Journal of Medical and Health Science
Doi: 10.21070/anamnetic.v4i1.1635

Original Article
ISSN 2338-8595

Astigmatism profile in children in karbala city in Iraq

Moaiad abdullateef almasoudy[1], Khaldoon khalil nile[2], Salam hamid alshebani[3]

[1,2,3]Department of surgery, College of Medicine, University of Kerbala, Kerbala, Iraq
Author Email: [1]moaiad.A@Uokerbala.Edu.Iq , [2]khaldoon.K@Uokerbala.Edu.Iq
[3]salam_alqaraawy@yahoo.com

Article history: Submitted 28 December 2025, Revised January 2026, Acepted 5 January 2026

ABSTRACT
Objectives: determine the types and percentage of Astigmatism in children in Karbala city in Iraq. Patients and methods: This study was cross-sectional comparative study performed in Imam Hussein ophthalmology center in Karbala governorate in Iraq from January 2024 to June 2025. The study included 1834 eyes with equal sex and mean age of 8.95±2.37 years. Results: Regarding the Astigmatism, the higher proportion was for "-2 to 0" Myopic Astigmatism (48.7%), followed by "0 to 2" hypermetropic Astigmatism (35.3%). Most of the children had against the role astigmatism. Conclusion: Myopic Astigmatism was more common in males, while Hypermetropic Astigmatism was more common in females. Most of the children had against the rule astigmatism..
Keywords: ***Astigmatism, Cornea, Refractive error***

1. INTRODUCTION

Refractive errors occurs when the eye cannot focus the light properly on the retina because of the length of eye or the refractive power of the cornea. Refractive errors divided into several types such as: near-sightedness (Myopia), far-sightedness (hypermetropia), astigmatism, and presbyopia. Myopia occurs when the image focus in front of the retina, hypermetropia occurs when the light focus behind the retina, while Astigmatism occurs when the cornea has irregular curvature causing light to focus on the retina at multiple points rather than only one image. The symptoms of refractive errors may be blurring for far vision or near vision and it can include impairment of the quality of vision, headache, and eye strain [1]. Eyeglasses, contact lenses or surgery are the solution to correct refractive errors. Eyeglasses are the most safe and simple way to correct the refractive errors. Contact lenses are more useful for increasing the field of view comparing to glasses; however, its role in astigmatism is less important than in myopia and hypermetropia. Contact lenses use may cause corneal complication such as infection. Refractive surgeries can involve alerting the corneal refractive power or using intraocular lenses [2].

The prevalence rates are different across regions of the world with approximately of 80 percent of Asians and 25 percent in Europeans being affected. The most common refractive error is near-sightedness (Myopia). In adults the rates are between 15 and 49 and children's rete are 1.2 and 42. On the other hand far-sightedness (hypermetropia) in more common in small children and the elderly [3, 4].

Astigmatism is a common refractive error that found in clinics, it nearly accounts for 13 percent of refractive errors in the eye. Untreated Astigmatism can cause loss of visual acuity and amblyopia in children if not discovered and treated early, so screening for refractive error is mandatory to prevent amblyopia from being delayed in diagnosis and difficult to be treated [5].

*Coresponding author.
E-mail address: moaiad.A@Uokerbala.Edu.Iq
Peer reviewed under reponsibility of Universitas Muhammadiyah Sidoarjo.

Astigmatism can be corneal, lenticular. That mean the source of defocusing the picture is the cornea or the lens. Corneal astigmatism can be discovered by corneal topography and corrected by laser refractive surgeries. Wile in corneal astigmatism the topography is normal and the source of blurred image is the lens and can be corrected by replacing the crystalline lens by intraocular lens. [6] Based on the meridian, it can be with the rule, against the rule and oblique Astigmatism. It also can be divided as simple, compound, and mixed. In the first type the steep axis is around 90 degree, while in against the role astigmatism the steep axis is around 180 degree. In oblique astigmatism the steepest meridian is not around 90 or 180degree but it is between 30 and 60 degree or 120 and 150 degree. [7]. Another different type of astigmatism is the irregular astigmatism in which the steep and flat meridian is not 90 degree to each other. This type can be caused by corneal scarring or keratoconus in which the corneal surface is not regular. This type can be managed by a rigid contact lens. [8].

There are some factors that can influence Astigmatism such as pupil size, pressure of extraocular muscles, eyelid pressure and accommodation [9].

2. MATERIALS AND METHODS

This study was cross-sectional comparative study performed in Imam Hussein ophthalmology center in Karbala city in Iraq from January 2024 to June 2025. The study included 1834 eyes with equal sex and age of 8.95±2.37 years of a range 6-12. Those with history of congenital glaucoma, severe trauma, congenital cataract, uveitis and corneal diseases “corneal dystrophy and keratoconus” were not included in the study.

1- Refractive error measured without cycloplegia especially for those with no squint. The autorefractometer was manufactures by Topcon and Visual acuity was determined by Snellen chart.

3. RESULTS AND DISCUSSION

The current study included 917 child (total 1834 eyes) with almost equal sex and mean age of 8.95±2.37 years and their age ranged from 6-12 years as showed in table 1.
Regarding the Astigmatism, the higher proportion was for "-2 to 0" Myopic Astigmatism (48.7%), followed by "0 to 2" Hypermetropic astigmatism (35.3%) as illustrated by figure 1. Myopic Astigmatism was more common in males, while Hypermetropic Astigmatism was more common in females figure 3. Most of the Astigmatism was against the rule of 957 eyes (52%) followed by 664 eyes (36%) of them was with the rule and 210 eyes (12%) had oblique astigmatism figure 2.

Journal Homepage: https://anamnetic.umsida.ac.id/i
DOI Link: 10.21070/anamnetic.v4i1.1635
Article DOI: 10.21070/anamnetic.v4i1.1635

Table 1: Age and sex of the study participants

Variables	Categories	Total No. (%)
Sex	Male	889 (48.5%)
	Female	945 (51.5%)
	Total	1834 (100%)
Age (years)	mean ±SD	8.95±2.37

Fig 3: Astigmatism according to sex

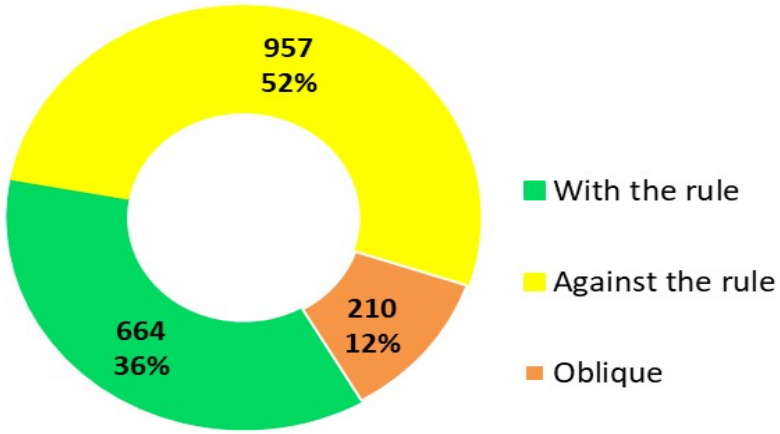

Fig 1: types of astigmatism among study eyes (total eyes= 1834)

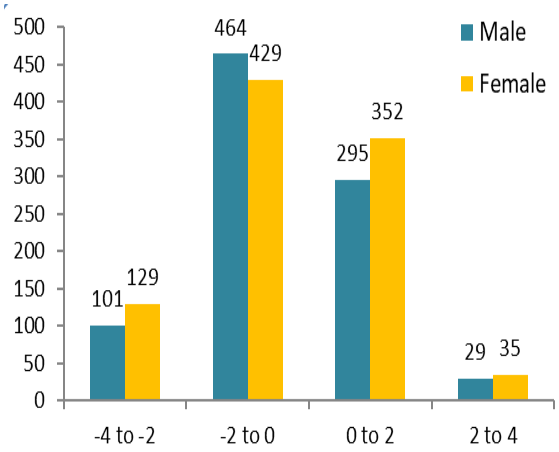

Fig 2: Astigmatism according to axis ,total study eyes (total eyes= 1834)

Journal Homepage: https://anamnetic.umsida.ac.id/i
DOI Link: 10.21070/anamnetic.v4i1.1635
Article DOI: 10.21070/anamnetic.v4i1.1635

Discussion:

Astigmatism is the refractive error in which the front surface of the eye (cornea) has irregular curvature, causing light rays focused on multiple points on the retina not a single point causing blurred vision. [10].

According to the position of the focal points, Astigmatism can be divided into three types: simple, compound and mixed Astigmatism. [11].

In simple Astigmatism one of the foci is focused on the retina and the other is in front or behind the retina, if one of the foci focused in front of the retina, the condition is simple myopic Astigmatism and if it's behind the retina the condition is simple hypermetropic Astigmatism. In compound Astigmatism both of the foci are focused either in front (compound myopic Astigmatism) or behind the retina (compound hypermetropic Astigmatism). [12].

In mixed Astigmatism one focal point is focused in front of the retina and the other is behind it, which means a mix between myopic and hypermetropic. [13].

Hypermetropic astigmatism were more common in female. However more than one study has been published in Mexico, Ethiopia and Eastern Mediterranean Region showed that myopic astigmatism is more common in female not in male [15-17].

As mentioned above the astigmatism can be with the role in which the vertical meridian is steeper than the horizontal (around 90 degree), against the rule Astigmatism which the horizontal meridian is steeper than the vertical (around 180 degree) and oblique Astigmatism which the steepest meridian is not around 180 or 90 degrees but on an oblique angle in 30-60 degrees or 120-150 degree[18].

Most common astigmatism regarding the axis was against the role astigmatism, a totally different results were found in Egypt in a study published in 2016 [19]. A similar result in China and Iran was found in 2019 and 2021 respectively [20, 21]. That study showed a higher percentage of the role astigmatism and a very low percentage of obliged astigmatism not reaching 12% that was found in our study.

That mean the astigmatism profile in Iraq is differ from the other countries as the percentage and distribution of myopia and hypermetropia regarding the gender, however a differ refractive error profile was found comparing to other countries, even the nearby countries, so an environmental cause can be excluded, while a genetic and behavioral causes can be attributed.

4. CONCLUSION

1. The most common Astigmatism was Against the rule Astigmatism.
2. Myopic Astigmatism was more common in males.

3. Hypermetropic Astigmatism was more common in females.
4. Oblique Astigmatism was the least common at a rate not exceeding 12 percent.
5. Myopic Astigmatism was more common than Hypermetropic Astigmatism in this age group.

REFERENCE

1. National Eye Institute. Facts about refractive errors [Internet]. Bethesda (MD): National Eye Institute; 2010 Oct [cited 2016 Jul 29]. Available from: https://nei.nih.gov

2. Kook D, Kohnen T. Refractive lens exchange. In: Spaeth GL, Danesh-Meyer HV, Goldberg I, Kampik A, editors. Ophthalmic surgery: principles and practice. 4th ed. Philadelphia: W.B. Saunders; 2012. p. 187-91. doi:10.1016/B978-1-4377-2250-5.00031-X.

3. Foster PJ, Jiang Y. Epidemiology of myopia. Eye (Lond). 2014;28(2):202-8. doi:10.1038/eye.2013.280. PMID:24406412; PMCID:PMC3930282.

4. Grosvenor T. Primary care optometry. 5th ed. St. Louis: Butterworth-Heinemann, Elsevier; 2007. p. 70.

5. Khalid, N., & Rosenfield, M. (2024). Astigmatism. In StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing.

6. Pan CW, Zheng YF, Wong TY, et al. Variation in prevalence of myopia between generations of migrant Indians living in Singapore. Am J Ophthalmol. 2012;154(2):376-81.e1.

7. Xu L, Li J, Cui T, et al. Refractive error in urban and rural adult Chinese in Beijing. Ophthalmology. 2005;112(10):1676-83.

8. Kim EC, Morgan IG, Kakizaki H, Kang S, Jee D. Prevalence and risk factors for refractive errors: Korean National Health and Nutrition Examination Survey 2008-2011. PLoS One. 2013;8(11):e80361.

9. Grosvenor T. Primary care optometry. 5th ed. St. Louis: Butterworth-Heinemann, Elsevier; 2007. p. 17.

10. Gianni T, Nikolaidou A, Tsina E. Retrospective analysis of refractive errors in pediatric patients in Greece. Acta Ophthalmol. 2025 Jan;103.

11. Leshaga L, Gaebolae K, Mutoloki E, Muma KI. Factors associated with refractive error among primary school going children in Molepolole, Botswana. Ophthalmol Res Int J. 2025 Mar 10;20(1):9-16.

12. Wu Q, Tian Q, Zhang X, Xu J, Tang G, Li R, Guo X, Xu Z, Feng J, Song J, Bi H. Prevalence of refractive error and visual acuity among school children in the plateau region of Qinghai, China. Int J Gen Med. 2021 Sep 16;14:5795-805.

13. Alghamdi W. Prevalence of refractive errors among children in Saudi Arabia: a systemic review. Open Ophthalmol J. 2021 May 24;15(1).

14. 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 Health Sci. 2012 Nov 11;5(1):125.

15. Lorato MM, Yimer A, Bizueneh FK. Prevalence of myopia in school-age children in Ethiopia: a systematic review and meta-analysis. SAGE Open Med. 2023;11:1-13.

16. Al-Ghamdi W, et al. Systematic review and meta-analysis of the prevalence of myopia among school-age children in the Eastern Mediterranean Region. Public Health. 2023;[Volume(Issue)]:[Pages].

17. Teran E, Romo-García E, Santiago HC, et al. Refractive errors of school children from economically ~ 37 ~ disadvantaged areas in Northwest México. J Clin Med. 2024;13(11):3094.

18. Sayed KM. Analysis of components of total astigmatism in infants and young children. Int Ophthalmol. 2017;37(1):125-9.

19. Mahmoud DA, Mansour MN. Prevalence of refractive errors and visual impairment due to refractive errors among school children in Cairo, Egypt. Delta J Ophthalmol. 2023 Jul 1;24(3):186-9.

20. Sayed KM. Analysis of components of total astigmatism in infants and young children. Int Ophthalmol. 2017;37(1):125-9.

21. He M, Foster PJ, Morgan IG, et al. Astigmatism and its components in 12-year-old Chinese children: the Anyang Childhood Eye Study. Ophthalmology. 2018;125(7):1078-86.