requirements for physicians may be the most reliable way to deploy the health workforce where physicians are unlikely to practice voluntarily.[13]

Trainees from our institute have to participate in community ophthalmology projects as part of their curriculum. These include providing ocular surgery, school screening and screening for treatable ocular diseases, in smaller cities and villages. This rotation also gives exposure to the doctors to decide about serving in these areas after graduation. The government and social sector alike, should look into the matter on a country wide scale so that the burden of eye diseases can be lessened in the under privileged areas by providing the required facilities to the trained doctors.

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ORIGINAL ARTICLE

Prevalence and Types of Refractive Errors in School going Children in Mirpur, Azad Jammu & Kashmir

Waseem Ahmed Khan[1], Ch.Tariq Masood[1], Muhammad Irfan Sadiq[1], Ovais Manzoom Kiani[1]

Abstract

Objective: To determine the prevalence, types and gender based distribution of refractive errors in school going children in the age group of 05-15 years.

Study Design: This was a descriptive cross sectional study.

Subjects and Methods: This study was conducted over a period of 13 months in Out Patient Department of Eye unit, Divisional Headquarters Teaching Hospital, and THQ Dadyal, District Mirpur, AJK. A sample of 22926 children presenting in the outpatient department was screened for the presence of any refractive errors.

Results: In our study, total of 22926 children were examined, only 916(3.99%) children had refractive error with uncorrected visual acuity of < 6/12 in both eyes. In which 286(1.24%) were male and 630 (2.74%) were female children. Out of 916 school children, 406(44.32%) were myopic, 218 (23.79%) were Hypermetropic and 277 (30.24%) were the cases of Astigmatism and 15(1.63%) were Amblyopic. Regarding the type of refractive error, the prevalence of myopia in male was 1.09% and in female 2.24%, hypermetropia in male was 0.87% and in female was 1.00%, the astigmatism in male was 0.98% and in female was 1.36% and Amblyopia in male was 0.05% and in Female was 0.07%.

Conclusions: Our study suggests that refractive error particularly Myopia is the major cause of ocular morbidity among the school going children in District Mirpur AJK. Provision of spectacles to rehabilitate them to normal was done during the study. *Al-Shifa Journal of Ophthalmology 2017; 13(1): 30-34.*

Introduction

Refractive errors affect a large proportion of world's population, regardless of sex, age and ethnicity. It is easy to diagnose, measure and correct these refractive errors with spectacles or other refractive corrections to achieve a normal vision [1]. According to the World Health Organization (WHO) estimates, about 285 million people are visually impaired out of which 39 million are blind and 246 million have low vision [2].Refractive error is the 3rd major cause of avoidable blindness. The prevalence of childhood blindness in the world is estimated as 1.5 million (0.75/1000) while in Pakistan it is 1/1000 [3]. Refractive errors can impose a heavy financial burden on the society [4]. School children are considered a high risk group because uncorrected refractive errors can negatively affect their learning abilities and their mental and physical health [5, 6].

To address the issue of visual impairment in children, the World Health Organization recently launched a global initiative, VISION 2020-The Right to Sight. WHO's strategy for the elimination of avoidable visual disability and blindness includes, correction of the refractive errors [7]. It is

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high time that we must recognize the situation as worthy of investment for the future generations [8].

The objective of this study was to determine the prevalence and pattern of refractive errors among school going children in the age group of 05-15 years of both sexes in district Mirpur, AJK.

Subjects and Methods

All the children visiting Divisional headquarters teaching hospital, Mirpur and THQ Dadyal over a period of 13 months were screened for the presence of refractive errors. Only childrens from the age group of 05-15 years were selected for this study. An informed written consent was taken from all children or parents who were included in the study. Unaided visual acuity was tested in both eyes and pin hole test was performed if the visual acuity was less than 6/12. Cycloplegic refraction was conducted if vision improved with pinhole in children under 7 years of age. Myopia ranging from -0.5 to -8.0 diopters, Hypermetropia form +1.0 to +8.0 diopters and Astigmatism from -0.50D and more were recorded and coded. However, children who needed further treatment were referred and examined by the ophthalmologist. Proforma were filled up for all the children screened. All the data obtained was entered into SPSS version 17and analyzed.

Results

Total 22926 school children in age group 05 - 15 years, registered in government as well as in private schools were examined in District Mirpur, AJK. Among 22926 children, 9503(41.45%) were male and 13423(58.54%) were female. Refractive error was detected in 916(3.99%) children. Male children were 286 (1.24%) and female children were 630(2.74%). The frequency of refractive error was cross tabulated against sex, a highly significant association was observed with female sex ($p < 0.001$) It reveals that the prevalence of refractive error is more in females school children than the male. Out of 916 school children, Myopes were 406 (44.32%), hypermetropes 218(23.79%), astigmatism in 277 (30.24%) while Amblyopia was seen in 15 (1.63%) cases as shown in table 1. The prevalence of myopia in male students was 1.09%% and in female it was 2.24%. Hypermetropia in male was 0.87% and in female was 1.00%. The astigmatism in male was 0.98% and in female it was 1.36%. Out of 22926 children, there were 22010 (96%) with normal vision and needed no treatment but 916(3.99%) with refractive error were prescribed glasses.

Table 1. Prevalence of refractive error in school children

	Total	Male	Female
Number of Children Screened	22926	9503(41.45%)	13423(58.54%)
Number of Glasses Prescribed	916(3.99%)	286 (31.22%)	630(68.77%)
Hypermetropic	218(23.79%)	83(38.07%)	135(61.92%)
Myopic	406(44.32%)	104(25.61%)	302(74.38%)
Astigmatic	277(30.24%)	94(33.93%)	183(66.06%)
Amblyopic	15(1.63%)	05(33.33%)	10(66.66%)

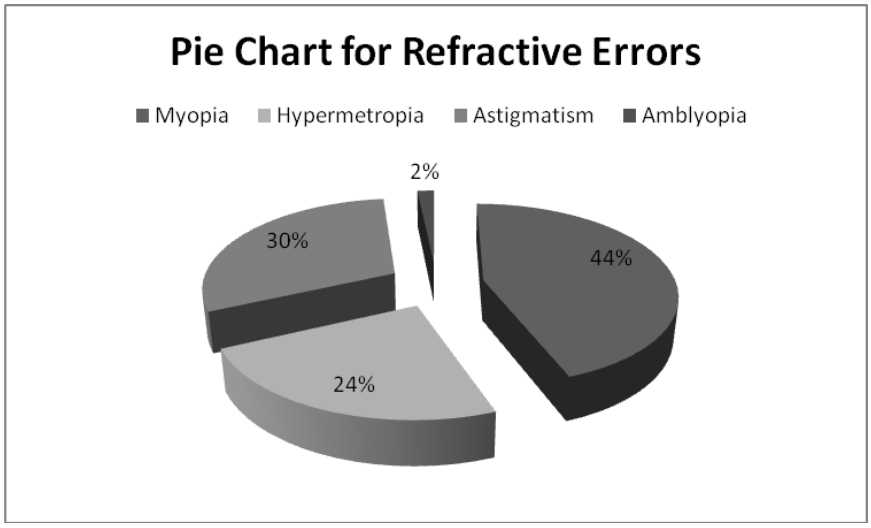

Fig 1. Pie Chart Demonstrating Refractive errors

Discussion

There are many immediate and long term consequences related with uncorrected refractive errors in children and adults including lost educational and employment opportunities, economic issues and poor quality of life [9].

Total 22926 school children in age group 05 - 15 years registered in government as well as in private schools were examined in District Mirpur, AJK. Refractive error was detected in 916(3.92%) children .This result is comparable with a study conducted by Gull A etal inRawalpindi who showed a prevalence of 3.35% [10]. This result is also comparable with a study done in Battagram (KPK),in which hussain M etal showed a refractive error of 4.58, [3]. These results are also comparable with international studies done in Benin city, southern Nigeria in which prevalence was 3.9% [11]and Kathmandu (Nepal) showed refractive error of 4.3% [12].However it is low as compared to studies done in Lahore [2] 20.07% and Karachi[13] in which prevalence of refractive errors was 8.9%.
In our 22926 children, 13423(58%) were female and 9503(42%) were male. Male children with refractive errors were 286 (1.2%) and female children were 630(2.74%) out of total. It reveals that the prevalence of refractive error is more in female school children than the male according to our study. The frequency of refractive error was cross tabbed against sex, a highly significant association was observed with female sex ($p < 0.001$)This is comparable to studies done in Karachi [13], Ghana [14] and India [15].

In our study, out of 916 school children with refractive errors, Myopes were 406 (44.32%), hypermetropes 218(23.79%) , astigmatism in 277 (30.24%) while Amblyopia was seen in 15 (1.63%). So myopia was most common refractive error followed by hypermetropia. This finding is consistent with studies conducted throughout the world including local statistics by Pavitra MB etal [16], Yared AW [17] and Ali A [8].

The prevalence of myopia in female was high i-e 2.24% as compared to male students, which was 1.09% in our study. Ali A etal [8] and Gull A etal [10] also depicted high frequency of myopia in females. However it is in contrast to

another study done in Iran in which there was a higher prevalence of myopia in boys ($p<<0.001$) and hyperopia in girls ($p = 0.007$) [18].

In this study, Hypermetropia in male was 0.87% and in female was 1.00% whereas,the astigmatism in male was 0.98% and in female it was 1.36%. Similar to our study, another study conducted in Qazvin, Iran, the prevalence of myopia in females (52.28%) was significantly higher than in males 47.72%, ($P = 0.018$). In that study, a total of 11821 subjects, myopia was detected in 66.2% cases, hypermetropia in 19.08%, astigmatism in 8.37%, and amblyopia in 6.34% cases [19]. Xiao OU etal showed overall prevalence of amblyopia was 0.74% (95% confidence interval, 0.64–0.83) which is less than that of our study [20.]

Out of 22926 children, there were 22010 (96%) with normal vision and needed no treatment but 916(3.99%) with refractive error were prescribed glasses.

Conclusion

It was concluded that the refractive error is one of the most common cause of visual impairment. It has strong relationship with sex and was predominant in females. Majority of students were never examined for the visual acuity. It is recommended that children should be examined periodically from grade 1 to 10. Best possible time is to examine at the time of admission to school and when they are leaving which makes it at least twice, during their study period. As visual impairment can have a significant impact on a child's life in terms of education and development, it is important that effective strategies be developed to eliminate this easily treated cause of visual impairment. .Eye health screening programs are beneficial in early detection and proper treatment of refractive error.

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ORIGINAL ARTICLE

Ocular complications of severe vernal keratoconjunctivitis (VKC) in patients presenting to a private clinic

Javed Rasul[1], Imran Ahmad[2]

Abstract

Objectives: To assess and document the ocular complications in patients with severe vernal keratoconjunctivitis (VKC).

Methods: It was a retrospective non-comparative observational study conducted from 1st January 2013 to 30th June 2016. A total of 130 patients with VKC seen at a private clinic were included in the study. Visual acuity was measured with the standard Snellen visual acuity chart. Visual impairment was assessed by means of the World Health Organization criteria for visual disabilities. Cases with severe VKC that developed ocular complications were analyzed.

Results: Out of 130 patients with VKC 16.15% were having ocular complications. Ocular complications included punctate epithelial erosions (7.70%), keratoconus (3.07%), peripheral corneal vascularization (1.54%), steroid induced glaucoma (1.54%), steroid induced cataract (0.77%), shield ulcer (0.77%) and Pseudogerontoxon (0.77%).

Conclusion: Potentially blinding complications of VKC may be Keratoconus, corneal opacities, shield ulcers, as well as complications of the unsupervised use of topically administered corticosteroids. *Al-Shifa Journal of Ophthalmology 2017; 13(1): 35-39.*

Introduction:

Vernal keratoconjunctivitis (VKC) is type 1 hypersensitivity allergic reaction of the eye which primarily affects pre-pubertal children. Its prevalence is estimated to be 15-20%[1]. The peak incidence is between 11 to 13 years of age with bilateral involvement and seasonal recurrences.[2] The eye is frequently involved in allergic reactions of both local and systemic type. Vernal keratoconjunctivitis (VKC) is a severe allergic conjunctivitis which disturbs the daily activities because it causes severe itching, foreign body sensation, photophobia and copious mucous discharge.[3]Vernal keratoconjunctivitis (VKC) frequently persists throughout the year and usually increases in hot weather.[4]Males are effected more commonly than females.[5]Most of the patients with VKC have a family or personal history of systemic allergic diseases, such as rhinitis, asthma and eczema.[6]

VKC is more prevalent in hot and dry areas and is uncommon in colder climates.[7] VKC is of three types, limbal (fine papillae with gelatinous limbal infiltration and Horner-Trantas dots); the palpebral (giant papillae of >1 mm in diameter on the superior tarsal conjunctiva) and a mixed type.[8]

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VKC is associated with many sight threatening complications and prompt recognition of these is important to decrease co-morbidity in children.[9]Keratitis, shield ulcers and keratoconus are sight-threatening complications of VKC.[10,11] Other sight-threatening complications of VKC are cataract and glaucoma due to the use of topical steroids.[7]

Although several studies have been published on this disease worldwide, only few have focused Khyber Pakhtoon Khwa. Since our area has hot climate and VKC is a major ocular problem in Lakki Marwat, the pattern of associated complications needs to be investigated further. The purpose of this study was to assess the ocular complications among patients with severe VKC in Lakki Marwat.

Patients and Methods:

This is a retrospective non-comparative observational study done in a private setup at Lakki Marwat. The study was conducted between January 1st2013 till 30th June 2016. One hundred and thirty consecutive patients (130) with VKC were included in the study. Patients of either gender between 5-20 years of age with bilateral VKC with conjunctival giant papillae formation at the superior tarsus and/or limbus as the hallmark of the disease and the presence of persistent and recurrent symptoms of conjunctivitis were included in the study. Patients were supposed to have severe VKC if they had persistent and specific symptoms and signs like diffuse palpebral conjunctival edema with papillary hypertrophy, giant papillary conjunctivitis or had limbal infiltration of 180° or more. Other causes of allergic conjunctivitis were excluded from the study.

All the patients were examined by a single ophthalmologist by Haag Streit slitlamp bio-microscopy for anterior segment examination, +78Dioptre Volk lens for fundal examination and Haag Streit Goldmann applanation tonometry for intraocular pressure checkup. All patients data including visual acuity and complications related to VKC or its treatment were noted and collected on a proforma.

Descriptive analysis was performed on the data collected using Microsoft Excel® spreadsheet 2003 (Microsoft Corporation, Seattle, USA).

Results:

The majority of VKC patients (n = 130) were males (n = 98) and females (n = 32) with a ratio of 3:1 (Male : Female)Table 1. Out of 130 patients examined with VKC 21 (16.15%) patients were having complications (details given in Table no 2).

Table 1: Age distribution of 130 vernal keratoconjunctivitis patients.

Age (years)	Male	Female	Total
0–4	5	1	6
5–10	59	18	77
11–14	15	6	21
15–19	12	5	17
>20	7	2	9
Total	98	32	130

Table No 2: Complications of VKC

Complications	Number of patients	Percentages
Punctate epithelial erosion	10	7.70%
Keratoconus	4	3.07%
Peripheral corneal vascularization	2	1.54%
Steroids induced glaucoma	2	1.54%
Steroids induced cataract	1	0.77%
Shield ulcer	1	0.77%
Pseudogerontoxon	1	0.77%
Total	21	16.15%

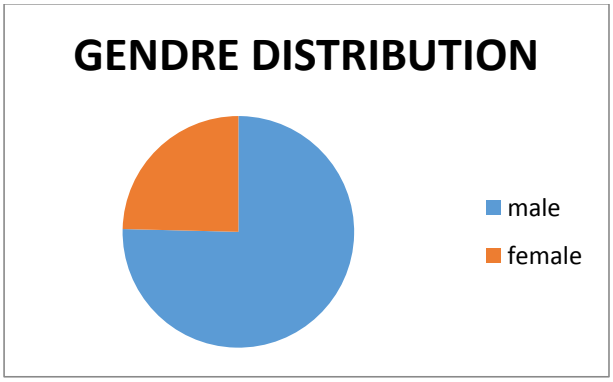

Figure No 1: Gender distributation

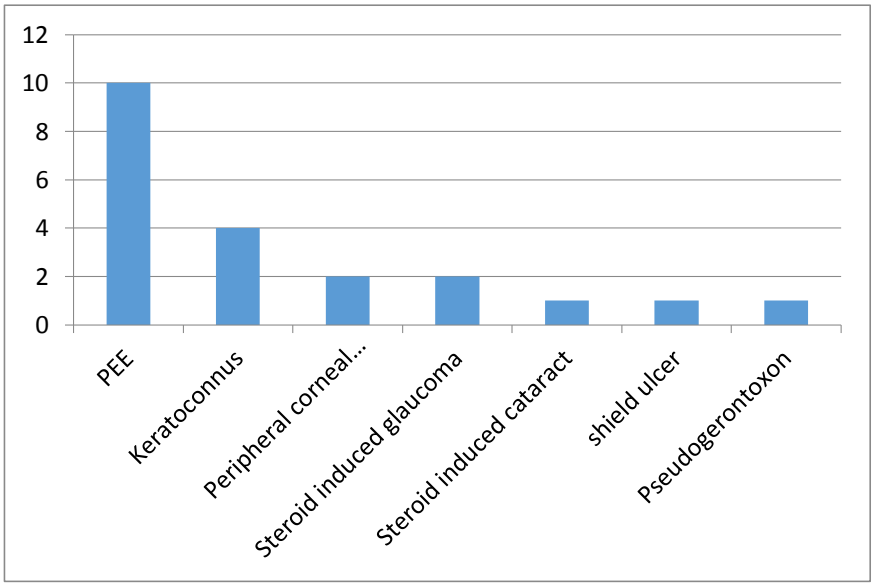

Figure No 2: Complications of VKC

Discussion:

Ocular allergy is a major problem in areas like Lakki Marwat. Many of the patients presenting to the outpatient department have VKC especially in summer season.

Allergic eye diseases including vernal keratoconjunctivitis (VKC) are common diseases.[12]In Nigeria, VKC was identified as the most common conjunctival disease in children seen in hospital.[13]Study done

by Farouk et al. showed that allergic eye diseases are the second most common diagnosis in the eye clinics after refractive errors.[14]

Most of the patients with VKC in our study were younger than 10 years(65%). It is slightly more than the study done by Sultan*et al* where 7% of the patients presented with the disease after 20 years.[15] In our study the number of male patients were more than female with a ratio 3:1 (75.38% male), same were the results of studies done by Kosrirukvongs in Italy.[16] Diagnosis of VKC was based on the patient's history and the presence of typical clinical signs and symptoms. The most common clinical type of VKC in this study was the limbal type followed by the palpebral type. The same findings were also reported in other studies .[17 18]

Patients who presented with ocular complications were 21(16.15%)that is slightly less than the study done by Tabbara.[19]The ocular findings in patients with severe VKC included punctuate epithelial erosions (10), keratoconus (4), peripheral corneal neovascularization (2), steroid-induced glaucoma (2) steroid-induced cataract (1), shield ulcers (1), and pseudogerontoxon (1). In a study by Tabbara in Saudi Arabia, 21% had a BSCVA of 20/200 or less due to steroid-induced cataract, steroid-induced glaucoma, central corneal scars, irregular astigmatism and keratoconus.[19]

Treatment of VKC includes topical antihistamines, mast cell stabilizers, combined antihistamine and vasoconstrictor, combined action antihistamine/mast cell stabilizer, non-steroidal anti-inflammatory drugs, topical steroids and ointments, antibiotics, acetylcysteine, and immune modulators.[20] Unfortunately many of the patients with severe VKC have frequent exacerbations and they do not respond to the topical drugs other than the steroids, which leads to frequent use of unsupervised steroids. Steroids have many complications including glaucoma, cataract and infection.[8]This is the reason that patients with VKC presents with steroids induced complications. A close ophthalmological supervision of treatment according to the disease severity is essential to avoid self-prescription and misuse of steroid drops.
The persistent inflammation and rubbing of eyes in patients with VKC can damage to the corneal and corneal stroma resulting in the formation of shield ulcers and plaques, infectious keratitis, keratoconus, scarring, and limbal stem cell deficiency. These corneal complications can cause permanent decrease or loss of vision in children suffering from VKC.

Conclusion:

Severe VKC is a chronic disease and a major ocular problem of country like Pakistan which can end up in blindness if not properly managed. Potentially blinding complications of VKC may be Keratoconus, corneal opacities, shield ulcers as well as complications of the unsupervised use of topically administered corticosteroids.

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ORIGINAL ARTICLE

Situation Analysis of Diabetic Retinopathy services in Muzaffarabad division of Azad Jammu and Kashmir, Pakistan

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ABSTRACT

Background: Diabetic Retinopathy (DR) is fast becoming the leading cause of avoidable blindness. A system needs to be developed for DR screening and management which is sustainable. This study was planned to assess the current situation of DR services in Muzaffarabad division, which is a relatively neglected area due to its difficult accessibility.

Subjects and Methods: Descriptive cross sectional survey was conducted in all the eye care centres (n = 8) of Muzaffarabad division. DR services were assessed in terms of human resources, infrastructure and service delivery. DR patients' characteristics and referral pathway was also assessed. Data was collected in June/July 2015 by using questionnaires during site visits. Data about patient characteristics was collected in separately. Quantitative data was recorded by frequency counting and qualitative data was entered using a scoring system. Data analysis was mostly descriptive, where needed MS Excel and Stata IC 13 were used.

Results: All eligible institutes participated in the survey. Muzaffarabad city was having all the facilities while other two districts (Neelum and Hattian) had none. There was no proper tertiary eye care facility. There were 9 ophthalmologists in total, only 4 of them having fellowship in ophthalmology. No vitreo-retina (VR) specialist was available. The highest mean scores were observed for ophthalmologists (fellows) in both training (0.68) and skills (0.75) in DR screening and management. Only 1 out of the 3 available laser machines was in working condition. An unmet need of about 4040 and 674 patients per month was observed in those screened and those given laser treatment per month respectively.

Conclusion: There is no functional policy on DR in Muzaffarabad division. DR screening is mainly opportunistic. The region needs a fully equipped tertiary eye care facility urgently. There is a huge unmet need in DR patients' screening and management. *Al-Shifa Journal of Ophthalmology 2017; 13(1): 40-49.*

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Introduction

Pakistan is the world's sixth most populous country.[1] It is a low middle income country ranking 146th on the human development index according to the UNDP (United Nations Development Programme) 2014 report.[2] About half of its population is not literate and it spends just 2.5 % of its GDP (Gross Domestic Product) annually on health.[3]

Muzaffarabad division forms the northern most part of the northern region of Azad

Jammu and Kashmir (AJK) in Pakistan. It is formed of three districts i.e. Neelum, Muzaffarabad and Hattian. The total projected population of this division for 2015 stood at about 1.2 million[4].

Diabetes Mellitus (DM) is fast becoming an epidemic. The global estimates suggest that the number of diabetics is going to cross the 500 million mark in the next 15 years and the increase is expected to be more prominent in the lower middle income countries.[5-7] Reliable evidence regarding number of diabetics in Muzaffarabad division is lacking. One population based study done in 2007 in two other districts of AJK showed an overall prevalence of DM to be 1.52 %.[8] Another population based cross sectional study carried out in the adjacent region of Kashmir valley of India showed that the number of unknown diabetics was almost twice that of known cases.[9] Making use of these figures and extrapolating the IDF (International Diabetes Federation) estimates for Pakistan to the region, we come up with a current estimate of more than 40,000 diabetics in Muzaffarabad division which is projected to increase to about 70,000 by 2030.

DR makes 1 % of all the blind people and so it is already an important issue.[10] What makes the case for DR public health intervention even stronger is its avoidable and treatable nature. There is sufficient scientific evidence to suggest that timely intervention in the DR patients can prevent the blinding complications of this chronic condition.[11-14] However, this would require a comprehensive DR screening and management programme.

Extrapolating the figures (14.2 % of the diabetics had DR) from the last national blindness and visual impairment survey (2003) of Pakistan to Muzaffarabad division, it is estimated that there are approximately 6000 DR patients in this area.[15] Applying the IDF projections for DM, this figure will increase to over 10,000 by 2030. Therefore, DR is already surfacing as a major public health issue in the region.

While we have these estimates of prevalence, we do not have a concrete idea about the available resources. The aim of this study was to gather an accurate knowledge about the available DR services in the region. Later on, this study can be extended to other parts of the country to have a wholesome picture of the DR services in Pakistan and to plan an effective national level DR screening and management programme.

Subjects and Methods

This descriptive cross-sectional study was conducted between June and August 2015 in the three districts of the Muzaffarabad division and the city of Islamabad, Pakistan.

Ethical approval was granted by the Ethics Committee of The London School of Hygiene & Tropical Medicine. Local ethical approval was obtained from the respective heads of all the institutes (as there were no active local ethical committees in any of those centres)
All institutes (100%) where an ophthalmologist or an optometrist had been practising eye care for a duration of at least 6 months as of March 1st, 2015 (n=8).

The questionnaires were validated in a pilot survey conducted in April, 2015.Two of the interviewees from participating institutions were interviewed via Skype calls in the pilot survey. In addition, the questionnaires about prospective and retrospective patients were sent to two ophthalmologists for trial and validation. During the actual data collection, the data was entered onto the questionnaires at the site of collection.

All the data was entered into an MS excel file, cleaned and then the part needing statistical analysis was transferred to STATA / IC 13 analytical package and analyzed. The remaining data was presented in a descriptive way.

Results:

There were a total 8 eye care facilities in Muzaffarabad division. One or more general ophthalmologists were available in all of these institutes.

All of these institutes or clinics were located in Muzaffarabad city. The other two districts, i.e. Neelum and Hattian, did not have any eye care service facility at all. All of the 8 facilities (100 %) participated in the survey. Of these, 5 were primary level, 2 were secondary level and only 1 was providing tertiary level services. The tertiary services were limited to only minor vitreo-retinal surgical procedures.

1. Human resources for DR

1.1 Availability and distribution

In all the participating institutions, general ophthalmologists (Gen-Opth) kindly consented to be interviewed as "key informants" for the survey. 100 % of the human resources in all the categories were concentrated only in the main city of Muzaffarabad. There was not a single VR specialist in the whole region. In terms of their training, 4 of them held the highest qualification of the country i.e. FCPS (Fellowship of the College of Physicians and Surgeons of Pakistan) while the other 5 were diploma holders i.e. DOMS (Diploma in Ophthalmic Medical Sciences). Two of the diploma holder ophthalmologists also had a master's degree in community ophthalmology.

The ratio of eye care human resources to population was found to be very low in comparison to the WHO recommendations for the region, as illustrated in the table below:

Table 1 : HR distribution ratios per 100,000 population in Muzaffarabad division and its comparison to WHO standards of 2010 for the region[16]

S / No	Category	Present ratio	Recommended for 2010	Need met	Additional Needed Numbers (per 2010 recommendations)
1	VR surgeons	0	1:1000,000	0 %	1 (preferably 2)
2	Gen. Ophthalmologists	1:92,000	1:100,000	100%	4
3	Optometrists	1:1200,000	-	-	-
4	Refractionists	1:400,000	1:100,000	25 %	9
5	Opth-Nurse/technician	1:240000	1:50,000	20 %	19

1.2 DR training and inclusion in the curriculum

All the different categories of the eye care personnel were assessed on the basis of the inclusion of training modules on DR screening and management in their training programme and curriculum. An overall score was given to each of the

categories according to a pre-set scoring system and an individual scoring for different sub categories was also done.

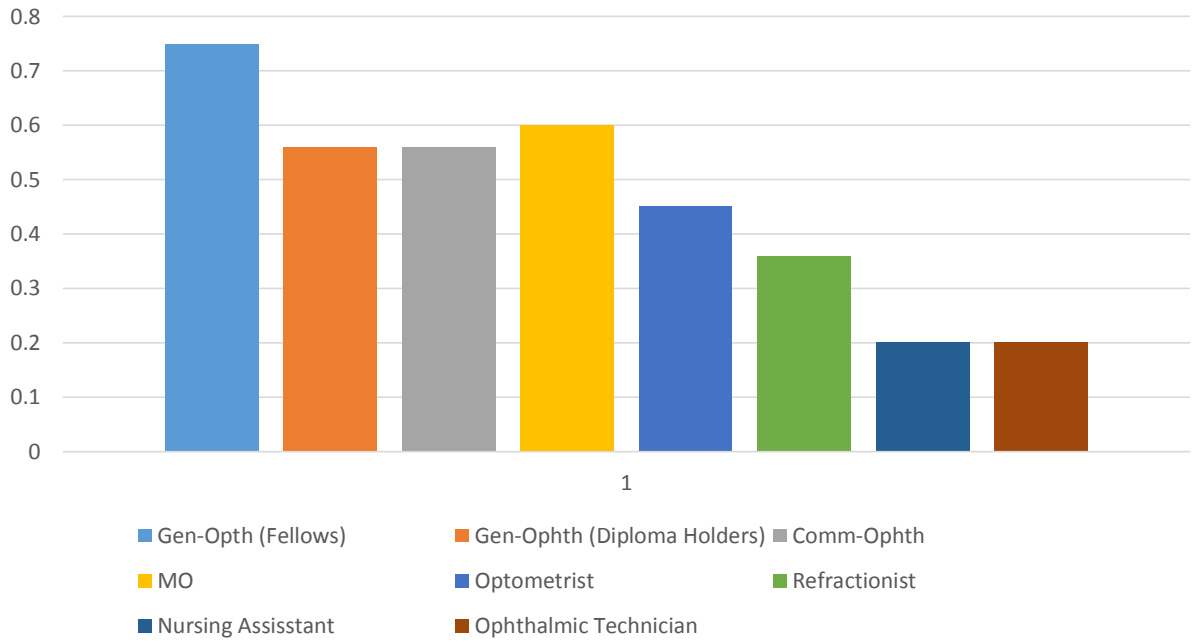
General ophthalmologists (fellows), general ophthalmologists (diploma holders), community ophthalmologists, medical officer and optometrist scored 0.68, 0.33, 0.28, 0.05 and 0.05 respectively.

Similarly, in the sub-category of DR screening and grading, fellows had the highest score, followed by diploma holders, community ophthalmologists, medical officers and optometrists respectively. While refractionists, ophthalmic technicians and nursing assistants scored zero here as well.In the category of DR laser treatment, only ophthalmologists had it included in their curriculum.

1.3 Experience and skills in DR screening and management

Diploma holding ophthalmologists were the most experienced followed by community ophthalmologists, fellows and the MO respectively. The paramedical eye care staff did not have any experience in DR screening and management.

Figure 1 Clinical staff's mean skill score in DR screening and management



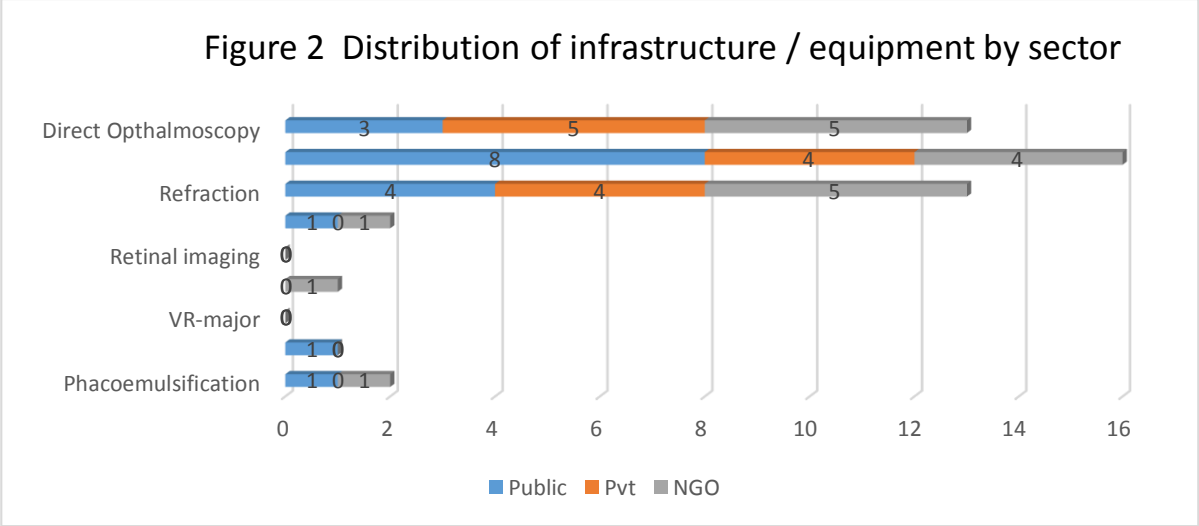
2. Infrastructure

2.1: DR services offered

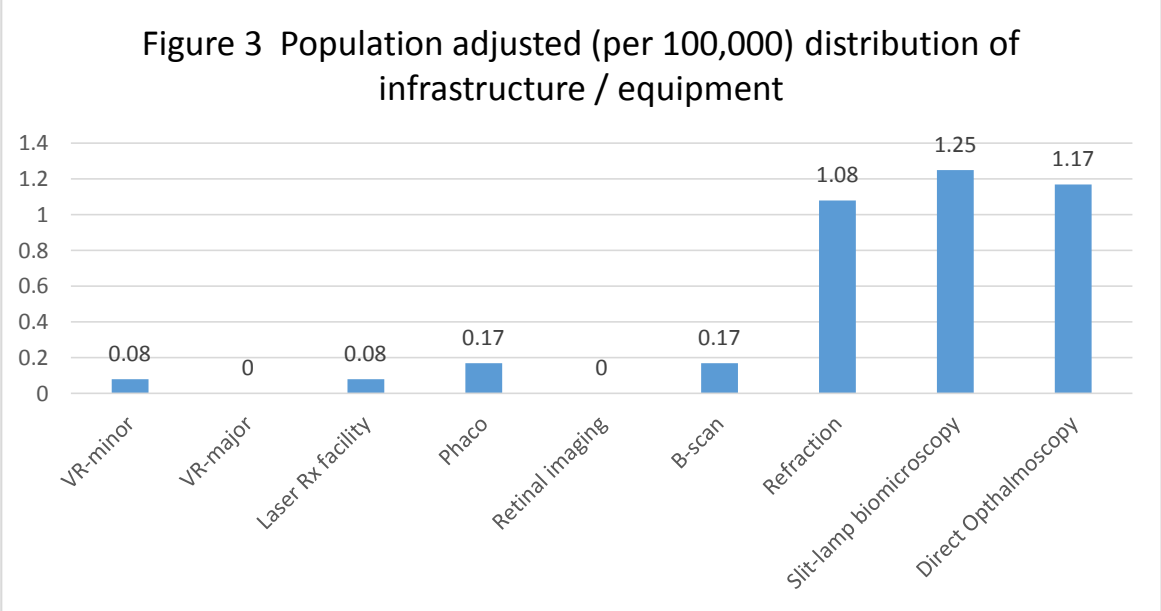
Screening for DR in Muzaffarabad division is oppurtunistic just like the rest of the country. All of the 8 participating institutes had general ophthalmological clinical services available (with only two of the centres having a functional phacoemulsification service). However, there was no VR-major surgical facility. A VR-minor surgical facility was available only in the tertiary care centre. There was only one functional laser treatment facility.

2.2: Infrastructure Assessment

Muzaffarabad city was the only one among the 3 districts of Muzaffarabad division which had some infrastructure for DR screening and management. Distribution of equipment by sector was as follows :



Assessment of the population to equipment ratios (per 100,000) is also shown below:



3. Health management information system

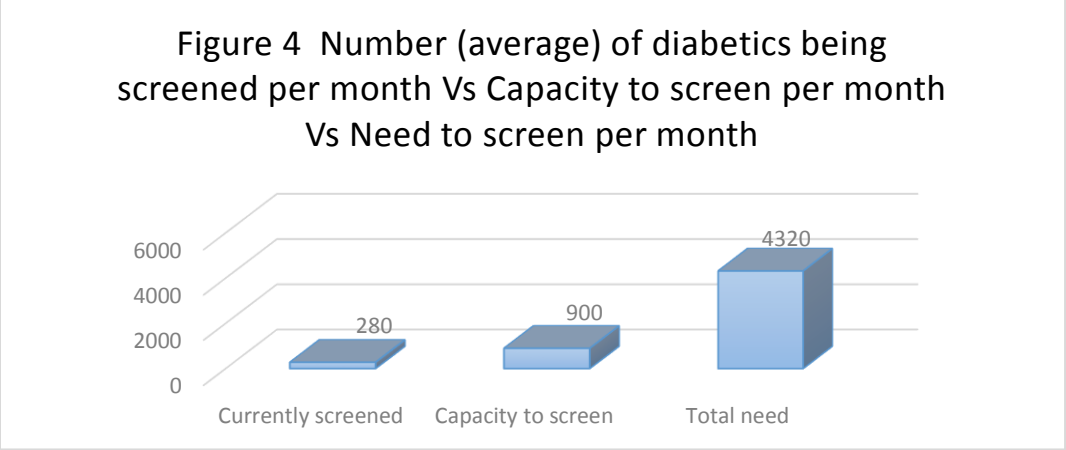
Table 3: Health management information system (medical record system availability)

	Available	**Not available**
Availability of management protocols for DR	0	8 (100 %)
Availability of record keeping system	1 (12.5 %)	7 (87.5 %)
Availability of patient contact details	1 (12.5 %)	7 (87.5 %)
Availability of follow-up reminders	0	8 (100 %)
Connectivity to a regional / national database of HMIS	0	8 (100 %)

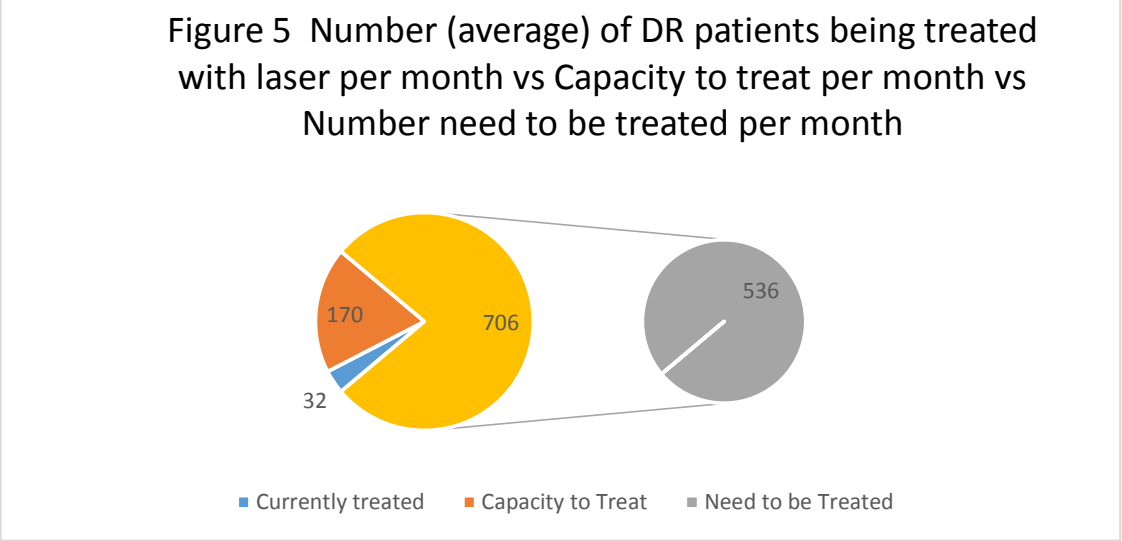
4. Service Delivery Output

The highest number of total general ophthalmological visits per month was observed in the public sector hospitals, followed by the NGO run facility and the private centres.

The total number of diabetic patients attending the general outpatient clinics per month was found to be an average of 280. This was compared to the current capacity to screen and the overall need to screen, as is presented below:



With only 1 functional machine, a big gap was found in the need to treat and those being treated. Even if the other two lasers were made functional, there would still be a huge gap in the capacity to treat and those in need of laser treatment.



5. Characteristics of DR patients of Muzaffarabad and their management

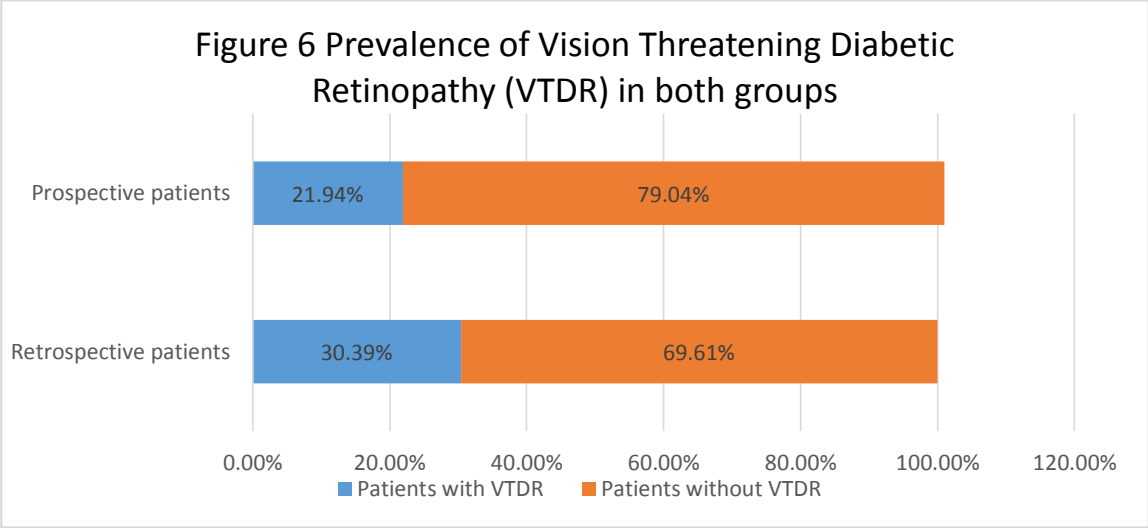
Prospective data on DR patients presenting during 6 weeks to the 8 eye care institutes was collected and analysed. Additionally retrospective data of DR patients from Muzaffarabad division presenting at a centre of excellence of ophthalmology in the neighbouring capital city of Islamabad in the preceding 6 month period was also collected and studied. These two groups of patients were then compared in their characteristics.

The predominant gender was male in both groups of patients (61.29 % and 71.24 %). In the retrospective data group this difference was found to be statistically

significant. Fisher's exact : (p-value : < 0.05). This points towards the relative problems being faced by the female patients in accessing the services if they have to travel out of city for that.

Most of the patients in both the groups were self-referred (66% and 89%). The rest were either referred by a physician (26% and 3%) or by an eye care worker (7% each).

The prevalence of vision threatening diabetic retinopathy (VTDR) was 21.94 % in the prospective and 30.39 % in the retrospective group of patients. This difference was not found to be statistically significant. (P-value = 0.05).



(P-value = 0.055)

Discussion

Muzaffarabad division, like other regions, is also facing the onslaught of multiple health challenges attributable to a number of factors like changing life styles, increasing urbanization and disease transitions. Eye care does not seem to be getting its due attention in the region due to the competing disease environment. So, studies like this one are important to generate the much needed evidence required to lobby for public health problems of eye care.

Analysis of retrospective patients presenting in the tertiary centre of excellence in Islamabad revealed that about 70 % of DR patients only needed observation and follow-up, which could have been managed at the primary or secondary eye care level.

Eye Care Institutions in the Region – number and distribution

Our study showed that all of the 8 eye care facilities were located in the main Muzaffarabad city with the other two districts being without any such service, not even a primary eye care centre. Even the distribution of the limited eye care centres within Muzaffarabad city is so uneven that 6 out of 8 are concentrated in a radius of about 0.5 km.

Human Resources - Availability and Distribution

Human Resource forms an integral part of any health care system which has quite often been neglected especially in low and middle income settings[17]. This study found that there was not even a single vitreo-retinal (VR) specialist in the whole region. All of the 8 eye care institutes had one or more general ophthalmologists (9 in total). Our study showed that availability of ophthalmologists was not the issue but their uneven distribution was making them inaccessible to the neediest population living in the periphery. Giving more incentives, both financial and career progression, to professionals opting to

serve peripheral populations would be of great help.

Human Resources - Training

Except for Fellowship holding ophthalmologists, training of other eye care professionals is neither standardised nor comprehensive. In a situation like this where we have primary health care physicians in relative abundance and distributed more widely, their services can be utilized for DR screening after a thorough planning.[18] Screened patients having DR can then be referred to the relevant professionals for management.

Human Resources – Skills in DR screening and management

General ophthalmologists (fellows) were the most skilled followed by general ophthalmologists (diploma holders) and community ophthalmologists. It was deduced that general ophthalmologists (diploma holders) are the professionals with the potential for a DR skill development programme especially in the laser treatment procedure. Besides, optometrists, if more of them are recruited from other parts of the country where they are relatively easily available, can be involved in a programme mainly for DR screening and grading.

Infrastructure

None of the 8 centres had all the equipment needed for comprehensive DR screening and management. So, patients with DR had to be referred to other cities at some point.

The only NGO run dedicated eye hospital was found to have the potential to take a lead in the eye care provision if equipped with necessary equipment and appropriate human resource and backed by financial support.

Health Management Information System (HMIS)

In this survey, it was observed that HMIS is almost non-existent in the whole region just like the rest of the country. None of the eye care centres had standard written protocols for DR management. And also none of those providers had a system to send follow up reminders to the diabetic patients when we know that reminders have an established role in improved care of the DR patients.[19]

Service Delivery Output

It was found that even if the currently available resources are utilized to the maximum, there will still be an unmet need of about 3420 patients to be screened per month. Arranging allied eye care professionals for the division and getting them involved in DR screening has the potential to serve the purpose. Similarly, the faulty laser machines need to be brought back into order at the earliest.

Characteristics of DR patients from Muzaffarabad division

Our assumption was that DR patients from Muzaffarabad, who are referred to Islamabad or other cities for tertiary care, present very late and most of the female patients do not present at all. The results verified our assumptions.

It was inferred that female DR patients are at a visible disadvantage in accessing the DR services, more so when they have to travel out of the city for it.

Most of the DR patients were self-referred, which again showed the poor / non-existent referral links within the local health care system. Lastly, the results showed that only about 2 % of the retrospective patients needed VR- major surgical intervention. This infers that expanding the facility of retinal laser and VR-minor surgical procedures in the region would solve problems for majority of DR patients.

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CORRIGENDUM

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