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Original Research Article

Slowing the progression of myopia in children: An insights from 0.01% low-dose atropine treatment

Vivek S Naik[1], Bharat Kumar Bhayal[1], Nitesh Pradhan[1]*

[1]Dept. of Ophthalmology, Goa Medical College, Bambolim, Goa, India

Abstract

Background: Myopia, a prevalent refractive disorder characterized by progressive axial elongation, poses a significant global health concern due to its increasing prevalence and risk of complications like myopic maculopathy, retinal detachment, and blindness. Low-dose atropine (0.01%) has emerged as an effective and safe pharmacological intervention to slow myopia progression in children. This study evaluates its efficacy and safety in controlling refractive error, axial elongation, and central macular thickness.

Materials and Methods: A prospective, descriptive study was conducted from May 2022 to December 2023. Sixty-six children aged 6-15 years with progressive myopia were included. Exclusion criteria comprised systemic illnesses, developmental delays, ocular conditions (e.g., amblyopia, strabismus, cataracts), allergies to atropine, prior ocular surgeries or trauma, and systemic health issues like cardiac or respiratory conditions. Baseline and follow-up assessments at 6, 12, and 18 months included visual acuity, refractive error, axial length, keratometry, and central macular thickness. Statistical analysis was carried out using SPSS version 21, with a significance level of $p<0.05$.

Results: Median spherical equivalent remained stable (-1.88D), with significant reductions in myopia progression at 12 and 18 months ($p=0.043$, $p=0.038$). Axial length changes were not significant ($p>0.05$), but keratometry showed minor significant changes ($p<0.001$). Central macular thickness significantly decreased at 18 months ($p=0.02$). Adverse effects were minimal, with 80.3% reporting no side effects.

Conclusion: Low-dose atropine (0.01%) effectively reduces progression of myopia with a favourable safety profile, though its effect on axial elongation requires longer follow-ups. It remains a viable option for large-scale implementation, particularly in developing countries. Further studies on long-term outcomes are recommended.

Keywords: Myopia, Low-dose atropine, Refractive error, Axial elongation, Myopia control, Children.

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1. Introduction

Myopia, or near-sightedness, has become a major global health concern due to its increasing prevalence and risk of complications such as myopic maculopathy, retinal detachment, glaucoma, and cataract.[1-4] In 2020, 22.9% of the global population was affected, and projections estimate nearly 50% by 2050, with 10% developing high myopia.[2,3,5,6,10,11] The prevalence is particularly high in East and Southeast Asia, reaching up to 90% in urban schoolchildren.[4,6,14] In India, prevalence is expected to rise to 48% in urban areas by 2050, with meta-analyses confirming a consistent increase among schoolchildren over the last four decades.[7-9] This trend poses significant challenges in rural and underserved areas where limited eye-care access can affect education and productivity.[1]

Both genetic and environmental factors contribute to myopia development. Children with myopic parents are at greater risk, while lifestyle factors such as prolonged near work, excessive screen time, and reduced outdoor activity are strongly implicated.[10-14] Among the various interventions explored, low-dose atropine eye drops have emerged as one of the most effective and practical options.[3,4,7,15,16]

*Corresponding author: Nitesh Pradhan
Email: sasa.76044@gmail.com

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Atropine, a nonselective muscarinic antagonist, is believed to slow axial elongation, though the exact mechanism is not fully understood. Landmark clinical trials, including ATOM2 and the LAMP series, demonstrated that 0.01% atropine reduced myopia progression by 50–60% with minimal side effects.[3,4,7,17] Its favorable safety profile and low cost make it especially relevant for public health programs in developing countries. The Indian National Consensus Guidelines[1,19] now endorse low-dose atropine as part of school-based screening and prevention strategies. Meta-analyses also confirm its efficacy and tolerability.[18]

2. Materials and Methods

2.1. Study design

This prospective, descriptive, experimental study evaluated the effect of 0.01% atropine eye drops on the progression of myopia in children.

2.2. Sample size and sampling technique

Participants were enrolled using a purposive convenience sampling method. The sample size was determined based on the following formula:

$$\text{Sample size} = 4 \times (\text{SD})^2 / \text{mean} \times \text{precision}$$

Where:

1. Standard deviation (SD) = 0.6 from previous study[15]
2. Mean = 0.49 from previous study
3. Precision = 0.3 from previous study

A total of 66 children presenting to the ophthalmology outpatient department (OPD) were included in the study.

2.3. Study population

The study population comprised 66 children aged between 6 -15 years.

2.4. Inclusion criteria

Children between the ages of 6 and 15 years diagnosed with myopia or myopic astigmatism were included in the study after obtaining informed consent from their parents or guardians. Enrolment required documented progression of myopia, defined as at least −0.50 D increase in spherical equivalent refraction over the preceding 12 months based on prior clinical records.

2.5. Exclusion criteria

Children with congenital or developmental delays, systemic diseases, or those unable to complete a full ophthalmic evaluation were excluded from the study. Exclusion also applied to those with eye conditions like amblyopia, strabismus, cataracts, or known hypersensitivity to atropine, as well as those with systemic conditions such as cardiac or respiratory disorders. Additionally, children with a history of ocular surgery, eye injury, premature birth, or a family history of high or pathological myopia were not considered for inclusion.

2.6. Ethical considerations

The study protocol was approved and all procedures adhered to the Declaration of Helsinki guidelines for research involving human subjects. Written informed consent was obtained from parents or guardians, and verbal assent was secured from participating children. Confidentiality was maintained by assigning unique research numbers to participants. Participants were allowed to withdraw from the study at any time.

2.7. Methodology

A comprehensive baseline eye examination was conducted for each participant. This included visual acuity testing using the Appasamy associates LCD display Log MAR visual acuity chart (I Chart HD Smart 3934157), objective refraction and keratometry using Topcon autokerato-Refractometer KR 800, and subjective refraction following standard protocols. Axial length measurements were obtained using contact Haag streit diagnostics A-scan optical biometry LS 900, and central macular thickness was measured using Carl Zeiss Cirrus HD OCT Model 5000 optical coherence tomography (OCT). The spherical equivalent (SE) is a simplified representation of refractive errors, calculated using the formula: SE = Sphere + (1/2 cylinder). This involves adding half of the cylinder value, which represents astigmatism, to the sphere value, which indicates either near sightedness or farsightedness.

These baseline assessments provided essential data for monitoring the progression of myopia over the course of the study.

After the initial baseline assessment, all participating children were prescribed 0.01% atropine eye drops, with instructions to administer one drop in each eye every night. The main objective was to evaluate the impact of low-dose atropine on the progression of myopia by monitoring changes in refractive error, axial length, and central macular thickness over time.

Follow-up assessments were scheduled at 6, 12, and 18 months. At each visit, the same evaluations were repeated, including visual acuity testing, both objective and subjective refraction, axial length measurements, and central macular thickness assessments. Additionally, the study evaluated how well parents and children accepted the treatment, their adherence to the dosage instructions, and any disruptions to their daily routines. Any adverse effects, particularly systemic side effects, were carefully monitored and recorded. Children who experienced significant side effects or opted to discontinue the medication were withdrawn from the study to ensure their safety.

All collected data—such as spherical equivalent refractions, keratometry values, and axial length measurements—were entered into Microsoft Excel. Statistical analysis was performed using SPSS Version 21.0 (IBM Corp., United States). Descriptive statistics, including minimum, maximum, mean, frequency, and percentage, were used to summarize the data. A 95% confidence interval was applied to assess the statistical significance of the findings, with a p-value of less than 0.05 considered statistically significant. To illustrate the results clearly, pie charts and bar graphs were employed to showcase key measurements and trends observed throughout the study.

3. Result

The study included a total of 66 children. Although demographic analysis focused on age and gender distribution, all subsequent measurements and evaluations were performed on each eye individually, leading to a total of 132 eyes being analysed in detail.

Table 1: Age distribution of the study participants

Age in years at the time of first enrolment (N = 66)			
Minimum	**Maximum**	**Mean**	**Standard Deviation**
7	15	11.27	2.31

The ages of the participants spanned from 7 to 15 years, with the youngest participant being 7 and the oldest 15. The mean age of the study group was 11.27 years, with a standard deviation of ±2.31 years. (**Table 1**)

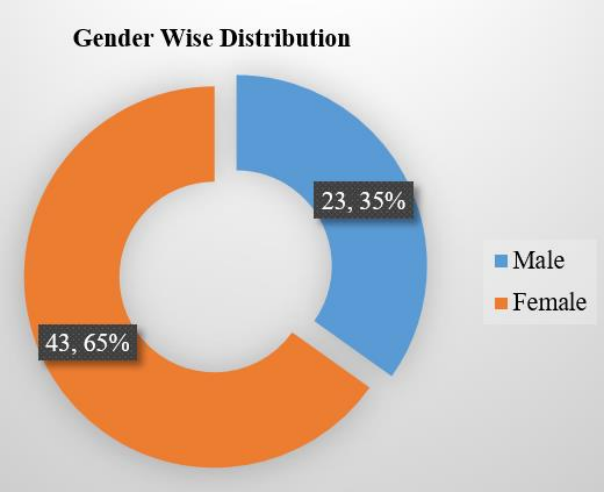

Figure 1: Gender distribution of the study participants (N = 66)

The gender distribution of the study participants revealed that 23 males (35%) and 43 females (65%) were included in the study shown in **Figure 1**.

The **Table 2** presents a descriptive summary of baseline ocular parameter measurements, along with follow-up data collected at 6, 12, and 18 months. The assessed parameters include refractive error (expressed as spherical equivalent), corneal curvature (evaluated using keratometric readings), axial length, and central macular thickness. A total of 132 eyes from 66 participants were evaluated at the initial visit and at each follow-up interval. The analysis revealed that the data did not follow a normal distribution, an important consideration for any further statistical comparisons.

Table 2: Overview of initial measurements and follow-up evaluations at 6, 12, and 18 months for study participants (N = 132 Eyes)

		Mean	Median	Standard Deviation	Skewness	Kurtosis
SE (Spherical Equivalent)	Baseline	-2.78	-1.87	2.45	-1.57	2.37
	6 Months	-2.78	-1.82	2.45	-1.57	2.38
	12 Months	-2.78	-1.87	2.46	-1.58	2.45
	18 Months	-2.78	-1.87	2.45	-1.57	2.39
Average Keratometric Readings	Baseline	43.96	43.88	1.41	0.153	0.168
	6 Months	43.99	44.00	1.40	-0.161	-0.127
	12 Months	44.00	44.00	1.39	-0.169	-0.100
	18 Months	44.01	44.00	1.39	-0.148	-0.126
AL (Axial Length)	Baseline	24.26	24.02	1.34	0.89	1.00
	6 Months	24.26	24.02	1.34	0.89	1.00
	12 Months	24.26	24.02	1.34	0.89	1.00
	18 Months	24.26	24.02	1.34	0.89	1.00
CMT (Central Macular Thickness)	Baseline	244.62	244.00	6.92	0.039	-0.93
	6 Months	244.59	244.00	6.83	0.034	-0.93
	12 Months	244.56	244.00	6.81	0.035	-0.93
	18 Months	244.51	244.00	6.80	0.030	-0.931

The data indicates minimal changes in the mean and median values over the 18-month period, with the mean consistently around -2.78 and the median remaining at -1.88 across all time points.(**Table 3**) The standard deviation shows little variation, suggesting stability in the data. Statistically, the Z-values for 6 months (-1.08) indicate a very slight difference, while the Z-values for 12 months (-2.02) and 18 months (-2.07) show more substantial changes. The p-values are 0.279 for 6 months (not significant), but 0.043 and 0.038 p value for 12 and 18 months, respectively, indicating significant changes at these later time points as also shown in **Figure 2**.

The data shows no significant changes from baseline to 6, 12, and 18 months. (**Table 4**) The mean remains constant at 24.26, and the median stays at 24.02 across all time points, indicating stability. The standard deviation is consistent at 1.34052, suggesting stable variability. The Z-values range from -1.41 at 6 months to -1.00 at 12 and 18 months, with corresponding P-values of 0.15 for 6 months and 0.31 for 12 and 18 months, all above the 0.05 significance threshold. These results indicate that the observed differences are not statistically significant, suggesting no meaningful change over time.

Table 3: Comparison of spherical equivalent between baseline and follow-up at 6, 12, and 18 months using the Wilcoxon signed-rank test

	N	Mean	Median	Std. Deviation	Z value	p-value
Baseline- 6 Months	132	-2.78	-1.88	2.45	-1.08	0.279
		-2.78	-1.83	2.46		
Baseline- 12 Months	132	-2.78	-1.88	2.45	-2.02	0.043
		-2.79	-1.88	2.46		
Baseline- 18 Months	132	-2.78	-1.88	2.45	-2.07	0.038
		-2.78	-1.88	2.46		

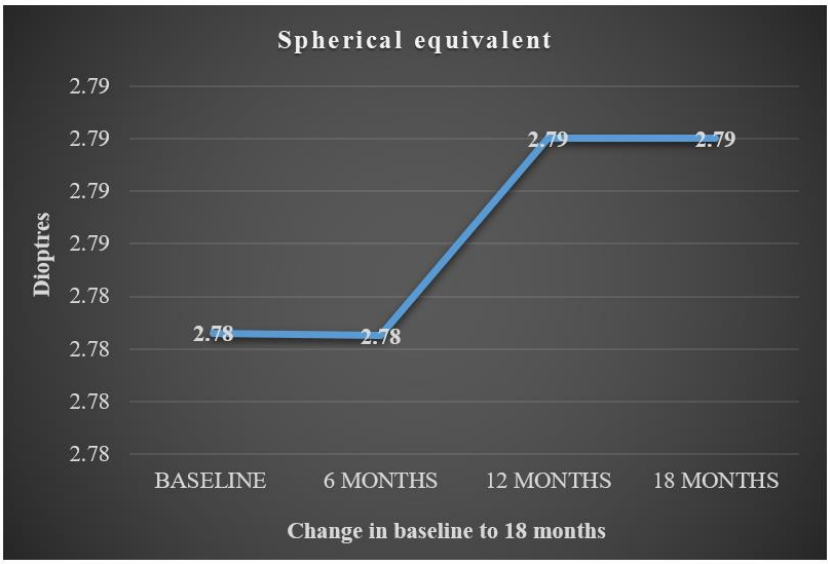

Figure 2: Changes in spherical equivalent baseline to 18 months

Table 4: Axial length comparison between baseline and follow-up at 6, 12, and 18 months using the Wilcoxon test

	N	Mean	Median	Std. Deviation	Z Value	p-value
Baseline- 6 Months	132	24.26	24.02	1.34052	-1.41	0.15
		24.26	24.02	1.34054		
Baseline- 12 Months	132	24.26	24.02	1.34052	-1.00	0.31
		24.26	24.02	1.34012		
Baseline- 18 Months	132	24.26	24.02	1.34052	-1.00	0.31
		24.26	24.02	1.34462		

Over the 18-month period, the data reveals a gradual increase in the measured variable. (**Table 5**) The mean starts at 43.96 at baseline, rising slightly to 43.99 at 6 months, 44.00 at 12 months, and 44.01 at 18 months. Similarly, the median shifts from 43.88 at baseline to 44.00 at all subsequent time points. The standard deviation remains consistent, around 1.41 at baseline and 1.39 at later time points, indicating stable variability. The Z-values show statistically significant differences between baseline and each time point: -4.579 at 6 months, -4.786 at 12 months, and -5.65 at 18 months, with the largest difference observed at 18 months. P-values for all comparisons are <0.001, confirming that the changes are statistically significant, suggesting the observed differences are meaningful and not due to chance as also shown in **Figure 3**.

The data shows a slight decrease in the mean from 244.62 at baseline to 244.51 at 18 months. (**Table 6**) The median remains constant at 244.00 across all time points. The standard deviation also decreases slightly over time. The Z-values indicate small differences between baseline and 6 months (-1.31) and 12 months (-1.77), with a more significant difference at 18 months (-2.32). The P-values are not statistically significant for 6 months (0.190) and 12 months (0.075), but the difference at 18 months (0.02) is statistically significant. This suggests a meaningful change by 18 months, but no significant differences at 6 or 12 months.

Table 5: Comparison of average keratometric readings between baseline with at 6 months, 12 Months and 18 Months using Wilcoxon test

	N	Mean	Median	Std. Deviation	Z value	p-value
Baseline- 6 Months	132	43.96	43.88	1.41	-4.579	<0.001
		43.99	44.00	1.40		
Baseline- 12 Months	132	43.96	43.88	1.41	-4.786	<0.001
		44.00	44.00	1.39		
Baseline- 18 Months	132	43.96	43.88	1.41	-5.65	<0.001
		44.01	44.00	1.39		

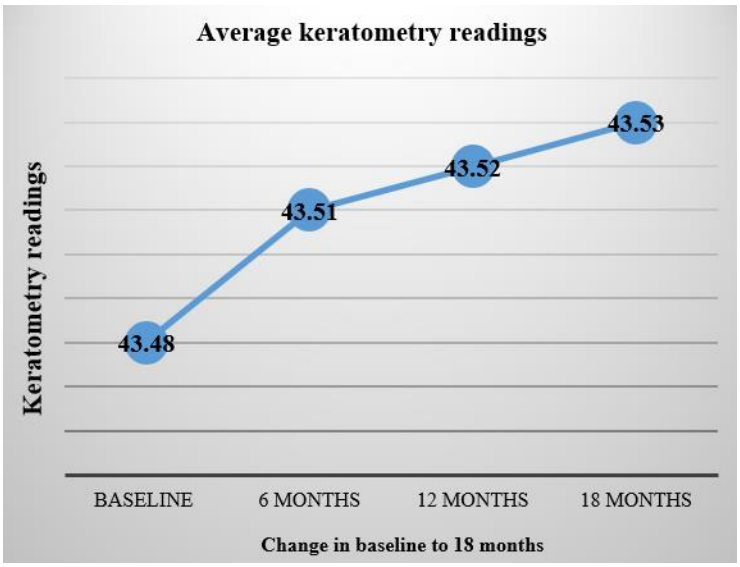

Figure 3: Changes in average keratometry readings from baseline to 18 months

Table 6: Comparison of central macular thickness changes from baseline to 6, 12, and 18 months using the Wilcoxon test

	N	Mean	Median	Std. Deviation	Z value	p-value
Baseline- 6 Months	132	244.62	244.00	6.92	-1.31	0.190
		244.59	244.00	6.83		
Baseline- 12 Months	132	244.62	244.00	6.92	-1.77	0.075
		244.56	244.00	6.81		
Baseline- 18 Months	132	244.62	244.00	6.92	-2.32	0.02
		244.51	244.00	6.80		

Table 7: Reported adverse effects of low-dose atropine treatment

Adverse Effect	Number of Eyes (132)	Percentage (%)
Mild irritation	5	3.8%
Difficulty focusing near objects	4	3.0%
Color halos	3	2.3%
Eye redness	2	1.5%
Dry eyes	2	1.5%
Sensitivity to light	3	2.3%
Blurred vision	4	3.0%
Dilated pupils	1	0.8%
Headaches	2	1.5%
Tingling or discomfort in eyes	1	0.8%
No Side Effects	106	80.3%

The **Table 7** summarizes the adverse effects observed in 132 eyes treated with low-dose atropine. The treatment was generally well-tolerated, with the majority—106 eyes (80.3%)—reporting no side effects. Among those that did experience side effects, mild irritation was the most frequently reported, occurring in 5 eyes (3.8%). Difficulty with near vision and blurred vision were each noted in 4 eyes (3.0%). Other less common side effects included color halos, light sensitivity, and headaches, each affecting 3 eyes (2.3% and 1.5%, respectively). Eye redness and dryness were reported in 2 eyes each (1.5%), while dilated pupils and a tingling or uncomfortable sensation in the eyes were the least reported, each noted in just 1 eye (0.8%). Overall, these findings indicate that low-dose atropine is associated with minimal and mostly mild adverse effects, with the vast majority of eyes showing no negative reactions.

4. Discussion

In this study, the effects of 0.01% atropine on myopia progression were assessed over 18 months. (**Table 8**) The median spherical equivalent remained stable at -1.87D, with statistically significant reductions in progression observed during the 2nd and 3rd follow-ups (p=0.043, 0.038), consistent with findings from the ATOM II study and the LAMP study, which demonstrated similar effects in reducing myopia progression.[3,4] The LAMP study further highlighted that 0.01% atropine reduced progression by -0.59D per year compared to -0.27D per year for a 0.05% dose, suggesting that while higher concentrations exhibit faster effects, 0.01% remains safer for long-term use.[4] Furthermore, meta-analyses such as those by Yam et al. support these findings, showing significant reductions in myopia progression using low-dose atropine.[7]

Regarding axial length, no significant reduction was found during the 18-month study period (p=0.15, 0.31, 0.31). However, the ATOM II study showed significant axial elongation control with longer durations (2 years) of 0.01% atropine use ($p<0.05$).[3] Similarly, the LAMP study observed that 0.05% atropine had slightly better control of axial elongation than 0.01%, suggesting that dose optimization may improve outcomes based on the severity of myopia.[4] Further noted that longer durations of treatment significantly reduce axial elongation compared to shorter durations. These findings suggest that while 0.01% atropine has some impact on axial elongation, longer treatment periods are necessary to observe stronger effects.

Central macular thickness changes were statistically significant only during the 3rd follow-up (p=0.02), mainly among individuals with higher myopia (> -6.00D). This finding suggests that further studies are required to better assess the effects of low-dose atropine on central macular thickness over time. Limited data on this parameter exist in other studies, which highlights a need for additional research.[4]

Table 8: Comparison table summarizes the impact of low-dose atropine (0.01%) on myopia progression observed in the current study and contrasts these results with findings from previous research

Parameter	Findings in Current Study	Findings in Other Studies	Remarks
Spherical Equivalent	Median spherical equivalent remained stable at -1.88D; statistically significant reduction in progression during 2nd and 3rd follow-ups (p=0.043, 0.038).	- ATOM II: 0.01% dose reduced progression by -0.30D/year[3] - LAMP Study (2019): 0.01% reduced progression by -0.59D/year compared to -0.27D/year with 0.05% dose[4] - Yam et al.: Meta-analysis confirmed significant reductions in myopia progression using 0.01% atropine[7]	Effectiveness in reducing progression aligns with findings from ATOM II and LAMP. Reinforces that while higher concentrations show faster effects, 0.01% is safer for long-term use. Consistent with global evidence.

Table 8 Continued…

Axial Length	No significant reduction in axial elongation over 18 months (p=0.15, 0.31, 0.31). Greater effect expected with longer durations (>18 months).	- ATOM II: Significant reduction in axial elongation with 0.01% atropine over 2 years ($p<0.05$)[3] - LAMP Study (2019): 0.05% atropine showed better control of axial elongation (0.19 mm/year vs. 0.21 mm/year with 0.01%)[4] –Zhou et al.: Meta-analysis showed 0.01% atropine reduces axial elongation significantly over 2–3 years	Short study duration limits axial length outcomes compared to longer trials. Suggests potential for dose optimization based on severity of myopia. Longer durations of 0.01% atropine treatment show better effects.
Central Macular Thickness	Significant changes observed only in the 3rd follow-up (p=0.02), mainly in high myopia cases (> -6.00D).	Limited direct data on macular thickness effects in most studies.	Suggests further research is needed to explore the effect of atropine on macular thickness.
Keratometric Readings	Minor changes (<0.25D in any meridian), statistically significant but likely unrelated to atropine (p=0.003, 0.001, 0.001).	- ATOM II (2012) and LAMP (2019): No significant Keratometric changes reported[3,4]	Changes in K-readings are unlikely related to atropine treatment.
Side Effects	Mild irritation (3.8%) was the most common side effect, followed by blurred vision and difficulty focusing (3.0%). Other effects included halos, light sensitivity, and headaches (up to 2.3%), while eye redness and dry eyes were seen in 1.5%. Dilated pupils and tingling were rare (0.8%), and no side effects were reported in 80.3% of cases.	- ATOM II: Minimal side effects with 0.01% atropine compared to higher doses[3] - Gong et al. Meta-analysis showed low incidence of side effects at 0.01% atropine[18]	Confirms 0.01% atropine as a safe treatment option. Low-dose atropine is safer and better tolerated compared to higher doses.

Keratometric readings showed only minor changes (<0.25D) in any meridian, with statistically significant values (p=0.003, 0.001, 0.001). However, these changes were likely unrelated to atropine's effects and align with other studies like ATOM II and LAMP, which reported no significant keratometric effects.[3,4] This supports the conclusion that these changes are likely incidental rather than treatment-induced.

Side effects associated with low-dose atropine were minimal, with the most common being mild irritation (3.8%) followed by blurred vision and difficulty focusing (3.0%).Other side effects, such as halos, light sensitivity, and headaches, were reported at rates of up to 2.3%, while redness and dry eyes were noted in 1.5%. Very few side effects, including dilated pupils and tingling, were reported (0.8%). No side effects were observed in 80.3% of cases. These findings align with the ATOM II study, which found minimal side effects with 0.01% atropine compared to higher doses.[3] Gong et al. also confirmed that the incidence of side effects was low and that 0.01% atropine remains a safe, well-tolerated treatment option for controlling myopia progression.[18]

4.1. Advantages of long-term low-dose atropine use on the ocular surface

Long-term use of low-dose atropine (0.01%) has shown a high level of safety and tolerability, particularly when used for controlling the progression of myopia in children. According to the data, 80.3% of users experienced no side effects, indicating that the vast majority tolerated the medication well. The most commonly reported side effect was mild irritation (3.8%), which is generally not severe and tends to resolve on its own.

In addition, blurred vision and difficulty focusing were reported in 3.0% of cases, while other mild effects such as halos, light sensitivity, and headaches occurred in up to 2.3% of users. Redness and dry eyes, which directly relate to the ocular surface, were noted in only 1.5% of cases, suggesting that the impact on the ocular surface is minimal. These findings are consistent with major clinical trials such as the ATOM II study, which demonstrated that 0.01% atropine has fewer side effects compared to higher doses. Similarly, Gong et al. confirmed that the incidence of side effects is low, and that this treatment is safe and well-tolerated over long-term use.[18]

4.2. Disadvantages of long-term low-dose atropine use on the ocular surface

Despite its overall safety, some mild ocular surface-related symptoms have been observed with long-term use. A small percentage of users reported mild irritation, dryness, and redness—these symptoms, though uncommon (around 5.3% combined), can still affect comfort, especially with chronic use. Additionally, a minority of patients experienced visual disturbances, such as blurred vision, focusing difficulties, halos, and increased light sensitivity. These may be related to pupil dilation, a known pharmacological effect of atropine, even at low concentrations.

Furthermore, individual sensitivity to the medication or its preservatives (such as benzalkonium chloride) can result in symptoms like headache or tingling, reported in approximately 0.8% of cases. While these effects are rare, they must be considered in long-term therapy. Another important consideration is the risk of myopia rebound if atropine is stopped suddenly without proper medical supervision.

Based on available evidence, including the data provided and findings from studies like ATOM II[3] and Gong et al. low-dose atropine (0.01%) is a safe and effective option for long-term use, with minimal impact on the ocular surface in most cases.[18] Although a small number of patients may experience mild side effects, these are generally manageable and do not outweigh the benefits of myopia control. Therefore, it is safe to try under the supervision of an eye care professional, with regular follow-up to ensure proper response and management of any rare side effects.

This study demonstrates that 0.01% atropine effectively slows the progression of myopia, particularly in terms of spherical equivalent changes, though its effects on axial length are limited within an 18-month window. It has minimal side effects and demonstrates long-term safety, supporting its use as a safe and effective treatment for myopia progression compared to higher concentrations. The findings are supported by previous studies such as ATOM II, LAMP, Yam et al.[4,7] Further studies over longer periods may further clarify the full range of its effects on axial elongation and other parameters.

Low-dose atropine can still be used in children with myopia even when documented progression is not available, because multiple studies have shown its preventive benefit. Large clinical trials such as ATOM2[3] and LAMP[4] demonstrated that 0.01% atropine significantly slows myopia progression in school-aged children irrespective of their initial rate of change. In real-world practice, particularly in countries like India, reliable prior records of refraction or axial length are often missing. To address this, the Indian National Consensus Guidelines recommend the use of low-dose atropine as part of school eye health programs, acknowledging that all myopic children are at high risk of future progression. Several Indian studies have also initiated atropine therapy without strict documentation of past progression, reporting favourable outcomes.[19] Therefore, its use is justified not only as a treatment for proven progressive myopia but also as a preventive strategy, especially in high-prevalence and resource-limited settings.

5. Conclusions

The study demonstrates that 0.01% atropine effectively slows the progression of myopia, particularly in terms of the spherical equivalent. However, the short follow-up duration of 18 months limited the ability to observe changes in axial elongation compared to longer studies like ATOM II and LAMP. Despite these limitations, 0.01% atropine proved safe, with only minor, non-severe side effects reported. Changes in central macular thickness were noted primarily in high-myopia cases, and small keratometric changes were statistically significant but biologically negligible. This further supports the efficacy and safety of low-dose atropine as a therapeutic choice for myopia control.

6. Limitations

The study had a few limitations that could impact the findings. First, the 18-month duration of follow-up might not have been sufficient to observe long-term changes in axial elongation. Second, the relatively small sample size of 66 participants may not allow for the findings to be generalized to the broader population. Third, the study primarily involved children from India, raising concerns about ethnic variability in response to treatment, as shown in other studies comparing populations. Fourth, the study used six-month intervals for follow-up assessments, and more frequent monitoring could have provided a finer understanding of the treatment's effect. Lastly, although side effects were rare, the possibility of underreporting in the qualitative assessment cannot be excluded.

7. Source of Funding

No external funding was received for this research

8. Conflict of Interest

No conflicts of interest were declared.

9. Ethical Statement

The study received permission for data collection at Goa Medical College and Hospital and obtained ethical clearance from the Institutional Ethics Committee of Goa Medical College, Bambolim, Goa.

10. Ethical Approval

ECR/83.Inst/GOA/2013/RR-20.

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