

A STUDY ON PREVALENCE OF REFRACTIVE ERRORS AMONG 5-16 YEARS RURAL CHILDREN IN CHANDRAGIRI, CHITTOOR DISTRICT, ANDHRA PRADESHKrishna Murthy V¹, Ravi Prabhu G², Ashok Kumar Reddy K³, Sridhar M. S⁴**HOW TO CITE THIS ARTICLE:**

Krishna Murthy V, Ravi Prabhu G, Ashok Kumar Reddy K, Sridhar M. S. "A Study on Prevalence of Refractive Errors among 5-16 Years Rural Children in Chandragiri, Chittoor District, Andhra Pradesh". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 47, September 25; Page: 11411-11418, DOI: 10.14260/jemds/2014/3492

ABSTRACT: BACKGROUND: Uncorrected refractive errors are a major cause of low vision and even blindness. The refractive errors can be easily diagnosed and corrected by effective screening programmes. The uncorrected refractive errors in children have a definite impact in adversely affecting the learning capacity and scholastic performance. **MATERIAL & METHODS:** This Cross sectional was conducted from July to December 2013 among 1412 children aged 5-16 years residing in Chandragiri rural area, Chittoor District, Andhra Pradesh. Visual acuity was assessed using Snellen's chart under standard illumination while detailed eye examination among the suspected cases was done by an ophthalmologist including detailed anterior segment evaluation, ocular motility, radioscopy and auto refraction under 2% homatropine cycloplegic refraction. **RESULTS:** The prevalence of refractive errors was found to be 7.4% among the study children (out of which 6.1% undiagnosed). Simple myopia was found in 2.4% children while astigmatism (both simple and compound combined) was found in around 2.7% children. It was found that the proportion of myopia increased with age being lowest in 5-7 years (0.0%) and highest in 14-16 age group (4.0%). The proportion of astigmatism also was found to be lowest in 5-7 age group (0.0%) and higher in 11-13 age group and 14-16 age group (4.0% each) However, the differences were not statistically significant (P=0.32; NS). The prevalence of myopia was found to be slightly higher in males (2.7%) than in females (2.1%) while that of astigmatism was found to be higher in females (3.1%) than in males (2.3%). However the differences were not statistically significant (P=0.43; NS). A similar prevalence of refractive errors was found in Bangalore and New Delhi while lower and higher prevalence was reported elsewhere. Myopia and astigmatism are the common disorders in several Indian studies including the present study while African studies found myopia to be less common compared to astigmatism and hypermetropia. Many studies including the present study reported an increase in the prevalence of refractive errors with age of the subjects. **CONCLUSIONS:** A large proportion of refractive errors in children remain undiagnosed. Thus there is tremendous scope for screening and early diagnosis and treatment of refractive errors in children.

KEYWORDS: Refractive errors, myopia, astigmatism, visual acuity, rural children.

BACKGROUND: Refractive errors affect a large proportion of population worldwide, irrespective of age, sex and ethnic group. Uncorrected refractive errors are a major cause of low vision and even blindness. The refractive errors can be easily diagnosed and corrected by effective screening programmes. It is estimated that globally 153 million people over 5 years of age are visually impaired as a result of refractive errors of which 8 million are blind. Around 12.8 million in the age group of 5-15 years are visually impaired because of refractive errors giving a proportion of 0.96% with highest

ORIGINAL ARTICLE

prevalence in urban and highly developed urban areas in South East Asia and China. In India, around 0.63% and in China, around 2.66% are visually impaired because of refractive errors.¹

In a study among 7-15 years school children in Bangalore, the prevalence of refractive errors was found to be 7.03%². The prevalence of myopia, a common form of refractive error in a study in New Delhi (urban) among 5-15 years age was found to be 7.4%.³ It is a known fact that mild and moderate refractive errors in children remain unrecognized in a large proportion of cases.

Hence the screening programmes for early detection and management of refractive errors has tremendous scope especially among school age children. The uncorrected refractive errors in children have a definite impact in adversely affecting the learning capacity and scholastic performance. This present study is an attempt to focus on the prevalence of refractive errors in 5-16 years children residing in rural Tirupati region, Andhra Pradesh.

OBJECTIVES:

1. To find out the visual acuity among study children in both the eyes.
2. To find out the various types of refractive errors in both the eyes.
3. To relate the prevalence of refractive errors among children by age group and gender.

MATERIALS AND METHODS: A cross sectional study design was employed in the study. The study was conducted during July 2013 to December 2013 in the field practice area of Rural Health Training Centre, Chandargiri, Chittoor district, Andhra Pradesh. The Rural Health Training Centre, Chandragiri is attached to S.V. Medical College, Tirupati and has 3 sub-centres namely Chandragiri main, Narsingapuram and Dornakambala with population coverage of around 31,000. The sample size required is calculated based on the assumed prevalence of 10% with an allowable error of 25% and alpha error of 0.05 and beta error of 0.20.

The sample size estimated was found to be 1298. A multistage sampling technique was employed in the study. A list of habitations with their population in all the sub-centres is obtained from the health centre and from each sub-centre, two villages were randomly selected. All the children of both sexes aged between 5-16 years were taken as the study subjects for the study in the selected villages. The study was conducted among by making house to house visits to the respective villages. A total of 1412 children were included in the study which also fulfills the requirement of the sample size.

The demographic and other information was collected using a pre-designed questionnaire. The visual acuity was determined by Snellen's chart. The data collection was done by 10 teams of house surgeons (two members each team) during their field postings. Prior training was given by a senior professor of ophthalmology (one of the authors for this study) and a faculty member of Community Medicine. The data collection was supervised and verified by senior residents as well as an Assistant Professor of Community Medicine. In case of any discrepancy, the data was again collected by house visit to the respective family. In this way, the data consistency and accuracy was checked.

All cases with suspected refractive error defined as visual acuity of 6/9 or less in any eye were instructed to come to the Rural Health Training Centre, Chandragiri. A senior Professor of Ophthalmology has conducted a detailed anterior segment examination, ocular motility, cycloplegic refraction using homatropine 2% eye drops and fundus evaluation.

ORIGINAL ARTICLE

Spectacles were prescribed and distributed free of cost. Those children who did not turn up for the eye examination were motivated to attend the Rural Health Training Centre by the teams of house surgeons during their subsequent field visits. Those who did not turn up even after repeated attempts were labeled as 'absent for follow up' and the results were presented accordingly. The results were analyzed using MS excel software and Epiinfo 7 software version using percentages and Chi-square test.

RESULTS: A majority of children was aged between 8-10 years (39.9%) and 11-13 years (39.0%). There was a preponderance of males (52.5%) compared to females (47.5%). The mean age of children was found to be 10.8 ± 2.46 years with 95% confidence interval being 10.6 to 11.0 years (Table 1). Around 89.0% had normal visual acuity (6/6). Taking visual acuity of 6/12 and less as the cut off level for defective vision, it can be seen that 94 (6.7%) had definite defective vision in the right eye while 92 (6.5%) had defective vision in left eye (Table 2).

It was found that 104 children (7.4%) had some form of refractive error. Out of this, only 24 of them had been known cases while the remaining 80 cases are undiagnosed cases of refractive error. Thus, in 80 children (6.1%), refractive error was newly diagnosed in this present study. Simple myopia was found in 2.4% children while astigmatism (both simple and compound combined) was found in around 2.7% children. There were two cases each of pathological myopia with amblyopia and primary optic atrophy.

Further another 2% children with suspected refractive error were absent for follow up even after repeated attempts. Hence in these cases, the refractive error could not be determined. Thus in 32 cases (2.3%), the refractive error remains undetermined. By including these children, the estimated refractive error is found to be 9.7% (Table 3). It was found that the proportion of myopia increased with age being lowest in 5-7 years (0.0%) and highest in 14-16 age group (4.0%). The proportion of astigmatism also was found to be lowest in 5-7 age group (0.0%) and higher in 11-13 age group and 14-16 age group. (4.0% each)

However, the differences were not statistically significant ($P=0.32$; NS) (Table 4 and Chart 1). The prevalence of myopia was found to be slightly higher in males (2.7%) than in females (2.1%) while that of astigmatism was found to be higher in females (3.1%) than in males (2.3%). However the differences were not statistically significant ($P=0.43$; NS) (Table 5 & Chart 2).

DISCUSSION: In the present study, it was found that majority of children was aged between 8-10 years or 11-13 years (78.9%) There was a slight preponderance of males (52.5%). The mean age of the subjects was found to be 10.2 years. A study in Bangalore² among 7-15 years children, has found the mean age to be 12.6 years. In the current study, around 89.0% had normal visual acuity (6/6) while the remaining children were found to have some form of defective vision.

The prevalence of refractive errors was found to be 7.4% among the study children (1.3% known and 6.1% undiagnosed). A similar prevalence of 7.03% of uncorrected refractive error was found in Bangalore study.² A lower prevalence of 5.3% in 7-15 years rural children was found in Mahbubnagar study⁴. Another study in New Delhi³ among urban children found the prevalence to be 6.4%. A lower prevalence of 4.5% (males-4.2% and females -4.9%) was found in Saudi Arabian study.⁵ A higher prevalence of 11.7% of found in another African study⁶. A high prevalence of 22.0% was found in Shima study.⁷

ORIGINAL ARTICLE

A study in adolescents (12-18 years) in Kashmir⁸ has found a very high prevalence of myopia (50.6%), astigmatism (35.3%) and hypermetropia (14.2%). A study among Class VII (around 12 year's age) subjects, a high prevalence of refractive error of 30.6% was found in Kancheepuram.⁹ The differences in the prevalence may be attributed to regional differences, age group of the study subjects and some differences in the definitions adopted.

In the current study, simple myopia was found in 2.4% children while astigmatism (both simple and compound combined) was found in around 2.7% children. The study in Bangalore² has found the prevalence of myopia to be 4.4%, astigmatism to be 1.6% and hypermetropia to be 1.03%. The age adjusted prevalence of myopia was found to be 4.4% while that of astigmatism was found to be 6.9% in a study among urban population in Southern India.¹⁰

In Saudi Arabian study,⁵ the prevalence of myopia, astigmatism and hypermetropia were found to be 2.4%, 2.1% and 2.5% respectively. Another African study⁶ has found the astigmatism to be commonest followed by hypermetropia while myopia was the least common. A study among 5-19 years school children in Ghana,¹¹ the prevalence of astigmatism, myopia and hypermetropia were found to be 14.1%, 6.9% and 4.6% respectively. Thus, myopia and astigmatism are the common disorders in several Indian studies including the present study while African studies found myopia to be less common compared to astigmatism and hypermetropia.

In the present study, the prevalence of refractive error was found to be highest in 14-16 years group (8.0%) and least in 5-7 years (0.0%). A similarly high prevalence was found in 13-15 years group (7.5%) compared to 7-9 years group (6.6%) in Bangalore study². It was found in the present study that the prevalence was insignificantly higher in females (5.2%) compared to males (5.0%). However a statistically significant high prevalence was found in females (9.0%) compared to males (5.3%) in Bangalore study.²

It was found in the present study that the proportion of myopia increased with age being lowest in 5-7 years (0.0%) and highest in 14-16 age group (4.0%). The proportion of astigmatism also was found to be lowest in 5-7 age group (0.0%) and higher in 11-13 age group and 14-16 age group (4.0% each). A similar trend was observed in a study in Ghana¹¹ wherein the myopia prevalence was found to increase with age being least in 5-7 years age group (0.9%) and highest in 14-16 years (8.9%) and 17-19 years (12.5%). However, the prevalence of hypermetropia was found to be highest in 5-7 years group (10.4%) and least in 14-16 years group (3.0%) in that study.

CONCLUSIONS: In the present study, the prevalence of refractive errors was found to be 7.4% among the study children (1.3% known and 6.1% undiagnosed) with 2.4% simple myopia and 2.7% astigmatism. The prevalence was found to be highest in 14-16 years group (8.0%) and least in 5-7 years (0.0%). The proportion of both myopia and astigmatism increased with age of the subjects.

RECOMMENDATION: Regular screening starting from school entry should be periodically conducted every year for early diagnosis and correction of refractive error which is also expected to prevent any scholastic backwardness because of uncorrected refractive errors.

ACKNOWLEDGMENTS: The authors acknowledge their thanks to Navya Nethralaya, Tirupati for providing the necessary equipment, trained staff for carrying out detailed eye examination among those children with refractive errors. The authors also acknowledge the help and support provided by staff of the Rural Health Centre, Chandragiri and the study participants for their willingness for the study.

ORIGINAL ARTICLE

S. No	Variable		No. of subjects	Percentage
1	Age group			
	(a)	5 - 7	100	7.1
	(b)	8 - 10	564	39.9
	(c)	11 - 13	550	39.0
	(d)	14 - 16	198	14.0
2	Gender			
	(a)	Male	742	52.5
	(b)	Female	670	47.5

Table 1: Age distribution and Gender (N=1412)

Visual acuity	Right Eye (%)	Left Eye (%)
6 / 6	1256 (88.9)	1258 (89.0)
6 / 9	62 (4.4)	62 (4.4)
6 / 12	22 (1.6)	18 (1.3)
6 / 18	20 (1.4)	28 (2.0)
6 / 24	32 (2.3)	32 (2.3)
6 / 36	8 (0.6)	4 (0.3)
Less than 6 / 36	12 (0.8)	10 (0.7)

Table 2: Visual acuity in children (N=1412)

Figures in parentheses are percentages

Type of Refractive error	Right Eye (%)	Left Eye (%)
Normal	1308 (92.6)	1308 (92.6)
Simple myopia	34 (2.4)	34 (2.4)
Simple myopic astigmatism	14 (1.0)	12 (0.9)
Compound myopic astigmatism	24 (1.7)	26 (1.9)
Pathological myopia with ambloopia	2 (0.1)	2 (0.1)
Primary optic atrophy	2 (0.1)	2 (0.1)
Absent for follow up	28 (2.0)	28 (2.0)

Table 3: Refractive errors in children (N=706)

Figures in parentheses are percentages

Age group (years)	Emmetropia	Myopia	Astigmatism	Undetermined
5 - 7	96 (96.0)	0 (0.0)	0 (0.0)	4 (4.0)
8 - 10	528 (93.7)	12 (2.1)	8 (1.4)	16 (2.8)
11 - 13	504 (91.7)	14 (2.5)	22 (4.0)	10 (1.8)
14 - 16	180 (91.0)	8 (4.0)	8 (4.0)	2 (1.0)

Table 4: Refractive errors by age group

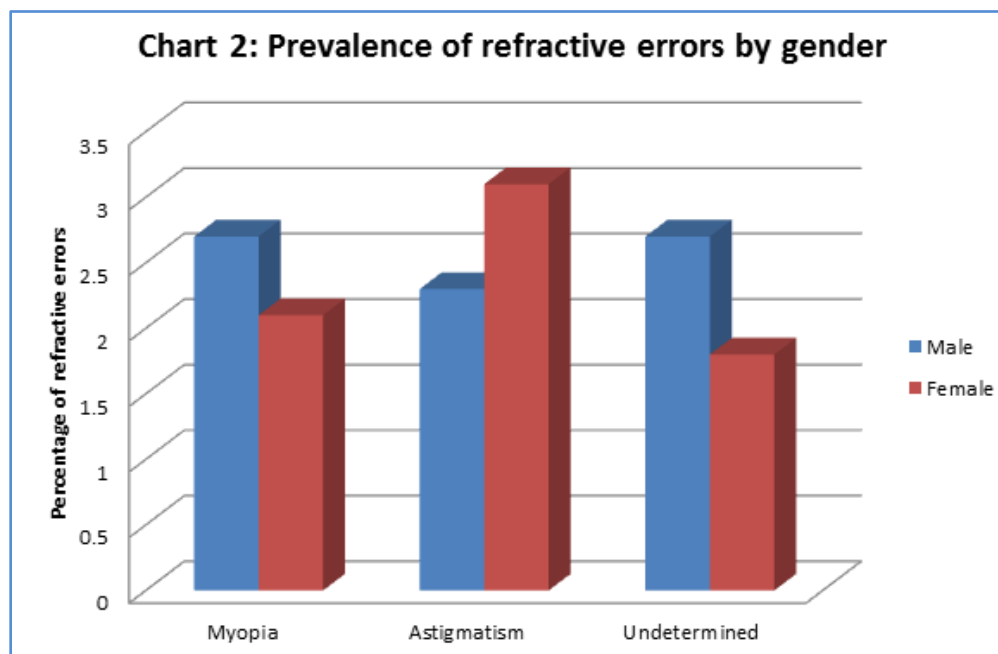
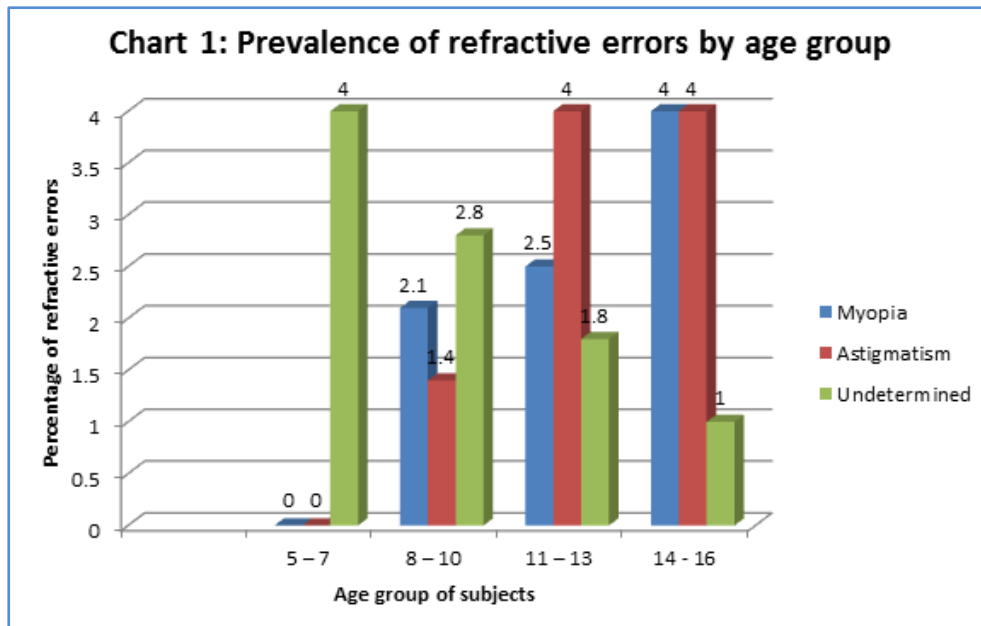
Figures in parentheses are percentages $\chi^2=6.97$ $P=0.32$; NS

ORIGINAL ARTICLE

Gender	Emmetropia	Myopia	Astigmatism	Undetermined
Male	685 (92.3)	20 (2.7)	17 (2.3)	20 (2.7)
Female	623 (93.0)	14 (2.1)	21 (3.1)	12 (1.8)

Table 5: Refractive errors by Gender

Figures in parentheses are percentages $\chi^2=2.75$ $P=0.43$; NS.



REFERENCES:

1. Resnik off S, Pascolini d, Sivio P Mariotti, Gopal P Pokharel. Global magnitude of visual impairment caused by uncorrected refractive errors in 2004. *Bulletin of World Health Organization* 2008; 86(1): 1-80.
2. Pavithra MB, Maheswaran R, Rani Sujatha MA. A study on the prevalence of refractive errors among school children of 7-15 years age group in the field practice areas of a medical college in Bangalore. *Int J Med Sci Public Health* 2013; 2(3): 641-5.
3. Murthy GV, Gupta SK, Ellwein LB, Mu-oz 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.
4. Dandona R, Dandona L, Srinivas M, Sahare P, Narsiah S, Munoz SR, Pokharel GP, Ellwein LB. Refractive error in children a rural population in India. *Invest Ophthalmol Vis Sci* 2002; 43(6): 615-22.
5. Mohammad A, Al Rowaily. Prevalence of refractive errors among preschool children at King Abudulaziz Medical city, Riyadh, Saudi Arabia. *Saudi Journal of Ophthalmology* 2010; 24(2): 45-8.
6. Kawuma M, Mayeku R. A survey of the prevalence of refractive errors in lower primary schools in Kampala district. *Afr Health Sci* 2002; 2(2); 69-72.
7. Gupta M, Gupta B, Bharadwaj A. Ocular morbidity prevalence among school children in Shimla, Himachal Pradesh, North India. *Indian J Ophthalmol* 2009; 57(2): 133-8.
8. Rohul, Aakifa Maqbool, Syed Arshad Hussain, Hamid Shamila, Fazli Anjum, Zahoor Ahmad Hamdani. Prevalence of refractive errors in adolescents in out-patient attendees of the preventive ophthalmology clinic of community medicine, SKIMS, Kashmir, India. *Nitte University Journal of Health Sciences* 2013; 3(1): 17-20.
9. Prema N. Prevalence of refractive error in school children. *Indian Journal of Science and Technology*; 4(9): 1160-1.
10. Dandona R, Dandona L, Naduvilath TJ, Sinivas M, McCary CA, Rao GN. Refractive error in an urban population in southern India; the Andhra Pradesh Eye disease study. *Invest Ophthalmol Vis Sci* 1999; 40(1): 2810-8.
11. Ovenseri Ogbomo GO, Omuemu VO. Prevalence of refractive error among school children in the Cape coast municipality, Ghana. *Clinical optometry*. Available from: www.dovepress.com/getfile.php?fileID=6793.

ORIGINAL ARTICLE

AUTHORS:

1. Krishna Murthy V.
2. Ravi Prabhu G.
3. Ashok Kumar Reddy K.
4. Sridhar M. S.

PARTICULARS OF CONTRIBUTORS:

1. Professor, Department of Ophthalmology, S.V. Medical College, Tirupati.
2. Professor, Department of Community Medicine, S. V. Medical College, Tirupati.
3. Professor & HOD, Department of Community Medicine, S. V. Medical College, Tirupati.
4. Principal & Professor, Department of General Medicine, S. V. Medical College, Tirupati.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. G. Ravi Prabhu,
Professor of Community Medicine,
S. V. Medical College,
Tirupati.
Email: raviprabhu1610@gmail.com

Date of Submission: 09/09/2014.

Date of Peer Review: 10/09/2014.

Date of Acceptance: 18/09/2014.

Date of Publishing: 24/09/2014.