

A Clinical Study of Prevalence of Myopia in School Going Children in Kakinada City

Ch. M Subrahmanyaswara Rao¹, V Satyasrinivas¹, V Muralikrishna², V Ashok³, Ramendra Pratap Singh⁴

¹Assistant Professor, Department of Ophthalmology, Rangaraya Medical College and Government General Hospital, Kakinada, Andhra Pradesh, India, ²Professor and Head, Department of Ophthalmology, Rangaraya Medical College and G.G.H., Kakinada, Andhra Pradesh, India, ³MS, Department of Ophthalmology, Rangaraya Medical College, Kakinada, Andhra Pradesh, India, ⁴Assistant Professor, Department of Public Health, SRM University, Sikkim, India

Abstract

Background: Refractive error is being the most common cause of visual impairment, in that myopia is the commonest cause. Myopia is a common vision condition affecting nearly 30% of population. It occur more frequently among school children aged between 8 and 12 years. Because the eye continues to grow during childhood, it typically progresses until about age 20. Uncorrected myopia is major public eye health problem in school - going children in India. Refractive error, and particularly myopia, places a substantial burden on the individual and on society. Therefore the magnitude of the problem needs to be assessed scientifically.

Objectives: This study evaluates the prevalence of myopia in school going children in Kakinada City of Andhra Pradesh.

Methods: Simple random sampling among school going children between 7 and 15 years of age were chosen for the study. Among the schools in Kakinada city, 6 schools were randomly selected for the study for a period of 1 year from January 1st, 2015 to December 31st, 2015. A detailed history regarding the personnel details, any presenting complaints, past history of wearing glasses was taken. The examination included thorough ocular torch light examination with special concentration to the visual axis by performing Hirschberg's test. A visual acuity cut off of 6/9 was taken.

Results: A total of 1.029 students were participated in study. The prevalence of myopia was found in 7.48% students. Increasing age was associated with the increased risk of having myopia. Girl students were more likely to have myopia than boys. The prevalence of myopia among girls was more than that of boys 8.2% and 6.68% respectively.

Conclusion: Simple myopia which is very common in school going children is often remains undetected and is a leading cause of visual impairment for school students. Early detection and proper optical correction can prevent the morbidity due to myopia.

Key words: Myopia, Optical correction, Refractive error, School going children

INTRODUCTION

It is estimated that there are 1.4 million blind children in the world, two thirds of whom live in the developing countries,^[1] and that the causes of blindness in children vary according to region and socioeconomic development.^[1,2] There are 12.9 million children in the age group of 5–15 years who are visually impaired from uncorrected or inadequately

corrected refractive errors, a global prevalence of 0.96%, with the highest prevalence reported in urban and highly developed urban areas in South-East Asia.^[3] Many of the causes of blindness in children are either preventable or treatable.

The incidence of blindness in children is very difficult to ascertain, requiring either very large longitudinal studies, accurate registers of the blind, or reliable active surveillance systems.^[4] Since in developed countries the majority of children attend schools or preschools, it is relatively easier to reach them by vision screening programs. However, in developing countries many children do not attend school, and they are therefore missed by vision screening programs conducted in schools.

Access this article online



www.ijss-sn.com

Month of Submission : 10-2017
Month of Peer Review : 11-2017
Month of Acceptance : 11-2017
Month of Publishing : 12-2017

Corresponding Author: Dr. V Satyasrinivas, Department of Ophthalmology, Rangaraya Medical College and Government General Hospital, Kakinada, Andhra Pradesh, India. Phone: +91-7797009999. E-mail: satish160@gmail.com

For the age group 5–15 years, the prevalence of visual impairment from uncorrected refractive errors in some regions appears to be higher in urban areas than in rural areas, despite access to service. This may be due to a high incidence of myopia in these populations: It is suggested that there may be a direct cause-effect relation between increased access to education and myopia, but other secular changes could be contributing factors.^[3]

Uncorrected myopia is major public eye health problem in school-going children in India. School myopia occurs at approximately 7–17 years of age and stabilizes by the late teens or early twenties. Over the past few decades, there has been an increase in the prevalence of myopia in some population, leading to growing concern among the public and the scientific community. There is no well-established or universally accepted treatment for the prevention of myopia onset or progression.^[5]

The importance of early detection and treatment of visual impairment in children in India is obvious, because 30% of these blind children lose their sight before 20 years of age.^[6] Poor vision in childhood affects performance in school or at work and has a negative influence on the future life of the child.^[7]

Ninety seven percent of all visual disabilities are preventable or treatable. Refractive error is the commonest type of ocular morbidity and myopia is the commonest type of refractive error as opposed to hypermetropia.^[8] As myopia is the most prevalent in school going children (7–15 years of age), the visual morbidity can be reduced by early detection through screening programs in school. Hence, these screening programs with treatment should be promoted in all schools.

The schools in Kakinada are randomly selected and screened using snellen's chart for distant vision, near vision charts, torch light examination, retinoscopy by Heine streak retinoscopy, distant direct and direct ophthalmoscopy and subjective testing using Trial frame and trial set of lenses.

Review of Literature

Aristotle (384-322 BC) was the first to describe short sight while it was only Galen (130-200AD) who attempted to put the problem of myopia within the physiological concepts of his days, the theory of humours. The optics of myopia was first elucidated by Johannes Kepler (1604) in his initial clarification of ophthalmic dioptrics when he correctly assumed that the incident light was brought to focus in front of retina. Von-Graefe (1954) was the first to correlate the ophthalmoscopic and degenerative changes of pathological myopia.^[9]

The prevalence of myopia varies by the country, age and by ethnic group it is a major cause of visual impairment in both the developed and the developing world.^[10]

The prevalence of myopia has been reported to be as high as 70–90% in some Asian population with Taiwan reporting a myopic prevalence of 84% among 16–18 years old high school students.^[11,12] In Europe and America, its prevalence varies between 30% and 40%, while in Africa 10–20% of the population is affected.^[13] Myopia affects 25% of the population United States.^[14]

In some parts of Asia, myopia is very common. Singapore is believed to have the highest prevalence of myopia in the world; up to 80% of people there have myopia, but the accurate figure is unknown.^[15] China's myopia rate is 31% which shows 400 million of its 1.3 billion people are myopic. The prevalence of myopia in high school of China is 77.3%, and in college is more than 80%.^[16]

However, some research suggests the prevalence of myopia in India in the general population is only 6.9%.^[17]

Kalivayi *et al.*, in 1997 studied 4,029 children between 3 and 18 years in Hyderabad city, India, prevalence of myopia to be 8.6% and was significantly higher in children around 10 years of age ($P < 0.00$), supporting vision screening of school children in developing countries could be useful in detecting correctable causes of decreased vision in minimizing long term permanent visual disability. The most important cause of uncorrectable visual loss in this study was found to be amblyopia, mostly caused by refractive errors.^[18]

Murthy *et al.*, in 2002 assessed the prevalence of refractive error and related visual impairment in school going children 5–15 years of age, in an urban population in New Delhi and reported a prevalence of 7.4% of myopia.^[19]

Fan *et al.*, in 2004 screened 7,560 Chinese children in Hong Kong of mean age 9.33 years range between 5 and 16 years, has found myopia the most common refractive error, and was found in 36.7%+2.87% of children, prevalence of myopia correlated positively with older age. Children aged 11 years were almost 15 times more likely to have myopia than children younger than 7 years. Increasing age was correlated with increased incidence of myopia with highest risk in children of aged 11 years.^[20]

Uzma *et al.*, in 2009 conducted study in Hyderabad on school-aged children in urban and rural population showed provision of health education, periodic visual screening programs and primary eye care by trained health care personnel in elementary schools will help to detect early

diagnosis of Myopia and common ocular diseases in school children.^[21]

Ghosh *et al.*, in 2012 conducted study in Kolkata on 2570 children of 10 primary schools. The age range was 6–14 years; refractive error was seen in 14.7%. Myopia was present in 307 (11.9%) visual acuity of <6/12 in better eye was present in 109 (4.2%) and 5 (0.2%) children pre and post-correction respectively.^[22]

MATERIALS AND METHODS

Sampling Area

This is a cross sectional and time bound study in which simple random sampling among schools in Kakinada city was done.

Sampling Population

All the children between 7 and 15 years of age in the selected schools were examined for visual impairment from January 1st, 2015 to December 31st, 2015.

The purpose and methods of examination of students were explained to the head of the schools concerned. A large room capable of distant vision assessment is taken. With the help of the respective class teachers each class was subjected to visual acuity tests, student by student. After obtaining consent from parents students were subjected for vision screening. The students whose visual acuity was observed to be 6/9 or less was again subjected to visual acuity testing.

These students were subjected to torch light examinations, cycloplegic refraction by streak retinoscopy and fundus examination. Refractive errors and other ailments of the eye were treated wherever necessary. The condition and prognosis were explained to the parents through the teachers. Data was recorded and analyzed.

Sample Selection

Mandal education officer, Kakinada was approached with the requisition for the permission of collection of data. It was decided to have a simple random sampling. The list of schools in Kakinada city was obtained; primary school and high schools were numbered separately. The chits bearing the numbers were rolled and put in a box. Ten schools were selected

The selected schools list were instructed by the Mandal education officer, Kakinada to co-operate in the ophthalmic examination of the students and separate requisition letters to each school from professor and Head of the department were also given.

Sample Size

Sample size is estimated using 7% of prevalence with 80% confidence interval at 1% error level and the minimum sample for the above mentioned criteria is 925. The size of sample taken was 1,029 children which is more than that of the minimum requirement.

OBSERVATIONS AND RESULTS

- Total number of children screened 1,029
- Total number of schools visited 10 [Table 1].

In our study total 1,029 students were screened among them 77 students had myopia. Prevalence of myopia was found to be 7.48%.

Among 77 children 45 (8.12%) were girls. In this study, prevalence of myopia was found to be more amongst girls than boys.

Chi-square test for all the demographic parameters is found to be no-significant as shown in Table 2.

The least prevalence of myopia was found in II class (4.1%) and highest prevalence was found in X class (11.7%). General observation was that the prevalence of myopia was more in older students [Table 3].

In our study 154 eyes of 77 students, 4 eyes had no refractive error. So, considering 150 myopic eyes 32 (21.3%)

Table 1: Characteristics of school children surveyed from Primary School of Kakinada in the year 2015

Sex	n (%)
Male	475 (53.8)
Female	554 (46.2)
Age	
7	84 (8.2)
8	124 (12.1)
9	120 (11.7)
10	108 (10.5)
11	134 (13.0)
12	147 (14.3)
13	115 (11.2)
14	103 (10.0)
15	94 (9.1)
Standard	
2	96 (9.3)
3	112 (10.9)
4	120 (11.7)
5	108 (10.5)
6	134 (13.0)
7	147 (14.3)
8	115 (11.2)
9	103 (10.0)
10	94 (9.1)
Total	1029

Table 2: Prevalence of myopia by age, sex, standard of study

Characteristics	Total numbers	Prevalence number	Percentage of prevalence (%)	Chi-square value
Sex				
Male	475	32	6.74	0.842 (non-significant)
Female	554	45	8.12	
Age				4.319 (non-significant)
7	84	5	5.95	
8	124	8	6.45	
9	120	6	5.00	
10	108	6	5.56	
11	134	9	6.72	
12	147	12	8.16	
13	115	10	8.70	
14	103	10	9.71	
15	94	11	11.70	
Standard				5.381 (non-significant)
2	96	4	4.1	
3	112	5	4.4	
4	120	7	5.8	
5	108	7	6.4	
6	134	10	7.4	
7	147	12	8.1	
8	115	10	8.6	
9	103	11	10.67	
10	94	11	11.7	

eyes had visual acuity 6/18 at least in one eye before correction was found to be high and 2 (1.3%) eyes had visual acuity CF3m at least in one eye before correction was found to be lowest [Table 4].

After optical correction, the corrected visual acuity was almost near normal in most of the eyes 144 (96%), 5 (3.3%) eyes had distant vision (6/9) and 1 (0.6%) eye had distant vision (6/12) even after correction. This could be due to possible amblyopia [Table 5].

In our study out of 77 cases, 73 (94.8%) students had bilateral myopia. Only 4 (5.19%) students had unilateral myopia.

In total of 150 eyes, 115 (76.7%) eyes had a refractive error of <-3.0 D. 29 (19.3%) eyes were between -3 and -6 D myopia and 6 (4%) eyes were >-6 D myopia.

In total of 150 eyes, 14 (9.3%) eyes had Simple myopic astigmatic refractive error and 32 (21.3%) eyes had compound myopic astigmatic refractive error.

In our study out of 150 eyes, 8 (5.3%) eyes found to have pathological myopia changes. Among them 2 (25%) eyes had large disc with temporal crescent, 1 (12.5%) eyes had only temporal crescent. 2 (25%) eyes had large disc, temporal crescent and super traction. 1 (12.5%) eye had large disc, annular crescent, super traction and degenerative changes. 1 (12.5%) eye had large disc, annular crescent and super traction. 1 (12.5%) eyes had large disc, temporal crescent, super traction and degenerative changes [Table 6].

Table 3: Visual acuity among the school children at the time of survey (before correction)

VA	Number of eyes (%)
6/9	36 (24)
6/12	26 (17.3)
6/18	32 (21.3)
6/24	34 (22.6)
6/36	10 (6.6)
6/60	6 (4)
CF3m	2 (1.3)
CF4m	2 (1.3)
CF5m	2 (1.3)
Total	150 (100)

Table 4: Visual acuity among the school children (after correction)

Corrected VA	Number of eyes (%)
6/6	144 (96)
6/9	05 (3.3)
6/12	01 (0.6)
Total	150 (100)

In total of 150 eyes, 96 (64%) eyes had Simple myopic refractive error and 8 (5.3%) eyes had Pathological myopia. Overall simple myopia was found to be more than pathological myopia.

DISCUSSION

The present study can be discussed considering the following criteria.

Table 5: Characteristics of myopia among the school children

Characteristics	Total number	Numbers of cases (%)
Laterality		
Unilateral	77	4 (5.19)
Bilateral		73 (94.8)
Degree of myopia		
<-3.0D (mid)	150	115 (76.7)
<-3.0D (mid)		29 (19.3)
<-3.0D (mid)		06 (04)
Condition of myopia		
Simple	150	96 (64)
Pathological		08 (5.3)
Astigmatism		
Simple myopic	150	14 (9.3)
Compound myopic		32 (21.3)
Fundus change		
DL, TC	150	02 (25)
TC		01 (12.5)
DL, TC, ST		02 (25)
DL, AC, ST, DG		01 (12.5)
DL, AC, ST		01 (12.5)
DL, TC, ST, DG		01 (12.5)

DL: Large disc, TC: Temporal crescent, ST: Super traction, AC: Annular crescent, DG: Degenerative changes

Table 6: Means, standard deviation of degree of myopia among school children

Severity	Mean±SD
Mild	-1.34±0.769
Moderate	-3.56±0.7789
Severe	-6.79±0.4852

SD: Standard deviation

Sex Distribution

In our study, the prevalence of myopia in girls was (8.2%) found to be more than that of the boys (6.68%). A study conducted on Greek students between 15 and 18 years in 1998 by Mavracanas *et al.*^[23] Showed myopia to be more common in females (46%) than in males (29.7%). Our study also shows myopia prevalence is more for females (8.2%) than for males (6.68%).

Class Wise Prevalence (Approximately Equalling Age)

In our study of 1029 students, it was found that students in higher standards had higher prevalence of myopia than students of lower standard. It was found that X class had 11.7% of prevalence and II class lowest prevalence 4.1%.

Study of Murthy *et al.*^[19] shown prevalence of myopia correlated positively with older age, which is also comparable to our present study.

Dandona *et al.*^[24] studied children between 7 and 15 years at Andhra Pradesh, India, and found the prevalence of myopia to be 4.1% and was significantly higher in children with older age; this was also comparable to our present study.

Vision Improvement

In present study visual acuity <6/6 at least in one eye present in 77 students. Out of these 150 eyes, visual acuity improved to 6/6 with correction in 144 eyes (96%) which is comparable to our study. Only 6 eyes (4%) of 150 eyes did not improve to 6/6 with correction due to possibly developed amblyopia.

Study of Ghosh *et al.*^[22] shown visual acuity <6/6 at least in one eye was present in 754 eyes. Out of these 754 eyes, visual acuity improved with correction in 712 eyes (94.4%).

Types of Myopia

In our study, out of 150 eyes 96 (64%) eyes had simple myopia, 14 (9.3%) eyes had simple myopia astigmatism and 32 (21.3%) eyes had compound myopic astigmatism. Out of 77 cases, only 4 cases had unilateral myopia, rest of the cases had bilateral myopia.

Study by Ghosh *et al.*^[22] shown out of 5139 eyes 370 (7.2%) eyes had simple myopia, 208 (4.05%) eyes had simple myopic astigmatism and 10 (0.2%) eyes had compound myopic astigmatism.

Overall, simple myopia cases were found to be more than simple myopic astigmatism and compound myopic astigmatism in our study when comparing to the above study.

Sperduto *et al.*^[25] in his study found prevalence rates of myopia were significantly lower for men than for women for all age.

Myopia and Near Work

In present study, 77 myopic patients of school children there was a highly significant association between myopia and near work. It suggests that students of higher classes were spending significantly more time than the students of lower classes in the near-work activities.

A comparative study by Ip *et al.*^[26] of 2353 patients between government and private schools, reported that girls were spending significantly more time than did the boys in the near-work activities of completing homework, reading books and using a computer. The study also showed that the prevalence of myopia in girl was (14.1%) with a greater tendency of myopic refraction and greater time spent in near-work activities.

In other study by Saw *et al.*^[27] also showed increased near-work which contributed to prevalence of myopia.

CONCLUSION

Observations and results showed that simple myopia is more common in school going children. Majority of the cases were detected only during the screening of the students. So, majority of them go unnoticed, making more students visually handicapped.

But with the co-operation of the teachers, school authorities and medical staff, affected can be treated with proper optical correction, thereby reducing morbidity due to myopia.

Thus an early diagnosis and visual rehabilitation of myopic students can be achieved by periodic eye examination at regular intervals by school teachers and basic health workers and educating them regarding optical correction of myopia thereby preventing the development of amblyopia which will definitely reduce the burden of morbidity due to myopia.

REFERENCES

- Resnikoff S, Pascolini D, Etya'ale D, Kocur I, Pararajasegaram R, Pokharel GP, *et al.* Global data on visual impairment in the year 2002. Bull World Health Organ 2004;82:844-51.
- Gilbert CE, Anderton L, Dandona L, Foster A. Prevalence of visual impairment in children: A review of available data. Ophthalmic Epidemiol 1999;6:73-82.
- Resnikoff S, Pascolini D, Mariotti SP, Pokharel GP. Global magnitude of visual impairment caused by uncorrected refractive errors in 2004. Bull World Health Organ 2008;86:63-70.
- Gilbert C, Foster A. Childhood blindness in the context of VISION 2020 – the right to sight. Bull World Health Organ 2001;79:227-32.
- Saw SM, Katz J, Schein OD, Chew SJ, Chan TK. Epidemiology of myopia. Epidemiol Rev 1996;18:175-87.
- Desai S, Desai R, Desai NC, Lohiya S, Bhargava G, Kumar K, *et al.* School eye health appraisal. Indian J Ophthalmol 1989;37:173-5.
- Seema S, Vashisht B, K AK, Minakshi K, Manish G. Effect of television watching on vision of school children in rural haryana. Internet J Prev Med 2010;2(6):21-4.
- Nepal BP, Koirala S, Adhikary S, Sharma AK. Ocular morbidity in schoolchildren in kathmandu. Br J Ophthalmol 2003;87:531-4.
- Duke-Elder S, Abrams D. Pathological myopia. System of Ophthalmology, Ophthalmic Optics and Refraction. Vol. V. London: Henry Kimpton; 1970.
- Morgan IG, Ohno-Matsui K, Saw SM. Myopia. Lancet 2012;379:1739-48.
- Pan CW, Ramamurthy D, Saw SM. Worldwide prevalence and risk factors for myopia. Ophthalmic Physiol Opt 2012;32:3-16.
- Lin LL, Shih YF, Hsiao CK, Chen CJ. Prevalence of myopia in taiwanese schoolchildren: 1983 to 2000. Ann Acad Med Singapore 2004;33:27-33.
- Katz J, ToelschJm, Sommer A, Katz J, Tielsch JM, Sommer A. Prevalence and risk factors for refractive errors in an adult inner city population. Invest Ophthalmol Vis Sci 1997;38:334-40.
- Burton TC. The influence of refractive errors and lattice degeneration on the incidence of RD. Trans Am Ophthalmol Soc 1990;89:143-55.
- Available from: <http://www.disabled-world.com/disability/types/vision/nearsighted-gene.php>. [Last accessed on 2017 Sep 09].
- Available from: http://www.news.xinhuanet.com/politics/2010-01/03/content_12745349.htm. [Last accessed on 2017 Sep 09].
- Mohan M, Pakrasi S, Zutshi R. Myopia in India. Acta Ophthalmol Suppl 1988;185:19-23.
- Kalikivayi V, Naduvilath TJ, Bansal AK, Dandona L. Visual impairment in school children in southern India. Indian J Ophthalmol 1997;45:129-34.
- Murthy GV, Gupta SK, Ellwein LB, Munoz SR, Pokharel GP, Sanga L, *et al.* Refractive error in children in an urban population in New Delhi. Invest Ophthalmol Vis Sci 2002;43:623-31.
- Fan DS, Lam DS, Lam RF, Lau JT, Chong KS, Cheung EY, *et al.* Prevalence, incidence, and progression of myopia of school children in Hong Kong. Invest Ophthalmol Vis Sci 2004;45:1071-5.
- Uzma N, Kumar BS, Khaja Mohinuddin Salar BM, Zafar MA, Reddy VD. A comparative clinical survey of the prevalence of refractive errors and eye diseases in urban and rural school children. Can J Ophthalmol 2009;44:328-33.
- Ghosh S, Mukhopadhyay U, Maji D, Bhaduri G. Visual impairment in urban school children of low-income families in Kolkata, India. Indian J Public Health 2012;56:163-7.
- Alrasheed SH, Naidoo KS, Clarke-Farr PC. Prevalence of visual impairment and refractive error in school-aged children in South Darfur State of Sudan: Original research. Afr Vision Eye Health 2016;75:1-9.
- Dandona R, Dandona L, Srinivas M, Shar P, Narasiah S, Munoz SR, *et al.* Refractive error in children in a rural population in India. Invest Ophthalmol Vis Sci 2002;43:615-22.
- Sperduto RD, Seigel D, Roberts J, Rowland M. Prevalence of myopia in the United States. Arch Ophthalmol 1983;101:405-7.
- Ip JM, Saw SM, Rose KA, Morgan IG, Kifley A, Wang JJ, *et al.* Role of near work in myopia: Findings in a sample of australian school children. Invest Ophthalmol Vis Sci 2008;49:2903-10.
- Saw SM, Hong RZ, Zhang MZ, Fu ZF, Ye M, Tan D, *et al.* Near-work activity and myopia in rural and urban schoolchildren in china. J Pediatr Ophthalmol Strabismus 2001;38:149-55.

How to cite this article: Rao CMS, Satyasrinivas V, Muralikrishna V, Ashok V, Singh RP. A Clinical Study of Prevalence of Myopia in School Going Children in Kakinada City. Int J Sci Stud 2017;5(9):176-181.

Source of Support: Nil, **Conflict of Interest:** None declared.