

Association Of Horizontal Strabismus And Refractive Errors For Children In Baghdad, Iraq

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ABSTRACT

Background: This research project intended to inquire affiliation betwixt comitant esotropia & exotropia & refractive error among children in Baghdad city, Iraq. The term strabismus is derived from the Greek word strabismos and means ocular misalignment. This deviation may be caused by abnormalities in binocular vision or by abnormalities in the neuromuscular control of eye movements. An esodeviation is manifest convergent misalignment of the visual axes. An exodeviation is a manifest (exotropia) or divergent strabismus.

Ametropias can also be classified according to the nature of the mismatch between the optical power and eye length. In myopia, the eye has too much optical power relative to its axial length, and (with accommodation relaxed) light rays from an object at infinity converge too soon and thus focus in front of the retina. This results in an out of focus image on the retina; the far point of the eye is located at the front of the eye, between the cornea and optical infinity point. In hyperopia, the eye does not have enough optical power for its axial length, and (with accommodation relaxed) an object at infinity will focus behind the retina, again producing an out of focus image on the retina; the far point of the eye (actually a virtual point, not a real point in space) is behind the retina. **Method:** In this cross-sectional study, 200 strabismic patients participated. After written informed consent was obtained, the children underwent a complete ophthalmic examination, with uncorrected and corrected visual acuity as well as cycloplegic refraction. Strabismus is defined as; an inward deviation and an outward deviation of 10 or more prism diopters. **Results:** This study included 200 patients ,114 (57%) female and 86 (43%) male .According to the strabismus 150 (75%) with esotropia case and 50 (25%) with exotropia. Of the 200 patients 173 (86.5%) were hyperopic and remaining 27 (13.5%) were myopic. **Conclusion:** This study found a close association between refractive error and horizontal strabismus in children in Baghdad city, Iraq. These findings may help establish guidelines for early correction of refractive errors to prevent the development of strabismus and amblyopia.

Keywords: Optical Power And Eye Length. Refractive Error, Horizontal Strabismus And Amblyopia.

Article Information

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INTRODUCTION

Squint is prevalent eye disease amidst children. Estimated frequency of comitant squint ranges 2.3% to 6.0% in children(1,2). The fate of strabismus can be ruinous. The initial outcome will be loss of binocular vision & stereopsis. It is also the most frequent cause of amblyopia & thus contributes considerably to childhood visual impairment(3,4). In addition to these functional effects,

it also has significant psychosocial consequences in terms of self-image(4,5), negative social prejudice(6,7) and even reduced likelihood of finding employment(8).

The pathogenesis of various types of comitant strabismus has not been well established. Many researchers have studied the connection between accommodative esotropia and hyperopia(9,10). Nevertheless, the degree of increased risk of accommodative esotropia in relation to the severity of hyperopia is not well documented. Conversely, the constant exotropia is consistently more prevalent in Asian(9,11) than Caucasians has been postulated to be related to the high prevalence of myopia(12,13), but this relationship has not been clearly demonstrated.

Across the globe, many individuals are afflicted with visual impairment. It is estimated that 285 million individuals worldwide have a visual impairment. Of these, 19 million are children under 14 years old. About 43% of this population has vision loss due to refractive errors, which is the leading cause of vision loss in children.(13) Blurred vision occurs when the eye is unable to focus images on the retina due to refractive error.(14) Clear vision is achieved by prescribing appropriate glasses to focus the image onto the retina. This treatment is a straightforward and efficient method of eye care. Immediate and long-term effects of vision impairment caused by untreated refractive errors can affect children's quality of life, including poor academic performance and joblessness. This may result in lower quality of life and reduced economic advantages for individuals, families, and societies.

Several factors contribute to uncorrected refractive errors. These include a lack of awareness about the issue, the inability to identify the problem at an individual and family level, the unavailability or unaffordability of the pediatric eye care services, and the cultural barriers that

discourage seeking treatment.(15) Uncorrected refractive error can lead to amblyopia and/or strabismus. The risk of developing amblyopia increases with higher levels of hyperopic refractive error and anisometropia. Unfortunately, there is no specific threshold of refractive error that guarantees the development of amblyopia or prevents its occurrence.

MATERIALS AND METHOD

A hospital based cross-sectional study was conducted at the Pediatric Ophthalmology clinic (Strabismus department) at Ibn Al-haithem Teaching Eye Hospital in Baghdad city, Iraq. The study was carried out from the period of January 2023 to August 2023. During this period, all the cooperative children with concomitant horizontal strabismus who visited the ophthalmology clinic, were included in our study.

Subjects with vertical tropias, ocular motility disorders, other ocular pathologies or history of strabismus corrective surgery, were excluded. All the medical procedures were performed after obtaining the ethical approval, and respected the Declaration of Helsinki. Signed informed consents were obtained from the children's parents or guardians.

All the participants underwent full ophthalmic examination by trained ophthalmologists and optometrists including ophthalmic history, monocular uncorrected visual acuity (UCVA) and best corrected visual acuity (BCVA). The VA testing was done using either Catford drum, Kay pictures cards or Snellen's (E letter) chart according to the age of the child. Since the accommodation may affect the results, cycloplegic refractions were carried out using 1% Cyclopentolate topical drops.

The presence of strabismus was diagnosed by performing cover/uncover test and alternating cover test at near and distance fixation targets with and without spectacles correction, and the degree of squint was measured by a prism bar. The findings were recorded in a self-designed proforma consisting of the patient profile, strabismus type, visual acuity, and refractive errors of both eyes.

For the purpose of this study, normal VA was defined as an uncorrected VA equal to or better than 6/6 in the better eye.

Diagnosis of strabismus was defined as any manifest intermittent or constant horizontal tropia of 10 or more prism diopters. Myopia was defined as a refraction of - 0.50 D or less. Hyperopia was defined as a refraction of +0.5 diopters (D) or more.

Statistical analyses

Version 26 of IBM impact of various factors on study's parameter was assessed using

statistics for the statistical package for the social sciences {SPSS}. Frequencies and percentage calculate for sex, age, squint and refractive errors. A chi-squared test was used for calculation coefficient correlation. That was consider significant when $p \leq 0.05$.

RESULTS

This study include 200 patients ,114 (57%) female and 86 (43%) male .According to the squint 150 (75%) with esotropia case & 50 (25%) with exotropia. From 200 patients 173 (86.5%) with hypermetropia and remaining 27 (13.5%) with myopia.

The distribution of patient according age range ≥ 1 year to 11 year is shown in table 1.

In table 2 shows that there was significant age groups variation with squint that were analyzed and there was no significant age groups variation with refractive error. There was significant difference between type of

Table 1: Frequency and percent of the each variable from total.

Variable		Frequency	Percent	Total
Sex	Male	86	43%	200 (100%)
	Female	114	57%	
Squint	Eso	150	75%	200 (100%)
	Exo	50	25%	
Refractive	Hypermetropia	173	86.5%	200 (100%)
	Myopia	27	13.5%	
Age	≥ 1 year	25	12.5%	200 (100%)
	2 year	51	25.5%	
	3 year	52	26%	
	4 year	25	12.5%	
	5 year	22	11%	

	6 year	12	6%	
	7 year	6	3%	
	8 year	3	1.5%	
	9 year	2	1.0%	
	10 year	1	0.5%	
	11 year	1	0.5%	

Table 2: Chi square test results for knowledge of disease and participants demographics data

		Squint		Total	X ² value
		Esotropia	Exotropia		
Sex	Male	66 (33.0%)	20 (10.0%)	86 (43.0%)	0.621
	Female	84 (42.0%)	30 (15.0%)	114 (57.0%)	
Refractive	Hypermetropia	139 (69.5%)	34 (17.0%)	173(86.5%)	0.000
	Myopia	11 (5.5%)	16 (8.0%)	27 (13.5%)	
Age	≥ 1 year	22 (11.0%)	3 (1.5%)	25 (12.5%)	0.018
	2 year	39 (19.5%)	12 (6.0%)	51 (25.5%)	
	3 year	38 (19.0%)	14 (7.0%)	52 (26.0%)	
	4 year	22 (11.0%)	3 (1.5%)	25 (12.5%)	
	5 year	12 (6.0%)	10 (5.0%)	22 (11.0%)	
	6 year	8 (4.0%)	4 (2.0%)	12 (6.0%)	
	7 year	6 (3.0%)	0 (0.0%)	6 (3.0%)	
	8 year	2 (1.0%)	1 (0.5%)	3 (1.5%)	
	9 year	0 (0.0%)	2 (1.0%)	2 (1.0%)	
	10 year	1 (0.5%)	0 (0.0%)	1 (0.5%)	
	11 year	0 (0.0%)	1 (0.5%)	1(0.5%)	
		Refractive			
		Hypermetropia	Myopia		
Sex	Male	73 (36.5%)	13 (6.5%)	86 (43.0%)	0.561

	female	100 (50.0%)	14 (7.0%)	114 (57.0%)	
Age	≥ 1 year	21 (10.5%)	4 (2.0%)	25 (12.5%)	0.077
	2 year	47 (23.5%)	4 (2.0%)	51 (25.5%)	
	3 year	46 (23.0%)	6 (3.0%)	52 (26.0%)	
	4 year	23 (11.5%)	2 (1.0%)	25 (12.5%)	
	5 year	15 (7.5%)	7 (3.5%)	22 (11.0%)	
	6 year	11 (5.5%)	1 (0.5%)	12 (6.0%)	
	7 year	5 (2.5%)	1 (0.5%)	6 (3.0%)	
	8 year	2 (1.0%)	1 (0.5%)	3 (1.5%)	
	9 year	2 (1.0%)	0 (0.0%)	2 (1.0%)	
	10 year	1 (0.5%)	0 (0.0%)	1 (0.5%)	
	11 year	0 (0.0%)	1 (0.5%)	1 (0.5%)	

Distribution of squint type by sex groups shown in (fig. 1) and relation of squint type (exotropia & esotropia) with refractive errors(hypermetropia and myopia) shown in (fig. 2). When distribution of refractive errors type (hypermetropia and myopia) by sex group shown in (fig. 3).

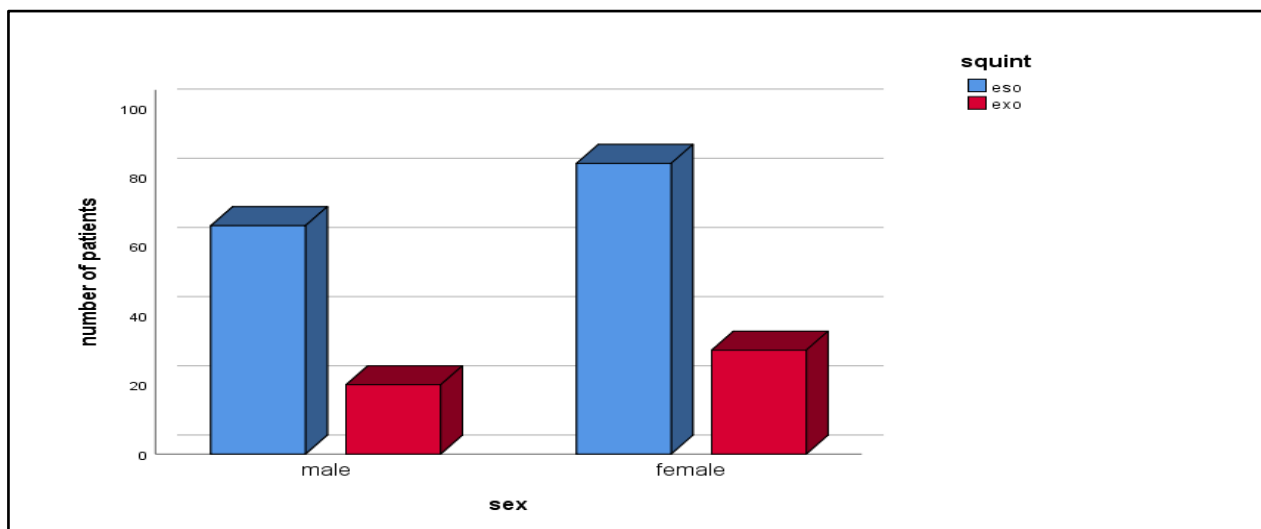


Fig.1 Distribution of squint type by sex group.

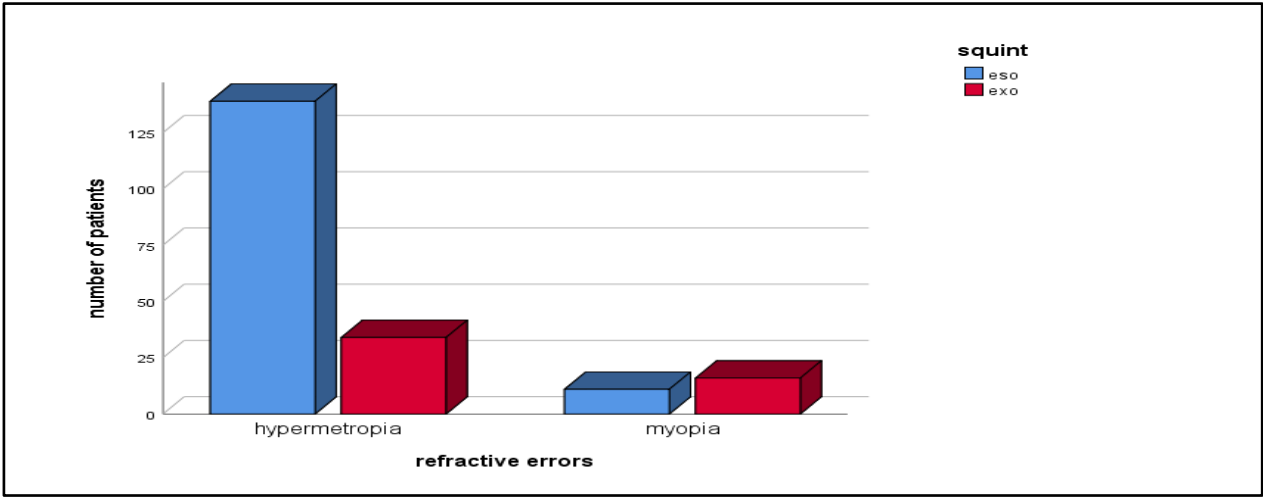


Fig 2: Relation of squint type by refractive errors.

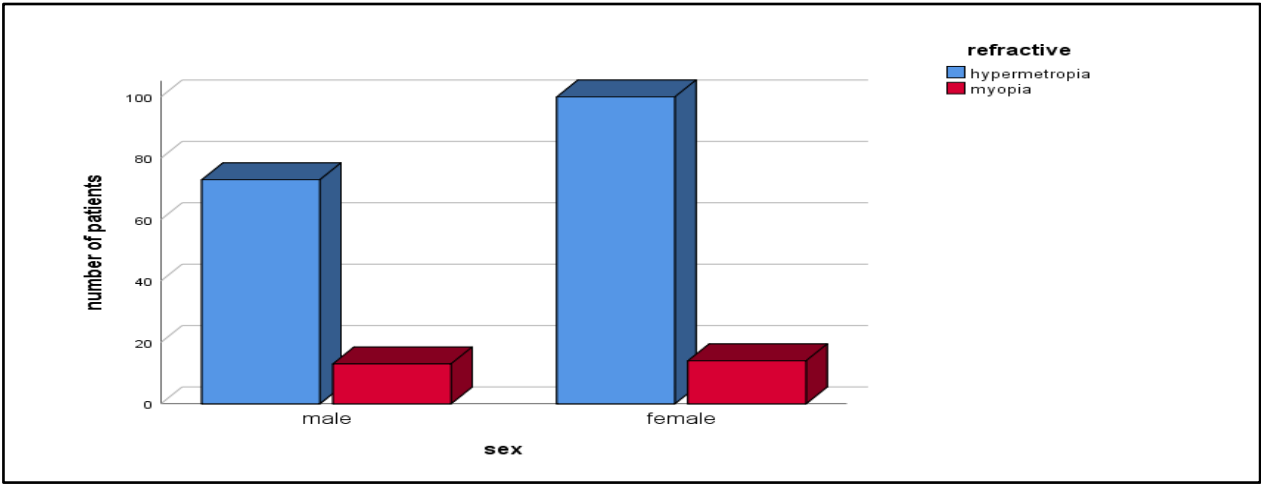


Fig 3: Distribution of refractive errors type by sex group.

The relation of squint type (exotropia & esotropia) & refractive error type (hypermetropia and myopia) according to age group demonstrated in fig.4 and fig.5

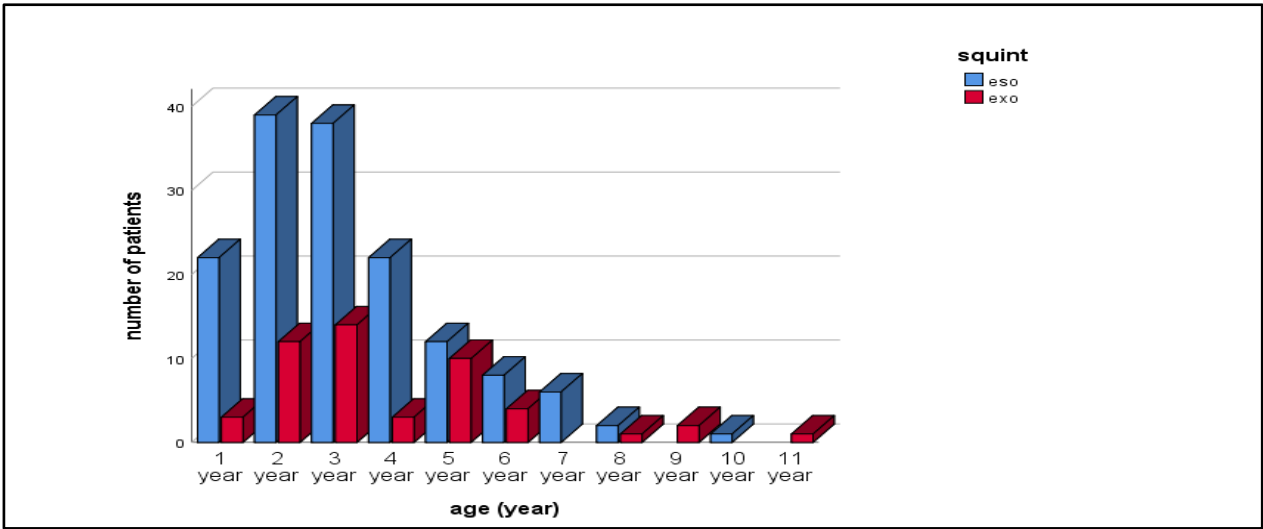


Fig 4: Distribution of squint type by age group.

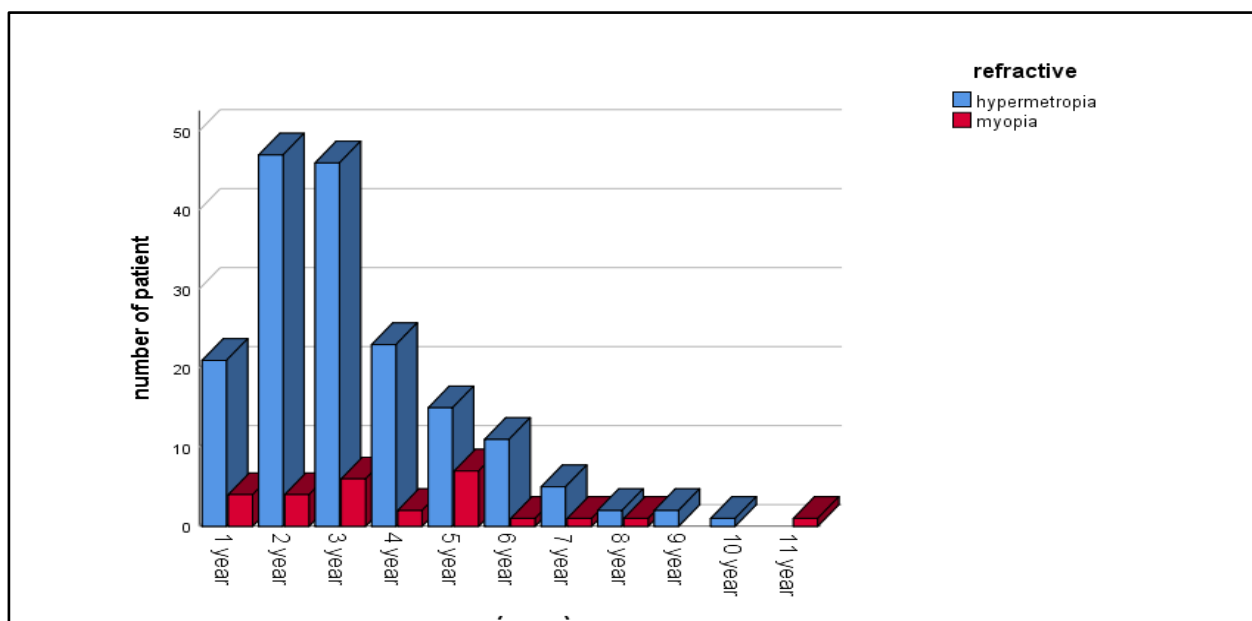


Fig.5: Distribution of refractive errors type by age group.

DISCUSSION

Comitant “esotropia” is the common type among cases of strabismus observed at pediatric ophthalmology clinic “Strabismus Department” in Ibn Al-haithem Teaching Eyes Hospital in Baghdad city, Iraq as shows in our research. This finding came in agreement with other studies which reported convergence squint “esotropia” as commonest type of the strabismus worldwide, that accounting for a one -half to two- thirds of all misaligned eyes (9, 16, 17).

However, in other studies in South East Asia [18] and in Brazil (19), the exotropia was found to be more prevalent than the esotropia. Reasons of these results could be due to differences in race and ethnicity as suggested by Bruce and Santorelli (20).

Moreover, the exotropia cases in our study were more common in females than in males. And this result agrees with the previous finding of Cotter and Colleagues (10) and Nusz and Colleagues (21) that reported noteworthy affiliation between exotropia and female sex.

In the “ Multi-Ethnic Pediatric Eye Disease Study ” (MEPEDS) and the “ Baltimore Pediatric Eye Diseases Study ” (BPEDS) (10), the esotropia was related to hyperopia. In the study by Zhu and Colleagues (22), hyperopia was related to the esotropia; while the exotropia was related to myopia & hyperopia.

Sydney Myopia Study (SMS) (9) found that hyperopia, myopia and anisometropia were associated with strabismus with no separate analysis for esotropia and exotropia.

And Strabismus, Amblyopia and Refractive Error in Singaporean Preschoolers Study (STARS) (23), only astigmatism and anisometropia were related to strabismus, also without separate analysis for esotropia and exotropia.

The purpose of our study was to assess the distribution and patterns of refractive errors in children for the proper planning of pediatric eye services at our centers. In this study, the refractive errors were more prevalent in females than males children. This is same as previous studies in Al Hassa and Riyadh, KSA, where the

errors were more prevalent in females than males.(24,25).

However, the distribution of subtypes of refractive error among children shows that hyperopia was more common than myopia. This is in contrast to other studies in which myopia was the predominant type of refractive error.(24,26,27,28,29,30,31,32)

The predominance of hyperopia in this study could be attributed to the sample selection criteria, and to the high number of patients with esotropia and amblyopia, who were seeking medical care since simple myopic cases are usually dealt with by optometrists.

The findings of present study validates the implementation of fundamental guidelines including recommendation that the parents of children with refractive errors, strabismus & amblyopia should have all of their children screened; promoting parent education and the distribution of brochures on amblyopia and strabismus at our medical centers. Periodic awareness campaigns on pediatric visual problems and the importance of early detection and management including screening examination when feasible, should be carried out at different places, including schools, shopping malls, and in the social media.

REFERENCES

1. Jing Fu, Shi Ming Li, Luo Ru Liu et al. {Prevalence of amblyopia & strabismus in a population of 7th-grade junior high school students in Central China: Anyang Childhood Eye Study (ACES)}. *Ophthalmic Epidemiology* 21, 197–203 (2014).
2. Rohit Varma {Prevalence of amblyopia & strabismus in African American & Hispanic children ages 6-72 months}:Multi-ethnic Pediatric Eye Disease Study. *Ophthalmology* 115, 1229–1236. e1221 (2008).

3. Samarawickrama, C., Fotedar, R., Mitchell, P. & Rose, K. Refractive error, strabismus, and amblyopia. *Ophthalmology* 116, 364–365, author reply 365, doi: 10.1016/j.ophtha.2008.09.028 (2009).
4. Chen, X. et al. Prevalence of amblyopia and strabismus in Eastern China: results from screening of preschool children aged 36-72 months. *Br J Ophthalmol* 100, 515–519, doi: 10.1136/bjophthalmol-2015-306999 (2016).
5. Bez, Y. et al. Adult strabismus and social phobia: a case-controlled study. *J AAPOS* 13, 249–252, doi: 10.1016/j.jaapos.2009.02.010 (2009).
6. Olitsky, S. E. et al. The negative psychosocial impact of strabismus in adults. *J AAPOS* 3, 209–211 (1999).
7. Lin, S. et al. Alcohol use and positive screening results for depression and anxiety are highly prevalent among Chinese children with strabismus. *Am J Ophthalmol* 157, 894–900 e891, doi 10.1016/j.ajo.2014.01.012 (2014).
8. Coats, D. K., Paysse, E. A., Towler, A. J. & Dipboye, R. L. Impact of large angle horizontal strabismus on ability to obtain employment. *Ophthalmology* 107, 402–405 (2000).
9. Robaei, D., Kifley, A. & Mitchell, P. Factors associated with a previous diagnosis of strabismus in a population-based sample of 12-year-old Australian children. *American Journal of Ophthalmology* 142, 1085–1088 (2006).
10. Cotter, S. A. et al. Risk factors associated with childhood strabismus: the multi-ethnic pediatric eye disease and Baltimore pediatric eye disease studies. *Ophthalmology* 118, 2251–2261 (2011).

11. McKean-Cowdin, R. et al. Prevalence of amblyopia or strabismus in asian and non-Hispanic white preschool children: multi-ethnic pediatric eye disease study. *Ophthalmology* 120, 2117–2124, doi: 10.1016/j.opthta.2013.03.001 (2013).
12. Wong, T. Y. et al. Prevalence and risk factors for refractive errors in adult Chinese in Singapore. *Investigative ophthalmology & visual science* 41, 2486–2494 (2000).
13. Pascolini D, Mariotti SP. Global estimates of visual impairment: 2010. *Br J Ophthalmol.* 2012;96:614–8.
14. Elkington A, Frank H, Greaney M. *Clinical Optic.* Oxford: Blackwell Science Ltd.; 1999.
15. Resnikoff S, Pascolini D, Mariotti SP, Pokharel GP. Global magnitude of visual impairment caused by uncorrected refractive errors in 2004. *Bull World Health Organ.* 2008;86:63–70.
16. Tang, S. M., Chan, R.Y.T., Lin, S.B., Rong, S.S., Lau, H.W., Lau, W.Y., Yip, W.K. et al. Refractive Errors and Concomitant Strabismus: A Systematic Review and Meta-analysis. *Sci. Rep.* 2016. 6:35177; doi: 10.1038/srep35177.
17. Khorrami-Nejad, M., Akbari, M.R., Khosravi, B. The prevalence of strabismus types in strabismic Iranian patients. *Clinical Optometry.* 2018;10:19-24.
18. Medghalchi A. A study on prevalence of horizontal strabismus in patients under 14 years. *J Guilan Univ Med Sci.* 2003;12(47):80–85.
19. Schaal L.F. et al., The prevalence of strabismus and associated risk factors in a southeastern region of Brazil. *Semin Ophthalmol.* 2016;14:1–4.
20. Bruce A, Santorelli G. Prevalence and risk factors of strabismus in a UK multi-ethnic birth cohort. *Strabismus.* 2016;24(4):153–160.
21. Nusz KJ, Mohnney BG, Diehl NN. Female predominance in intermittent exotropia. *Am Ophthalmol.* 2005;140:546 –7.
22. Zhu H, Yu J-J, Yu R-B, Ding H, et al. Association between Childhood Strabismus and Refractive Error in Chinese Preschool Children. *PLoS ONE.* 2015; 10(3):doi:10.1371/journal.pone.0120720.
23. Chia A, Lin X Y, Dirani M, Gazzard G, Ramamurthy D, Quah BL, et al. Risk factors for strabismus and amblyopia in young singapore chinese children. *Ophthalmic Epidemiology.* 2013;20(3): 138–147.
24. Al Wadaani FA, Amin TT, Ali A, Khan AR. Prevalence and pattern of refractive errors among primary school children in Al Hassa, Saudi Arabia. *Glob J Health Sci.* 2013;5:125–34.
25. Al Rowaily M, Alanizi B. Prevalence of uncorrected refractive errors among adolescents at king Abdul-Aziz Medical City, Riyadh. *J Clin Exp Ophthalmol.* 2010;1:114.
26. Ali A, Ahmed I, Ayub S. Prevalence of undetected refractive errors among school children. *Biomedica.* 2007;23:96–101.
27. Hashim SE, Tan HK, Wan-Hazabbah WH, Ibrahim M. Prevalence of refractive error in malay primary school children in suburban area of Kota Bharu, Kelantan, Malaysia. *Ann Acad Med Singapore.* 2008;37:940–6.
28. AL-Nuaimi A, Salama R, Eljack I. Study of refractive errors among school children Doha. *World Fam Med J.* 2010;8:41–8.

29. Padhye AS, Khandekar R, Dharmadhikari S, Dole K, Gogate P, Deshpande M. Prevalence of uncorrected refractive error and other eye problems among urban and rural school children. *Middle East Afr J Ophthalmol*. 2009;16:69–74.
30. Bataineh A, Khatatbeh E. Prevalence of refractive errors in school children of Tafila city. *Rawal Med J*. 2008;33:85–7.
31. Pokharel A, Pokharel PK, Das H, Adhikari S. The patterns of refractive errors among the school children of rural and urban settings in Nepal. *Nepal J Ophthalmol*. 2010;2:114–20.
32. Yared AW, Belaynew WT, Destaye S, Ayanaw T, Zelalem E. Prevalence of refractive errors among school children in Gondar Town, Northwest Ethiopia. *Middle East Afr J Ophthalmol*. 2012;19:372–6.