The Study of Refractive Status among School Children

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Abstract: Childhood visual impairment due to refractive errors is one of the most common problems among school-age children and is the second leading cause for treatable blindness [1]. Vision 2020: The Right to Sight, a global initiative launched by a coalition of non-government organizations and the World Health Organization (WHO) [2] is to eliminate avoidable visual impairment and blindness on a global scale. In India, the problem of uncorrected refractive error is particularly common [3] and the refractive errors have become one of the leading causes for visual impairment and blindness, especially among children [4]. In order to reduce the occurrence of avoidable visual impairment and blindness caused by refractive errors, there is an urgent need for obtaining the epidemiological information on refractive errors and other eye diseases among school-age children. Although there are some reports in this research field from India, the subjects are mainly children attending schools or patients seen in eye clinics [5] which may not be representative of all school-age children. Furthermore, the majority of the reported population-based epidemiological researches on eye diseases among school-age children [6, 7, 8] are conducted in regions near the national capital or in developed coastal metropolis, which may not be fully representative of the whole India, especially the developing regions. In order to obtain the refractive status in school-age children in Western India, we selected Navsari District, as the study site for our population-based research. The focus of our research was to determine the factors on the prevalence of refractive errors within a single ethnicity. Additionally, with a comparison with previous reports [6, 7, 8] our results may provide a basis for establishing effective strategies for the prevention and treatment of refractive errors among school-age children in India. The goal of present study is to find the Prevalence of refractive error in School Children’s and also compare of refractive status among school children in previous year and the same year. The purpose of study is also to assess the prevalence of type of refractive error and also find the impact of refractive error correction on student’s study.

Keywords: Refractive status, Right to Sight, avoidable visual impairment, Blindness.

I. INTRODUCTION

The eye’s refractive error has been studied for decades. Many of these investigations have focused on associations between the distribution of refractive error and a wide variety of factors. These factors include-but are not limited to-age, gender, ethnicity, geographical location, diet, intelligence, socioeconomic status, performance of near work, and genetic factors.

The ocular refractive status refers to the locus within the eye conjugate with optical infinity during minimal accommodation. Under these conditions:

- In an emmetropic eye, incident parallel rays of light are brought to a focus upon the retina.
- In a hyperopic (or hypermetropic) eye, incident parallel rays of light are brought to a focus behind the retina.
- In a myopic eye, incident parallel rays of light are brought to a focus in front of the retina.
Visual impairment in children poses particular challenges that are different from those of adults. Children are born with an immature visual system and for normal visual development to occur; they need clear images to be focussed on the retina. Failure of normal visual maturation cannot be corrected in adult life; so, early detection and compensation of refractive errors will undoubtedly have a positive effect on children’s education and life in general.

II. CHILD AND REFRACTIVE EXAMINATION

Routine eye examinations are advised for all children beginning at age 6 months. Diagnosing and managing eye and vision problems that present at this age require special knowledge and skills, a need which is increasingly recognized with recent attempts to mandate eye examinations prior to school entry, and reports of over-prescription of spectacles to preschool children by non-pediatric eye specialists. Many eye and vision problems occurring throughout childhood are caused by or complicated by refractive error. Prompt and appropriate correction of early refractive errors helps ensure proper optical, acuity, binocular, and overall development, with lifelong benefits to the child.

Clinicians who treat children whose vision is still developing (infancy to approximately age 6 years) must know the impact of any disorder or treatment on the child’s eyes, vision, and overall development. Inappropriate refractive prescriptions may adversely affect ongoing optical and neurological development in infants and toddlers. Appropriate correction of abnormal refractive errors may enhance the development of many neural networks with visual input. Clinicians who work with our youngest patients accept a serious responsibility, because the child will live with the side effects as well as the benefits of such treatment for an entire lifetime.

Clinicians need to know how to adapt their clinical techniques to suit the response capability of the infant or child. The younger the child, the more likely that (a) the child has hyperopia, astigmatism, or anisometropia, (b) the refractive state is not stable, (c) treatments will have effects on the development of the eye, visual system, or other neural functions, (d) objective techniques will provide the most reliable data, and (e) cycloplegia will be necessary to determine optical prescriptions.

Conversely, the older the child, the more likely that (a) a vision disorder will be detected, (b) treatment will fail to remediage abnormal neural development, (c) the child is myopic, (d) subjective and non cycloplegic techniques will yield reliable data, and (e) a nonstrabismic binocular vision disorder will be an important factor in spectacle prescription.

III. DISPENSING SPECTACLES FOR CHILDREN

Paediatric dispensing is not an official term, but it is considered to relate to children aged 0-16 years of age. Statutory regulations do not permit the dispensing of spectacle prescriptions by unqualified individuals to children under the age of 16 years according to the Opticians Act (1989) and as a result, dispensing can only be carried out by, or under the supervision of, a registered practitioner, ie, a dispensing optician or optometrist.

There are various factors that make paediatric dispensing different from adult dispensing. These include the “duality of the patient, where the dispenser is effectively dealing with two patients-the child and the parent. The dispenser needs to be able to deal with two personalities, each with their own ideals and conflicting requirements. Communication difficulties and an understanding of the psychology involved in dealing with both adult and child present challenges to be overcome. The dispenser also needs skills in handling the parents’ reaction to their child being prescribed spectacles. Some parents feel helpless, frustrated, or even like failures, so the dispenser must be prepared for dealing with this and needs to be capable of empathising. The child may not be happy at the prospect of wearing spectacles, which also leads to a more challenging dispense process.

However, compared to adult dispensing, prescription analysis requires additional considerations. These include the patient’s mental age, stage of visual development, common ocular problems encountered, visual acuities attained, and any extra information gleaned from the child/parents.

Refraction management in children should be based on (a) an understanding of what constitutes a normal Refractive error for same-aged children, (b) selection of an appropriate measurement technique, (c) longitudinal Measurements, often before prescribing to infants or Toddlers, (d) possible modifications in corrections to allow for natural reductions expected in some refractive Errors at some ages, (e) modifications in optical prescriptions Based on an understanding of accommodative and vergence relationships, and (f) caution that unusual refractive errors can be related to ocular and Systemic diseases with insidious onset in children.

IV. BRIEF REVIEW OF LITERATURE

1. In the study done by Dr. Priyanka Gupta, Dr. Pina Soni on The effect of optometric and ophthalmologic program in screening of refractive error among camp site. 471 Student’s of Ahmedabad were screened by trained teacher. The students referred by teacher were examined by optometrists and ophthalmologists. Spectacles were given to child with Refractive errors and those required detailed examination were referred to higher centers.In Result 10% had Refractive error, 1.56% had Cataract, and 1.14% had Squint and 27% were false positive detected by teachers.
Study was concluded that effective vision screening can detected as key to prevent convertible blindness and minimize long term visual disability.

2. BP Pant, R Ghising, S Awasthi, SR Pant and RC Bhatt from Far western regional eye care centre, Geta hospital, Kailali, Nepal, Department of Ophthalmology, Nepal Medical eye College, Kathmandu, Nepal [12] found that Out of 328 students presenting to Geta Eye Hospital, Kailali, Nepal found that Out of 328 students presenting to Geta Eye Hospital, presenting visual acuity was normal (6/6) in 67.4% students, while 32.6% had reduced presenting visual acuity.

Altogether 7.0% students had presenting visual acuity worse than 6/18 in the better eye and 2.4% improved to better than 6/18 with correction. Significant refractive error (>0.50 D Spherical Equivalent) was found in total of 32.0% students. Myopia was present in 11.89% students, whereas Astigmatism and hypermetropia were present in 11.3% and 8.8% of the total students respectively. Out of total students, 95.4% students were found to have best corrected visual acuity of 6/6-6/18 in the better eye.

Altogether 7.6% cases of amblyopia were found. Hyperopia was most commonly associated with amblyopia. Associated ocular morbidity in either eye was assessed and found in 25.0% students. 6.4% cases had convergence insufficiency. About one third of the students presenting to hospital had significant refractive error. Thus, School can be our peripheral referral unit if we could train teachers to detect abnormal vision.

3. In another study by Mohammad Khalaj, Professor assistance of public health, department of public health Qazvin medical university, Qazvin – Iran on Prevalence of Refractive Errors in Primary School Children [7-15 Years] of Qazvin City.[13]

Main aim of this study was to assess the prevalence of refractive error and related visual impairment in school children between 7-15 years in the city of Qazvin Northeastern Iran. Cross-sectional study performed in schools of Qazvin city conducted from October 2002 to September 2008 for 5913 school children. The data were evaluated by the SPSS. Of 5903 students 7 to 15 years old, 59% were females and 41% were males.

The distribution of refractive errors was: Myopia, Hypermetropia, astigmatism and Amblyopia were 65%, 12.46%, 16.1% and 6.37% respectively. Myopia was more prevalent in women [60%] than in men [40%] [P < .005], and in hyperopia was 56.74% in women and 43.26% [P < .005] in men. There was an age related shift in refractive error from hyperopia in younger children [14% in 7 year olds] towed myopia in older [55% in 15year olds]. Refractive error was the main cause of visual impairment in children aged between 7 and 15 years in Qazvin-Iran. An increased prevalence of refractive error especially myopia was found in this study. Amblyopia and reduced vision because of uncorrected refractive error is a major public health problem in Qazvin school-aged children in Iran [14]

V. METHODOLOGY

Research Design:
This is a prospective; School based study designed in order to evaluate the visual status of the students presenting to School.

Study Location:
The present study is conducted in 5 different School; namely Aklavaya School, Mishra sala No 8 and Mishra shala 9, chovisi high school, jalalpore high school,(Navsari, Gujrat, India)

Selection of Study Population:
A purposive sample of 2301 School students of Navsari District was chosen for the study.

Objectives:
The aim of study was to find the Prevalence of refractive Error in School Children’s and also compare of refractive status.

INCLUSION & EXCLUSION CRITERIA

Inclusion Criteria
All Students who attending school eye camp.
Age Group: 3 to 18 Years child
All Ocular Abnormality.
All range of visual acuity.
All kind of Refractive Errors.

Exclusion Criteria
All Students’s who were not attending eye camp.
Age Group: less than 3 years and more than 18 years.
Student’s with Systemic Disease.

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The study was divided into four phases:

**Phase-I**

**Study Design and Development:**
First of all, small case paper was designed and arranges procedure in manner by which we can check the ocular status easily.

**Phase-II**

**Tool Development:**
For eye camp in schools, we took permission of respective organizations and afterward Rotary eye institute was design a camp under title “BLINDNESS PREVENTION PROGRAMME”.

**Phase-III**

**Implementation of School Eye Camp Procedure:**
First of all demographic data of all presenting students were collected. Presenting visual acuity of all children was taken with the help of Snellen’s vision chart. Pinhole vision was also taken in eyes with visual acuity worse than 6/6.

Each student’s pupillary reaction was assessed in all cases with the help of focusable torchlight.

After that Refraction and Keratometry reading was done in all cases with the help of autorefractometer.

All students’ Subjective refraction was done with the help of trial set.

For detailed measurement extra ocular movements were assessed in all cardinal gazes (Broad H test). Hirschberg test was assessed in cases suspected of ocular misalignment followed by cover test where required.

Even Convergence and accommodation test was performed in all cases with the help of RAF rule. Some cases requiring consultation, to an Ophthalmologist were referring to Rotary Eye Institute, Navsari.

Child who found Refractive error was given spectacle and effect of spectacle was seen after 1 month follow up.

**Phase-IV**

**Evaluation Strategy:**
After 2 month of dispensing spectacle effect of it was measured. For evaluate effect of Spectacle child’s refractive status were further evaluate.

### VI. RESULTS

<table>
<thead>
<tr>
<th>Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence of Refractive Error</td>
</tr>
<tr>
<td>Variants</td>
</tr>
<tr>
<td>Total Eyes</td>
</tr>
<tr>
<td>Eyes Having Refractive Error</td>
</tr>
<tr>
<td>Eyes Having No Refractive Error</td>
</tr>
</tbody>
</table>

![PREVELANCE OF REFRACTIVE ERROR](image)

- **85.79%** of 3948 Eyes
- **14.21%** of 654 Eyes
- **100%** of 4602 Eyes
In this prospective, School based comparative study, the participants’ having refractive error and 85.79% having no refractive error.

Table 2
Gender Distribution (Only Refractive Error Patients)

<table>
<thead>
<tr>
<th>Gender</th>
<th>No. of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>149</td>
</tr>
<tr>
<td>Female</td>
<td>178</td>
</tr>
<tr>
<td>Total</td>
<td>327</td>
</tr>
</tbody>
</table>

In this prospective, School based comparative study, the participants’ included aged between 3 to 18 years. Study shows that 45.56% males and 54.43% females having refractive error.

Table 3
Prevalence of Refractive Error According To Subjective Refraction

<table>
<thead>
<tr>
<th>REFRACTIVE ERROR (D)</th>
<th>SPHERICAL</th>
<th>CYLINDRICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 TO -2.00</td>
<td>439</td>
<td>500</td>
</tr>
<tr>
<td>-2.00 TO -4.00</td>
<td>095</td>
<td>009</td>
</tr>
<tr>
<td>-4.00 TO -6.00</td>
<td>039</td>
<td>002</td>
</tr>
<tr>
<td>-6.00 TO -8.00</td>
<td>004</td>
<td>000</td>
</tr>
<tr>
<td>-8.00 TO -10.00</td>
<td>002</td>
<td>000</td>
</tr>
<tr>
<td>+0.12 TO +2.00</td>
<td>074</td>
<td>053</td>
</tr>
<tr>
<td>+2.00 TO +4.00</td>
<td>000</td>
<td>000</td>
</tr>
<tr>
<td>+4.00 TO +6.00</td>
<td>001</td>
<td>000</td>
</tr>
<tr>
<td>+6.00 TO +8.00</td>
<td>000</td>
<td>000</td>
</tr>
<tr>
<td>+8.00 TO +10.00</td>
<td>000</td>
<td>000</td>
</tr>
</tbody>
</table>

SPHERICAL REFRACTIVE ERROR
The above graph shows that 608 eyes having mild Spherical refractive error; 40 eyes having moderate Spherical refractive error and 6 eyes having high Spherical refractive error according to Subjective Refraction.

The above graph also shows that 652 eyes having mild cylindrical refractive error; 2 eyes having moderate cylindrical refractive error and 0 eyes having high cylindrical refractive error according to Subjective Refraction.

Above table also shows that there is high prevalence of Myopia as compare to Hypermetropia in School students.

<table>
<thead>
<tr>
<th>Year</th>
<th>Previous year</th>
<th>Present year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>1000</td>
<td>2301</td>
</tr>
<tr>
<td>Refractive error</td>
<td>126</td>
<td>327</td>
</tr>
<tr>
<td>Percentage</td>
<td>12.6%</td>
<td>14.21%</td>
</tr>
</tbody>
</table>

In previous study the prevalence of refractive error was 12.60% and in these studies there was 14.21%.

VII. CONCLUSION:

The present study shows one of the ideal methods to prevent long term visual impairment and its socioeconomic impact on students in future. Visual impairment in children poses particular challenges that are different from those of adults. Children are born with an immature visual system and for normal visual development to occur; they need clear images to be focussed on the retina. Failure
of normal visual maturation cannot be corrected in adult life; so, early detection and compensation of refractive errors will undoubtedly have a positive effect on children’s education and life in general.

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13. Prevalence of Refractive Errors in Primary School Children [7-15 Years] of Qazvin City. Mohammad Khalaj assistance Professor of public health; department of public health Qazvin medical university, Qazvin – Iran