



## PREVALENCE OF REFRACTIVE ERRORS IN THE SCHOOL GOING CHILDREN IN THE DISTRICT OF DAVANGERE, KARNATAKA, SOUTH INDIA

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**ABSTRACT** **Aims:** To determine the prevalence, type of refractive error, number of students diagnosed with refractive error during general health check up in school going children in age group between 9 to 15 years in district of Davangere. **Methods and Material:** Retrospective study at a district hospital was under taken depending on the refractive error data available of the students from the refractionist, optometrist, school teachers, male social worker of respective taluk and district, Davangere. Students demographics such name, age, sex, school name was noted. Details of comprehensive ocular examination performed along with refractive error spherical, cylindrical error and the management available in the records were noted. On the basis of records available the type of refractive error, number and outcome of such students were categorized. Data was recorded in specially designed proforma which was transferred to master sheet, data was subjected to statistical analysis by statistician of our institution. **Results:** Prevalence of refractive error was 13.88% for the year 2018 to 2020, where girls were predominantly affected compared to boys. Simple myopia being the most common (70.2%) refractive error found in students, hypermetropia being the least. Prevalence of astigmatism was found to be 27.2%. A large number students between the age group of 14 – 16 years had refractive error. BCVA of 98% of the students was 6/6. One student was diagnosed with amblyopia, and treated for the same. Pathological myopia was also diagnosed during screening 16 such students were present. **Conclusions:** There is a need to stimulate the initiation of various preventive and corrective measures for myopia control, resource planning and infrastructure augmentation especially targeting the school going children.

**KEYWORDS :** Myopia, hypermetropia, astigmatism, refractive error in school going children

Refractive error is an optical defect intrinsic to the eye which prevents the light from being brought to a single focus on the retina thus reducing normal vision. Refractive error is a major contributor to visual impairment which is a significant cause of morbidity in children worldwide.<sup>1</sup> Since children do not usually complain of visual difficulties, early detection and prompt treatment of eye disease is important to prevent vision problems and eye morbidities which could affect their learning ability, personality and adjustment in school.<sup>2,3</sup> Screening is the search for unrecognized disease or defect by means of rapidly applied test, examinations or other procedures in apparently healthy individuals. A screening test is not intended to be a diagnostic test, it is only an initial examination.<sup>4</sup> Those who are found to have positive test results are referred to an ophthalmologist for further diagnostic work-up and treatment.

The RIGHT to SIGHT : VISION 2020 had special emphasis on childhood visual impairments blindness and uncorrected refractive errors, a global initiative launched by coalition of non government organization and WHO to eliminate avoidable visual impairment on a global scale. The number of people estimated to be visually impaired from uncorrected refractive errors in the world is around 153 million, of whom 8 million are blind. There are 19 million children aged 5-15 years worldwide with visual impairment and over 13 million children are due to uncorrected refractive errors, as estimated by WHO.<sup>5</sup> Thus, childhood visual impairment due to refractive errors is one of the most common problem among school aged children and is the second leading cause of treatable blindness. Refractive Error Study in Children (RESC) surveys were designed to assess the age- and sex-specific prevalence of refractive error and related visual impairment in children of different ethnic origins and cultural settings, using consistent definitions and methods.<sup>6</sup> To cater the rising prevalence issue, various school eye screening programs have been evolved in the Indian context majorly under the initiative of the District Blindness Control Society to yield the highest effect from timely referral and correction. District of Davangere has a population of 4,86,000 in the 2017 census. Davangere consists of a socioeconomically heterogeneous population: residing in low-income housing typical of urban resettlement colonies; in middle- and upper-middle income, in urban slums within the area; and in several remaining original villages comprising lower-middle and middle economic strata. This population mix is typical of urban areas, with resettlement colonies found in the larger cities of India. Health services in Davangere are provided by the government sector and by a large number of private practitioners (both

licensed and self-styled).<sup>7</sup> A few elite private schools and numerous public-funded, government-run schools are located in the area. Therefore there is a need to know the prevalence of refractive error in such school going children in order to take appropriate actions and make our future generation bright and beautiful

**Objectives of the study:** To determine the prevalence, number of students diagnosed with refractive error during general health check up in school going children in age group between 9 to 15 years, type of refractive error.

**Materials and Methods:** Retrospective study of 5437 students from about 37 schools who were screened for refractive error. Screening done from March 2018 to March 2020. Ophthalmologists and refractionist working in district hospital Davangere. Students of both sex attending school between age group of 9 to 16 years who have been screened for refractive error was considered. Students who were drop outs from school, absent during the time of screening, other systemic illness, protein energy malnutrition and records of those which could not be retrieved could not be included under this study.

### Methodology:

Data was collected from ophthalmologist, refractionist, optometrist, school teachers, male social worker of respective taluk and district of Davangere who had screened children of both rural and urban schools of Davangere for refractive error. Approval from the institute was taken to retrieve documents of the patients who were screened and treated for refractive error. Students demographics such name, age, sex, school name was noted. Details of comprehensive ocular examination performed along with refractive error spherical, cylindrical error and the management available in the records were noted. On the basis of records available the type of refractive error, number and outcome of such students were categorized.

**Results:** out of the 5437 school children who were screened during general ophthalmic examination, 755 students were diagnosed with refractive error. Prevalence of refractive error was found to be 13.88% (Table 1). 487 (64.5%) girls and 268 (35.5%) boys were diagnosed with refractive error. Mean  $\pm$  SD 13  $\pm$  2.0, Range 9-16 years

**Table 1 : Prevalence of refractive error**

Gender	Number of students with refractive error	%
Girls	487	64.5

Boys	268	35.5
Total	755	100

**Table 2 : Sex wise distribution of refractive error.**

Number of Students screened	Number of students with refractive error	% of prevalence
5437	755	13.88

**Table 3 Age wise distribution of cases**

Age (yrs)	No.of cases	%
9	9	1.2
10	31	4.1
11	55	7.3
12	85	11.3
13	94	12.5
14	139	18.4
15	137	18.1
16	205	27.2
Total	755	100

Age (yrs) : Mean  $\pm$ SD 13  $\pm$ 2.0 Range : 9-16 years

**Table 4 : Type of refractive error**

Refractive Error	Number	%
Only spherical error	550	72.8
Spherical and Cylindrical error	205	27.2

**Table 5 : Range of refractive Error**

Range of refractive Error (Spherical )	No.of cases	%
> -4.0	28	5.1
-2.0 to -4.0	110	20.0
0 to -2.0	391	71.1
0	4	0.7
0 to +2.0	13	2.4
> +2.0	4	0.7
Total	550	100.0

**Table 6 : Best corrected visual acuity**

Distant Vision	No.of cases	%
6/6	740	98.0
6/9	4	0.5
6/12	1	0.1
6/18	4	0.5
6/24	5	0.7
3/60	1	0.1
Total	755.0	100.0

**Table 7 : Type of refractive error**

RE Type	No.of cases	%
Simple Myopia (SM)	530	70.2
With the rule astigmatism(WTR )	111	14.7
Against the rule astigmatism (ATR )	94	12.4
Amblyopia with simple myopia (AMB SM)	1	0.1
Compound myopia (CM)	3	0.4
Pathological Myopia	16	2.2
Total	755	100

27.2%, 18.4%, 12.5%, 11.3%, 7.3% children in the age group of 16, 15, 14, 13, 12, 11 years have refractive error respectively. As the age of the children increased, the number of children diagnosed with refractive error increased. At the age of 9 and 10 years, refractive error was found to be 1.2% and 4.1% respectively. Only spherical was present in 72.8%, 27.2% had both spherical and cylindrical errors (Table 4). 71% (391 children) had spherical error of -0.25 to -2, with a p value of 0.017 which is statistically significant.

20% (110) had spherical error of -2 to -4. 28 cases >-4 spherical error. 2.4% (13) of them have refractive error 0 to +2. 0.7% (4) have > +2 refractive error (Table 5). 98% (740 children) attained BCVA of 6/6,

0.5% (4) had 6/9, 0.1% (1) 6/12 and 3/60 respectively. 0.5% (4) have 6/18, 0.7% (5) have 6/24 BCVA (Table 6). 70.2% (530) of them had simple myopia, 14.7% (111) had with the rule astigmatism (WTR), 12.4% (94) had against the rule astigmatism (ATR), 0.1% (1) Amblyopia with simple myopia, 0.4% (3) had compound myopia. 2.2% (16) had pathological myopia. (Table 7)

## DISCUSSION

Uncorrected refractive error is the most common cause of visual impairment around the world, and in children uncorrected refractive error and its consequences have a profound effect on their overall development, most importantly on educational and psychosocial development.<sup>8</sup>

In our study we found that prevalence of refractive error was 13.88% for the year 2018 to 2020, where girls were predominantly affected compared to boys. Simple myopia being the most common (70.2%) refractive error found in students, hypermetropia being the least. Prevalence of astigmatism was found to be 27.2%. A large number of students between the age a group of 14–16 years had refractive error. One student was diagnosed as amblyopia, and treated for the same. pathological myopia was also diagnosed during screening 16 such students were present. Holden et al has estimated the prevalence of myopia in South Asia region (which includes India) to be around 20% in 2010, 38% in 2030 and 53% in 2050. They found a lower prevalence of myopia in school going children in India over the last four decades as compared to other Asian countries where myopia is far more prevalent.<sup>9</sup> Rudnicka et al has also found that increment in myopia prevalence in South Asian countries is less as compared to East Asian countries.<sup>10</sup>

Systematic review by Sheeladevi et al. showed very low prevalence of myopia in rural settings as compared to urban settings in Indian children (3.5% vs 10.8%). While this might be a result of a demographic transition, their study assessed only eight school-based and four population-based studies.<sup>2</sup>

There could be multiple reasons for the increase observed in rural school children.<sup>11</sup> For the past few years, many Indian villages have become developed with access to basic amenities just like their urban counterparts. India is also witnessing a digital revolution starting from the past decade with increasing number of televisions, mobiles, laptops and computers. Internet usage has increased dramatically owing to reduced data tariff, low cost smartphones and improved telecom connectivity in Indian villages. This might have resulted in decreased outdoor activities, increased near work, and computer-related visual stress and fatigue.<sup>12,13,14</sup> Changing schooling pattern to high pressure education system can also be another contributory factor. While direct causal relationship may be difficult to prove, but the rapidly changing environment (nurture) especially the ongoing urbanisation of rural environment in India could be implicated as a potential factor for this rising myopic prevalence.

Our study confirms the findings of existing literature that urban adolescents (11–15 year age group) constitute an important 'at risk' subset of the general population requiring immediate attention and intervention where the prevalence of myopia increased to more than double in the last decade.

Limitations of our study was only presentees were included in the study population, only school going children were included. Significant proportion of children in rural India do not go to schools hence a more complete assessment of visual impairment in children would be possible with population based studies not restricted only to school going children. Population based studies covering non school going children are recommended.

## CONCLUSION

Health education regarding refractive errors and spectacle usage should be encouraged. School teachers to be assigned monthly screening and identifying such problems and referring the child to nearest government hospital. Regular screening programmes can reduce ocular morbidity in school going children. Myopia control programs require consistent efforts to increase awareness about risk factors, encourage lifestyle modification and changes in the school curriculum and education policy of the country. Therefore, there is a need to stimulate the initiation of various preventive and corrective measures for myopia control, resource planning and infrastructure augmentation especially targeting the school going children.

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