

Study of Association of Environmental Factors in Myopic Children

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Abstract

Background: Refractive error accounts for 19.7% of blindness and myopia is the most common refractive error. Early detection, assessing the regular wear of glasses and stressing the importance of outdoor activities are important in myopic patients.

Aim and Objectives: To analyse the environmental factors in association with various grades of myopia in school going children.

Methods: A prospective study of 105 myopic patients of age 13-17 years was carried out at Department of Ophthalmology during June 2015 to May 2016. Questionnaire regarding their residency, outdoor and indoor activities were completed by all patients and were examined for visual acuity and cycloplegic refraction.

Results: In our study, 43.8% were males and 56.2% were females. 61% of myopes were from urban area and 39% were from rural area. Outdoor activities were seen in 75.6% of rural children and 19% of urban children. 47.6% of low myopes and only 15% of moderate myopes had outdoor activities. 79.7% of low myopes and all 100% of moderate myopes showed indoor activities.

Conclusion: Myopia and its related visual impairment may affect the quality of life in children. Early recognition and influence of environmental factors should be emphasized. Pediatrician, teachers and parents play a crucial role.

Key words: Activities, Myopia, Rural, School children, Urban

INTRODUCTION

Myopia is very common in India. It is a major cause of visual disability. As per NPCB survey in 2006-2007 uncorrected refractive error¹ accounts for 19.70% of bilateral blindness second only to cataract. In Tamil Nadu, 21% of people have low vision due to refractive error. Since prevention is not possible, the percentage of visual disability and amblyopia can be reduced by early detection of cases, assessing their regular wear, stressing the significance of concentrating in outdoor activities and teaching the parents regarding periodic follow-up of their children by an ophthalmologist.

Aim

The aim of the study is to analyze the environmental factors in association with various grades of myopia in school going children.

Objectives

To study the following parameters in myopia:

1. Environmental factors in association with myopia
2. Percentage of regular users.

MATERIALS AND METHODS

A prospective study was conducted in 105 myopic patients of age 13-17 years who attended the Outpatient Department of Ophthalmology, Thanjavur Medical College from June 2015 to May 2016. Informed consent was obtained from parents. A questionnaire was given to all the children and was asked to fill it up with the help of their parents. The parameters which were stressed in the questionnaire were age and sex of the children, their residency, their outdoor/indoor activities.

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Inclusion Criteria

1. Children with myopia (low to high degree myopia)
2. Children in the age group of 13-17 years
3. Both males and females included.

Exclusion Criteria

1. Children <13 and more than 17 years
2. Children with congenital anomalies
3. Children with previous ocular trauma or surgery.

The criteria regarding outdoor activities as per the study were playing outdoor games or staying outdoors for 1 h or more in a day.

The criteria regarding indoor activities as per the study were continuous reading for more than 2 h or playing with electronic gadgets (laptop, mobiles, and video games) for more than 1 h or watching television for more than 2 h in a day.

The criteria for irregular users as per this study were those who have been prescribed spectacles in the previous 6 months by an ophthalmologist and who were not wearing the spectacles.

Refraction was done in two stages, first under cycloplegic drug using 2% homatropine which was instilled in the inferior conjunctival *cul-de-sac* twice at an interval of 10 min. Cycloplegia was considered complete if pupil dilated to 6 mm or more and there was no pupillary reflex. Retinoscopy was done using a streak retinoscope. Subjective acceptance was done at a visit after 1 week and post mydriatic test was done. The refractive error was documented based on the subjective acceptance. The children were prescribed with spectacles. The examination was done by a single trained person to avoid inter observer variations.

RESULTS

Among 105 children who attended the outpatient department, 56.2% were females and 43.8% were males (Table 1), and 61% were town residents and 39% were village residents (Table 2).

In our study, out of 105 children, 41.9% of children had involvement in outdoor activities (Table 3) and 83.8% of children showed involvement in indoor activities (Table 4).

In our study, out of 105 children, 90 children were regular users, and 15 were irregular users (Table 5 and Chart 1).

Among 105 children examined, 80% came under the category of low myopia (<3.00 D), 19% under moderate myopia (3.00-6.00 D), and only 1% was high myopia

Table 1: Sex distribution

Age (years)	Male	Female	Total
13	15	36	51
14	15	7	22
15	7	11	18
16	6	4	10
17	3	1	4
Total (%)	46 (43.8)	59 (56.2)	105 (100)

Table 2: Residency distribution

Age (years)	Village	Town	Total
13	29	22	51
14	7	15	22
15	3	15	18
16	1	9	10
17	1	3	4
Total (%)	41 (39)	64 (61)	105 (100)

Table 3: Outdoor activities

Age (years)	Outdoor activity present	Outdoor activity absent	Total
13	26	25	51
14	13	9	22
15	3	15	18
16	0	10	10
17	2	2	4
Total (%)	44 (41.9)	61 (58.1)	105 (100)

Table 4: Indoor activities

Age (years)	Indoor activity present	Indoor activity absent	Total
13	40	11	51
14	18	4	22
15	17	1	18
16	10	0	10
17	3	1	4
Total (%)	88 (83.8)	17 (16.2)	105 (100)

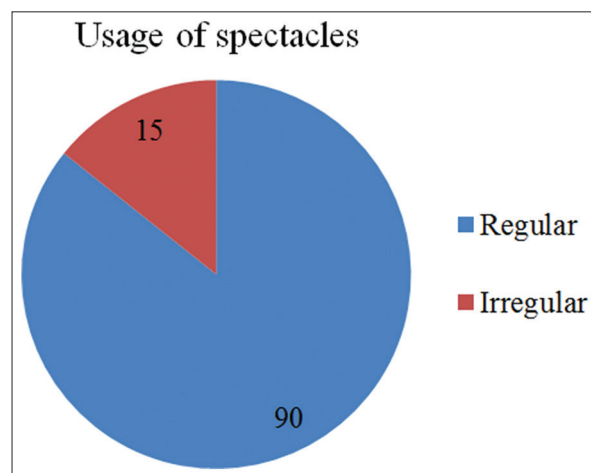
**Chart 1: Usage of spectacles**

Table 5: Irregular usage of spectacles

Age (years)	Regular use	Irregular use	Total
13	43	8	51
14	19	3	22
15	17	1	18
16	8	2	10
17	3	1	4
Total (%)	90 (85.7)	15 (14.3)	105 (100)

Table 6: Grading of myopia

Age (years)	Low myopia	Moderate myopia	High myopia	Total
13	47	4	0	51
14	18	3	1	22
15	12	6	0	18
16	7	3	0	10
17	2	2	0	4
Total (%)	84 (80)	20 (19)	1 (1)	105 (100)

Table 7: Myopia grading among both sex

Gender	Low myopia	Moderate myopia	Total	χ^2 (df)	P value
Male (%)	36 (42.8)	9 (45)	45	0.03	0.862
Female (%)	48 (57.2)	11 (55)	59		
Total (%)	84 (100)	20 (100)	104		

Table 8: Myopia grading among different residencies

Area	Low myopia	Moderate myopia	Total	χ^2 (df)	P value
Town (%)	45 (53.6)	18 (90)	63	8.976	0.003
Village (%)	39 (46.4)	2 (10)	41		
Total (%)	84 (100)	20 (100)	104		

Table 9: Myopia grading among regular and irregular users of spectacles

Usage	Low myopia	Moderate myopia	Total	χ^2 (df)	P value
Regular (%)	72 (85.7)	17 (85)	89	0.007	0.935
Irregular (%)	12 (14.3)	3 (15)	15		
Total (%)	84 (100)	20 (100)	104		

(>6.00 D) and were excluded from the study for further comparisons (Table 6).

The grading of myopia as per sex showed that 57.2% females were low myopes as compared to males (42.8%) and 55% females were moderate myopes as compared to males (45%) (Table 7).

In our study, 53.6% town residents were low myopes and 46.4% villagers were low myopes, and 90% of town

Table 10: Myopia grading compared with outdoor activity

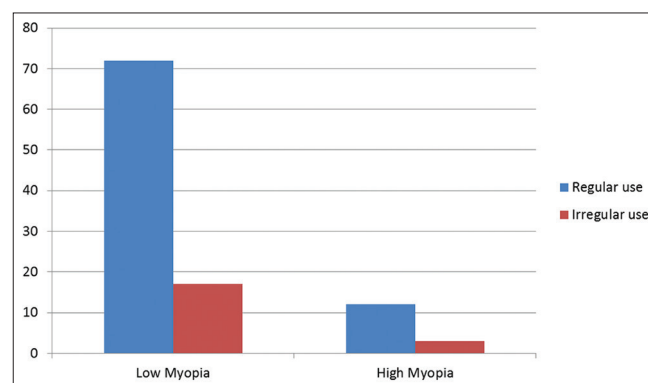
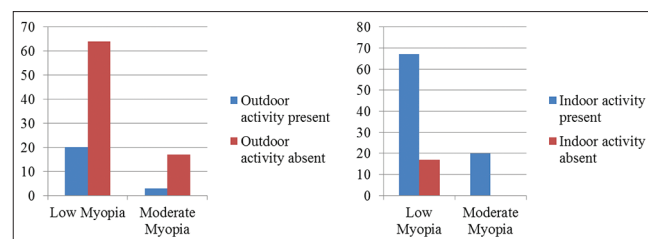
Outdoor activity	Low myopia	Moderate myopia	Total	χ^2 (df)	P value
Present (%)	40 (47.6)	3 (15)	43	5.806	0.016
Absent (%)	44 (52.4)	17 (85)	61		
Total (%)	84 (100)	20 (100)	104		

Table 11: Myopia grading compared with indoor activities

Indoor activity	Low myopia	Moderate myopia	Total	χ^2 (df)	P value
Present (%)	67 (79.7)	20 (100)	87	3.472	0.0624
Absent (%)	17 (20.3)	0 (0)	17		
Total (%)	84 (100)	20 (100)	104		

Table 12: Outdoor activity among different residencies

Outdoor activity	Town	Village	Total	χ^2 (df)	P value
Present (%)	12 (19)	31 (75.6)	43	30.474	0.0001
Absent (%)	51 (81)	10 (24.4)	61		
Total (%)	63 (100)	41 (100)	104		

**Chart 2: Usage of spectacles in low and high myopia****Chart 3: Myopia grading compared with outdoor and indoor activities**

residents were moderate myopes as compared to the counterpart (10%) (Table 8).

In our study, out of 84 children with low myopia, 72 were regular users, and 12 were irregular users. 85% of children

with moderate myopia were regular users and 15% of children were irregular users (Table 9 and Chart 2).

In our study, 47.6% of low myopes had outdoor activity and 52.4% had no significant outdoor activities. Only 15% of moderate myopes had outdoor activities and 85% had no significant outdoor activities (Table 10). 79.7% of low myopes had indoor activity and 20.3% had no indoor activity. Among moderate myopes, 100% had indoor activity (Table 11 and Chart 3).

Analyzing the outdoor activities among different residencies, 75.6% of rural children showed significant outdoor activities as compared to only 19% of urban children (Table 12).

DISCUSSION

A total of 105 children who visited our Outpatient Department in Government Raja Mirasudhar Hospital, Thanjavur Medical College, Thanjavur, were analyzed in this study period of June 2015 to May 2016.

It was found that among 105 children, the occurrence of myopia in males was 43.8% and in female 56.2% which correlates with the previous studies.^{2,3} Magnitude of myopia was more in town residents (61%) as compared to village residents (39%) which correlate with the study of Foster *et al.*⁴ and other studies.^{5,6} It was found that among the previous myope's females were irregular users (20.3%) as compared to males (6.7%) which correlate with the study of Prema *et al.* and Sonam *et al.*⁷ In addition, it was found that irregular usage was more in villagers (22%) as compared to town residents (9.6%) which showed that awareness regarding regular usage and periodic visits to ophthalmologist was less in them.

It was found that outdoor activity was more in village residents (75.6%) as compared to town residents (19%) which might be responsible for the lower magnitude of myopia in them. Hence, the significance of exposure to sunlight in this study correlates with that of Rose⁸ and Morgan *et al.*⁹

It was found that almost all the town residents had indoor activities as compared to villagers (58.5%) which might again contribute to the higher magnitude of myopia in town children.^{10,11} The percentage of nil indoor activities in 41.5% of villagers was surprising that even today certain villagers do not have electronic gadgets such as television and mobiles as per the history elicited from parents.

It was found that 52.4% of low myopes had no outdoor activity while 47.6% had outdoor activity. On the other hand, 85% of moderate myopes had no outdoor activity

while the rest 15% had outdoor activity. The percentage of moderate myopia was high in those not involved in outdoor activity.¹²⁻¹⁴

It was found that the percentage of females with outdoor activity was 32.2% as compared to males 53.3%. Although it was not statistically significant; it's a bitter truth that girl children are not allowed for outdoor physical activities right from their high school level.

CONCLUSION

The literature on myopia was studied. Materials and methods employed were stated. In the study of 105 children, out of 40 village children, 95% has low degree of myopia, and 5% has moderate myopia. Out of 65 town children, 72% has low degree of myopia and 26% has moderate myopia. Out of 26 girls in village, 30.76% had the previous history of irregular use of glasses. Out of 33 girls from town 63% had a history of limited outdoor activity, and out of 32 boys from town 31% had limited outdoor activity due to study pressure. Almost all children gave a history of playing with computers and mobiles.

With school health programs, early diagnosis of children with refractive error helped to decrease the incidence of amblyopia significantly.

This study stressed the significance of periodic follow-up of all myopic children since there are a significant number of irregular users especially girls since they feel shy (as per history).

As per the study of Morgan, adequate exposure to sunlight has a significant role in slowing down the progression of myopia by controlling the axial growth of eyeball. Hence, parents must be taught about the significance of involving them in outdoor activities. Parents are happy to say that their children are bookworms. This idea should be totally swept out of their mind and children in the study were given health education.

Myopia and its related visual impairment may affect the productivity, mobility, and quality of life when these children become tomorrow's citizens. Hence, not only early recognition of myopia is important but also the awareness regarding its progression and the influence of environmental factors should be emphasized.

Role of Pediatrician

Sedentary lifestyle and intake of high saturated fat increase the risk of progression of myopia. Hence, pediatricians who deal with childhood obesity not only play a role in reducing childhood mortality due to systemic complications of obesity but also are responsible for preventing ocular morbidity by giving health education.

Role of Teachers

Although our school education curriculum allotted certain periods for physical education; it is not practically followed especially in urban schools. Hence, awareness programs must be conducted periodically in schools regarding the significance of physical activity in schools. The progress cards provided by schools must have a separate column regarding the child's sports status.

Role of Parents

Last but not the least, parents have a crucial role in preventing their children becoming educated blind. Parents must encourage them in their sports activities. They must take them outdoors periodically.

To conclude myopia is always a simple study to start with but the upcoming data are promising regarding control of its progression. As per recent studies treatment of myopia is not only optically oriented but also it's a multidisciplinary approach. Hence, periodic review studies on myopia in school children always gain importance.

Questionnaire

1. Name:
2. Age/Sex:
3. Standard:
4. Address:
5. Personal history:
 1. Playing outdoor games or staying outdoors for 1 h in a day.
 2. Continuous reading more than 2 h.
 3. Playing with electronic gadgets (laptop, mobiles, and video games) for more than 1 h.
 4. Watching television more than 2 h.
6. Previous history of eye check-up.

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