

Pediatric spectacle prescription: Understanding practice patterns among ophthalmologists and optometrists in Saudi Arabia

Rawan Malaika¹, Lina Raffa¹, Mohammed Algethami², Sara Alessa²

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Abstract:

PURPOSE: This study aims to understand the approach to prescribing spectacles for children and the interpretation of refractive errors among ophthalmologists/optometrists in Saudi Arabia.

METHODS: A cross-sectional survey was conducted between September and November 2018 using a database of online registrants for ophthalmologists and optometrists practicing in Saudi Arabia. The survey included 10 multiple-choice questions designed to elicit information about how ophthalmologists and optometrists deal with commonly encountered case scenarios covering different practical aspects of pediatric refraction. The responses were compared using the proportion of pediatric clientele received in the respondents' practices (Group A: <25%, Group B: 25%) and drawing upon concepts from the published literature.

RESULTS: One hundred and three participants, including ophthalmologists, specialists/registrar, and optometrists from across Saudi Arabia, participated in this survey. Approximately 25% were classified as Group A. Large discrepancies were observed between the participants' responses and actual practices based on guideline recommendations. Responses varied significantly between Groups A and B on certain issues pertaining to pseudomyopia ($P < 0.001$), anisometropia ($P = 0.033$), and high astigmatism ($P = 0.023$).

CONCLUSION: Practice patterns regarding pediatric spectacle prescription varied among ophthalmologists and optometrists in Saudi Arabia. The approach to managing refractive errors in children was better among ophthalmologists/optometrists servicing a larger pediatric clientele, suggesting the need to increase awareness among all groups of ophthalmologists/optometrists.

Keywords:

Amblyopia, children, eyeglasses, refractive error, survey

INTRODUCTION

Refractive errors are one of the most common causes of correctable visual impairment. Approximately 116 million people are diagnosed with a refractive error worldwide, and this number is expected to reach 127 million by 2020.^[1] A recent report from the World Health Organization revealed that uncorrected refractive errors are the leading cause of moderate to severe visual impairment globally and the second cause of blindness worldwide.^[1]

Nationally, refractive errors are the most common cause of amblyopia.^[2] Uncorrected refractive error has a short and long-term impact on education, career, and quality of life for affected individuals.^[3] Thus, successful treatment of refractive error is essential to prevent amblyopia and provide normal development of binocularity and stereopsis. Spectacle correction is the simplest and most cost-effective way to correct for refractive errors in children.^[4]

Globally, the prevalence of myopia, hyperopia, and astigmatism in children is determined to be 11.7%, 4.6%, and 14.9%, respectively.^[5] In Saudi Arabia, the prevalence of uncorrected refractive errors among children is estimated to be 34.9%.^[6]

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¹ Department of Ophthalmology, King Abdulaziz University Hospital, Jeddah,
² Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia

Address for correspondence:
Dr. Lina Raffa,
Department of Ophthalmology,
King Abdulaziz University
Hospital, Prince Majid Rd.,
Al Sulaymaniyah,
Jeddah 22252, Saudi Arabia.
E-mail: lraffa@kau.med.sa

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and 22%^[3] in Medina and Jazan, respectively, and the overall prevalence of refractive errors was 13.7%,^[7] 18.6%,^[8] 13%^[9] in Alhassa, Al Qassem, and Riyadh, respectively.

The provision of corrective spectacles is considered to be a cost-effective health intervention.^[10] However, pediatric spectacle prescription, especially in preschool children, is very challenging due to several factors. These factors include difficulties examining these children due to their limited cooperation, different judgments for the same refractive error among ophthalmologists, and variable working distances and accommodative abilities. In addition, children's visual systems present special challenges, making them more vulnerable to developing amblyopia from refractive errors, strabismus, and anisometropia.^[11]

In addition to these difficulties, some guidelines exist on how to prescribe refractive correction for children without strabismus.^[12,13] However, most of these guidelines were written based on the expertise and experience of practitioners^[11] rather than randomized, masked clinical trials. Given this lack of international consensus, this study was conducted to explore the current local management approach of national ophthalmologists/optometrists to determine if there is agreement or variability in their practice.

METHODS

An anonymous online survey was administered to ophthalmologists and optometrists in Saudi Arabia between September and November of 2018, using a database of online registrants for ophthalmologists/optometrists. All certified ophthalmologists and optometrists who practiced in Saudi Arabia were included. Twenty-nine participants did not meet the inclusion criteria and were excluded from the study. Those were either due to incomplete responses from participants, were practicing outside of Saudi Arabia at the time of the survey or were still under training.

The survey instrument was a previously designed questionnaire and it has been modified to accommodate for the inclusion of optometrists in our study. Permission to use the questionnaire was granted by Monga and Dave.^[14] The questionnaire was divided into two parts: the first part captured demographic data, and the second part included ten multiple-choice questions about commonly encountered pediatric refraction cases (supplemental file). The thrust of the survey was on the decision-making approach regarding when and how much the practitioner would prescribe for children for a given refractive error.

All the questions were closed-ended with multiple (four to five) options, and respondents were required to answer all ten questions before submitting their responses. Friendly reminders to complete the survey were sent at least twice during the survey period. The analysis was done by comparing the participants' responses to actual practices based on recommendations from the published literature.^[12] Ethical clearance to conduct

the study was granted by the institution's research ethics committee.

Statistical analysis

The results were analyzed using IBM SPSS, version 23 (IBM Corp., Armonk, N.Y., USA). The answers were categorized according to the proportion of pediatric patients that the participants received in their medical practice: Group A serviced a smaller pediatric clientele (<25%), and Group B serviced a larger one ($\geq 25\%$). Simple descriptive statistics were used to describe the characteristics of the study variables by means of counts and percentages for the categories. Chi-square test was used to correlate the survey knowledge questions to pediatric clientele, years of experience and job title. Knowledge questions was also converted to correct/incorrect answers and correlated with the same risk factors. Also, for additional analysis the converted knowledge questions are scored by using a simple additive method and Independent *t*-test was used to correlate it to pediatric clientele, years of experience and job title. Normal distribution tests were always done for all types of related tests. Finally, a conventional $P < 0.05$ was the null hypothesis rejection criteria.

RESULTS

One hundred and three ophthalmologists/optometrists responded to the questionnaire. Most responses were from the Western region. Based on specialty, the frequency of pediatric spectacle prescription was as follows: general ophthalmologists ($n = 20$), pediatric ophthalmologists ($n = 31$), subspecialty ophthalmologists ($n = 13$), and optometrists ($n = 49$) with a varying proportion of pediatric clientele or patients. Demographics of the participants are outlined in Table 1.

Approximately one-fourth of the responses (25%) were from Group A participants. Group B participants received a wide range of pediatric patients: 25%–40% pediatric patients for 27% of the respondents, 40%–60% pediatric patients for 17%, and >60% pediatric patients for 31% of the respondents.

Table 1: Demographics of the respondents

Demographics	Count (%)
Gender	
Male	64 (62.1)
Female	39 (37.9)
Years of experience	
<1	14 (13.6)
1-3	17 (16.5)
4-6	15 (14.6)
7-10	17 (16.5)
>10	40 (38.8)
Pediatric clientele percentage (%)	
<25	25 (24.3)
25-40	27 (26.2)
40-60	17 (16.5)
>60	32 (31.1)
Missing	2 (1.9)

The outline of the survey responses is shown in Table 1 (questions 4–10). Glasses were prescribed in 53% of the cases by ophthalmologists who did both refraction and prescription. In 11% of the cases, refraction was done by optometrists and prescription by ophthalmologists. Optometrists did both refraction and prescription in 25% of the cases, whereas 9% of the optometrists/ophthalmologists referred patients to pediatric ophthalmologists. Regarding eyeglass specifications, about two-fifths (42%) participated in this process.

There were discrepancies between the survey responses and actual practices based on guideline recommendations (questions 7, 8, and 10). Otherwise, most of the respondents were fairly in agreement with one another regarding the management of different clinical scenarios [Table 2]. In our study, years of experience of the participants did not have any significant effect on knowledge scores in answering Q 6–10 (≤ 3 years 2.36 ± 1.2 vs. ≥ 4 years 2.53 ± 1.2 , $P = 0.5$). The background of the participants did not have a significant effect on knowledge score of Q 6–10. (Optometrists 2.52 ± 1.3 vs. ophthalmologists 2.40 ± 1.1 , $P = 0.6$).

The groups differed in terms of their approach to managing different clinical scenarios. Groups A and B differed in their approach of managing moderate hyperopia, pseudomyopia, and anisometropia [Figures 1-3].

DISCUSSION

This cross-sectional study is novel in that it describes the practice patterns of ophthalmologists/optometrists in Saudi Arabia regarding the prescription of spectacles for children. It focuses not only on ophthalmologists' and optometrists' decision-making approach regarding the prescription of glasses for refractive errors but also on commonly encountered pediatric refraction cases. In addition, it reveals some differences in spectacle prescription patterns for moderate hyperopia, pseudomyopia, and anisometropia. Of note, Group B participants (who service $\geq 25\%$ of pediatric cases) were more in agreement with current guidelines on spectacle prescription for refraction than their colleagues in Group A, who had limited pediatric patient exposure (i.e., $<25\%$ of their clientele were children).

Approximately 42% of the participants in this survey reported being involved in selecting the lens materials and frames for spectacle production. In a similar survey of ophthalmologists practicing in India, Monga and Dave^[14] reported that close to 67% of the participants were involved in the spectacle-making process (lens material and frame selection). Regarding the decision to monitor refraction [Q4 Table 1], most participants (89%) reported that they followed-up with their patients and considered visual acuity, alignment, and binocular vision state.

According to the American Academy of Pediatrics (AAP), it is crucial to assess the alignment and binocular state, in addition to visual acuity, of preschool and early school-aged children.^[15] In the current survey, aged-based screening was preferred

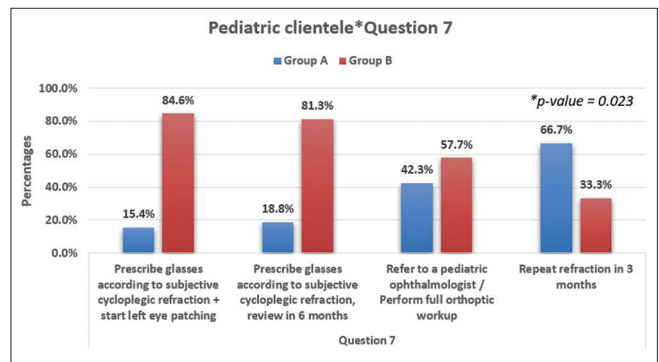


Figure 1: Responses of Groups A and B regarding their approach to managing moderate hyperopia

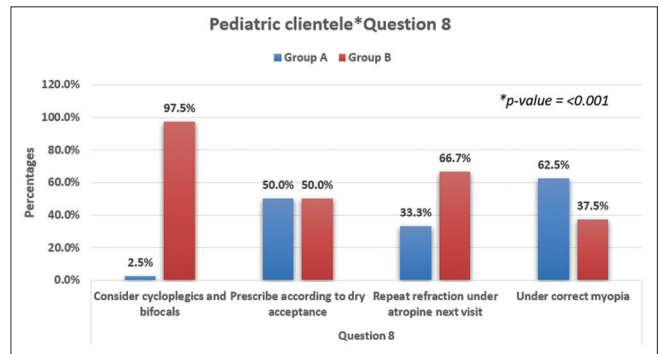


Figure 2: Responses of Groups A and B regarding their approach to managing pseudomyopia

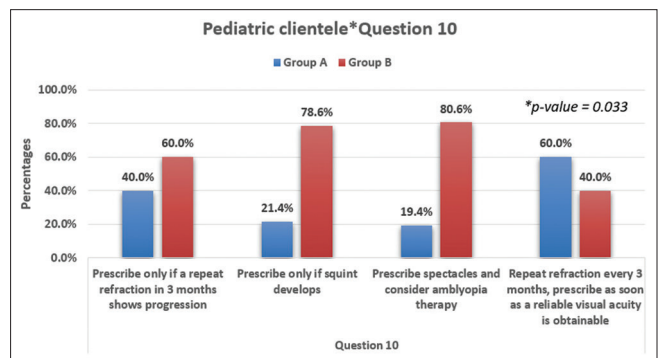


Figure 3: Responses of Groups A and B regarding their approach to managing anisometropia

by 80% of the respondents, with approximately 40% opting for screening at the age of 3 years [Q5 Table 1]. A small proportion of our participants would screen for refractive errors only when a child can give a verbal response or upon the development of strabismus. This is in line with the US Preventive Services Task Force's recommendation on vision screening and the AAP's recommendation of visual acuity testing, which states that vision screening should be offered to children beginning at age 3 years as the standard of care.^[16,17]

Question 6 [Table 1] was included in the survey to evaluate the concept of emmetropization. More than 88% of the

Table 2: Summary of survey questions and participants' responses categorized by group

Survey question	Congruence of survey response with desired response	Other responses	Results		
			Group A	Group B	P (Chi-square test)
Q4. Methods of RE monitoring	89% screened using VA, alignment and binocularity	6% chose VA and alignment only, and 4% chose either VA alone or with binocular status	24/26	68/77	0.421
Q5. First RE screening in amblyopic child	40% chose school joining age at age 3	21% chose to assess when a child could read or when misalignment was present	11/26	31/77	0.692
Q6. RE with NR for the age	88% Observed	10% would prescribe according to refraction	20/26	69/77	0.105
Q7. Moderate hyperopia	25% chose to refer to a pediatric ophthalmologist for review	31% prescribed glasses according to subjective refraction, 39% would start patching simultaneously	11/26	15/77	0.023
Q8. Pseudomyopia	39% prescribed cycloplegia and bifocals	6% prescribed myopia as per dry acceptance, 45% would repeat refraction with atropine, and 8% would under-correct myopia	1/26	39/77	<0.001
Q9. High astigmatism	29% prescribed full cylindrical correction	Almost two thirds (69%) considered under-correction of cylindrical power	5/26	25/77	0.194
Q10. Anisometropia	66% prescribed spectacles and considered patching	One third (34%) would conservatively manage	13/26	54/77	0.033

RE=Refractive error; NR=Normal range; VA=Visual acuity

participants affirmed that the refractive error was normal in this age group and that glasses should be prescribed only if the child was amblyopic. This finding is consistent with the guidelines for spectacle prescribing in children outlined by the AAP Ophthalmology and Strabismus.^[12] Regarding the management of moderate hyperopia [Q7 Table 1], one-third would prescribe glasses based on subjective refraction while 39% would consider occlusion therapy for amblyopia based on asymmetrical visual responses. Apart from the subjective acceptance, it is well known that when prescribing for hyperopic refractive errors, parameters such as accommodation, alignment status, fixation preference, and binocularity should also be taken into consideration.^[18] These measures should be evaluated by a trained pediatric ophthalmologist; only one-quarter of the participants in our survey reported that they would assess other measures of visual function in their patients. In the sub-analysis, 42.3% of Group A respondents chose to perform full orthoptic workup or refer to a pediatric ophthalmologist compared to 57.7% of Group B ($P = 0.023$). This statistically significant difference is probably attributed to Group B having more experience approaching and dealing with common pediatric ophthalmology cases such as moderate hyperopia due to the larger numbers of pediatric cases encountered in their daily practice. Mild-to-moderate hyperopia accounted for the majority of all hyperopic cases (88.7%) diagnosed among 5176 primary school children as reported by Aldebasi therefore knowledge of how to manage these cases is very important.^[8]

Another situation [Q8 Table 1] was accommodative spasm leading to pseudomyopia. It is well known that accommodative spasm is a component of near reflex where the ciliary muscle remains in a constant state of contraction. Pseudomyopia typically results from the excessive accommodative tone.^[19] Patients with pseudomyopia might benefit from cycloplegic therapy (atropine for a few weeks), along with bifocal spectacles for temporary use,^[18] which was the choice among 39% of our participants. With the increased use of screen time,

children are more prone to accommodative spasm given the prolonged near work.^[19] 2.5% versus 97.5% in Groups A and B respectively chose cycloplegics and bifocals as the treatment of choice. This huge discrepancy in correctly managing pseudomyopia is remarkable and reflects the importance of seeking advice from an experienced professional.

Regarding the management of high astigmatism, only 29% of our respondents prescribed the full cylindrical power. In contrast, almost two-thirds (60%) stated that they would under-correct the cylindrical power.

The discrepancy regarding astigmatic prescription in our study is in agreement with the results of a survey conducted on 412 pediatric ophthalmologists; the investigators reported considerable variability in the level of astigmatism at which the participants would prescribe eyeglasses for astigmatism for children ages 0–3 years.^[20] It is well known that astigmatism ($>1.5D$) is associated with poorer recognition acuity for this age group (≥ 4 years old) because it is not neutralized by accommodation.^[21] As opposed to adults, the total cylindrical power is prescribed for children to correct both the meridians entirely, thus preventing any chance of amblyopia.^[22] Children accept high cylindrical powers far more easily than adults, and no attempt to under-correct should be made, at least in younger children.^[23] Children with symmetrical meridional amblyopia tend to have improved vision when prescribed the appropriate corrective eyewear.^[22] Studies conducted in 3–10 year-old children with bilateral refractive amblyopia showed that patching was usually not required.^[24-26] In most cases, binocular acuity improved in children with bilateral astigmatism who received only optical treatment by an average of 3.5–5.4 lines after a year of treatment.^[24-26]

The issue of anisometropia is often encountered in pediatric patients [Q10 Table 1]. Anisometropia was the cause of amblyopia in 37% of the 409 patients enrolled in the large, prospective, multicenter Amblyopia Treatment Study 1

(ATS 1).^[27] About 34% of the respondents in ATS 1 considered conservative measures for the management of amblyopia, and 66% reported that they would prescribe spectacles and consider amblyopia therapy. Anisometropia (especially anisohyperopia) is another potent stimulus for amblyopia.^[28] The cut-off points for the prescription of anisometropic refractive errors are lower than those for symmetrical, isometropic refractive errors. In managing a preverbal child, fixation preference and preferential looking cards are appropriate methods for assessing amblyopia; it is not necessary to wait for a child's visual response because the condition may lead to dense amblyopia.^[29-31] Prescribing glasses and considering amblyopia treatment was chosen by 19.4% and 80.6% in Groups A and B, respectively. Amblyopia is a preventable consequence of anisometropia if treated properly in a timely fashion during the critical period of visual development and thus knowledge of how to approach this issue is detrimental to avoid permanent vision loss of the affected eye.^[32]

Limitations

Online surveys have their own set of obstacles and limitations, including small sample size and poor participation. In addition, multiple-choice questions have fixed selected responses that may fail to reflect clinical practice. While these multiple-choice questions may vary from the true daily practice patterns, they are the closest reflection and shed light on the variance in clinical practice between ophthalmologists/optometrists in the region. In light of those limitations, this study does not reflect the full range of practice in Saudi Arabia. Nevertheless, this is the only cross-sectional study that has attempted to describe the spectacle prescribing pattern in the pediatric population among ophthalmologists/optometrists in Saudi Arabia. The findings can serve as preliminary data to identify practice gaps that can help optometrists and ophthalmologists when prescribing for refractive errors in pediatric patients.

CONCLUSION

Practice patterns regarding pediatric spectacle prescription varied among ophthalmologists and optometrists in Saudi Arabia. Although practice patterns were similar in some situations regardless of the years of experience, ophthalmologists/optometrists servicing a larger pediatric clientele had a better understanding of the guidelines for spectacle prescribing in children. These findings highlight the need to improve ophthalmologists' awareness in all specialties regarding the prescription of spectacles in the pediatric population. Based on our findings, pediatric patients ought to be examined by pediatric ophthalmologists and optometrists who had a better approach to managing refractive errors and followed the guidelines. Further studies can help develop national guidelines to help ophthalmologists and optometrists when prescribing spectacles in children.

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Conflicts of interest

There are no conflicts of interest.

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A. OPHTHALMOLOGY SURVEY QUESTIONNAIRE

Spectacle Prescription in Children

1. What percentage of your overall practice is pediatric patients? *
 - Less than 25%
 - 25-40%
 - 40-60%
 - More than 60%
2. How are glasses in children prescribed at your set up? *
 - I do both refraction and prescription
 - Optometrist does refraction and ophthalmologist prescribes
 - Optometrist does both refraction and prescription
 - I refer to a pediatric ophthalmologist
3. How do you decide on the material and design of spectacles in a child? *
 - I leave it to the optician
 - Optometrist instructs
 - I write the specifications in my spectacle prescription
 - My patient chooses the design
 - Not applicable
4. How do you monitor a child with refractive error? * (one point)
 - Visual acuity responses
 - Alignment status
 - Binocular vision status
 - All of the above
5. When should the first screening for refractive errors be done in an asymptomatic child? * (one point)
 - As soon as the child can give a verbal response on visual acuity testing.
 - 6 months
 - 3 years
 - Required only in case of visual complaints or strabismus.
6. A 3-year-old child's cycloplegic refraction was found to be + 1.50 -0.50 x 180 OU. Child's eyes are aligned with normal anterior and posterior segments. What would you decide to do? * (one point)
 - Prescribe full cycloplegic refraction.
 - Prescribe according to subjective cycloplegic refraction.
 - Reassure, repeat refraction in 6-8 months.
 - Repeat refraction in 3 months.
7. A 5-year-old child has unaided vision of 6/18 OD and 6/12 OS. His eyes are aligned on torch light test and ocular movements appear full. Anterior and posterior segments are unremarkable. Cycloplegic refraction reveals +4.50 -1.00 x180 OU. Subjective cycloplegic refraction is +2.00 -0.50 x180 OU and improved to 6/12 OD, 6/9 OS. What do you do? * (one point)
 - Prescribe glasses according to subjective cycloplegic refraction, review in 6 months.
 - Refer to pediatric ophthalmologist/preform full orthoptic workup.
 - Prescribe glasses according to subjective cycloplegic refraction + start left eye patching.
 - Repeat refraction in 3 months.
8. An 8-year-old comes with blurred vision OU for 1 week. Unaided vision 6/36 OD, 6/18 OS. Dry acceptance: OD -4.50 (improving to 6/12), OS -2.50 (improving to 6/9). Anterior and posterior segments are unremarkable. Cycloplegic refraction show + 0.25 OU. What would you do next? * (one point)
 - Prescribe according to dry acceptance.
 - Repeat refraction under atropine next visit.
 - Under-correct myopia.
 - Consider cycloplegics and bifocals.

9. A 6-year-old girl has unaided vision of 6/36 OU. Aligned eyes and unremarkable anterior and posterior segments. Cycloplegic refraction +5.00 -4.50 x180 OU. Subjective refraction is +2.00 -2.50 x180 OU (improving to 6/18 OU). Which of the following prescriptions would you agree with? * (one point)
- Prescribe according to subjective cycloplegic refraction (BCVA 6/18) + alternate patching.
 - Prescribe + 5.00 - 4.50 x 180 (BCVA 6/18).
 - Prescribe + 3.50 - 3.50 x 180 (BCVA 6/18).
 - Prescribe + 2.00 - 3.50 x 180 (BCVA 6/18).
10. A 2 year-old girl was found to have pseudostrabismus. Her cycloplegic refraction under atropine 1% was found to be +4.50 OD, +1.50 OS. Anterior and posterior segments were unremarkable. What do you do? * (one point)
- Repeat refraction every 3 months, prescribe as soon as a reliable visual acuity is obtained.
 - Prescribe only if a repeated refraction in 3 months shows progression.
 - Prescribe spectacles and consider amblyopia therapy.
 - Prescribe only if squint develops.

*Required