

Causing factors of refractive error in children: heredity or environment?

N. Prema

Lecturer, SRM School of Teacher Education & Research, SRM University Kattankulathur-603203, Tamil Nadu, India
premaguhan@gmail.com

Abstract

The study is aimed at assessing the prevalence of Refractive Error and the factors associated with it. A total of 123(VII STD) students aged between 12 and 13 were screened with the help of an Optometrist in the classroom. Forty-six (37.39%) of them were found to be having the problem of Refractive Error. Detailed information regarding their parental Refractive status, near work (watching TV, working on the computers, playing video games and reading books for pleasure etc) and outdoor activities (Time spent on outdoor games and other activities) per day were collected carefully and subjected to association analysis. Students with Refractive Error were more likely to have parents with Refractive Error; significant association exists with near work and is inversely associated with outdoor activity.

Keywords: Refractive Error, Parental Myopia, Near work, Outdoor Activity, Biological theory, Use-abuse theory.

Introduction

Right To Education Act come into force in India from April 2010 and it is one of the flagship programmes in the educational reformation. By implementing this Act, all children (between 6 and 14 years of age) would get the fundamental right to free and compulsory education. Good health is valuable tool to achieve the objectives (Prema, 2011). Besides, education includes the full development of physical, mental, aesthetic and spiritual power of man.

The biological theory of myopia views myopia as the result of genetically determined characteristics of eye tissues, whereas the use-abuse theory views myopia as the result of habitual use of the eye at a near focal length, near-work. The use-abuse theory implies that myopia is preventable whereas the biological theory does not. Myopia varies over age, gender, race, and ethnicity, level of education, social class and degree of urbanization.

Our objectives are: To study the prevalence of Refractive Error among VII std students and to find out whether heredity or the environment is responsible for myopia. The hypotheses are: H - No significant Association exists among vision defective students with respect to their; H1 - Parental history of myopia; H2 - Near work; H3 - Outdoor Activity.

Materials and methods

By random sampling 123 students (VII std.) were selected from two schools: one from Government School and a private St. Joseph Matriculation school located in Maraimalai nagar, Kanchipuram District, Tamil Nadu. Since it is an experimental study, there was a need to supply eye glasses, the investigator could adopt only small samples. Screening was made in the school premises with the help of an experienced optometrist. Out of 123 only 77 students (62.61%) were with good vision, the remaining 46 (37.39%) students were affected by Refractive Error. All the 123 students were taken for the study to find out the factors involved in Refractive Error among children.

Details regarding the students' near work, (such as watching TV, using computers, reading books other than

subjects and video games etc) the time they spent for playing outdoor games and parental history of wearing glasses were collected from their parents by sending a copy of the schedule through students. The collected information on samples was subjected to Chi-square analysis

Results and discussion

In a total of 123 students examined, of them 46 (37.39%) were suffering from refractive error.

H1- Significant association was found between Refractive Error and Parental glass history (Table 1). If one or both the parents wearing glasses, their children definitely have the problem in their vision. The other children also have problem in vision, but this is comparatively less in number. This finding supports the Biological theory. This result is similar to the study conducted by Saw *et al.* (2001) which states that 'A positive family history is related to the progression of myopia in Singapore children' thus supporting the evidence that hereditary factors may play an important role in myopia progression.

Table1. Relationship between students' vision and parental myopia

Parental Glass History	Refractive Error		Total	Chi-square value	P value
	Yes	No			
Wearing	21 (100.0) [45.7]	0 (80.0) [88.3]	21	42.38	0.000**
Not wearing	25 (24.5) [54.3]	77 (75.5) [100.0]	102		
Total	46	77	123		

The value within () refers to Row Percentage. 2. The value within [] refers to Column Percentage

H2- Significant association was found between Refractive Error and Near Work (Table 2). Many of the Children who work more than two hours with computers and watching TV a lot are affected by Refractive Error than the children who use the same, for less than two

hours. This result supports the Use-abuse theory. This result is similar to the study conducted by Kinge *et al.* (2000) which indicates that intensive near work could initiate myopia. Children with high myopia are more likely to have parents with myopic vision and spend significantly more time studying, more time reading and less time playing sports. This statement was given in the study conducted by Donald & Mutti (2002).

Table.2. Relationship between students' vision and near work

Near work	Refractive Error		Total	Chi-square Value	P value
	Yes	No			
Below 2 hrs	17 (20.0) [37.0]	68 (80.0) [88.3]	85	35.57	0.000**
Above 2 hrs	29 (76.3) [63.0]	9 (23.7) [11.7]			
Total	46	77	123		

H3- Significant inverse association was found between Refractive Error and Outdoor Activities (Table 3). Only less number of children who play outside or do any work in the outside for more than two hours are affected by Refractive Error than the number of children who are doing the same, for less than two hours. Pei-Chang Wu *et al.* (2010) found the result as follows: Myopia prevalence was 31 %. In univariate analysis, myopia was significantly associated with a myopic parent and television watching. Outdoor activity proved to be significant and was inversely associated with myopia. The same view has been given by Dirani *et al.* (2009) as participants who spent more time outdoors were less likely to be myopic. Kathryn Rose *et al.* (2008) also conveyed the same message through their research. They said: 'The lower prevalence of myopia in Sydney was associated with increased hours of outdoor activities. Sreeraman (2008) observed and the conclusion arrived at from a study of the investigation was that the lowest rates of myopia were associated with the highest rate of outdoor activity, and the children with the worst eyesight did lots of near work and spent very little time outside.

Recommendations

Awareness among the public must be created regarding the consequences of refractive error, through the mass media and other possible sources. Research scholars should be encouraged to find out the actual causes of the defective vision. If either or both the parents having vision problem, they must take their wards to the ophthalmologists, before detecting the problems in their vision. Using computers and other near work activities must be shortened. Parents insist that their children should have as many outdoor activities as possible. Health and hygienic habits to be inculcated in children to maintain good vision.

Conclusion

Sense organs are the gateways of knowledge. Visual learning is the only way to achieve unlimited goal in the early ages. Heredity is one of the factors for Refractive

Error. Modern technology is changing the life style; hence children are spending lot of time in front of TV or computers. This leads to tribulations in their vision. If the problems are unnoticed, they will suffer in future from visual impairment and they may even lose their vision completely. Hence it is the responsibility of parents and

Table.3. Relationship between students' vision and outdoor activities

Outdoor Activities	Refractive Error		Total	Chi-square value	P value
	Yes	No			
Less than 2 hrs	36 (49.3) [78.3]	37 (50.7) [48.1]	73	10.89	0.001**
More than 2 hrs	10 (20.0) [21.7]	40 (80.0) [51.9]	50		
Total	46	77	123		

teachers to protect the vision of children by taking them for periodical eye checkups, minimizing the time of computer usage, permitting them for outdoor games, and giving proper food such as fruits and vegetables which contains vitamin-A for good vision and so on.

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