Association Visual Acuity with Different level of Astigmatism in Paedriatic Patients

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ABSTRACT

PURPOSE: This study was conducted to determine the association of visual acuity at different level of astigmatism in patients visiting Shalamar Hospital.

METHODOLOGY: Ethical approval of this cross sectional study was obtained from Shalamar School of Allied Health, Lahore Patients of either gender ranging from 6 to 16 years were included while those above 16 years were excluded. A detailed history of each patient was taken to rule out any existing pathology which can deteriorate the visual acuity of the patient which was followed by pen torch examination to grossly examine the anterior chamber of eye. Visual acuity was measured on Snellen chart which was followed by automated and subjective refraction by single examiner. The findings were recorded on a proforma Data was entered and analyzed in SPSS version 26 and Chi Square test was applied to check for statistical significance. P value of less than 0.05 was considered significant.

RESULT: A total of 115 patients (54 females and 61 males) were recruited for this study from ages 6 to 16 years, with an average mean age standard deviation of 3.216 years. 73 patients out of 115 had with-the-rule astigmatism with 63.5% whereas 32 patients had against-the-rule astigmatism with 27.8%. Oblique astigmatism was present in 10 patients with the least percentage i.e, 8.7%. Chi-square test, which is parametric test, was used for the statistical analysis.

CONCLUSION: This study concluded that there were significant results for variables (visual acuity, types of astigmatism) because p-value is less than 0.05 but there is insignificant results between variable (visual acuity, level of astigmatism) because there p-value is greater than 0.05.

Keywords: Astigmatism, Amblyopia, Asthenopia.

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INTRODUCTION:

Refractive error is a problem with focusing light accurately on the retina due to the shape of the eye.[1] The most common types of refractive error are near-sightedness (myopia), far-sightedness (hyperopia), astigmatism, and presbyopia.[2] Emmetropization is a term of refraction where corresponding rays of light

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coming from eternity lies at the sensitive layer of retina with accommodation remains neutral.[3] Ammetropia is defined as a condition of refractive error wherein the corresponding rays of light coming from eternity lies either in front or behind the sensitive layer of retina.[4] Hypermetropia is defined as a condition of to the refractive state of eye wherein the corresponding rays of light coming from eternity lies behind the retina with accommodation remain neutral.[5]

A population-based study was conducted that show hyperopic school-aged children were mostly anisometropic. Results show that hyperopic preschool children have not only a risk of having anisometropia but also had a great risk of having astigmatism.[6] Astigmatism has various patterns and different etiologies.[7] Clinical features can vary according to the cause of astigmatism and the age of the patient. There are two main forms of astigmatism i.e. regular and irregular astigmatism which are further subdivided into many categories (with the rule (WTR) and against the rule (ATR).[8]

According to one of the researches conducted the prevalence of ATR was estimated to be 5.3%.Whereas the prevalence of against-the-rule astigmatism was 5.3% and oblique astigmatism was prevalent in 13.3% of the cases.[9] A study carried out in Pakistan in 2020, reported that that compound myopic astigmatism was the most common error which had a prevalence of 26.9%, mixed astigmatism was present in 11%. They also stated that compound myopic astigmatism was more prevalent in younger individuals as compared to older ones and was slightly greater in females.[9]

In another study, most common type of astigmatism in young patients was found to be against the rule astigmatism with the most common symptom of eye strain in 83 percent of subjects.[10]This study aims at finding the different types of astigmatism diagnosed in the patients visiting the outpatient department of Shalamar hospital, Lahore.

METHODOLOGY:

Ethical approval of this cross sectional study was obtained from Shalamar School of Allied Health, Lahore Patients of either gender ranging from 6 to 16 years were included while those above 16 years were excluded. A detailed history of each patient was taken to rule out any existing pathology which can deteriorate the visual acuity of the patient which was followed by pen torch examination to grossly examine the anterior chamber of eye. Attendant of a child of age 6 to 12 year was asked if he/she wanted his/her child to participate in this research, if he/she agreed then a consent form was given to the child's participant to ensure his voluntary participation. A proforma was used by principal investigator including the bio data of child and associated clinical findings in eyes. A child of age 12 to 16 years was asked if he/she wanted to participate in this research, if he/she agreed then a consent form was given to the participant to ensure his voluntary participation. Visual acuity was measured on Snellen chart which was followed by automated and subjective refraction by single examiner. The findings were recorded on a proforma Data was entered and analyzed in SPSS version 26 and Chi Square test was applied to check for statistical significance. P value of less than 0.05 was considered significant.

RESULTS:

A total of 115 patients (54 females and 61 males) were recruited for this study from ages 6 to 16 years, with an average mean age standard deviation of 3.216 years. 73 patients out of 115 had with-the-rule astigmatism with 63.5% whereas 32 patients had against-the-rule astigmatism with 27.8%. Oblique astigmatism was present in 10 patients with the least percentage i.e., 8.7%. Chi-square test, which is parametric test, was used for the statistical analysis.

Table -1. Distribution of Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	61	53.04	53.04	53.0
	Female	54	46.96	46.96	100.0
	Total	115	100.0	100.0	

Table -2: Distribution of Age

Age of participants	N	Mean	St.Deviation	Minimum	Maximum
	115	10.6609	3.217	6	16

Figure -1: Type and Level of Astigmatism

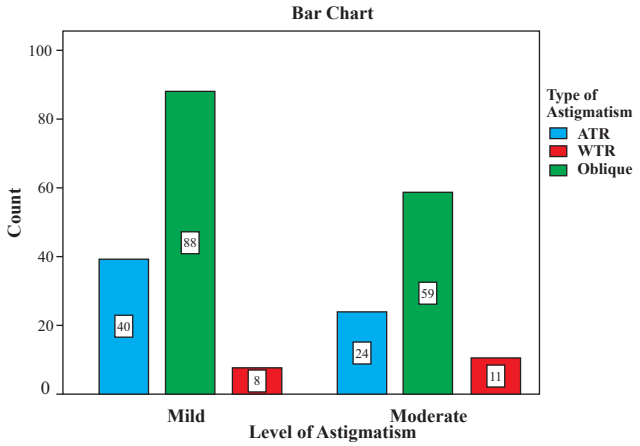

Figure- 2: Visual Acuity in Relation to Laterality

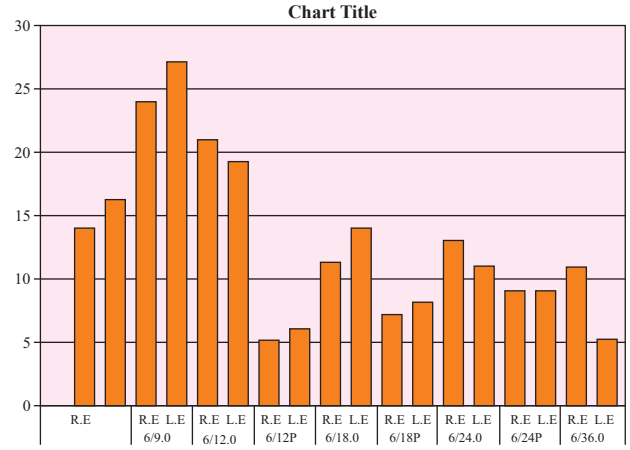

Table -3: Visual Acuity and Level of Right Eye

			Level of Right Eye		
			Mild	Moderate	Total
Visual Acuity of Right Eye	6/7.5	Count	14	0	14
		% within Visual Acuity of Right Eye	100.0%	0.0%	100.0%
	6/9	Count	20	4	24
		% within Visual Acuity of Right Eye	83.3%	16.7%	100.0%
	6/12	Count	10	11	21
		% within Visual Acuity of Right Eye	47.6%	52.4%	100.0%
	6/12P	Count	0	5	5
		% within Visual Acuity of Right Eye	0.0%	100.0%	100.0%
	6/18	Count	6	5	11
		% within Visual Acuity of Right Eye	54.5%	45.5%	100.0%
	6/18P	Count	3	4	7
		% within Visual Acuity of Right Eye	42.9%	57.1%	100.0%
	6/24	Count	3	10	13
		% within Visual Acuity of Right Eye	23.1%	76.9%	100.0%
	6/24P	Count	7	2	9
		% within Visual Acuity of Right Eye	77.8%	22.2%	100.0%
	6/36	Count	5	6	11
		% within Visual Acuity of Right Eye	45.5%	54.5%	100.0%
Total		Count	68	47	115
		% within Visual Acuity of Right Eye	59.1%	40.9%	100.0%

Likelihood ratio is 41.419. There is association between visual acuity and level of right eye as its p value was 0.00 (Chi Square test).

Table -4: Visual Acuity and Level of Left Eye

			Level of Left Eye		
			Mild	Moderate	Total
Visual Acuity of Left Eye	6/7.5	Count	15	1	16
		% within Visual Acuity of Left Eye	93.8%	6.3%	100.0%
	6/9	Count	16	11	27
		% within Visual Acuity of Left Eye	59.3%	40.7%	100.0%
	6/12	Count	12	7	19
		% within Visual Acuity of Left Eye	63.2%	36.8%	100.0%
	6/12P	Count	2	4	6
		% within Visual Acuity of Left Eye	33.3%	66.7%	100.0%
	6/18	Count	4	10	14
		% within Visual Acuity of Left Eye	28.6%	71.4%	100.0%
	6/18P	Count	4	4	8
		% within Visual Acuity of Left Eye	50.0%	50.0%	100.0%
	6/24	Count	5	6	11
		% within Visual Acuity of Left Eye	45.5%	54.5%	100.0%
	6/24P	Count	7	2	9
		% within Visual Acuity of Left Eye	77.8%	22.2%	100.0%
	6/36	Count	3	2	5
		% within Visual Acuity of Left Eye	60.0%	40.0%	100.0%
Total		Count	68	47	115
		% within Visual Acuity of Left Eye	59.1%	40.9%	100.0%

Likelihood ratio is 19.675. There is association between visual acuity and level of left eye as its p value was 0.02 (Chi Square test).

DISCUSSION:

Our study was a cross-sectional study that only included the patients visiting Shalamar Hospital, Eye OPD, Lahore. Our study was conducted among the patients, male and female. Study included a total of 115 participants visiting OPD of Shalamar hospital, Lahore. The patients were aged between 6-16 years. Out of these 115 participants, 54 were females and 61 were male patients. After obtaining consent from the parents of age 6 to 12 years and assent form from patients of age 12 to 16 years falling under our inclusion criteria the remaining patients were excluded. Their visual acuity is recorded by Snellen box. Then myopic astigmatism was corrected by cylindrical lenses in both eyes. Their astigmatic level was noted with their dioptric correction. Mild level was up to -1D and moderate level was less than -4D. The data obtained from our patients were not only viewed to evaluate different types of astigmatism in patients visiting OPD whereas we also analyzed our data to calculate the

dioptric level of astigmatism in these selected patients. Out of 230 eyes, 136 patients had mild astigmatism and can be corrected easily by cylindrical lenses without needing any surgical operations, 94 eyes were having somewhat moderate astigmatism. At mild level 6/9 had highest frequency followed by 6/7.5 whereas at moderate level 6/9 and 6/18 had highest frequency followed by 6/12 and 6/24.

Vision is important aspect of clarity in children as it has a role in physical and emotional development. Hameed S screened 1644 pediatric students from schools. It was noted that 20.43% students had visual impairment owing to refractive errors. Astigmatism accounted for 3.6% of whole study population. So visual impairment leads towards illness and discouragement.11 Zahra T et al12 randomly screened 528 madrassa students for visual impairment. Both qualitative and Quantative methods were applied in their research. It was found that 31.5% madrassa students had errors of refraction while 11% of them were astigmatic. Almost similer results were reported by various local and international researches.13,14,15 These results highlighted an urgent need of awareness in screening the potential cause for blindness in madrassa students.

Any type of astigmatism whether monocular or binocular disintegrated visual acuity and stereopsis. The majority of the astigmatism is arising due to corneal distortion or scarring.16 Similar results were reported from researches conducted across various countries.17,18 In my study majority of patients complaints for deterioration of vision as it occur because of change in axis so there was no significantly difference between our study and previous study.

The main etiology for astigmatism is either any pathology of cornea or aberration in the lens of the eye, known as corneal astigmatism and lenticular astigmatism respectively. It occurs when the radius of the cornea changes and it refracts the light in various directions adjusting at more than one focal point.19 Labuz G and associates did a retrospective analysis of topography results of more than eleven thousand patients. Their research revealed that 53% of eyes had WTR, 34% had ATR, and 13% had oblique astigmatism. In my study mostly patients at moderate level of astigmatism presented with light sensitivity so there is no significant difference between our study and previous study. This study was conducted at a single center and on a smaller sample size which constitute major limitations of this research.

CONCLUSION:

The most prevalent type of astigmatism present in age group 6-16 was with-the-rule astigmatism followed by against-the-rule astigmatism. This study concluded that it may help to find the most prevalent type of astigmatism present in our population and can proof to be helpful in finding the burden of astigmatism at Shalamar Hospital.

Conflict of Interest: None to declare

Ethical Approval: The study was approved by the Institutional Review Board / Ethical Review Board **No. SMDC-IRB/AL/02/2022.**

Author Contributions: Amina Ashraf: Concept, Design, Literature Search, Data Collection, Article Draft.

Areej Iftikhar: Data Collection and Analysis, Critical Review.

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