Original Research

Profile of Children with Strabismus Managed without Surgery at a Tertiary Eye Hospital of Central Saudi Arabia

Dora H. AlHarkan MD.*, †

* Department of Ophthalmology, Medical College, Qassim University, Qassim, Saudi Arabia.
† Department of Pediatric Ophthalmology, King Khalid Eye Specialist Hospital, Riyadh, Saudi Arabia.
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Corresponding author: Dora H AlHarkan, Department of Ophthalmology, Qassim University Hospital, P.O.Box 4490 – Qassim 51491, Saudi Arabia. Phone: 966554882552
Email: harkanophtha@gmail.com

Abstract:

Aim: To determine the causes of strabismus among Saudi children who attended a tertiary eye hospital in central Saudi Arabia.

Methods: This is a cross-section study included 112 children aged less than 16 years who attended the pediatric ophthalmology unit of King Khaled Eye Specialist Hospital (KKESH) in 2013 with complaints of strabismus, but not undergone surgical correction in the past. Demographic ocular status, refraction, fixation, visual acuity, ocular mobility status, history of eye patching, and penalization in the past were evaluated.

Results: We included 112 children with strabismus. Their mean age was 7.7 ±2.5 years, and there were 63 boys (56%). Esotropia and exotropia were found in 99 and 13 children, respectively. Six children had hypertropia. Accommodative esotropia was found in 76 (76.8%) participants. The median angle of deviation in 99 children with esotropia was 30ΔD [interquartile range (IQR) 16: 35]. The median angle of deviation in 13 children with exotropia was 25ΔD (IQR 22.5: 32.5). High hyperopia, amblyopia, anisometropia, and high astigmatism were found in 65 (58%), 22 (19.6%), 2, and 16 children, respectively. Sixty-six (59%) and 82 (73%) children had undergone eye patching and refractive error in the past six months.

Conclusions: Accommodative esotropia was the main cause of strabismus. One-fifth of the participants had amblyopia. Although half of them were given medical/optical treatment in the past, failure to align eyes and address amblyopia is a matter of concern and needs further investigation.

Keywords: Strabismus; Squint; Amblyopia; Refractive Error; Childhood Blindness; Esotropia; Exotropia

الملخص

الهدف: تحديد أسباب الحول بين الأطفال السعوديين الذين التحقوا بمستشفى العيون التخصصي في المنطقة الوسطي من المملكة العربية السعودية.

طريقة البحث: تضمنت هذه الدراسة المستعرضة ١١٢ طفلاً تقل أعمارهم عن ١٦ عامًا والذين حضروا يشتكون من الحول لعيادة عيون الأطفال في مستشفى الملك خالد التخصصي للعيون في عام ٢٠١٣، ولكن لم يخضعوا لعمليات جراحية. تم أخذ بيانات عن فحص العين الشامل، قوة الابصار، فحص العيوب الانكسارية، نسبة الحول في العين، التاريخ المرضي للحول وتاريخ استخدام علاج الكسل إما بالتغطية او باستخدام قطرات التوسيع.

النتائج: شملت الدراسة ١١٢ طفلاً يعانون من الحول. كان متوسط أعمارهم ٧.٧ ± ٢.٥ سنة، منهم ٦٣ ذكور (٥٦ ٪). كسل العين وجد عند ٢٢ (١٩.٦٪) من الأطفال. بلغ عدد مرضي الحول الأنسي والوحشي ٩٩ و١٣ طفلاً، على التوالي. ستة أطفال منهم كانوا يعانون من حول فوقاني. بلغ متوسط زاوية الحول في ٩٩ طفلاً مصابًا بالحول الانسي ٣٠ درجة منشورية)١٦:٣٥(IQR. بلغ متوسط زاوية الحول في ١٣ طفلاً مصابًا بالحول الوحشي ٢٥ درجة منشورية)٢٢.٥ :٣٥(IQR. بلغ عدد الحول الأنسي التكيفي ٧٦ (٧٦.٨ ٪) من أصل ٩٩ من المشاركين. طول النظر العالي وجد عند ٦٥ (٥٨٪) طفل. تفاوت العيوب الانكسارية بين العينين وجد عند اثنين من الأطفال. الانحراف العالي وجد عند ١٦ (١.٤٪) من الأطفال. نسبة ٦٦٪ من الأطفال وجد ان لديهم تاريخ علاجي للكسل بتغطية احدى العينين. نسبة ٧٣٪ من الأطفال تلقوا علاج بالنظارة خلال الستة أشهر الماضية.

الخلاصة: هناك عدد من عوامل الخطر المسببة للكسل لوحظت عند الأطفال السعوديين الذين يعانون من الحول. أن العلاج الطبي المناسب متضمنا لبس النظارة في الوقت المناسب هو الخط الأول العلاجي عند الأطفال المصابين بالحول في السعوديين.

Introduction:

Strabismus in children is a major concern for the parents. However, lack of proper knowledge and fear of surgery result in late but frequent visits to eye care professionals[1,2]. Genetic and acquired causes are responsible for strabismus in children[3,4,5].

The prevalence of strabismus in children is [6,7] 1.2%–2.3%; however, there could be as many as 60,000 to 115,000 children with strabismus in Saudi Arabia[8]. In a study conducted in Jezan province, 37% of children attending the pediatric ophthalmology unit were diagnosed with strabismus[9]. Strabismus is responsible for ocular diseases in 6% of preschool children in Jeddah[10]. The majority of eye problems were due to refractive error and strabismus among preschoolers in a study conducted in Riyadh [11].

To the best of our knowledge, no data of strabismus are available in Saudi children less than 16 years. Routine eye screening is not performed in Saudi Arabian schools, and hence information about strabismus as one of the causes and outcome of amblyopia in young children would be of paramount importance.

The pediatric ophthalmology unit of our institution is unique as most of the children with complex ocular diseases are referred from the entire Saudi Arabian Kingdom, and most of the pediatric ophthalmologists have been qualified from our institution. Therefore, studying the profile of children with strabismus at this institute would be unique and likely to be different from those managed at other institutions and complement the findings to represent all children in the Saudi Arabian Kingdom.

In the current study, we included Children with strabismus aged less than 16 years presented at a tertiary eye institution of central Saudi Arabia in 2013.

Methods:

Institutional research & ethical committee approval was obtained. A total of 1,072 children with strabismus (ICD 10 code H50.0 to H50.90) aged less than 16 years attended the pediatric ophthalmology unit of King Khaled Eye Specialist Hospital in 2013, and among them, a representative sample of 112 children was randomly enrolled in the present study based on the inclusion criteria.

One pediatric ophthalmology fellow was the field investigator. Only the children who cooperated for the measurement of vision were included in the study. The patients with a previous history of strabismus or intraocular surgery, congenital or developmental ocular diseases (e.g. cataract, glaucoma, and retinal dystrophy), ocular trauma, paralytic or restrictive strabismus were excluded. Demographic information including age at presentation and gender of child was obtained. The past history including patching, use of spectacles, and penalization of eyes in the past six months and before six months was recorded. Ocular examination including visual acuity assessment,

ocular mobility assessment, ocular fixation preference, and hand dominance was carried out as described in our previous publication [12]. If best-corrected vision in both eyes had a difference of more than 2 lines, the child was labeled as amblyopic with less vision. Cycloplegic refraction was carried out using 1% cyclopentolate eye drops. The refractive status of each eye was tested and documented in spherical and cylindrical correction, and its axis. If the spherical equivalent of both eyes had a difference of more than 2.5D, the child was defined as having anisometropia. If cylindrical refraction was more than 2.5D, even if spherical equivalent was calculated, the child was labeled as having high astigmatism[13].

On the basis of the refractive error of the worse eye, the children were grouped into the following categories: emmetropic (-0.5 to +0.5D), mild myopia (–0.5 to <-3.0D), moderate myopia (-3.0 to <-6.0D), high myopia (>-6.0D), mild hyperopia (+0.5 to +3.0D), and high hyperopia (>+6.0D)[14].

The data was collected using a pretested data collection form. It was then transferred into a spreadsheet of Statistical Package for Social Studies (SPSS 25, IBM, Chicago, USA). The qualitative variables such as gender, grades of refractive error, fixation, and dominant eye were presented as the number and percentage of the patients. The quantitative variables such as the angle of horizontal deviation and spherical, cylindrical refractive error were presented as the mean and standard deviations if their distribution was normal, and as median and interquartile range if their distribution was not normal.

Results:

A total of 112 children with strabismus participated in our cohort study. Their mean age and male: female ratio were 7.7 ±2.5 years and 63:49, respectively, and their age ranged from 3.2–5 years (17 children), 6–10 years (72 children), and 11– 15 years (23 children). All were of verbal age and responded well to vision testing.

There were 99 (88.4%) children with esotropia and 13 (11.6%) with exotropia. In addition to horizontal misalignment, there were 6 (5.4%) with hypertropia. The further gradation of horizontal deviation suggested that there were 21 (18.8%) children with infantile esotropia, 76 (67.9%) with partly accommodative esotropia, 13 (11.6%) with intermittent exotropia, and 2 (1.8%) cases of esotropia with anisometropia.

Among the 99 children with esotropia, 13 children with exotropia, and six children with additional vertical deviation, the mean angles of deviation were 27.4 ± 13.6 ΔD (prism diopters), 28.4±9.3 ΔD, and 6.8 ± 2.2 ΔD, respectively.

The refractive error of the worse eye suggested that there were four (3.6%) children with emmetropia, seven (6.3%) with mild myopia, three (2.7%) with high myopia, 33 (29.5%) with mild myopia, and 65 (58%) with high hyperopia. On the basis of the relationship be-

tween horizontal deviation and refractive error, we noted that esotropia was significantly associated with high hyperopia ($\chi 2 = 27$, DF (degrees of freedom) = 3, P <0.001).

In 53 (47.3%) children, eye patching treatment was performed before six months. Of them, 21 (39%) children and 13 (11.6%) new children were managed by patching in the past six months. Overall, 82 (73.2%) children were given appropriate spectacles after cycloplegic refraction in the past six months. None of them had undergone penalization by atropine instillation in the past 6 months.

Considering the preference of fixating eye, 43 (38.4%) children preferred right eye, 38 (33.9%) preferred left eye, and 31 (27.7%) had no preference of eye for fixation. The degree of fixation is shown in Figure 1.

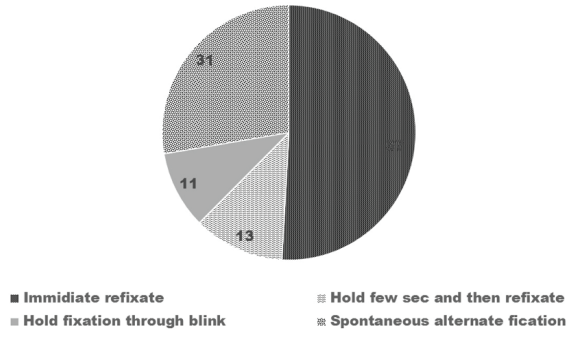


Figure:1 The Degree of fixation for strabismus cases.

The best corrected visual acuity was similar in both eyes in 51 (45.5%) children, 40 (35.7%) children had 2 or less line difference in two eyes, while 21 (18.8%) children had more than 2 lines difference (amblyopia) in our cohort study. The functional normal vision was observed in 85 (75.9%) children and moderate visual impairment in 27 (24.1%) children.

Among the 99 children with esotropia, the right eye was the dominant (in 52) and left eye (in 46 children), and information was not available for one child. The median of spherical equivalent of refraction in 98 dominant eyes with esotropia was +3.75 D (interquartile range 2.5; 4.5). In 13 children with exotropia, right eye was the dominant in 8 and left eye in 5 children. The spherical equivalent of the dominant eyes was 0.00D (IQR -1.1; +1.4).

Discussion:

Nearly half of the children with strabismus presented at our institution had undergone medical management in the past six months. Provision of appropriate spectacles for three-fourths of the participants and patching were the main mode of management. Nearly one in five children with strabismus had amblyopia. Accommodative esotropia was the main type of horizontal strabismus.

In the absence of any reliable school- or primary healthcare-based information of ocular ailments in Saudi Arabia, hospital-based information of strabismus is used to formulate and recommend policies for eye care in the Saudi Arabian Kingdom. Although some studies are available in this context (in the province), our study based on the information from the referral center and cases dealt by pediatric ophthalmologists would be more reliable and useful to plan effective treatment strategies

The majority of the participants were after-school aged children, which is generally con-

sidered as a late-diagnosis group. However, in the absence of information when strabismus was first detected, it is difficult to determine if the disease management is late. Mandatory eye screening of preschoolers and school-age students are recommended for the early detection of eye problems including strabismus[15,16].

Esotropia was the main type of horizontal strabismus in our study, and 75% were of accommodative type. This is consistent with the results of another Saudi Arabian study [17] and contrast to that of another Pakistan-based study, where palsy contributed to pediatric strabismus[18]. Owing to better antenatal care and childbirth assistance in Saudi Arabian hospitals, the incidence of palsy was very low among our study participants.

The proportion of male children with strabismus was higher than female children in our study. This is different from the study of Lloyd et al[19] where the incidence of strabismus was equal in both genders, but the surgical uptake was significantly higher in females compared to males. Our study was performed in kids less than 16 years old in a country where eye care services are free of cost; therefore, comparison of gender distribution with other studies should be done with caution.

Among children with esotropia, the angle of horizontal deviation was ≤20ΔD in nearly 45%. These children were managed by judicious medical management, and residual deviation was managed by botulinum toxin injection[20] or surgical correction. The best modality of treatment for cases of exotropia is the surgical management [21].

Two-thirds of children had accommodative esotropia and hyperopic refraction. Optical management complimented with eye patching treatment with subnormal vision is recommended[22]. Although the proportion of children with exotropia was small in our study, their association with the type of refractive error was not conclusive. Among the six cases of exotropia in the study group, three had hyperopia while the other three had myopia .

In our study, one in five cases of strabismus had amblyopia, while anisometropia cases were very few. Amblyopia was caused by strabismus, anisometropia, or a combination of both of these[23]. Thus, childhood blindness can be prevented by the correction of strabismus in the study area.

In our study, 50% of the children with strabismus had previously undergone patching treatment, while another three-forth had done refractive error correction. Despite these treatments, they had strabismus when they presented to our institution, which could be due to poor compliance or late presentation. Parents' awareness about the timely treatment of amblyopia and its underlying cause is important to address this issue[24]. Generally, the staff working at the tertiary eye care centers are very busy, and hence they fail to provide adequate information for the parents regarding the importance of early eye patching and the need of good compliance. To en-

sure good compliance with the treatment, it is recommended to provide health education for parents regarding this issue. In cases with large angle deviation, prompt surgical intervention in addition to optical treatment is required. For small angle deviation and residual deviation following surgery, botulinum toxin injection of eye muscles is very effective [25, 26].

In addition to refractive error correction for accommodative esotropia, patching of the dominant eye is required if amblyopia is present; however, the child's and parent's cooperation are absolutely required for this procedure. Short-time patching and permitting the patched eyes for near work are very effective compared with one-eye patching for a long time[24]. None of the strabismus children in our study had undergone penalization using atropine eye drops.

There were a few limitations of the study. The children with strabismus were not selected randomly. Hence, extrapolation of the study results to other children with strabismus should be done with caution. The presence of positive family history of strabismus can be a risk factor for strabismus. In this study, information on family history was not collected, and hence the prevalence of familial strabismus could not be determined.

Conclusion:

This study was performed in children with strabismus who attended a tertiary eye hospital in Saudi Arabia, and the results were consistent with the previous studies in Saudi Arabia and other countries. The majority of the past treatment strategies for strabismus were not effective. Better cooperation of caregivers with the children with strabismus is required for the better outcomes of medical/optical treatment in these cases. After discussion with the parents, surgical management should be planned for cases of strabismus with a significant angle of deviation.

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