Prevalence of Astigmatism in School Going Children

Rida Ijaz, Hijab Ijaz, Naeem Rustam

Purpose: To assess the prevalence of astigmatism, and most common type of astigmatism among school going children.

Study Design: Cross sectional observational study.

Place and Duration of Study: City District Govt. Girls High School, Shadman and “Department of Ophthalmology” FMH College of Medicine & Dentistry, Shadman Lahore from September 2014 to February 2015.

Materials and Methods: After taking consent data was collected through a self-designed performa at City District Govt. Girls High School, Shadman Lahore from 550 students. Each eye was considered as a separate individual data. Total 1098 eyes were taken for the study, age ranges 5 – 16 years. First visual acuity was measured monocularly by using snellen’s visual acuity chart. In case of substandard vision, pinhole test was done to assess the maximum improvement after correction. Amount and type of astigmatism was assessed by using cycloplegic refraction. Eyes with amblyopia, strabismus or other ocular pathologies were excluded.

Result: We examined 1098 eyes of the 550 students, with mean age of 10.31 ± 3.276 years including 255 (46.4%) male students and 295 (53.6%) female students. Astigmatism was seen in 818 eyes (74.5%), out of which 0.5 – 1.00 diopter cylinder was the most common and was present in 454 eyes (41.3%), With the rule astigmatism was seen in 605 eyes (55.1%) and 355 (32.3%) had compound myopic astigmatism.

Conclusion: With the rule astigmatism and compound myopic astigmatism are more common among males and females and maximum in the age group of 14 – 16 years of age.

Key words: Amblyopia, Astigmatism, Children, Refractive error.
Severe degree of astigmatism can be caused by diseases of cornea e.g. keratoconus and late effects of scarring from wound such as corneal incision following cataract surgery.

Astigmatism can cause visual impairment in children, but it can be corrected.

MATERIALS & METHODS
This was a cross sectional observational study. The study was conducted in six months from September 2014 to February 2015. After taking ethical approval from the hospital and school data was collected and it was only for research purpose. After taking consent from students' data was collected through a self-design performa at city district govt. girl's high school, shadman Lahore from 550 students sample size was calculated by using formula of

Sample Size = \( \frac{Z_{\alpha/2}^2 \cdot SD^2}{d^2} \)

First visual acuity was assessed by using Snellen’s visual acuity chart with patient seated at distance of 6 meters. If visual acuity was less than 6/6, which is the standard line of this chart then pinhole test was done. If vision improved to 6/6 in this test then the patients were considered to have refractive error. Total refractive error was calculated using a retinoscope. For retinoscopy, patient’s pupil were dilated with cycloplegic drug i.e. 1% cyclopean three times with the interval of 10 minutes and retinoscopic reflex was noted after 90 minutes of instillation of first drop. By this method, type and amount of refractive error was calculated. Patients whose eyes had amblyopia, strabismus or other ocular pathologies were excluded from this study.

RESULTS
In this study, there were 1098 eyes of 550 students with their mean ages were 10.31 ± 3.276 (range: 5 – 16 years) years. For study purpose it was stratified into four groups (5 – 7, 8 – 10, 11 – 13, 14 – 16 years) as shown in table 1 including 509 eyes of 255 (46.4%) male students and 589 eyes of 295 (53.6%) female students. From the total 1098 eyes having refractive error, only 280 eyes (25.5%) had no astigmatism and 818 eyes (74.5%) had astigmatism details of which are given in table 2.

In this study, with the rule astigmatism was most commonly found in 605 eyes (55.1%) in which vertical meridian of cornea or lens is steeper than horizontal while least frequent astigmatism was against the rule which was found in 100 eyes (9.1%) of students and remaining 113 eyes (10.3%) had oblique astigmatism. Compound myopic astigmatism 355 (32.3%) was more commonly present in students in both males and females eyes Simple myopic astigmatism was seen in 151 (13.8%) eyes, mixed astigmatism was present in 92 (8.4%) eyes and compound hypermetropic astigmatism in 152 eyes (13.8%) of students. Least common type of astigmatism was simple hypermetropic astigmatism that was seen in only 69 (6.3%) eyes of both males and females.

Using multinominal logistic regression analysis results found that mixed astigmatism belongs to reference category. Students having age group range of 14 – 16 years are more likely to be non-astigmatic than mixed astigmatism as compared to other age groups. Students having age group range of 14 – 16 years are most probable to have simple myopic

Table 1: Age of Patient Vs Type of Astigmatism

<table>
<thead>
<tr>
<th>Age of Patient</th>
<th>5 – 7 Years</th>
<th>8 – 10 Years</th>
<th>11 – 13 Years</th>
<th>14 – 6 Years</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Astigmatism according to Power meridian (p-value=0.00)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Astigmatism</td>
<td>44</td>
<td>78</td>
<td>80</td>
<td>78</td>
<td>280</td>
</tr>
<tr>
<td>Myopic Astigmatism</td>
<td>75</td>
<td>132</td>
<td>122</td>
<td>130</td>
<td>459</td>
</tr>
<tr>
<td>Hypermetropic Astigmatism</td>
<td>71</td>
<td>85</td>
<td>27</td>
<td>13</td>
<td>196</td>
</tr>
<tr>
<td>Mixed Astigmatism</td>
<td>60</td>
<td>56</td>
<td>35</td>
<td>12</td>
<td>163</td>
</tr>
<tr>
<td>Total</td>
<td>250</td>
<td>351</td>
<td>264</td>
<td>233</td>
<td>1098</td>
</tr>
</tbody>
</table>
### Table 2: Type of Astigmatism According to Power Meridian

<table>
<thead>
<tr>
<th>Predictor Value</th>
<th>No Astigmatism</th>
<th>Simple Myopic Astigmatism</th>
<th>Simple Hypermetropic Astigmatism</th>
<th>Compound Myopic Astigmatism</th>
<th>Compound Hypermetropic Astigmatism</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B 95% CI</td>
<td>B 95% CI</td>
<td>B 95% CI</td>
<td>B 95% CI</td>
<td>B 95% CI</td>
</tr>
<tr>
<td>5 – 7 Years</td>
<td>-2.60***</td>
<td>0.02-2.02</td>
<td>-1.79*** 0.05-0.47</td>
<td>-0.93 0.11-1.34</td>
<td>-2.70*** 0.02-0.18</td>
</tr>
<tr>
<td>8 – 10 Years</td>
<td>-1.64**</td>
<td>0.07-0.52</td>
<td>-1.26** 0.09-0.81</td>
<td>-0.36 0.20-2.40</td>
<td>-1.63*** 0.07-0.52</td>
</tr>
<tr>
<td>11 – 13 Years</td>
<td>-1.51**</td>
<td>0.08-0.60</td>
<td>-1.26** 0.09-0.83</td>
<td>-1.52* 0.05-0.86</td>
<td>-1.63*** 0.07-0.53</td>
</tr>
<tr>
<td>14 – 16 Years</td>
<td>Ref.*</td>
<td>-</td>
<td>Ref.* -</td>
<td>Ref.* -</td>
<td>Ref.* -</td>
</tr>
</tbody>
</table>

a. The reference category is: Mixed astigmatism.

* Reference
Table 4: Type of Astigmatism According to Axis Meridian

<table>
<thead>
<tr>
<th>Predictor Value</th>
<th>No Astigmatism</th>
<th>With the rule Astigmatism</th>
<th>Against the Atigmatism</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>95% CI</td>
<td>B</td>
</tr>
<tr>
<td>5-7 Years</td>
<td>-0.15</td>
<td>0.43-1.68</td>
<td>0.89**</td>
</tr>
<tr>
<td>8-10 Years</td>
<td>0.08</td>
<td>0.59-1.98</td>
<td>0.79**</td>
</tr>
<tr>
<td>11-13 Years</td>
<td>-0.08</td>
<td>0.51-1.64</td>
<td>0.08</td>
</tr>
<tr>
<td>14-16 Years</td>
<td>Reference</td>
<td>-</td>
<td>Reference</td>
</tr>
</tbody>
</table>

a. The reference category is: Oblique astigmatism.

DISCUSSION

Astigmatism can occur in any age group, children and adults. Previous studies have suggested that uncorrected astigmatism is associated with increased risk of myopia or amblyopia. Early detection of astigmatism in pediatric populations is particularly important because of its potential influence on normal visual development\textsuperscript{10, 11}.

In this study, there was no relationship between gender and type of astigmatism according to axis and meridian in the above conducted study. And in study of China, there was also no significant difference in the occurrence of astigmatism between boys and girls\textsuperscript{12}.

Amount of astigmatism does not change much after the age of 25. The changes in the shape of the cornea can happen quickly or may occur over several years\textsuperscript{13}. If astigmatism is left untreated in children then it can cause meridional amblyopia\textsuperscript{14}. Corneal topography is a valuable diagnostic tool for diagnosing subclinical keratoconus and for tracking the progression of the disease\textsuperscript{13}.

It is shown that, 280 eyes (25.5\%) had no astigmatism, but 605 eyes (55.1\%) had with the rule astigmatism, 100 eyes (9.1\%) had against the rule astigmatism and 113 eyes (10.3\%) had oblique astigmatism.

In this study, there was simple myopic astigmatism in 151 (13.8\%), compound myopic astigmatism in 355 (32.3\%) students while mixed astigmatism in 92 (8.4\%) students. In others simple hypermetropic astigmatism was in 69 (6.3\%) and compound hypermetropic astigmatism was seen in 152 (13.8\%) students. While in a study conducted in Taiwan, 42.5\% of school children had astigmatism. Most of them (80\%) had -1.0 D while 60\% of them had myopic astigmatism\textsuperscript{15}.

Of the 914 eyes with astigmatism, myopic astigmatism was present in 700 eyes (76.60\%), hypermetropic astigmatism in 175 eyes (19.14\%), and mixed astigmatism in 39 eyes (4.26\%)\textsuperscript{16}.

A study held in Canada in 2004 on preschool children included 129 children for their study. Of the 129 subjects, 29 were classified as high astigmatism (-1 D of cylinder) in one or both eyes and the other 100 subjects were classified as normal astigmats\textsuperscript{17}.

A study held on Native Americans in 2010 included 1502 children. According to results, the prevalence of astigmatism of 2.00 diopters was 30\% during infancy (6 months to 1 year of age) and was 23 to 29\% in ages 2 to 7 years\textsuperscript{18}.

Astigmatism can be treated by anyone of the following options; eye glasses, contact lenses and refractive surgery\textsuperscript{19}. In refractive surgery corneal curvature is altered to change the focusing of the light rays on retina. Radial keratotomy and photorefractive surgery are examples of refractive surgeries\textsuperscript{20}.

CONCLUSION

With the rule astigmatism and compound myopic astigmatism are more common among males and females and maximum in the age group of 14-16 years of age. If it is not treated timely then it will leads to amblyopia. Therefore, proper screening can prevent a child from permanent visual loss due to amblyopia.

Author’s Affiliation

Dr. Rida Ijaz
BSc Hons Optometry and orthoptics, Transitional Doctor of Optometry
Lecturer
Dept of optometry & vision sciences/ Imperial college of business studies Lahore
Dr. Hijab Ijaz
BSC Hons Optometry and orthoptics, Transitional Doctor of Optometry
Senior Lecturer
Dept of optometry & vision sciences/ The university of Lahore

Dr. Naeem Rustam
FCPS, MBBS, Assistant professor
Dept of optometry & orthoptics/FMH college of medicine & Dentistry Lahore

Role of Authors
Dr. Rida Ijaz
Concept, Design of study, data collection, data analysis, manuscript drafting, Revision data analysis.

Dr. Hijab Ijaz
Data collection, manuscript drafting.

Dr. Naeem Rustam
Manuscript drafting, Revision data analysis.

REFERENCES


6. Grosvenor, T. Epidemiology f Ametropia, Primary Care Optometry. Elsevier Health Sciences, 2007; 33. 5th Edition


