ISBN : 978-81-943584-6-6

A cross sectional on refractive error among school children aged 11 to 14 years in Thiruvallur district, Tamil Nadu India

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Abstract:

*Background**:** Refractive error as a reason for blindness has not gotten a lot of consideration, different meanings of blindness have been base on best-revised separation visual sharpness incorporate the definition utilized in the universal factual characterization of maladies & related health problem, WHO estimates that refractive error are a major reason of blindness in the globe leading to 42% cases of visual impairment.*

Aim of the study: To determine, if there is any association among types & age.

Material & Methods: In this cross sectional study on school children were performed simple random sampling, in this sample design each & every item in the twelve secondary government schools aged among 11-14 years having equal chance to add in the sample. The study was completed through oral questionnaire based on previous review literature, validated by the pilot of the study, translated into the Tamil & again back to English, followed by ocular examination.

Results: The age range of children was 11-14 years, with mean 12.69 years. Among children selected, most of the children were in the age of 14 years accounting for (33.6%) 586 children followed by the age of 12 years representing (23.26%) 406 children. The frequency of refractive error was higher in the age of 14 years. Myopia & astigmatism were more frequent in the age groups of 13-14 years accounting for (62.1%) 105 children, & (26.9%) 50 children.

There is no statically significant relationship among age & refractive status (P= 0.787).

*Conclusion**:** In our study, we concluded the frequency of refractive error according to the age showed that the frequency is more among older age compared to the young age, reported that the frequency of refractive error increment with age.*

Keywords: Blindness, Frequency, Frequency Of Refractive Error, Refractive Error, School Children.

INTRODUCTION

Refractive error is a very common eye disorder; it occurs at the point when the eye can't unmistakably center the picture from the external world on to the retinal plane. The aftereffect of refractive error is obscured vision; which is some of the time so extreme that it causes visual impairment [(1).]

There are three most common of refractive error:

1. Myopia (near sightedness), difficult in seeing distance object clearly, near sightedness are the most common disorder [(2)].
2. Hypermetropia (far sightedness), difficult in seeing near object clearly.
3. Astigmatism, twisted vision coming about because of a sporadically bended cornea (the clear covering of the eyeball).

Astigmatism can also be classified based on the axis, as with-the-rule astigmatism (WTRA), against-the-rule (ATRA) & oblique astigmatism (OBLA). With-the-rule is referred to axis of the right cylinder located inside 30 degrees of the flat (0 – 30 degrees or 150 – 180 degrees). Against-the-rule astigmatism is the circumstance when the hub of the rectifying chamber is inside 30 degrees of the vertical meridian (60 – 90 – 120), while all other meridians were classified as oblique. This classification has been applied in a previous study (Raliavegwa & Oduntan, 2000) [(3)].

Refractive error can be easily diagnose, measured & corrected with spectacles or other refractive corrections to get normal clear vision. The most commonly used form of refractive correction is by using spectacles, since they are the cheaper & simpler [(4).] Developing countries have to face challenges in the form of availability & affordability of spectacles. Inequities prevail in the availability of spectacles among developed urban & under-developed rural areas. If however, the error is not correct or the correction is inadequate, refractive error can lead to low vision (partial sight) & even blindness (Serge et al., 2004) [(5).]

Uncorrected refractive error (URE) for distance vision including under-corrected refractive error are the major grounds of low vision worldwide & are the second foremost cause of blindness after cataract, also uncorrected refractive error stays a general medical issue which considerably affects learning and scholastic accomplishment particularly in underserved & under resourced communities. Refractive error as a reason of blindness has not received much consideration on the grounds that numerous meanings of visual impairment have been founded on best-revised separation visual keenness, incorporating the definition utilized in the Worldwide Measurable Order of Infections and Related Medical issues [(6).] In view of the expanding acknowledgment of the colossal requirement for revision of refractive error.

WHO estimates that Refractive error is a major ground of blindness in the world leading to 42% cases of visual impairment [(7)] .More recently, Maharaj et al. (2011) [(8)] , estimated that 300 million people are visually impaired globally & uncorrected refractive error with the associated visual impairment result in global economy losing $269 billion in productivity annually.

Blindness because of refractive error usually manifests at an early age & the number of blind-person-years due to refractive error in developing countries is approximately twice as high as cataract related blindness[(9,10)] , can also have dramatic effect in personality development & career opportunities, along with causing an economic burden to the society [(11)] .

The authors further pointed out that the impact of blindness from myopia may be different from that of hyperopic since those that are blind due to myopia are likely to have better near vision than those with hyperemia. Therefore, they can read at near, where most reading is done. Children generally never complain of defective vision. Generally they are not aware of their problem or they may adjust to their poor vision. Even some time they used to avoid work which needs visual concentration. For several reasons, children are at a greater risk of having visual impairment, however, many of the causes are correctable & preventable if treated early.

MATERIALS AND METHODS

In this cross sectional study on school children in Thiruvallur district, Tamil Nadu India State were performed simple random sampling, in this sample design each & every item in the twelve government school children aged among 11-14 years having equal chance to add in the sample.

We have taken twelve secondary government schools children in Thiruvallur district, Tamil Nadu state India. The systematic selection was done with probability proportionate to size, & student in each school were chosen by basic arbitrary testing. The no. of understudies chose from each school was proportionate to the quality of the school. The persons who were not present on the day of data collection were barred from the study.

All children in the selected schools were included in the study. The minimum sample size was 1745 schools children.

The Principals of the selected schools were informed about the study & permission sought from them to conduct the study in their schools. They informed the parents of the student regarding the study & permission taken from the guardian of the student to be examined.

Written approval from the head teachers of each school was then obtained on behalf of the entire students who participate in the study. Questionnaire for the present investigation was created dependent on previous review of literature. It was validated with the help of pilot study. It was translated into Tamil & again back translated to English to make sure that the meaning of the message conveyed did not vary.

It consists of socio demographic details of the individual & the family, history related to refractive error, parental & sibling history of refractive error. Based on the observations from pilot study, necessary modifications were made for the primary investigation. The outcomes from the pilot study were barred from the last investigation.

Demographic data of each Child was obtained. History was taken in regard to ocular (eye) complaints. In family history, emphasis was put on immediate family members with regard to use of spectacles. History was also obtained as to whether a Children had sought medical advice in the past concerning eye problems & if so, whether spectacles were prescribed. Reasons for failure to obtain glasses if previously prescribed were established. Also enquired in the history were previous ocular surgery & its indication.

Ocular examination, before & after refraction, visual acuity was calculated at a distance of six meter under appropriate illumination Log MAR charts designed for 6 meter test distances were used. Cycloplegics refraction was used so as to interfere with normal school function of the children.

The child was seat at the distance of 6 meter from the VA snellen's chart & visual acuity was measured each eye was tested separately monocular one eye closed & other eye is testing.

The right eye is tested first then the left eye every time occluding the fellow eye & binocularly (both eyes open) using a log MAR chart. The vision was recorded in the questionnaire, asked by optometrist, & the Vision screening was done with the help of experienced Optometrist. For those wearing glasses already, first the Visual acuity was taken monocular vision without glasses & with glasses, we started right eye & left eye is closed & them left eye is testing & right eye is closed. Secondly For binocularly vision, we tested with & without the glasses, & make comparison with glasses & without glasses which visual acuity is the best for this patient, & worse glasses, the power of the lens was determined by the lensometer, after the subjective refraction the prescription of spectacle for these children were recorded for the best correction of visual acuity (BCVA), for used trial lenses & trial frame.

When the BCVA was still more awful than 20/32, a total ophthalmic assessment was performed first we tested by slit lamp examination by the anterior segment & the second step further examination tested by posterior segment, before started further examination we dilated the children with eye drop cyclopentaloate 1% & after we checked the reason for low vision was recorded in one of the accompanying five classifications: corneal opacities, waterfall, retinal conditions, amblyopic, or other. In instances of amblyopia, it was important to preclude any natural reason, and discover one of the accompanying criteria: Esotropia, exotropia, or vertical tropia in four meters, or esotropia or vertical tropia in 0.5 meter (strabismic amblyopia). In instances of an uncorrectable low vision with no natural issue, the amblyopia was sorted as "vague." Tropias were surveyed with the spread test and watching the corneal reflex in 0.5 and 4.0 meters and characterized in three gatherings of esotropia, exotropia, and vertical tropia. The level of tropia was estimated utilizing the Hirschberg strategy for corneal light reflex.

Jaeger's outline for close to vision was tried by keeping 25-30 cm good ways from the eyes of the subjects. On the off chance that the youngster wears displays, visual sharpness was tried both with & without spectacles.

The children were screened for refractive errors. Children with visual acuity of 6/9 to 6/18, 6/24 to 6/60 & less than 6/60 in the better eye were categorized as having mild visual impairment, moderate visual impairment & severe visual impairment respectively. Teachers were informed about children who had visual acuity equal or less than 6/12 & other ocular problems.

The statistical software namely SPSS (statistical package for social sciences), was used for the analysis of data & Microsoft word & excel have been used to generate graphs, tables, etc.

Also, Correlation test (Chi Squared test) correlation & regression. Results were presented using odds ratio & their confidence intervals were calculated to assess the estimate of the risk proportion, rates, tables & diagrams wherever appropriate, was utilized to investigate relations among variables such as age & gender with refractive errors. Statistical significance was set at 0.05 ($p < 0.05$). A statistician was consulted for data analysis.

Ethical clearance was obtained from research & ethics committee of NIMS UNIVERSITY RAJASTHAN, JAIPUR & department of optometry/ophthalmology NIMS UNIVERSITY as well as the principal of the schools for consent to direct the study .General data regarding the age, sex, address, history related to refractive error was collected by interviewing the child & entering in the pre-tested semi structured questionnaire by the investigator followed by the measurement & screening of vision of the child. All procedures in the study are painless & non-invasion .Participants were informed of the purpose of the study, & that declining would not affect their getting eye care & other related health services in future. Results of the eye examination & test were made available to each participant confidentially. Confidentiality of the data was maintained. No participant was identified by name. Results were presented in group format. A short talk supported by charts, posters & audio visual tapes regarding eye health

ISBN : 978-81-943584-6-6

education was given to children after general & ophthalmic examination. Any serious ocular disease detected during the project, was referred to the ophthalmology department in DR Agarwals Eye Hospital main branch of Chennai. Eventually, screening, school heads & their parents were informed about the refractive status of the children & also the importance of early correction with spectacles & regular use of it.

RESULTS

In the study population comprised 1745 children, their ages range from 11-14 years with a mean of 12.69 years. Among the children selected, most of the children were in the age of 14 years accounting for (33.6%) 586 children, followed by the age of 12 years accounting for (23.26%) 406 children & the age of 13 years accounting for (22.57%) 394 children, the least proportion was in the age of 11 years accounting for (20.57%) 359 children, the results were shown in the figure 1.

The frequency of refractive error in our investigation was (17.25%) 301 children. The frequency of refractive error was higher in the age of 14 years representing (5.49%) 96 children pursued by the age of 12 years representing (4.23%) 74 children, & the age of 13 years accounting for (3.78%) 66 children, the least was in the age of 11 years accounting for (3.75%) 65 children. Distribution of uncorrected visual acuity Log (MAR) values by the age is tabulated in table1.

The frequency of corrected refractive error by age in the right eye, most of the participants (95.55%) 1667 children showed rectified visual keenness of 0.0 Log MAR (6/6) or better. The percentage distribution of rectified visual keenness of 0.0 Log MAR (6/6) in the age of 11 years was (93.1%), & worse 0.2-1.0 Log MAR (6/9 to 6/60) was (6.9%), the age of 12 years rectified visual keenness of 0.0 Log MAR (6/6) or better, it was (94.7%) & worse 0.2-1.0 Log MAR (6/9 to 6/60) was (5.3%), & the of 13 years, it was (96.4%) of rectified visual keenness of 0.0 Log MAR (6/6) or better, & worse it was (3.6%). The least proportion was in the age of 14 years, it was (98%) the percentage distribution of rectified visual keenness of 0.0 Log MAR (6/6) or better & worse it was (2%). figure 2

The frequency of corrected refractive error by age in the left eye, most of the participants (96.6%) 1685 children showed rectified visual keenness of 0.0 Log MAR (6/6) or better. The percentage of rectified visual keenness of 0.0 Log MAR (6/6) in the age of 11 years was 94.6% & worse 0.2-1.0 Log MAR (6/6 to 6/60) was (5.4%), the age of 12 years percentage distribution of rectified visual keenness of 0.0 Log MAR (6/6) or better was (95.6%) & worse it was (4.4%), & the age of 13 years, it was (97.6%) of rectified visual keenness of 0.0 Log MAR (6/6) or better & worse 0.2-1.0 Log MAR (6/9 to 6/60) was (2.4%). The least proportion was in the age of 14 years, (98.8%) percentage distribution of rectified visual keenness of 0.0 Log MAR (6/6) or better, & worse it was (1.2%), the results is shown in the table 2.

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Relationship among age & refractive status, we found myopia was more frequent in the ages groups of 13-14 years accounting for (62.1%) 105 children, astigmatism was more frequent in the ages groups of 13-14 years accounting for (29.6%) 50 children, hypermetropia was little more frequent in the ages groups of 11-12 years accounting for (9.1%) 12 children, the results were shown in the table 3. From this table, we conclude that there is not statistically significant relationship among age & refractive status.

Figure 1: illustrating distribution of the age of children participants

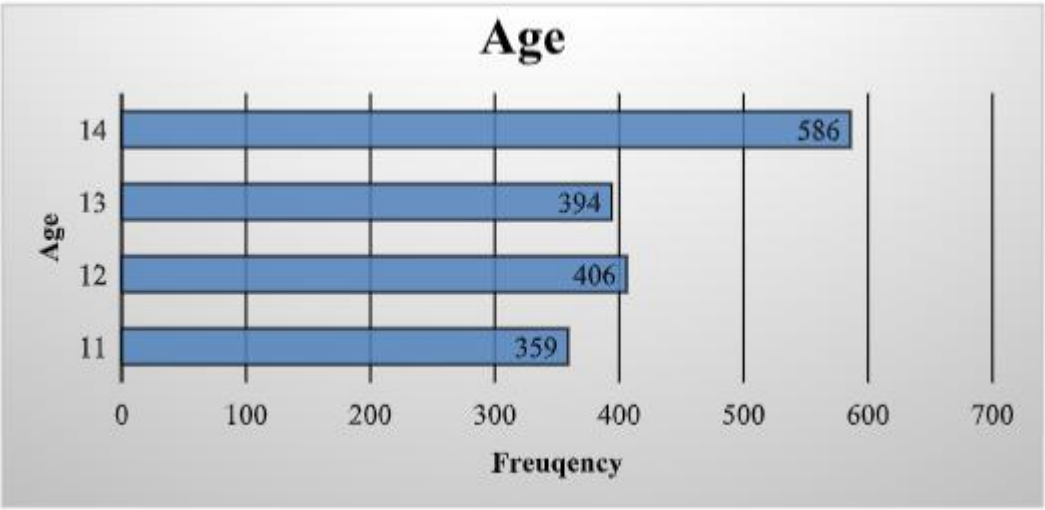

Table 1: Distribution of uncorrected visual acuity Log (MAR) values by the age

Age range years	**Visual acuity range Log (MAR) N%**							
	0.0	**0.2**	**0.3**	**0.5**	**0.6**	**0.8**	**1.0**	**N %**
11	16.79	0.89	1.12	0.43	0.41	0.42	0.48	20.54
12	19.05	0.72	1.70	0.39	0.55	0.39	0.48	23.28
13	18.81	1.28	1.12	0.26	0.32	0.25	0.55	22.59
14	28.10	1.55	1.92	0.56	0.49	0.58	0.39	33.59
Total	**82.75**	**4.44**	**5.86**	**1.64**	**1.77**	**1.64**	**1.9**	**100.0**

ISBN : 978-81-943584-6-6

Figure 2: distribution of corrected visual acuity Log (MAR) values in the right eye by age

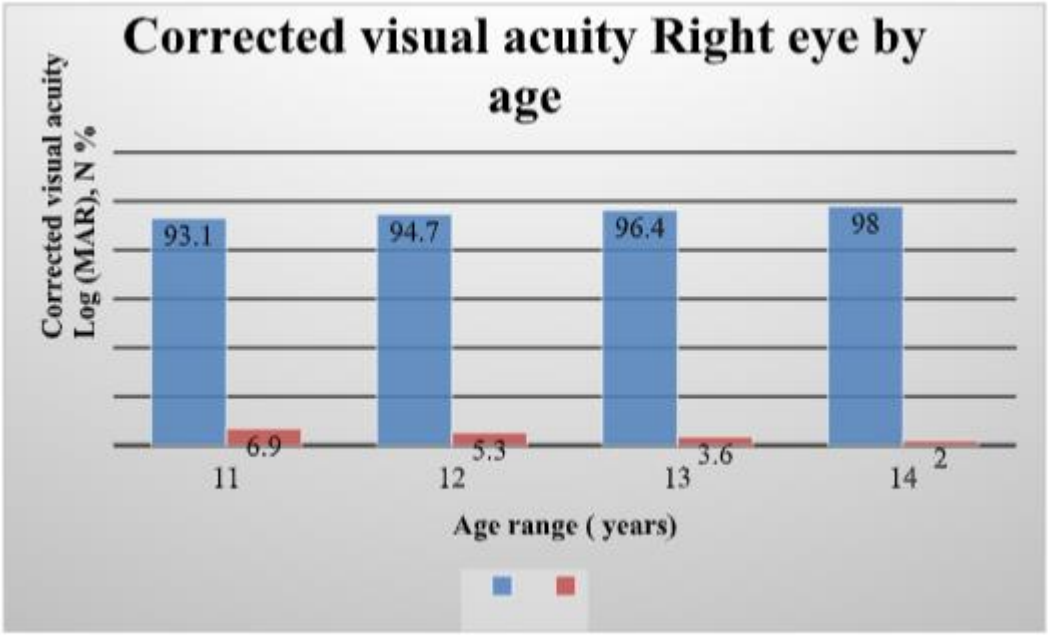

Table 2: distribution of corrected visual acuity Log (MAR) values in the left eye by age

Age range (years)	Corrected visual acuity (Log MAR) N%	
	0.0 n%	**0.2-1.0 n%**
11	94.6	5.4
12	95.6	4.4
13	97.6	2.4
14	98.8	1.2

Table 3: Relationship among age & refractive status

Characteristics	Age distribution			
	11 to 12, n (%)	**13 to 14, n (%)**	**OR (95% CI)**	**P value**
Myopia	87 (65.9)	105 (62.1)	0.674694	0.787
Hypermetropia	12 (9.1)	14 (8.3)		
Astigmatism	33 (25)	50 (29.6)		

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DISCUSSION

Frequency of refractive error was significantly higher in the age of 14 years compared the others aged 11, 12 & 13 years. Our study was found similarity in others studies like:

For example, Varma (USA), [12] Munouz (Mexican American), [13] Thiagalingam (Australia), [14] Rosman (Singapore) [15] & Liou (Victoria, Australia) [16], reported that the frequency of refractive error increase with the age. In the present study shows the frequency of refractive error was more in 13-14 years of age accounting for 9.68% compared to in 11-12 years of age group accounting for 7.56%, which similar findings by pavithra et al [17], Matta et al [18] & Rathod Hetal K [19] that frequency of refractive error increases with increasing ages. The frequency of refractive error according to the age showed that the frequency is more among older children compared to the young children. The finding were similar to other studies [20-21] .The higher frequency reported in older children could be due to better articulation & detection of visual problems by older children, suggesting a lack of detection by older children, suggesting a lack of detection by parents & teachers at younger ages.

The frequency of refractive error varies depending on the children or population under study, particularly to the age group under consideration. In the present study, population or children consisted of age group among 11-14 years, it is during this period, the children are at danger of developing refractive errors, because they are actively rising & subjected to the strain of near work due to demanding academic schedules, such as children is likely have additional number of myopic, what is the case of our study.

In the current study also showed that the no. of students with refractive error increased as the student move to high class, for example in the age group of 11-12 years myopic frequency was done in 28.9% (87) children & the age group of 13-14 years myopic prevalent was done in 34.9% (105) children.

In our study, myopia was the most frequency of refractive error accounting for 63.8% followed by astigmatism & hyperopia. In the present study myopia was found to be higher or more myopic in the age of 13-14 years old than those aged in 11-12 years old, myopia was most prevalent in old children. In this study, myopia frequency increases with age as well as the axial length, which is similar to the findings by previous authors (Zelalem & Abdirahman, 2013 ;[22] Trivedi et al, 2006 ;[23] Mabaso et al 2006) [24]. The age related toward myopia could be related to the increased intensity of schooling with age (Trivedi ET al.2006), what is the case of our study.

In our study, when association of type of refractive error was studies we found that the frequency of myopia & astigmatism significantly increased with age, but our study regarding the relationship among age & hyperopia was found almost similar of age group. In the others studies that reported relationship among hyperopia & age decreased with the age [25-26-27-28] showed a decreased in hyperopia with age, what is contrary our study. In the present study

was found astigmatism frequency increases with the age, which similar findings study is done in Mabaso et.al (2006) reported that the astigmatism increased with the age. Some others studies have reported astigmatism frequency decrease with the age [29], this was contradictory in our study. The children aged 13-14 years were also more likely to be astigmatism as compare to those aged 11-12 years. This was contrary to what wedneretal found myopia was more in 11-13 years as compared those aged 11-15 years & mostly female children [30].

In our study, the frequency of hypermetropia was found to be 8.6% (26) children, there are not so many difference children aged among 11-12 years old 9.1% (12) children & children aged among 13-14 years old 8.3% (14) children, almost was similar frequency of age group.

In the present study, myopia is toward in older children & hypermetropia is associated with females gender, which is similar found the study done in Kalkivaji V et al [31] in &hra Pradesh found that myopia was significantly higher among older children & hypermetropia was significantly associated with females' gender [32].

CONCLUSION

From this study, we concluded the frequency of uncorrected refractive error according to the age showed that the frequency is more among older children compared to the young children, the higher frequency reported in older children might be due to better articulation & detection of visual problem by older children, suggestion a lack of detection by older children, suggestion a lack of detection by parents & teachers at young age. The frequency of uncorrected refractive error increase with the age.

Acknowledgement

We are thankful all school children participants for this study and principals and teachers for their co- cooperation without which this study could not have been possible.

Funding: No finding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the institutional Ethics committee

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