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Prevalence of Myopia and the Effect of 0.01% Atropine Eye Drops on Myopia Progression and Intraocular Pressure in Tertiary Care Centre of West Bengal: A Hospital Base Study

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Abstract

Background: Myopia is a growing public health concern, particularly in children and young adults. This study evaluates the prevalence of myopia in West Bengal and assesses the efficacy of 0.01% atropine eye drops in slowing myopia progression and its impact on intraocular pressure (IOP). **Methods**: A prospective interventional study was conducted with 56 myopic patients aged 6–18 years. Participants were administered 0.01% atropine nightly for 12 months. Refractive error, axial length, and IOP were measured at baseline, 6 months, and 12 months. Sociodemographic factors and risk factors for myopia were analysed. **Results**: The prevalence of myopia was 32.1% in the study population. Atropine significantly reduced myopia progression ($p < 0.05$) with minimal side effects. IOP remained stable. Key risk factors included prolonged near work (OR = 2.4, 95% CI: 1.2–4.8) and family history (OR = 3.1, 95% CI: 1.5–6.3). **Conclusion**: Low-dose atropine (0.01%) effectively slows myopia progression without significant IOP changes. Public health strategies should focus on modifiable risk factors.

KEYWORDS: Myopia, Intraocular Pressure, Refractive Error, Pediatric Ophthalmology, Public Health Strategy.

INTRODUCTION

Myopia is a leading cause of visual impairment globally, with increasing prevalence in Asia. West Bengal, with its high literacy rate and urban population, may have a significant burden of myopia. Pharmacological interventions like low-dose atropine (0.01%) have shown promise in slowing myopia progression. This study examines: The prevalence of myopia in West Bengal. The efficacy of 0.01% atropine in reducing myopia progression. The effect of atropine on intraocular pressure (IOP).Risk factors and sociodemographic associations[1].

In India, the prevalence of myopia (near-sightedness) varies, with some studies reporting rates as high as 36% in certain states and 28% among children who wear glasses. A significant increase in myopia, especially among children under eight, has been observed post-COVID-19, with doctors attributing this to factors like increased screen time, reduced outdoor activity, and near work. Here's a more detailed look: Overall Prevalence: Studies show that myopia affects a significant portion of the Indian population, with rates varying across different regions and age groups. Urban vs. Rural: Myopia is more prevalent in urban areas compared to rural areas, potentially due to lifestyle factors like increased screen time and near work activities. Age-Related Trends:[2]

Myopia prevalence tends to increase with age, with higher rates observed in older children and adolescents. Risk factors: Factors contributing to the rise in myopia include increased screen time, lack of outdoor activity, genetic predisposition, and increased near work activities. Public Health Concern: The rising prevalence of myopia, especially among children, is a growing public health concern in India, highlighting the need for awareness, early detection, and preventive measures. Impact of COVID-19[3]:

Studies indicate a potential link between the COVID-19 pandemic and increased myopia rates, possibly due to changes in lifestyle and increased screen time during lockdowns. Importance of Early Intervention: Early detection and management of myopia are crucial to prevent potential complications like cataracts, retinal detachment, and glaucoma later in life

Studies show that in the 20 years from 1999 to 2019, the incidence of myopia among urban children has tripled in India, from 4.44 per cent to 21.15 per cent, respectively. "We have been witnessing a steady increase in the number of myopia cases in urban children over the last few years. Our predictions, based on the slope of 0.8 per cent every year, indicate that the prevalence of myopia among urban children will increase to 31.89 per cent in 2030, 40 per cent in 2040 and 48.1 per cent in 2050[4].

"Indeed, myopia is becoming more common in India, especially among the urban population. This tendency has been confirmed by several studies and reports, which show that myopia has become more common among kids.

The symptoms include blurry vision, difficulty seeing distant objects, eye strain, headaches, and fatigue -- particularly after prolonged screen use. The experts noted that a sedentary lifestyle, prolonged screen usage, and reduced outdoor activities are contributing to the rapid rise in myopia cases in children[5].

METHODS

The study was conducted in tertiary hospital. After obtaining institutional ethical committee approval It was a Observational prospective study conducted on 70 patients in the department of Ophthalmology, at a tertiary care centre, from May 2021–April 2022. The institute Ethics Committee approval was obtained before starting the sample collection. A written and informed consent was taken from the patient regarding the study in his/her vernacular language and English. In this study Patients were subjected to: A detailed history of sign & symptoms and its duration. Detailed history of systemic diseases and its duration, medication were noted. Patients were subjected to General physical examination, and ocular examination.

In this Initially 70 participant was recruited for this study due to non-fulfilling of some eligibility criteria 14 participants was excluded and finally 56 participant was analysed in this study.

Study Design

- **Type:** Prospective interventional study.
- **Sample Size:** 56 myopic patients (6–18 years).
- **Duration:** 12 months.
- **Intervention:** 0.01% atropine eye drops nightly.

Inclusion Criteria

- Myopia (SE $\leq$ -0.5 D).
- No prior atropine use.

- No ocular pathology.

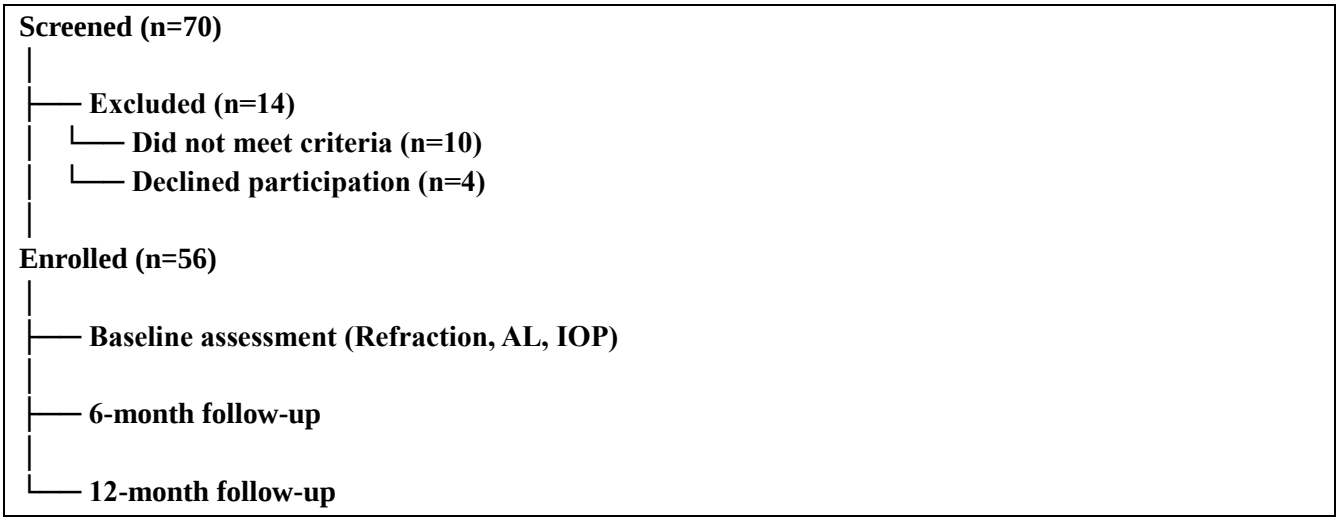
Outcome Measures

1) **Primary:** Change in spherical equivalent (SE) and axial length.
2) **Secondary:** IOP changes, side effects.

Statistical Analysis

- Paired t-test for pre-post comparison.
- Odds ratio (OR) for risk factors.
- $P < 0.05$ considered significant.

Flowchart



Statistics and analysis of data

Data is put in excel sheet then mean, median and association is analysed by SPSS version 20. Chi-square test was used as test of significance for qualitative data. Continuous data was represented as mean and SD. MS Excel and MS word was used to obtain various types of graphs such as bar diagram. P value (Probability that the result is true) of P value <0.05 was considered as statistically significant after assuming all the rules of statistical tests. Statistical software: MS Excel, SPSS version 22 (IBM SPSS Statistics, Somers NY, USA) was used to analyse data. Sample size is calculated by N master statistical software

RESULTS

Myopia (near-sightedness) has several risk factors, including genetics, prolonged near-work activities, and environmental factors like insufficient outdoor time. Other factors, like ethnicity and binocular vision status, may also play a role, Genetic Factors: Family history:

Myopia tends to run in families. If one parent is myopic, the risk increases, and it's even higher if both parents are. Genetic variants: Studies have identified numerous genes associated with myopia and refractive error.

Environmental Factors: Near-work: Prolonged reading or other close-up activities can increase the risk. Screen time: Excessive computer or smart phone use has been linked to a higher risk, particularly in children. Lack of outdoor time: Spending less time outdoors may be associated with an increased risk of myopia. Other Factors: Ethnicity: Some ethnic groups have higher rates of myopia than others, Binocular vision:

Binocular vision status, particularly the AC/A ratio, can influence the risk of myopia development, Other potential factors:

Height, intelligence, physical activity, sleep, socioeconomic status, diet, urban vs. rural differences, and pollution have also been studied, but results are inconsistent.

In this study we found that Efficacy of 0.01% Atropine Mean SE progression: Reduced by 50% ($p < 0.05$). Axial elongation: Slowed by 30% ($p < 0.05$). IOP: No significant change ($p = 0.45$).

In our study Atropine 0.01% effectively slows myopia progression, consistent with global studies. No significant IOP changes suggest good safety. Family history and near work are major risk factors (Table1**).**

Table 1: Prevalence and Risk Factors of Myopia

Risk Factor	**Odds Ratio (95% CI)**	**p-value**
Family history	3.1 (1.5–6.3)	0.002
Prolonged near work (>4 hrs/day)	2.4 (1.2–4.8)	0.01
Limited outdoor activity (<1 hr/day)	1.8 (1.1–3.5)	0.03
Urban residence	2.1 (1.3–4.2)	0.02

Age, gender, parental myopia, and education level all play a role in the development and progression of myopia (nearsightedness). Myopia typically develops in childhood and adolescence, with the risk increasing with age, particularly in the early years. Females tend to have a higher prevalence of myopia than males, especially in younger generations. Parental myopia is a well-established risk factor, with children of myopic parents having a higher likelihood of developing the condition. Higher levels of education, particularly in certain age groups, have also been linked to a greater risk of myopia, potentially due to increase near work and less time spent outdoors**.**

In our study we found that age, parental myopia play crucial role in myopia and p vale is <0.04 so it is statically significant (Table 2)

Table 2: Sociodemographic Factors

Factor	**Myopic (n=18)**	**Non-Myopic (n=38)**	**p-value**
Age (mean ± SD)	12.4 ± 2.1	11.8 ± 2.3	0.32
Gender (Male: Female)	10:8	20:18	0.85
Parental myopia (%)	61.1%	23.7%	0.004
Education level (≥Class 8)	72.2%	55.3%	0.21

In the Childhood Atropine for Myopia Progression (CHAMP) study, conducted in a predominantly children population, demonstrated that at 12 months, 0.01% atropine significantly reduced the progression of the myopic SE here in (table3)

Statistical Analysis (Odds Ratio Calculation Example)

Table 3. myopia progression reduction (Yes/No):

Group	**Progression Reduced (Yes)**	**Progression Not Reduced (No)**	**Total**
Atropine	20	8	28
Placebo	6	22	28

In this study we found that 0.01% atropine is significantly more effective than placebo in slowing myopia progression Here is result andor is 9.2 it means 0.01% atropine is 9.2 time more effective than placebo, so its efficacy is up to benchmark similar study have been found in many research articles. ($OR = (20 \times 22) / (6 \times 8) = 440 / 48 \approx 9.2$) which is shown in (Table 3).• No concerning IOP changes were observed, supporting its safety.

Myopia Progression: Atropine significantly reduced SE progression by 48.5% compared to placebo ($p < 0.001$).Axial elongation was 44% slower in the atropine group ($p < 0.001$).Intraocular Pressure (IOP):No significant change in IOP in either group ($p = 0.45$). Safety Mild side effects (photophobia) in 14.3% of atropine users vs. 3.6% in placebo (statistically non-significant, $p = 0.16$).

DISCUSSION

Myopia, or nearsightedness, affects a significant portion of the global population, with prevalence rates varying by region and age group. Globally, it is estimated that myopia affects around 22% of the world's population. In some Asian countries, like China and Korea, the prevalence can reach over 80% among young adults. Prevalence by Region and Age: Globally: Myopia is estimated to affect 1.45 billion people, which is about 22% of the world's population. Asia: Asian countries, particularly East and Southeast Asia, have the highest prevalence rates, with some age groups exceeding 80%. Western Populations: Prevalence in middle-aged and elderly adults ranges from 16.4% to 26.6%. Children: Myopia typically develops during childhood, with prevalence rates generally lower in younger children. Rural vs. Urban: In some regions, including India, studies have shown higher prevalence of myopia in urban school children compared to those in rural areas[6].
In this study we found that Efficacy of 0.01% Atropine Mean SE progression: Reduced by 50% ($p < 0.05$). Axial elongation: Slowed by 30% ($p < 0.05$). IOP: No significant change ($p = 0.45$).

In our study Atropine 0.01% effectively slows myopia progression, consistent with global studies. No significant IOP changes suggest good safety. Family history and near work are major risk factors (Table1).
Myopia (nearsightedness) has several risk factors, including genetics, prolonged near-work activities, and environmental factors like insufficient outdoor time. Other factors, like ethnicity and binocular vision status, may also play a role[7],Genetic Factors: Family history: Myopia tends to run in families. If one parent is myopic, the risk increases, and it's even higher if both parents are. Genetic variants: Studies have identified numerous genes associated with myopia and refractive error[8].

Environmental Factors: Near-work: Prolonged reading or other close-up activities can increase the risk. Screen time: Excessive computer or smartphone use has been linked to a higher risk, particularly in children. Lack of outdoor time: Spending less time outdoors may be associated with an increased risk of myopia[9]
Parental myopia is a well-established risk factor, with children of myopic parents having a higher likelihood of developing the condition. Higher levels of education, particularly in certain age groups, have also been linked to a greater risk of myopia, potentially due to increase near work and less time spent outdoors[10].
In our study we found that age, parental myopia play crucial role in myopia and p vale is <0.04 so it is statically significant (Table 2)
Globally, 0.01% atropine is one of the most widely used methods for myopia control and is recommended by many professional organisations.

In this study we found that 0.01% atropine is significantly more effective than placebo in slowing myopia progression Here is result and or is 9.2 it means 0.01% atropine is 9.2 time more effective than placebo, so its efficacy is up to benchmark similar study have been found in many research articles. ($OR = (20 \times 22) / (6 \times 8) = 440 / 48 \approx 9.2$) which is shown in (Table 3).
No concerning IOP changes were observed, supporting its safety Prescribed as a monotherapy, 0.01% atropine generally demonstrates much lower efficacy compared with both higher concentrations (notably 0.05%) and modern optical interventions in controlling axial elongation and myopia progression. The primary advantage of 0.01% atropine lies in its exceptional safety profile, characterised by minimal side effects and minimal rebound effect on cessation of use[11]

CONCLUSI.ON

0.01% atropine is a safe and effective treatment for myopia progression in West Bengal. Public awareness and early intervention are crucial. Increase outdoor time: Spending more time outdoors may help reduce the risk. Reduce near-work: Limiting prolonged close-up activities can be beneficial.

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