



CHILDHOOD MYOPIA-EPIDEMIOLOGY, RISK FACTORS AND MANAGEMENT IN MEERUT DISTRICT

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ABSTRACTS

Myopia is a refractive condition in which the images of distant objects are formed in front of the retina when the eye is in the un-accommodated or relaxed state. It occurs when the eyeball is too long or the refractive power is too great. McBrien et. all categorized myopia into two types: early-onset myopia and late onset. Childhood myopes will be classified as progressing or stable.

Risk Factor

1. Environmental Factors

Environmental factors include head position, posture, high levels of intraocular pressure, eyelids rubbing, squeezing by the extraocular muscles, uncorrected corneal astigmatism or exophoria, dietary deficiencies, high urine concentrations of acid mucopolysaccharide, infectious disease, dental caries and so on.

2. Hereditary risk factors in childhood myopia

Prevalence of myopia were significantly high among person with parent or siblings have myopia.

3. Other Risk Factors

High saturated fat and cholesterol intake were associated with longer AL and likely to be myopia.

Preterm is risk factor of myopia and the degree of myopia.

Management of Myopia

a. Basis for Treatment

The goals for management of the patient with myopia are clear, comfortable, efficient binocular vision and good ocular health.

b. Available Treatment Options

i. Optical Correction

Optical correction in the form of spectacles or contact lenses provide clear distance vision.

ii. Medical (Pharmaceutical)

Administration of atropine and cyclopentolate reduces myopia progression rates.

iii. Orthokeratology

Orthokeratology is the programmed fitting of a series of contact lenses.

iv. Refractive Surgery

There are several refractive surgery methods in use; others are in various stages of research and development.

v. Vision Therapy and Visual Hygiene

Some clinicians suggest that some myopia control can result from the use of vision therapy and visual hygiene.

4. Patient Education

i. Simple Myopia

Clinicians should also tell parents about the options available for myopia correction, possible myopia control, or myopia reduction in their children.

ii. Degenerative Myopia

Patients with degenerative myopia should be advised to have annual or more frequent eye and vision examinations,

Prognosis and Followup

The prognosis for correction of simple myopia is very good. Followup at 6-month intervals may be appropriate. The prognosis for patients with degenerative myopia varies with the retinal and ocular changes that occur. Examinations should be conducted on an annual or more frequent basis, depending upon the nature and severity of retinal and ocular changes.

AIMS AND OBJECTIVES

The objective of the study is to review good evidence based articles related to risk factors and interventions of myopia in child.

1. To assess the prevalence of myopia in childhood age between 5-15yrs in rural and urban population.
2. To assess the risk factors related to the onset and development of myopia in childhood.
3. To assess improvement in vision.

MATERIALS AND METHODS

In our prospective cross sectional study of childhood myopia age 5-15 yr associated with epidemiology, risk factor and management conducted over a period of 6 months. 460 patients, who fulfilled the inclusion criteria were enrolled for the study.

Inclusion Criteria

The subjects between the age group of 5-15 yrs who failed to have BCVA 6/6 on screening.

Exclusion Criteria

1. Subjects below 5 yrs & above 15 yrs.
2. Any other disease in the posterior segment and anterior segment of the eye.

According to above criteria we included 460 patients.

OBSERVATIONS AND RESULT

Prevalence of myopia was 7% in rural population and 10.08% in urban population 62.4% boys and 37.6% were girls. 64% children were between the age of 11 to 15 years 36% were between 5 to 10 years. There was a significant relation between prevalence of myopia with watching TV (30.44%), playing mobile (20.43%), nutritional deficiency (16.52%), rubbing eyes (14.56%) and family history (10.08%).

Conclusion

In our prospective cross sectional study we found the prevalence of childhood myopia in rural is 7% urban 10.8% in Meerut district. Most of the children who had refractive error were myopic. We found that prevalence of myopia to be highest for children age 11-15 yrs and to be higher in boys than girls.

In our study we found that prevalence of myopia is much more common in child watching TV and playing computer/mobiles that means they lack of out door activity.

Key Words

Myopia vitreous chamber
Visual acuity
A and B scan ultrasonography
Accommodation
AC/A ratio
Visual fields

INTRODUCTION

Childhood is defined by UNICEF as 5-15 years. Uncorrected refractive error is increasing recognized as a significant cause of avoidable visual impairment

worldwide.

Myopia is a refractive condition in which the images of distant objects are formed in front of the retina when the eye is in the un-accommodated or relaxed state. It occurs when the eyeball is too long or the refractive power is too great or a combination of both.^[1] More commonly, the axial length elongation is caused by vitreous chamber expansion.^[2]

There are several ways to classify myopia (e.g. based on age of onset, clinical entity or progression pattern), clinical characteristics and anatomic difference.^[3]

Grosvenor and Goss (1999)^[4] re-classified into four major types of myopia on the basis of age-related onset, progression pattern and degree of myopia.

(McBrien and Millodot 1986b; Gilmartin and Bullimore 1991; Strang, Winn and Gilmartin 1994) categorized myopia into two types: early-onset myopia (myopia develops before the age of 15 yr), and late onset (Goldschmidt 1968)^[5]

Childhood myopes will be classified as progressive or stable. The myopia in children (age up to 15 yr) is early onset and progressing. The myopia usually stabilizing when young adulthood is reached.

Risk Factor

i. Environmental Factors

Environmental factors include head position, posture, high levels of intraocular pressure, excessive pressure on the eye (such as eyelids rubbing), squeezing by the extraocular muscles, uncorrected corneal astigmatism or exophoria, dietary deficiencies (such as lack of vitamin A and calcium, eating excessive amounts of sugar and overcooked proteins), high urine concentrations of acid mucopolysaccharide, infectious disease, dental caries and so on. Near work activities have been proved to plays an important role in myopia.^[6]

ii. Hereditary risk factors

Idea of inherited factors which were thought to play an important role in the onset and development of myopia was proposed, many researches have been done.

Most of results showed that the prevalence of myopia were significantly high among person with parent or siblings have myopia, especially with.

The exact cause for the onset or progression of myopia has not yet been identified and the mechanism underlying myopic development is not well understood.

Amongst the plenty of treatment and intervention for slowing the progression of myopia, three methods are mainly focused. The first one is spectacle lenses. Spectacle lenses include bifocals and progressive lenses; they showed relatively small treatment effects.^[7] The

second is contact lenses; it is based on the idea of corneal flattening to slow myopia progression. The effects of contact lenses are controversial.

The last is pharmaceutical agent. Pharmaceutical agents include atropine and pirenzepine.^[8]

Most of the study which conducted to explore the relationship between myopia and family history showed that family history were associated with children's myopia.^[9,10]

iii. Other Risk Factors

Diet was proved to be associated with myopia. **High saturated fat and cholesterol** intake were associated with longer AL and likely to be myopia. **Preterm** is risk factor of myopia and the degree of myopia seems to be related to axial length and anterior chamber depth.

Treatment of Myopia

A. Diagnosis of Myopia

The evaluation of a patient with myopia includes the elements of a comprehensive eye and vision examination.

1. Patient History

Chief complaint, visual, acuity, and general health history, developmental and family history, use of medications and medication allergies, and vocational and avocational vision requirements.

2. Ocular Examination

Both unaided distance and near visual acuity should be measured. When the patient regularly wears an optical correction, aided visual acuity should be measured.

3. Refraction

Retinoscopy provides an objective measure of refractive error and yields a good approximation of the subjective refraction.^[11]

A careful subjective refraction should be conducted to determine the lowest minus lens power that achieves best visual acuity. A cycloplegic refraction is required for the definitive diagnosis of pseudomyopia. Keratometry is useful in predicting the of degree of any astigmatism.

4. Ocular Health Assessment and Systemic Health Screening

Examination of the patient with myopia should include direct or indirect ophthalmoscopy or fundus biomicroscopy and measurement of intraocular pressure.

5. Supplemental Testing

- Fundus photography
 - and B-scan ultrasonography
- Visual fields
- Tests such as fasting blood sugar (e.g., to identify causes of induced myopia).

B. Management of Myopia

1. Basis for Treatment

- The goals for management of the patient with myopia are clear, comfortable, efficient binocular vision and good ocular health.
- Regimens to reduce myopia lessen dependence on spectacles or contact lenses, but they do not lessen the risk for myopia sequelae.

2. Available Treatment Options

a) Optical Correction

Optical correction in the form of spectacles or contact lenses provides clear distance vision.

(1) Advantages of spectacles for patients with myopia are

- Spectacles may be more economical in many cases.
- Spectacles provide some eye safety, particularly when the lenses are of polycarbonate materials.
- Spectacles readily allow the incorporation.
- Spectacles require less accommodation than contact lenses.
- Spectacles provide better correction of some types of astigmatism.

(2) Advantages of contact Lenses

- Provide better cosmesis.
- Contact lenses provide a larger retinal image size.
- Contact lenses result in less aniseikonia in anisometropia.
- Contact lenses reduce the problems of weight, visual field restrictions.
- Contact lenses may reduce the rate of myopia progression

(B) Medical (Pharmaceutical)

Cycloplegic agents are sometimes used to reduce accommodative response as part of the treatment of pseudomyopia. Some studies have reported that daily topical administration of atropine and cyclopentolate reduces myopia progression rates in children with youth-onset myopia.

(C) Orthokeratology

Orthokeratology is the programmed fitting of a series of contact lenses, over a period of weeks or months, to flatten the cornea and reduce myopia.

(D) Refractive Surgery

There are several refractive surgery methods in use; others are in various stages of research and development. One procedure is radial keratotomy (RK), in which a spoke-like radial pattern of incisions in the paracentral cornea weaken a portion of the cornea.

Excimer laser photorefractive keratectomy (PRK) is a procedure in which corneal power is decreased by laser ablation of the central cornea.

Additional refractive surgery procedures for myopia include cryolathekeratomileusis, automated lamellar keratomileusis (ALK), and laser in situ keratomileusis (LASIK). In cryolathekeratomileusis, a section of corneal stroma is removed, frozen, and shaped on a lathe to minus power. It is then replaced in the cornea to reduce corneal power.

LASIK is similar to ALK, except that corneal stromal tissue is removed by a laser rather than by microkeratome.

3. Management Strategy for Myopia Correction

It is generally not necessary to correct myopia of less than about 3 D in infants and toddlers. Myopia of more than 1.00-2.00 D in preschool children can be corrected with minus lenses. Demands for both distance and near vision increase as children enter and progress through school.

Most clinicians will proceed to correct any significant degree of myopia to improve distance visual acuity in the adolescent or adult patient.

In general, any degree of myopia should be corrected in time otherwise the patient would be adversely affected by the lack of clear distance vision.

In cases of compound myopic astigmatism, cylinder correction should generally be incorporated in the prescription when the amount of astigmatism is 0.50 D or greater.

Accommodation and Vergence

It is important to consider the patient's accommodation and vergence functions. Full-time wear of the full minus power correction for myopia may be recommended for young patients with high exophoria, a moderate accommodative convergence/accommodation (AC/A) ratio, and normal accommodative function.

Treatment to reduce accommodative dysfunction may include one or a combination of the following

- Vision therapy
- Instillation of a cycloplegic agent to eliminate accommodative spasm
- Near point plus lens addition
- Instruction in visual hygiene.

4. Vision Therapy and Visual Hygiene

Some clinicians suggest that some myopia control can result from the use of vision therapy to improve accommodation and vergence functions and from recommendations for improved visual hygiene (i.e., reading conditions and lifestyle).

- When reading or doing intensive near work, take a break about every 30 minutes. During the break, stand up and look out a window.
- When reading, maintain proper distance from the book.

- Be sure illumination is sufficient for reading.

5. Patient Education

a) Simple Myopia

Clinicians should inform parents of children with simple myopia that the condition almost always increases in severity until the progression slows or stops in the mid to late teens. Clinicians should also tell parents about the options available for myopia correction, possible myopia control, or myopia reduction in their children.

b) Degenerative Myopia

Patients with degenerative myopia should be advised to have annual or more frequent eye and vision examinations, depending upon the severity of ocular changes. Patients need to understand the importance of regular retinal examination, visual fields testing, and measurement of intraocular pressure.

6. Prognosis and Followup

The prognosis for correction of simple myopia is very good. Patients can achieve better distance vision with correction. Depending upon the degree of myopia, astigmatism, anisometropia, and the patient's accommodation and vergence functions, the patient may or may not see better at near with correction.

Followup at 6-month intervals may be appropriate for children who have unusually high myopia progression rates.

The prognosis for patients with degenerative myopia varies with the retinal and ocular changes that occur. Examinations should be conducted on an annual or more frequent basis, depending upon the nature and severity of retinal and ocular changes. Regular retinal examination, visual fields testing, and measurement of intraocular pressure are important aspects of followup care.

AIMS AND OBJECTIVES

The objective of the study is to review good evidence based articles related to risk factors and interventions of myopia in child, as address in the following research questions

1. To assess the prevalence of myopia in childhood age between 5-15yrs in rural and urban population.
2. To assess the risk factors related to the onset and development of myopia in childhood.
3. To assess improvement in vision.

MATERIALS AND METHODS

In our prospective cross sectional study of childhood myopia age 5-15 yr associated with epidemiology, risk factor and management conducted over a period of 6 months. The study was carried out during 2015-2016. A total no. of 460 patients, who fulfilled the inclusion criteria were enrolled for the study.

Inclusion Criteria

The subjects between the age group of 5-15 yrs who failed to have BCVA 6/6 on screening.

- Any other disease in the posterior segment and anterior segment of the Eye.

According to above criteria we included 460 patients.

Exclusion Criteria

- Subjects below 5 yrs & above 15 yrs.

OBSERVATIONS AND RESULT**Table 1: Prevalence of Myopia in Meerut.**

Total no of rural patients	Rural	Percentage Of myopia in rural	Total no of urban patients	Urban	Percentage of myopia in urban
2000	140	7	3000	320	10.08

TOTAL =5000

% of myopia in rural area is lower (7%) in Meerut

Table 2: Prevalence of Myopia in Either Sex.

	BOYS	%	GIRLS	%	TOTAL
RURAL	89	31.01	51	29.48	140
URBAN	198	68.99	122	70.52	320
TOTAL	287	62.40	173	37.60	460

62.40 % of study are boys

Table 3: Prevalence of Myopia in Different Age Groups.

AGE GROUP	RURAL	%	URBAN	%	TOTAL
5 - 10	57	40.71	108	33.75	165 (35.87%)
11-15	83	59.29	212	66.25	295 (64.13%)
					460

64 % of Myopic are in age group of 11-15 years

Table 4: Chi square test applied between different age group in relation with rural and urban area.

Chi square test	Test value	Degree of freedom	p- value
Different age group in relation with different area	6.781	1	0.009

As per the above table the number of children between group 5 to 10 and 11 to 15 who suffering from myopia of urban area is more than rural area this is signify by chi

square test which shows that test value is 6.784 with 1 degree of freedom which is showing strong correlation P-value is also significant (p- value 0.009).

Table 5: Relation of myopic with significant history.

	Rural	urban	total	Percentage
Family history of wearing glass	20	30	50	10.08
Watching TV	55	85	140	30.44
Playing computer/mobile	32	62	94	20.43
Rubbing of eye	29	38	67	14.56
Nutritional deficiency	40	36	76	16.52
Posture	12	52	64	13.91

30 % of Children are associated with watching TV.

Table 6: Percentage of Cases Associated with BCVA 6/6.

No of Rural Cases	No of cases improving to BCVA 6/6	Percentage	No of urban cases	No of cases improving To BCVA 6/6	Percentage
140	128	91.42	320	304	95

Total no of urban children improving to BCVA 6/6 is 304 (95 %) and that of rural children is 128 (91.42 %) as shown in table.

CONCLUSION

In our prospective cross sectional study of childhood myopia age from 5-15 yr associated with epidemiology,

risk factor and management over a period of 6 months. The study was carried out during the period of 2015-2016. On patient coming to out patient department of Upgraded Department of Ophthalmology LLRM Associated with SVBP Meerut and School Health Camps. A total no. of 460 patients, who fulfilled the inclusion criteria were enrolled for the study.

In our prospective cross sectional study we found the prevalence of childhood myopia in rural is 7% urban 10.8% in Meerut district. Most of the children who had refractive error were myopic. We found that prevalence of myopia is highest in children age 11-15 yrs and higher in boys than girls. We screened schools where children did not go to an ophthalmologist even if they were suffering.

In our study we found that prevalence of myopia is much more common in child watching TV and playing computer/mobiles that means they lack of out door activity.

BIBLIOGRAPHY

- Pizzarello L, Abiose, ftyche T. VISION. the right to sight, a global, initiative to eliminate avoidable blindness..Arch ophthalmology, 2004; 122:615-620.
- Edwards, M. H. and C. S. Y. Lam "The epidemiology of myopia in Hong Kong." *Annals of the Academy of Medicine Singapore*, 2004; 33: 34-38.
- Dandona L. Visual impairment in school children in southern India. *Indian J Ophthalmol*, 1997 Jun; 45(2): 129.
- Grosvenor, T. and D. A. Goss Epidemiology of myopia. In: Clinical management of myopia. T. Grosvenor and D. A. Goss (ed). Woburn, USA, Butterworth Heinemann, 1999; 3-39.
- Goss, D. A. and J. B. Eskridge Myopia In: Diagnosis and Management in Vision Care J. F. Amos (ed). Boston, Butterworth-Heinemann USA, 1987; 121-148.
- Grosvenor, T. and D. A. Goss Epidemiology of myopia. In: Clinical management of myopia. T. Grosvenor and D. A. Goss (ed). Woburn, USA, Butterworth Heinemann, 1999; 3-39.
- McBrien, N. A. and M. Millodot "Amplitude of accommodation and refractive error." *Investigative Ophthalmology and Visual Science*, 1986; 27(7): 1187-1190.
- Win and Glimartin, D. M., L. A. Ostrin, S. Kasthurirangan, et al. "Objective accommodation measurement with the Grand Seiko and Hartinger coincidence refractometer." *Optometry and Vision Science*, 1994; 84(9): 879-887.
- Walline JJ, Jones LA randomized trial of the effect of soft contact lenses on myopia progression 2008; 49: 4702-6.
- Guggenheim JA. Correlations in refractive errors between siblings in the Singapore cohort study of risk factors for myopia BJO, 2007 Jun; 91(6): 781-4.
- Jones –Jordan LA. Early childhood refractive error and parental history of myopia as predictors of myopia ophthalmol and visual science, 2010; 51: 115-21.