

# Myopia management attitudes in children in clinical practice, towards an innovative and environmental study in Morocco

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**Abstract.** Myopia is a global public health problem due to its increasing prevalence. Thus, there is growing interest in its early prevention. However, there is a lack of information on the interventions adopted by visual health professionals in Morocco for the management of myopia in children. This study aims to assess their knowledge and raise their awareness of the impact of environmental factors likely to influence the risk of myopia progression. To achieve these objectives, an online survey was distributed to eye care specialists across the country, including a questionnaire assessing their mastery of the different methods available for treating myopia, their level of concern about its development in children, and their opinion on the impact of environmental factors on its onset and growth. The results indicate that most of the professionals consulted are concerned about this pandemic. However, they currently only offer single vision lenses and soft contact lenses, indicating the need for professional training aimed at educating specialists in clinical approaches to myopia management. This would encourage them to adopt alternative solutions for managing myopic children and to pay particular attention to the environmental factors that influence the onset and progression of myopia.

**Index Terms**— Myopia management, Environmental factors, Survey, Orthokeratology, Clinical attitude in Morocco, Prevalence, Clinical practice.

## 1 Introduction

The high prevalence of myopia represents a major public health problem, making it the most frequently encountered refractive error worldwide. Despite advances in the optical, pharmaceutical, and environmental fields, the prevalence of myopia continues to rise [1]. According to several previous studies and WHO's forecasts, around 5 billion people worldwide (or 50% of the global population) will be affected by myopia, by 2050 if current trends continue [2], [3], [4], [5], [6]. It should also be noted that the rate of high myopia is rising even faster than that of myopia, which is a risk factor for associated ocular pathologies

including cataract, staphyloma, glaucoma, retinal detachment, and myopic choroidal neovascularization [7]. This provides strong motivation for scientific research into effective therapies that can reduce its progression and axial elongation, including orthokeratology [8].

The risk factors for myopia are multiple, with both genetic and environmental components. The high rate of myopia indicates that environmental influences such as pollution, urbanization, climate change, proximity to work, and the impact of reduced time spent outdoors play an important role in the progression of myopia in children [9]. It is therefore essential to explore effective strategies to slow down or even halt this progression. For this reason, there is growing interest in early prevention methods, as well as in the clinical attitudes and interventions of Moroccan professionals (ophthalmologists, optometrists, orthoptists, opticians, etc.) to slow the prevalence of myopia in children. Recent studies [10], [11] have reported that there are several management options aimed at delaying the onset of myopia or slowing its progression [12]. These include new lens designs with special geometries, visible cut bifocals with internal base prism (IB) for near vision (NV), peripheral addition lenses, and orthokeratology ... [13]. It has also been found that spending much more time outdoors delays the onset of myopia [14]. There are also pharmaceutical options such as atropine, although several studies have reported that the discontinuation of the treatment cause a risk of reduced accommodation and increased rebound of axial elongation [15], [16], [17].

This study aims to assess the knowledge and attitudes of Moroccan ocular vision specialists towards myopic management in their clinical practice, to develop their views about the effects of optical, pharmacological, and environmental interventions and their effectiveness in the management of myopia in children, and to understand the reasons behind always prescribing single vision lenses and soft contact lenses by most practitioners and the reasons for not adopting other strategies.

Today, there is still a lack of information on the various interventions and techniques currently used by Moroccan visual health professionals, as well as a lack of long-term monitoring of the evolution of myopia in children. Although various methods are effective in controlling this progression, no curative remedy exists to halt the evolution of myopia, especially given the absence of previous work on myopia management strategies and attitudes in clinical practice in Morocco.

The design of our article will be developed as follows: we will describe the methodology adopted and the target population, then proceed to data collection, interpretation, and discussion of the main results obtained from this survey, and end with a perspective conclusion.

## **2 Methodology**

Firstly, a literature search on the various existing interventions was carried out to slow the progression of myopia in children, and also on global trends in attitudes and strategies for its management in the clinical practice of eyecare professionals. Subsequently, a self-administered online cross-sectional study was performed in the form of a questionnaire, written in French, which was developed via the google forms electronic platform for data collection. The questionnaire was distributed via various regional professional bodies to eye specialists (ophthalmologists, opticians; optometrists, orthoptists...and others) in all regions of Morocco. The study took place over a four-month period between February 15 and May 30, 2023.

The elements of the questionnaire were based on a review of other studies [18], [19] that assessed the level of knowledge of eye health and vision specialists, their knowledge and mastery of various strategies available for the management of myopia, their awareness of its increasing prevalence in children, and their opinion with regard to environmental factors. The

participation in the survey was voluntary. The questionnaire contained a preamble explaining the purpose of this study, stating the knowledge on the subject, and specifying its use in an academic context. The types of questions were diversified: short-answer questions, tick-box questions, multiple-choice questions, etc. In order to increase the response and participation rate, a link to the survey was published on various professional groups and pages on WhatsApp and Facebook, and was also sent electronically.

The survey contained 18 questions focusing on the clinical practice and behavior of eye care professionals with regard to the various strategies available for the management of myopia. The participation in the survey was voluntary and anonymous. The first part of the questionnaire served to collecting demographic data on the eye care professionals (gender, region, profession, years of practice, and daily work environment - private, public, or academic practice). The second part of the questionnaire was focused on their level of concern about the growing prevalence of myopia in children, the strategy(ies) adopted in their clinical practice for the control of pediatric myopia, the extent to which this practice is considered active (assessed from not at all to fully active), the minimum age of the patient and the minimum degree of myopia that should be present to consider prescribing the various strategies. The third part consisted in assessing the level of knowledge and mastery of the respondents, especially on the impact and role of environmental factors, such as the reduction in time spent outdoors, on the control of myopia. Finally, the questionnaire concludes with a response on the reasons why the majority of vision care professionals are content to prescribe only single vision spectacles and soft contact lenses for the management of myopia in their clinical practice. Among the reasons preventing them from adopting other options was the high financial cost to patients; insufficient information and knowledge about control options; potential adverse effects; or not believing in their efficacy.

### 3 Data collection and analysis

After data collection, data entry and statistical processing were effected using SPSS software, version 19. Data were described as mean  $\pm$  standard deviation (SD) for continuous variables and proportions for categorical variables. Means were compared using the ANOVA test. To assess statistical significance, a threshold of  $p \leq 0.05$  was used.

The characteristics of the survey population are shown in Table 1. The survey covered a sample of 354 eye health professionals in Morocco.

**Table.1.** Characteristics of study participants (n=354).

	Characteristic	Respondents; n (%)
Sex	Male	208 (58.8)
	Female	146 (41.2)
Profession	Optometrist	178 (50.3)
	Ophthalmologist	44 (12.4)
	Optician	56 (15.8)
	Orthoptist	60 (16.9)
	Other	16 (4.5)
Years in practice	<1	10 (2.8)
	1-5	76 (21.5)
	6-10	78 (22.0)
	11-15	102 (28.8)
	16-20	58 (16.4)
	>20	30 (8.5)
Regions	Marrakech Safi	120 (33.9)
	Beni Mellal Khenifra	85 (24.0)
	Casablanca-Settat	49 (13.8)

	Rabat Sale Kenitra	26 (7.3)
	Tangier - Tetouan – Al Hoceima	23 (6.5)
	Daraa-Tafilalet	23 (6.5)
	Others region	28 (8)
Work environment	Private Practice	270 (76.3)
	Public practice	78 (22)
	Academic	6 (1.7)

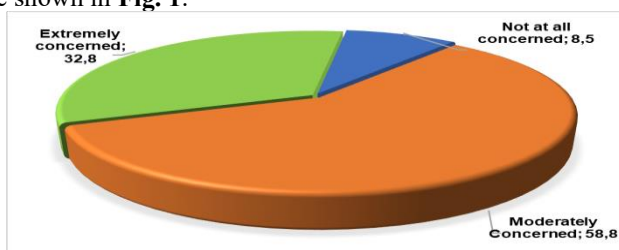
By professional status, respondents included optometrists (50.3%), ophthalmologists (12.4%), opticians (15.8%), orthoptists (16.9%), and other professions (4.5%).

The specialists contributing to this investigation were spread across different regions of Morocco. The most represented regions were Marrakech Safi (33.9%), Beni Mellal Khenifra (24%), Casablanca-Settat (13.8%), Rabat Sale Kenitra (7.3%), Tangier - Tetouan - Al Hoceima (6.5%), Daraa-Tafilalet (6.5%), and other regions (8%).

In terms of work environment, the majority of respondents worked in private practice (76.3%), followed by public practice (22%) and academia (1.7%).

### 3.1 Respondents' levels of concern about the increase in pediatric myopia

Respondents' levels of concern about the progression of myopia in children, expressed as a percentage, are shown in **Fig. 1**.



**Fig. 1.** Participants' levels of concern about the growing prevalence of myopia.

These data indicate that the majority of respondents (58.8%) were moderately concerned about the progression of myopia in children. A significant proportion (32.8%) also expressed extreme concern. Only 8.5% of respondents indicated not being concerned at all. These levels of concern may reflect respondents' perception of the importance of managing and preventing myopia in children. These data may influence the attitudes and decisions of vision care professionals regarding the myopia management and prevention strategies they adopt in their clinical practice.

**Table 2** shows the levels of concern among different professional groups about the growing prevalence of myopia.

**Table.2.** Participants' levels of concern about the growing prevalence of myopia, by profession

	Not at all concerned	Moderately Concerned	Extremely concerned
<b>Optician-Optometrist</b>	1.1%	76.4%	22.5%
<b>Ophthalmologist</b>	0.0%	13.6%	86.4%
<b>Optician</b>	28.6%	60.7%	10.7%
<b>Orthoptist</b>	3.3%	43.3%	53.3%
<b>Other</b>	62.5%	37.5%	0.0%

These data show significant variations in levels of concern between different professional groups. Ophthalmologists are the most concerned group, with a high proportion (86.4%) extremely concerned about the increasing prevalence of myopia. Orthoptists are also highly concerned, while opticians-optometrists and opticians have moderate levels of concern. Professionals classified as "Other" appear to be generally less concerned. These results highlight the importance and necessity of providing professional training for the various eye care specialists to enhance their knowledge.

### 3.2 Strategies adopted by eye health specialists in clinical practice

Fig.2 shows the percentage of utilization of different myopia correction strategies by respondents.

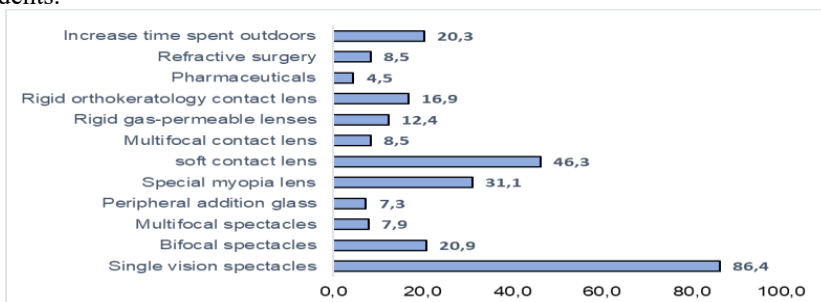


Fig.2. Percentage of strategies adopted by eye health specialists in clinical practice

Figure 2 provides information on the different approaches used by respondents to manage myopia. Single vision spectacles (86.4%) and soft contact lenses (46.3%) are the most commonly used strategies, followed by special myopia lenses (31.1%), and rigid contact lenses. Refractive surgery and increasing time spent outdoors are also mentioned as strategies used by some respondents. These results reflect the diversity of options available for managing myopia, and underline the importance of choosing the method best suited to each individual's needs and visual condition.

### 3.3 Perceived effectiveness of different myopia control options

The figure 3 shows the percentages of efficiency of different myopia management strategies.

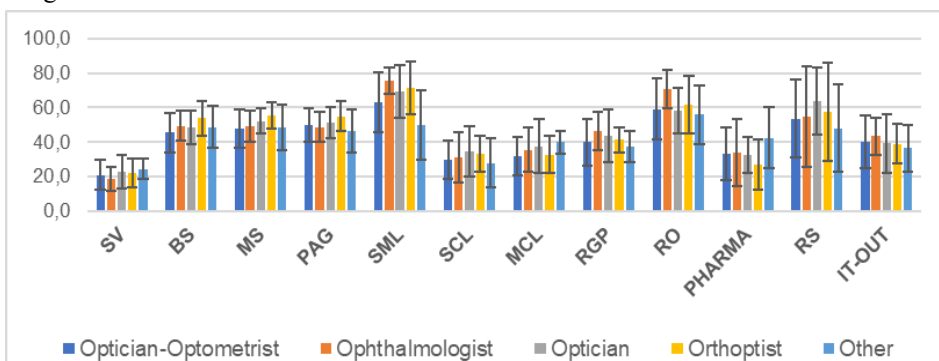


Fig.3. Perceived efficacy of the different myopia control methods. Error bars represent standard deviation

Analysis of Fig. 3 evinces that vision care professionals chose orthokeratology and rigid gas-permeable lenses as the most effective methods for managing myopia, followed by special myopia lenses despite their unavailability, while pharmaceuticals (low-dose atropine) were perceived as ineffective. Orthoptists also have a relatively high use of rigid lenses and visible cut bifocals with internal base prism for near vision. On another hand, opticians and optometrists frequently use single-vision lenses and soft contact lenses. Other professionals use a combination of different strategies, with no particular predominance.

These variations in the use of myopia management strategies may be influenced by factors such as insufficient knowledge or personal preferences. It is important to take these differences into account when developing myopia management strategies, in order to meet the specific needs of each professional group and improve outcomes for myopia patients.

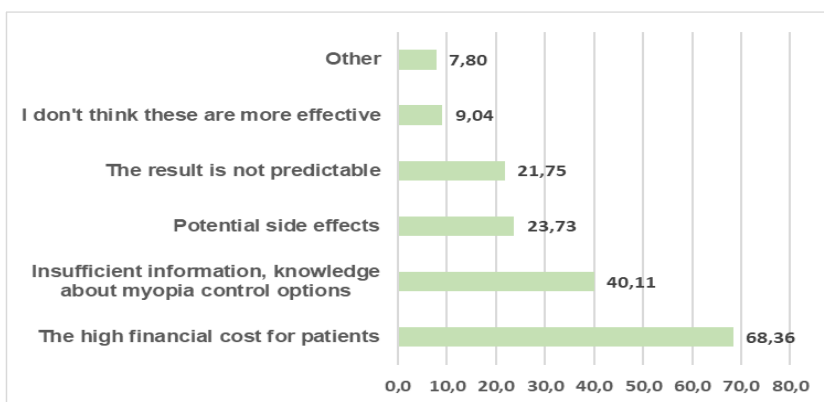
### 3.4 Frequency of under-correction prescriptions in clinical practice

Table 3 reports significant variations in the clinical practices of different professional groups with regard to under-correction for myopia control. Opticians-optometrists and orthoptists have the highest percentages of under-correction practice, while ophthalmologists and opticians have lower percentages.

**Table.3.** Percentage of practitioners who always, sometimes, or never use under-correction as a myopia control option

	Always	Sometimes	Never
<b>Optician-Optometrist</b>	16.9%	61.8%	21.3%
<b>Ophthalmologist</b>	4.5%	81.8%	13.6%
<b>Optician</b>	7.1%	53.6%	39.3%
<b>Orthoptist</b>	10.0%	86.7%	3.3%
<b>Other</b>	12.5%	12.5%	75.0%

### 3.5 Reasons for not adopting other practitioner control options.



**Fig.4.** Constraints for which other strategies are not adopted by practitioners

Figure 4 exhibits the constraints for which other myopia control strategies are not adopted by vision care professionals. Indeed, specialists gave several reasons for being satisfied with prescribing only single vision lenses or soft contact lenses. Overall, we note that the high financial cost to patients (68.3%) appears to be the main constraint, followed by insufficient information and knowledge about control options (40.11%). Concerns about potential side effects and predictability of results (23.7%) are also mentioned but to a lesser degree.

## 4 Results

In this research study, the focus was on understanding the strategies employed by eye health specialists in managing myopia, also known as nearsightedness, along with their perceived effectiveness. The study gathered responses from 354 eye care practitioners in Morocco, shedding light on their attitudes and practices. The results revealed that the most commonly used methods to manage myopia were single vision spectacles and soft contact lenses. These strategies were preferred by a significant majority of respondents, with 86.4% and 46.3% utilization rates, respectively. Additionally, other approaches like special myopia lenses, rigid contact lenses, refractive surgery, and increasing outdoor time were also mentioned by some practitioners.

To evaluate the perceived effectiveness of various myopia control options, the researchers presented a figure showing the percentages of efficiency for different methods. Orthokeratology and rigid gas-permeable lenses were considered the most effective ways to manage myopia, while pharmaceuticals, like low-dose atropine, were seen as ineffective by the surveyed practitioners. The preferences for management strategies varied among different professional groups, with orthoptists and optometrists showing relatively high use of rigid lenses and visible cut bifocals with internal base prism for near vision. In contrast, opticians frequently employed single-vision lenses and soft contact lenses. The study also found that some practitioners occasionally used under-correction prescriptions with single-vision lenses to slow myopia progression, despite published studies suggesting otherwise.

When analyzing the reasons for not adopting certain myopia control options, the study revealed key constraints faced by vision care professionals. The high financial cost to patients emerged as the primary concern, followed by insufficient information and knowledge about alternative strategies. Concerns about potential side effects and the predictability of results were also mentioned, though to a lesser extent. One noteworthy finding was that the majority of practitioners (83.6%) showed interest in receiving training in myopia control. This indicates their openness to learning new knowledge and skills to better manage the condition. However, a small percentage (7.3%) expressed disinterest in such training, prompting the need to understand their reasons more deeply.

## 5 Discussion

This study presents an assessment of Moroccan practitioners' attitudes toward managing myopia in their clinical practice. Among 354 responses collected, 50.3% were from opticians and optometrists, reflecting their involvement in the management of myopia. Morocco is one of the countries where the high prevalence of myopia in children is of great concern. The survey carried out reported that 91.7% of practitioners are concerned about this growth, which is in line with other studies carried out in other African countries [20][21]. This level of concern is also similar to current reports from Asia, Europe, South and North America, and is consistent with the prevalence rate reported by the World Health Organization (WHO) over the last few decades. This concern is justified since the absence of rapid treatment of myopia increases the risk of evolution into high myopia, which in turn will develop associated ocular pathologies such as cataracts, glaucoma, and retinal detachment.[23].

Orthokeratology has been considered by all Moroccan visual health professionals to be the most effective method of slowing the progression of myopia, which is in accordance with numerous studies[24]. On another hand, pharmaceutical agents, such as low-dose atropine (0.01%), were seen as an ineffective and under-appreciated approach by practitioners, which is similar to the results of Wolffsohn and al.[25]. Environmental factors, such as the increase in time spent outdoors, were underestimated by respondents. In contrary, several studies have demonstrated that outdoor activities are beneficial in preventing the onset of myopia and



slowing its progression [26], [27]. This shows the lack of information on the impact of environmental factors on myopia. In addition, around 70.9% of respondents sometimes use under-correction with single-vision lenses in order to slow myopia progression by reducing accommodative demands in near vision, although published studies report the opposite. Furthermore, the majority of professionals still continue to adopt single-vision lenses and soft contact lenses in their clinical practice, although these approaches are ineffective. Indeed, there are several reasons for not adopting other approaches, such as the high cost of other myopia management techniques, lack of information, unpredictable results and unavailability of any current models for myopia control.

Analysis of the results of the present investigation indicates that the majority of practitioners (83.6%) are interested in training in the field of myopia control. This suggests an interest and openness to learning new knowledge and skills to better manage this condition. However, a small percentage of practitioners (7.3%) indicated that they were not interested in such training. It may be beneficial to explore the reasons for these negative or uncertain responses in order to better understand practitioners' needs and concerns regarding myopia control training. For eye care practitioners, this new challenge is based not on compensating for refractive error in children, but on taking control, by various means. This study adds significant value by focusing on different interventions to slow the progression of myopia in children, as well as understanding the attitudes of Moroccan eye specialists to manage this epidemic in their clinical practice.

However, this study is limited by the low response rate, so the results may not represent the opinion of all Moroccan vision professionals.

## **6 Conclusion**

In conclusion, controlling the progression of myopia has become a public health issue. For this reason, various optical and pharmaceutical devices and recommendations for outdoor activities have been developed, through an increasing number of scientific articles published. This study identified several gaps in knowledge of myopia management approaches among Moroccan practitioners.

Consequently, professional training courses need to be organized for eye care specialists to raise their awareness, increase their knowledge of myopia control interventions, and mobilize them to acquire the skills needed to adopt the necessary and effective strategies to deal with this pandemic. It's needed to foster and encourage collaboration between researchers, eye health professionals and organizations, and industry, in order to identify and innovate new approaches to myopia management and develop new interventions. It turns out so to be necessary to raise public awareness of the importance of environmental factors, such as increasing the amount of time spent outdoors and the need for exposure to natural light.

## **7 Acknowledgements**

The authors would like to express their gratitude to the Regional Professional Union of Opticians of Marrakech region for their help in distributing the questionnaire, and all the Moroccan vision specialists who participated in the survey in any way. We would also like to thank all who helped in the translation of this article.

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