ISSN No:-2456-2165

Prevalence and Progression of Myopia in Children at Raipur

[1]Dipali Sahu, [2]Divya Sharma
[1]Optometry Department, Master in Optometry, Shri Rawatpura Sarkar, University Raipur Chhattisgarh.
[2]Assistant Professor (Optometry) Shri Rawatpura Sarkar University, Raipur Chhattisgarh.

Abstract:- The purpose of this study was to determine the prevalence and progression of myopia in children in Raipur.
Design: A retrospective case study.
Material And Method: In this retrospective study, we included 1395 patients (male & female). This study had five years of data collection from 2015-2019 in an eye hospital, Raipur, between august 2019-may 2020.
Studied parameters: vision, refraction included uncorrected visual acuity (UCVA), best-corrected visual acuity (BCVA), after follow-up refraction.
Results: According to retrospective data, the total number of patients is 1395 (male & female). The constant power of myopia was 30 subjects (2.15%) & the increased power of myopia was 171 subjects (12.25%). In all, over data 4 – 10 years, children had 20.46% myopia, 11- 15 years, 35.67% & 16 – 18 years children had 43.85% of myopia progression.
Conclusion: In our study had prevalence and progression of myopia. The constant power of myopia in children was 2.15% & the increased power of myopia in children was 12.25%.

Keywords:- *Retrospective, Prevalence, Progression, Myopes, Subjects, Children, Constant, Power, Increase, Study.*

I. INTRODUCTION

Myopia or short-sightedness is a refractive error in which parallel rays of light coming from infinity are focused in front of the retina when accommodation is at rest. Myopia is the most common disorder.

Myopia is a prevalent worldwide condition leading to visual disturbance. Myopia results from an eye having immoderate refractive power of its axial length. This may be due to the eye having a relatively long axial length or the increased dioptric power of one or more of the refractive elements.

Persons with a high degree of myopia, especially those with degenerative or pathological changes, also have a higher chance of constant visual impairment or blindness from macular degeneration, retinal detachment, glaucoma & cataract. These myopia-related situations also tend to occur earlier than other common blinding disorders, such as diabetic retinopathy & age-related macular degeneration.

The prevalence of myopia varies in different parts of the world. The Baltimore eye survey & beaver dam study reported the prevalence in adults to be 22.7% & 26.2%, respectively. These are compared with recent data from East Asia.

It has become more common. Short-sightedness is a leading cause of vision throughout the world, and its prevalence is increasing. Although most researchers agree that people's refractive status is largely genetically determined, a growing body of evidence shows that visual experiences early in life may affect ocular growth & eventual refractive quality.

A. Myopia Related Eye Abnormalities:

Myopia, commonly referred to as short-sightedness, is a common cause of visual disability worldwide. The world health organization has grouped myopia & uncorrected refractive error with cataract, macular degeneration, infectious disease & vitamin A deficiency among the leading cause of blindness globally.

People with myopia can be classified into two groups, those with low to a modest degree of myopia (referred to as "simple" or "school" myopia, 0 to -6 degree) & those with high or pathological myopia (more significant than -6 degrees). Simple myopia can be corrected with spectacles or contact lenses, whereas "high" (pathological myopia) is often associated with potentially blinding conditions such as retinal detachment, macular degeneration & glaucoma.

B. The complication with high myopia –

Optic nerve and optic disc abnormalities	**Glaucoma Peripheral atrophy**
Medical retinal complications	Chorioretinal atrophy Choroidal neovascularisation
Surgical retinal complications	Peripheral retinal degeneration Rhegmatogenous retinal detachment Optic macular hole Optic traction maculopathy

C. Definitions And Epidemiology:

To obtain clear vision, the eye must accurately focus an image in space on the retina. The primary ocular causality of refraction is the cornea's focusing power and crystalline lens & eye length.

In myopia, the image is focused in front of the retina, the cornea or lens curvature is too strong, or the eye is too long (axial length). When optical components focus image

ideally on the retina, this is known as emmetropia & when the eye focuses on the image behind the retina, this is known as hyperopia—Refractive error measured in diopters (D). Myopia is denoted with a minus sign.

When the optical components focus the image ideally on the retina, this is known as emmetropia & when the eye focuses the image behind the retina, this is known as hyperopia. Refractive error measured in diopters (D). myopia is denoted with a minus sign.

Mild myopia is 0D to -1.5D, moderate myopia -1.5 to -6D & high myopia -6D or more. Pathological myopia occurs with more than -8D, although retinal disease, cataract & glaucoma, the associated possibilities to vision can also occur in patients with moderate & high myopia. At birth, most infants are hyperopic, but when the eyes grow, they usually become less hyperopic & by age 5-8 years, emmetropic.

This process, wherein the refractive state of children's eyes shifts in magnitude and reduces invariance to reach near emmetropia, is called emmetropisation. The question for researchers is how much of this emmetropisation process is genetically determined and how much it is modulated by early visual experience. Epidemiological research into this question must be carefully conducted. Historically, most research into myopia has been limited by its retrospective nature, lack of measurement of ocular refractive variables of patient and parents, lack of adequate randomization, control group, and follow-up, and poor therapeutic compliance. In the past decade, well-designed epidemiological agreements have been used to investigate the epidemiology of myopia.

D. Etiological Classification of Myopia:-

Types of myopia	Definition
Axial myopia	Axial myopia results from an increase in the anteroposterior length of the eyeball. It is the most typical form.
Curvature myopia	Curvature myopia occurs due to increased curvature of the cornea, lens, or both.
Positional myopia	Positional myopia is produced by the anterior placement of the crystalline lens in the eye.
Index myopia	Index myopia results from an increase in the refractive index of crystalline lens associated with nuclear sclerosis.

Table 1.2 etiological classification of myopia

E. Genetic Factors & Refractive Status

A study of the correlation between refractive error in parents & siblings showed a stronger correlation than would be expected by chance.

Additional evidence supporting the role of genetics in the development of myopia includes the wide changeability of the prevalence of myopia in different genetic groups. Myopia prevalence in Asia is as high as 70 – 90%, in Europe, America 30 – 40% & Africa 10 – 20%.

The two lines of research that support the idea that myopia & refractive errors in large part are genetically determined come from twin studies of refractive errors in parents & their children. Two well-conducted and well-controlled studies so that refractive errors are much more strongly correlated in monozygotic twins than in dizygotic twins. An analysis of the correlation between refractive error in parents and siblings showed stronger correlations than would be expected by chance.

F. Gradings of Myopia

According to American Optometric Association (AOA) has defined three grades of myopia:-

Grading	Findings
Low myopia,	when the error is ≤-3D.
Moderate myopia,	when the error is between -3D to -6D.
High myopia,	when the error is ≥ -6D.

Table 1. Gradings of myopia

- *Effect of the first spectacle age on high myopia in adolescence:-*

The age at first spectacle use remarkably impacted high myopia prediction; thus, we examine for high myopia based on the ages at first spectacle use.

Those younger than nine years or 10-12 years at the time of their first spectacle use had an or of 24.9 & 5.3, respectively, compared with those older than 13 years. This result manifests that a younger age at the time of first spectacle use was a predictor of more severe myopia progression in the future.

- *Risk factors:-*

Myopia may also occur due to environmental factors or other health problems- Some people may experience blurred distance vision only at night. With "night myopia," low light makes it difficult for the eyes to focus correctly. Or the increased pupil size during dark conditions allows more peripheral, unfocused light rays to enter the eye.

People who do an excessive amount of near vision work may experience a false or "pseudo" myopia. Their blurred distance vision is caused by the overuse of the eyes' focusing mechanism. After a long period of near work, their eyes cannot refocus to see clearly in the distance. Clear distance vision usually returns after resting the eyes. However, constant visual stress may lead to a lasting reduction in distance vision over time.

Symptoms of myopia may also be a sign of variations in blood sugar levels in people with diabetes or maybe an early indication of a developing cataract.

- *Diagnosis*

Testing for myopia may use several procedures to measure how the eyes focus light & to determine the power

of any optical lenses needed to correct the reduced vision. As part of the testing, I will identify letters on a distance chart. This test measures visual acuity, which is written as a fraction, such as 20/40. The top fraction is the standard distance at which testing is performed(20 feet). The bottom number is the minor letter size read. A person with 20/40 visual acuity would have to get within 20 feet to identify a letter that could be seen clearly at 40 feet in a "normal" eye. Normal distance visual acuity is 20/20, although many people have 20/14 (better) vision.

Using a phoropter instrument, a doctor of optometry places a series of lenses in front of eyes & measures how they focus light using a handheld lighted device called a retinoscope. Or the doctor may choose to use an automated instrument that evaluates the focusing power of the eye.

➢ *Prevention*

Children who are at high risk of progressive myopia(family history, early age of onset, & extended period of near work) may benefit from treatment options that have been shown to reduce the progression of myopia. These treatments include the prescription of bifocal spectacle or contact lenses, orthokeratology, eye drops, or a combination of these. Because persons with high myopia are at a greater risk of developing cataracts, glaucoma & myopic macular degeneration, myopia management may help preserve eye health.

G. Prevention of Myopia Onset

➢ *Time Outdoors and Atropine*

There are two approaches to myopia control. One method is to reduce patients' risk of developing myopia. Given that the prevalence of myopia can be as high as 84% in some Asian countries,[1] finding ways to prevent the onset of myopia is essential. Although little is known about this approach, researchers have discoverer the importance of time outdoors and the use of low-dose Atropine.

➢ *Types of diplopia control*

There are four extensively accepted types of diplopia control treatments Orthokeratology (OrthoK aka CRT), Atropine eye drops, Distance-Center Multifocal Contact Lenses, and in some cases, Bifocal or Multifocal Eyeglasses. Optometrists throughout the country use styles grounded on patient age, tradition, and bear, occasionally combining techniques for maximum impact. There is a lot of wrong information out there, and recommendations are made for ways that actually may increase myopia, such as "under-correction," where the doctor provides a lower prescription than required.

➢ *Lenses*

In several scientific studies, specific types of contact and eyeglass lenses have effectively controlled myopia progression. Ortho-K lenses, distance-center bifocal contact lenses, and bifocal eyeglasses are all methods with randomized, controlled peer-reviewed studies on their effectiveness in slowing down or preventing the progression of myopia. The myopia control specialist you choose will determine which methods best fit a child based on prescription and lifestyle and monitor change over time to minimize myopic "creep".

➢ *Orthokeratology*

Also known as Ortho-K or CRT, medical devices similar to contact lenses are applied to the eye while asleep. The gentle pressure exerted on the cornea or surface of the eye overnight results in the temporary "molding" of the outer layers, providing "lens-like" effects for the user. The effects last all day, providing vision for users without wearing glasses or contact lenses during their waking hours. The results are dramatic and free people from issues with glasses or regular contact lenses for sports, swimming, and performing the activities they love to perform. It has many peer-reviewed, randomized, and longitudinal studies that show it is an effective method to reduce the progression of myopia and, in many cases, halt it altogether.

➢ *Medication*

Atropine, available in eye drop or ointment form, has reduced myopia progression in several studies. Applied once a day, atropine treatment is continued as long as myopia progression continues. It is not a cure, but it has been shown to control myopia in many patients. In some cases, it may be used in conjunction with bifocal eyeglasses to enhance the myopia control effect. Pirenzepine is an analog of Atropine that has been shown effective but is not currently on the market. Dopamine has also been studied, but its use has been impractical.

H. Risk Factors

The patient and his guardian should always be made aware of the possible side effects and the clinical safety profiles of myopia control choice. Although there is always a risk of microbial keratitis with contact lens wear, research suggests that children aged 8 to 14 years are less likely to develop adverse events than individuals aged 15 to 25 years. The approximate risk of microbial keratitis for soft multifocal contact lenses is about four per 10,000 wearers. For orthokeratology, approximately 20 cases per 10,000 wearers. Given that multifocal contact lenses have been linked with increased exophoria at near compared with single-vision contact lenses, clinicians should be mindful of multifocal contact lens use in children with large exophorias.[18]

Atropine is a nonspecific antimuscarinic eye drop often used in eye care to dilate or decrease accommodation. Its exact mechanism in myopia control is unknown. The effect of Atropine in the reduction of myopia progression is concentration-dependent. The ATOM Study found that a concentration of 0.01% had the best therapeutic index. However, initial data from the Low-Concentration Atropine for Myopia Progression (CLAMP) study has shown that, of the three concentrations used (0.05%, 0.025%, and 0.01%), 0.05% was the most effective in controlling myopia progression.[19] Atropine 0.01% also had a good safety profile in the ATOM 2 study, with minimal effects on pupil dilation (0.8 mm) and reduction of accommodative amplitude (2–3 D reduction).

The long-term safety profile of low-dose Atropine has not been established, but 1% of Atropine has a well-established safety profile for amblyopia treatment in children. Overall, Atropine is an effective mechanism for myopia control, and doctors should examine its use for this purpose.

Myopia is becoming more common. Douglas Fredrick describes recent research into this condition and discusses future management of patients.

Myopia is a leading cause of loss of vision throughout the world, and its prevalence is increasing. Although most researchers agree that people's refractive status is in large part genetically determined, a growing body of evidence shows that visual experiences early in life may affect ocular growth and eventual refractive status. This review describes recent human and animal research into the pathogenesis of myopia and discusses suggestions for the management of patients.

➢ *Visual Experience & Ocular Growth*

People who wear spectacles for myopia may remember being told that they would ruin their eyes if they read in the dark or a moving car or held the book too close to their faces. The idea that using our eyes early in life can affect ocular growth and refractive error is gaining scientific credence. It has been hypothesized that prolonged reading or the retinal blur of prolonged near work leads to myopia development. This is supported by evidence showing an increase in the prevalence of myopia from near 0% to rates found in the Western population in aboriginal peoples exposed to a Western curriculum of education.[16] The correlation between the level of academic achievement and the prevalence and progress of myopic refractive errors is strong; people whose professions entail much reading during either training or performance of the occupation (lawyers, physicians, microscopists, and editors) have higher degrees of myopia. Myopia may progress not just in people's teenage years but throughout their 20s and 30s. Although it has been presumed that people with higher intelligence have higher degrees of myopia, these studies have been confounded by the higher degrees of educational attainment, and the cumulative amount of near work in patients with a higher IQ and intelligence per se thus cannot be correlated strongly with myopia.

I. Models for development of myopia

➢ *Retinal blur*

Based on epidemiological studies of myopia, myopia can postulate experimental animal models of myopia and analysis of people with visual deprivation early in life, a model of myopia development. Prolonged near work was thought to lead to progressive myopia through the direct physical effect of prolonged accumulation. According to current theory, prolonged near work leads to myopia via the blurred retinal image during near focus. This retinal blur initiates a biochemical process to stimulate biochemical and structural changes in the sclera and choroid that lead to axial elongation.

➢ *Accommodation problems*

People with short-sightedness cannot focus accurately by accommodation, which leads to even more retinal blur and defocus. In this model, the infant eye at birth is hyperopic or shorter than it should be to focus on incoming light properly. Early visual experiences affect the growth of the eye. Deprivation of formed vision leads to an eye that grows in an uncontrolled fashion, ever searching for a focal point, bypassing emmetropia, and developing axial myopia. People who do not have a strong predisposition for myopia—who have no family history of high myopia or come from an ethnic group with no strong preponderance of myopia—also begin life hyperopic and emmetropisation occurs until the images are correctly focused on the retina when the process stops. Further myogenic stimuli such as prolonged reading or occupations that require near extensive work may lead to mild myopia later in life.

➢ *Familial factors*

In children with a familial or ethnic predisposition to myopia, the emmetropisation process continues, but they become mildly myopic early in life. When they are exposed to apoptogenic factors, such as near extensive work, which produces blur and defocused images on the retina, motivation consequently proceeds unchecked, searching for a focal point, which causes axial elongation and moderate myopia in late adolescence. Additional myogenic factors such as near extensive work in secondary or postgraduate school or occupation can lead to higher degrees of myopia. This model raises whether any interventions should be recommended to stop or slow this abnormal process of myopisation.

J. Therapeutic interventions to prevent myopia

Utmost myopic children will develop only low to moderate situations of diplopia, but some will progress fleetly to high diplopia. Threat factors for the development of high diplopia include race, maternal refraction, and diplopia progression rate. In those children in peril, interventions should be considered.

Sweats to help the progression of diplopia date back centuries, and eye exercises, specifics, and hygiene have been proposed to avoid weak eyes. Most current efforts have been focused on decreasing the accommodative requirements of the eyes. Anticholinergics such as Atropine have been used in combination with bifocals to slow the progression of myopia. Although progression is slowed during treatment, the long-term effects seem to be a difference of not quite 1-2 dioptres, and no cases of pathological myopia are prevented with this treatment.

Anticholinergics may act by a direct effect on the retina. Pirenzepine may be a selective antimuscarinic that has no anti-accommodative effects. It has been shown to retard experimental myopia in chickens through an immediate impact on the retina and sclera, and its efficacy is currently being investigated in a multicentre trial. Other biochemical modulators of scleral growth are being investigated in animal models, and limited human trials are underway.

Accommodative effort and retinal blur can be minimized by bifocal glasses, which change the focal point for near work. The use of bifocals may slow the rate of progression of myopia; prospective randomized trials are addressing this question.[29] Rigid or gas permeable contact lenses may offer a mode of treatment that may slow the progression of myopia.[30] The rate of myopia progression is slower in patients using these contact lenses than in patients using lenses placed in spectacles. The exact mechanism by which rigid contact lenses prevent axial myopia from developing is unclear. Laser refractive surgery can eliminate the refractive condition of myopia. Still, it doesn't decrease the speed of the blinding diseases of the detachment of the retina , degeneration, and glaucoma associated with high myopia.

Other interventions have included the application of vitamins, scleral surgery to supply shortening of the attention, biofeedback, optical hypotensives, optical relaxation ways, and acupuncture, and proponents of those treatments frequently make unwarranted and inflated claims of success. Their efficacity has not been verified in randomized controlled trials.

If the myopia is mild, ophthalmologists call this low myopia. They call severe myopia high myopia. High myopia will usually stabilize between the ages of 20-30 years old. Usually, I can correct high myopia with glasses or contact lenses. Sometimes, refractive surgery corrects high myopia.

Myopia may be inherited. If a parent has myopia, their child may get it as well. Myopia is often discovered in children when they are between ages 8 and 12 years old. During the teenage years, when the body proliferates, myopia may become worse. Between the age of 20-40, there is usually little change. Myopia can also occur in adults.

II. METHODS AND MATERIALS

1. 6 meters room
2. Snellen's chart
3. Trial set

Study design:- Retrospective study
Study duration:-June 2019 – June 2020
Sample size:-1872 subjects
Source of populations:- Sai Baba Eye Hospital Raipur

- *Data collection:-*

For a retrospective study. I collected previous data, which included myopes patient of age 4-18 years.

This was a retrospective study involving 1395 subjects from 'Sai Baba Eye Hospital, Raipur, being a retrospective study. I collected previous data, which included myopes subjects of 4 – 18 years. The parameters recorded were subjective refraction before and after follow-up.

Inclusion criteria included the history of myopia and 4 – 18 years of age children.

Exclusion criteria included the history of Hypermetropia, Astigmatism, age more than 19 years.

The topic of myopia control has obtained increased attention among clinicians over the past few years. Educating patients about myopia control options are now considered a standard of care due to the vision-threatening conditions, economic burden, and public health concerns associated with myopia. The literature suggests several effective modalities to prevent the onset of myopia and slow down its progression. This article provides information regarding current management strategies for myopia control and offers ways to select the best approach for each patient.

The increase in myopia prevalence has a guide to the development of new standards of care. Young, pre-myopic children should be advised to increase their time spent outdoors. Myopic children diagnosed with myopia control should be advised to use either Atropine, multifocal contact lenses, or orthokeratology. Patient education is an essential element of myopia management. Details should be discussed with the patient or guardian before the start of treatment.

This review article was prepared by searching Medline for citations of articles in English using the keyword "myopia." In addition, abstracts from the annual meetings of the Association for Research in Vision and Ophthalmology were reviewed.

A common cause of visual disability throughout the world. The World Health Organization has grouped myopia and uncorrected refractive error with cataract, macular degeneration, infectious disease, and vitamin A deficiency among the leading causes of blindness and vision impairment globally.[1] People with myopia can be classified into two groups, those with low to modest degrees of myopia (referred to as "simple" or "school" myopia, 0 to −6 dioptres) and those with high or pathological myopia (more significant than −6 dioptres). Simple myopia can be corrected with spectacles or contact lenses, whereas "high" (pathological) myopia is often associated with potentially blinding conditions such as retinal detachment, macular degeneration, and glaucoma.

III. RESULTS

The purpose of this study was to compare between prevalence and progression of myopia. The total data of 1395 patients who satisfied the inclusion criteria during the study period were analyzed. The individual patient with constant power was 30, which is 2.15%, while the individual whose power increased during follow-up was 171, which is 12.25%. N = 1395)

Showing the constant & increasing power of myopes in children (Figure 1)

Showing the ongoing & increasing power of myopes in percentage (Table 1)

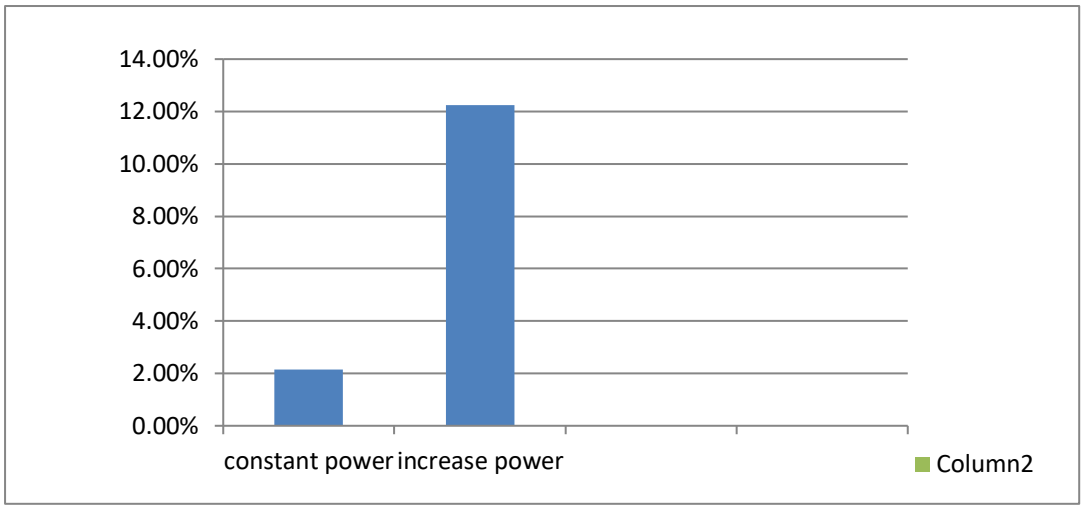


Fig 1 . Showing the constant and increased power of myopes in children.

Category	Subjects	Power in percentage
Constant power	30	2.51%
Increase power	171	12.25%

Table 2 . showing the constant and increased power in percentage.

Myopes under the age of 4 – 10 years that is 35 subjects that increased myopes subjects are 20.46%, whereas in the age group of 11 – 15 years that is 61 subjects had that total increase in myopes subjects are 35.67%, were taken of the age group 16 – 18 years that is 75 subjects the total increased myopes subjects are 43.85%.

Progression of myopes subjects according to age group (Figure 2) Showing the progression of myopes subjects according to age group in percentage (Table 2)

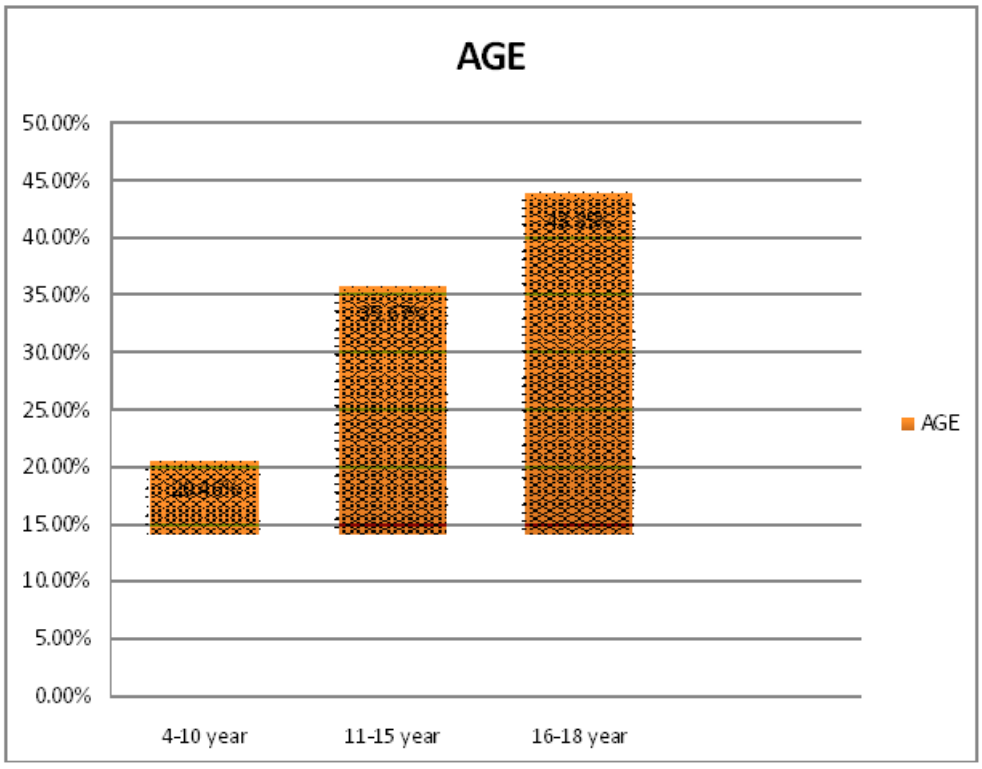


Fig 2 . showing the progression of myopes subjects according to age group.

Age group	subjects	progression
4-10	35	20.46%
11-15	61	35.67%
16-18	75	43.85%

Table 2. showing the progression of myopes subjects according to age group.

IV. DISCUSSION

To our knowledge, this is the largest cross-sectional & longitudinal study examining the prevalence and incidence of myopia in school children. Few epidemiologist studies addressing similar issues had a comparable population size. Our children were selected randomly from all over Hong Kong & were of different academic & socioeconomic backgrounds. The response rates for the initial prevalence & the letter cohort study were good. 77.9% & 84.5%, respectively. We believed children who participated in the study were representative of the target population.

One year cohort study found the incidence of myopia to be 144 per 1000 primary school children per annum, an incident from a previous study in Hong Kong in which the incidence was 118 per 1000 among children of age 6 -17. The cohort was much smaller, with 142 school children non-cycloplegic refraction.

Studies reporting non-cycloplegic measurements show that studies described high myopia prevalence rates in school children in East Asia (73%) and high speeds in North America (42%). Low prevalence under 10% in African and South American children. In late studies, risk factors for myopia in school-going children included quiet outdoor time and near work, dull light exposure, the use of LED lamps for homework, low sleeping hours, a reading distance less than 25 cm, and living in a citified environment.

V. CONCLUSION

Short-sightedness is the most common disorder. All myopes must establish the physical and financial burden of spectacles & contact lenses throughout their lives. The necessity for optical correction in young myopes has affected career choices & social activities. The national eye institute considers that costs of refractive eye examinations amount to $ 1 billion annually, with another $ 1.5 billion spent on spectacles each year.

Cataract surgery in high myopia eyes has excellent visual outcomes but less than emmetropic eyes. High myopic patients are inclined to have cataracts at a younger age. The incidence of intraoperative ruptured posterior capsule & postoperative YAG capsulotomy was more elevated in tall myopic eyes.

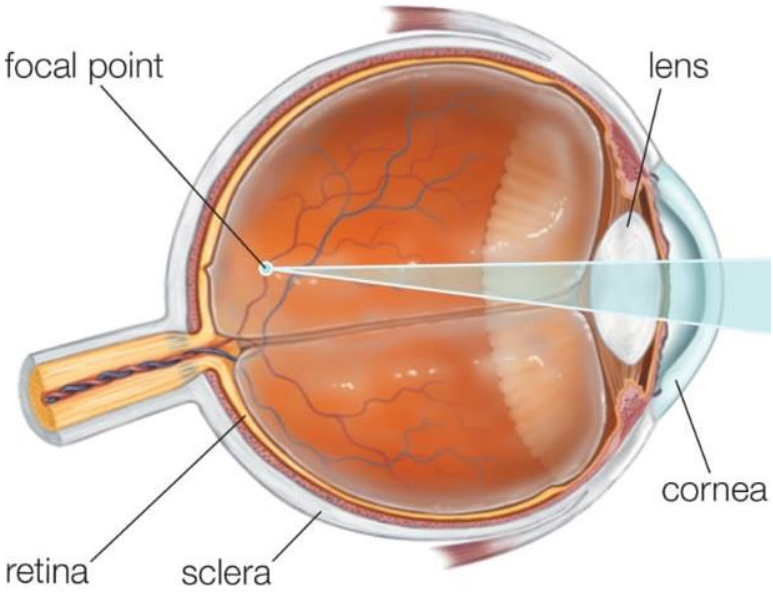
ACKNOWLEDGEMENT

The author is very grateful to the former head of the science department. The author would like to acknowledge participants for their patience.

REFERENCES

[1]. Pararajasegaram R. vision 2020 the right to sight: from strategies for action. Am J Ophthalmol. 1999;182:359-360 (Pubmed) (Google scholar)
[2]. Chow YC, Dhillon B, Chew PT, Chew SJ. Refractive error in Singapore medical students. Singapore MED J. 1990;31:472-473 (Pubmed) (Google Scholar)
[3]. Wong TY, Foster PJ, Hee J, Ng TP, Tielsch JM, Chew Shy, et al. Prevalence and risk factors for refractive errors in an adult Chinese population in Singapore. Invest Ophthalmol Vis Sci. 2000;41: S324. (Pubmed) (Google scholar)
[4]. Takashima T, Yokoyama T, Futagami S, Ohno-Matsui K, Tanaka H, Tokoro T, et al. The quality of life in patients with pathologic myopia. Jpn J Ophthalmol. 2001;45:84-92. (PubMed) [Google Scholar]
[5]. 5.Rajan U, Tan FT, Chan TK. Increasing prevalence of myopia in Singapore school children. In: Chew SJ, Weintraub j, editors. Proceedings of the fifth international conference on myopia, Toronto, Ontario, Canada, June 22-24, 1994. New York: Myopia International Research Foundation; 1995. pp. 41-46 [Google Scholar]
[6]. Vongphanit J, Mitchell P, Wang JJ. Prevalence and progression of myopic retinopathy in an older population. Ophthalmology. 2002;109:704-711 [Pubmed] [Google Scholar]
[7]. Javitt JC, Chiang YP. The socioeconomic aspects of laser refractive surgery. Arch Ophthalmol. 1994;112:526-530 [Pubmed] [google scholar]
[8]. Nigel AD, Maul E, Pkharel GP, Zhao J, Ellwein LB. Refractive study in children: sampling and measurement methods for a multi-country survey. Am J Ophthalmol. 2000;129:421-426. [Pubmed] [google scholar]
[9]. Hammond CJ, Snieder H, Gilbert CE, Spector TD. Genes and environment in refractive error: the twin eye study. Invest Ophthalmol Vis Sci. 2001;42:1232-1236. [Pubmed] [Google Scholar]
[10]. Saw SM, Katz J, Schein OD, Chew SJ, Chan TK. Epidemiology of myopia. Epidemiol Rev. 1996;18:175-187. [Pubmed] [Google Scholar]
[11]. Tay MT, Au Eong KG, Ng CY, Lim MK. Myopia and educational attainment in 421,116 young Singaporean males. Annu Acad Ed Singapore. 1992;21;785-791. [Pubmed] [Scholar]
[12]. Dunphy EB, Stoll MR, King SH. Myopia among American male graduate students. Am J Ophthalmol. 1968;65:518-521. [Pubmed] [Google Scholar]
[13]. Dorothy S P Fan et al. Invest Ophthalmol Vis Sci. 2004 Apr; 45;4:1071-5. Doi: 10.1167/is. 03-1151. [Pubmed]

[14]. Ying yang Ma et al. BMC Ophthalmol. 2018 Feb. 23;18 (1): 53. Do 10.1186/018-0716-3. [Pubmed]
[15]. Aisha Md. Aleman et al. J Ophthalmol. 2018 Nov. 7;2018:3708409. Doi:10.1155/2018/3708409. eCollection 2018. [Pubmed]
[16]. Rohit Saxena et al. PLoS One 2017 Dec 18;12: e0189774. Do 10.1371/journal. Pone. 0189774. Collection 2017. [Pubmed]
[17]. Neeraj Kumar Singh et al. Optom Vis Sci. 2019 Mar.; 96 (3): 200-205. DOI: 10.1097. [Pubmed]
[18]. Borish new edition pdf.
[19]. Ian G Morgan et al. Prog Retina Eye Res. 2018 Jan.
[20]. Pei – Chang Wu et al. Eye (Lond). 2019 jan.
[21]. Olavi Parssinen et al. Acta Ophthalmol. 2019 Aug.
[22]. Zhao- Yu Xiang et al. J Ophthalmol. 2020 Nov. 4; 2020;4395278. Doi; 10. 1155/2020/4395278
[23]. Wong T. Y. Ferreira A., Hughes R., Carter G., Mitchell P. Epidemiology and disease burden of pathologic myopia and myopic choroidal neovascularisation: an evidence-based systematic review. American Journal of Ophthalmology. 2014;157(1):9 e12-25. e12.DOI-Pubmed
[24]. Dolgin E. The myopia boom. Nature. 2015;519(7543):276-278. Doi: 10. 1038/519276a. – DOI- Pubmed
[25]. He M, Xiang F, Zeng Y, et al. Effect of time spent outdoors at school on myopia development among children in China. JAMA. 2015;314:1142. 10. 1001/jama.2015.10803. DOI – Pubmed
[26]. Statistical Abstract of Delhi 2016. Government of National Capital Territory of Delhi.
[27]. Goldschmidt E. On the etiologic of myopia. An epidemiological study. Acta Ophthalmol. 1968;98:1-172-PubMed
[28]. Morgan IG, Rose KA. Myopia and international educational performance. Ophthalmic Physiol Opt. 2013;33:329-338. Doi- Pubmed
[29]. Resnikoff S, Pascolini D, Mariotti SP, Pokharel GP, Global magnitude of visual impairment caused by uncorrected refractive errors in2004. Bull World Health Organ. 2008;86:63-70. Doi: 10.2471/BLT.07.041210-DOI-PMC-Pubmed
[30]. Morgan IG, Onhi - Matsui K, Saw SM. Myopia. Lancet.2012;379:1739-1748. Doi: 10.1016/S0140-6736(12)60272-4-DOI-Pubmed
[31]. Zhou WJ, Zhang YY, Li H, Wu YF, Xu J, Lv S, et al. Five- year progression of Refractive errors and incidence of myopia in school-aged children in Western China. J Epidemiol.. 2016;26:386-395 DOI: 10. 2188/jea. JE20140258- DOI- PMC- Pubmed



MYOPIC EYEBALL

NORMAL EYEBALL