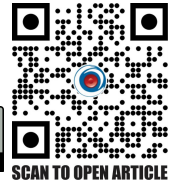


# Iris Colour Distribution and Its Relation with Refractive Errors in Gilgit - Baltistan

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## ABSTRACT

**Purpose:** The main purpose of this study was to find out the iris colour distribution and its relation with refractive errors in Gilgit Baltistan.

**Methodology:** This cross-sectional study was conducted after obtaining ethical approval. About 214 individuals with age ranging from 15 to 35 were selected from Gilgit Baltistan through the process of random sampling. Myopia, hyperopia and astigmatism were included in this study. The iris colour was classified into 5 groups I.e. Light brown, dark brown, green, grey and blue. All individuals were examined for visual acuity, objective and subjective refraction. Data was entered and analyzed in SPSS version 26.

**Results:** Out of the 214 selected individuals, 159 (74.3%) individuals were myopic, 21 (9.8%) individuals were hyperopic and 34 (15.9%) were astigmatic. Light brown 135 (63.1%) was the most common iris colour in myopic individuals followed by dark brown 38(17.8%), individuals with green 22(10.3%), iris colour grey 10 (4.7%), blue 9 (4.2%) were least common.

**Conclusion:** Individual with light and dark brown iris colour are at higher risk of myopia. Individuals with grey and blue iris colour have more chances to develop astigmatism

**Key Words:** Iris, Refractive error, Myopia, Hyperopia, Astigmatism.

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## INTRODUCTION

The eyeball lies in the protective structure of bones like a socket known as the orbit. A tissue layer called sclera covers almost the whole eyeball's surface.<sup>1</sup> The cornea, the transparent, dome-shaped front part of the eye, directs light into the eye. The colored component of the eye, the iris, which contains the pupil, is a dark hole in the middle. It is located in the back of the anterior chamber. The lens is located directly behind the pupil.<sup>2</sup> Our finely focused, center vision is produced by the macula, a tiny yet extremely specialized area of the retina. The retina sends electrical signals of light to the brain via the optic nerve. The coloured tissue in the front of the eye is called the iris.<sup>3</sup> It aids in regulating pupil size and adjusting how much light enters the eye. A two-cell-thick, highly pigmented epithelial layer covers the rear surface. The high pigment content prevents light from reaching the retina through the iris.<sup>4</sup>

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One of the key conditions that has a strong correlation with iris colour is refractive errors. However, the predominance of distinct eye colours may vary by continent or location.<sup>5</sup> For instance, whereas these two colours account for only 12% of the global occurrence, blue and/or green eyes are present in 86 percent of Irish people. Most of the Asian are born with brown eye colour due to high melanin content.<sup>6</sup> Myopia is the most common form of vision impairment among people, and its prevalence is rising globally. When accommodation is relaxed, light rays focus behind the retina in the condition of refraction known as hyperopia. It mostly found in children.<sup>7</sup>

Young children are more likely to have hyperopia, which is frequently encountered in conjunction with the onset of strabismus and amblyopia.<sup>8</sup> However, thorough optometric or ophthalmic training, in addition to expertise evaluating very young children, are requirements for retinoscopic screening of babies.<sup>9</sup>

When the cornea, the front surface of the eye, or the lens within the eye have uneven curvature, astigmatism results. The surface is formed like an egg rather than having a single curve like a spherical ball.<sup>10</sup> Astigmatism occurs when the cornea or lens curves more sharply in one direction than another.<sup>11</sup> If your lens has uneven curves, you may have lenticular astigmatism. Both kinds of astigmatism can result in blurred vision. Vision blurriness may be more prevalent in one direction: either horizontally, vertically, or diagonally.<sup>12</sup>

## METHODOLOGY

This cross-sectional study was conducted after obtaining ethical approval. About 214 individuals with age ranging from 15 to 35 were selected from Gilgit Baltistan through the process of random sampling. Myopia, hyperopia and astigmatism were included in this study. The patients were excluded if they had any previous ocular disease, mixed astigmatism and compound astigmatism. The iris colour was divided into 5 groups i.e. light brown, dark brown, green, grey and blue. Snellen chart, auto-refractometer and trial box was used for this study. After informed consent, the patient was seated in front of the auto-refractometer to take

objective visual acuity.

After that we noted subjective refraction of patients with the help of Snellen chart and trial box. First we positioned the patient at 6m away from the Snellen chart and asked the patient to look at the chart After that we corrected the vision of patient by using plus, minus and cylindrical lenses, minus lenses used for myopic patient, plus lenses used for hyperopic patients and cylindrical lenses used for astigmatic patient to cover their errors. And at the same time, the iris colour of every patient was checked. SPSS version 36 was used for data analysis.

## RESULTS

Out of the 214 selected individuals, 159 (74.3%) individuals were myopic, 21 (9.8%) individuals were hyperopic and 34 (15.9%) were astigmatic. Light brown 135 (63.1%) was the most common iris colour in myopic individuals followed by dark brown 38(17.8%), individuals with green 22(10.3%), iris colour grey 10 (4.7%), blue 9 (4.2%) were least common.

**Table -1: Gender Distribution**

	FREQUENCY	PERCENT
Female	102	47.7
Male Total	112	52.3
Total	214	100.0

**Table -2: Iris Color Distribution**

	FREQUENCY	PERCENT
Light brown	135	63.1
Dark brown	38	17.8
Green	22	10.3
Grey	10	4.7
Blue	9	4.2
Total	214	100.0

**Table- 3: Distribution of Refractive Errors**

	FREQUENCY	PERCENT
Myopia	159	74.3
Hyperopia	21	9.8
Astigmatism	34	15.9
Total	214	100.0

**Table -4: Distribution of Visual Acuity**

	FREQUENCY	PERCENT
6/6	5	2.3
6/9	45	21.0
6/12	52	24.3
6/18	33	15.4
6/24	28	13.1
6/36	25	11.7
6/60	22	10.3
C.F	4	1.9
Total	214	100.0

**Table -5: Iris Colour and Refractive Error**

IRIS COLOUR * REFRACTIVE ERROR CROSBTABULATION						
			Refractive error			Total
			Myopia	Hyperopia	Astigmatism	
Light brown	Count	114	9	12	135	
	% Within Iris color	84.40%	6.70%	8.90%	100.00%	
Dark brown	Count	32	1	5	38	
	% Within Iris color	84.20%	2.60%	13.20%	100.00%	
Green	Count	10	9	3	22	
	% Within Iris color	45.50%	40.90%	13.60%	100.00%	
Grey	Count	3	1	6	10	
	% Within Iris color	30.00%	10.00%	60.00%	100.00%	
Blue	Count	0	1	8	9	
	% Within Iris color	0.00%	11.10%	88.90%	100.00%	
Total	Count	159	21	34	214	
	% Within Iris color	74.30%	9.80%	15.90%	100.00%	

## DISCUSSION

This present study revealed that in Gilgit Baltistan light brown colour is more common in people and they have myopia, some of them have hyperopia with light iris colour (blue or gray), as we go from darker to lighter iris colour myopia shifts to hyperopia and astigmatism because the number of melanocytes inference with hue of iris and less amount of light reflected back from the eye having less melanocytes.<sup>13</sup>

Our study showed that people having dark brown iris in contrast to gray or blue iris had greater chance

of myopia but there is too much controversy in this statement unfortunately according to Winn et al. study there is no relationship between iris colour and refractive error.<sup>14</sup> According to Sun et al., the eye increases the pigmentation in the iris, making the iris darker to prevent excessive light from entering the eye, in order to manage light entry. Myopic patients are less inclined to use sunglasses, which increases the entry of light to the eye.<sup>15</sup>

As per the investigations of natural eye variety it is an actual trademark depends on the morphology, science, formative science, and hereditary elements of the iris structure. Behind the iris is a layer of cuboidal cells called the iris color epithelium (IPE), which is one cell thick. Since each epithelial cell has countless melanosomes, the cells are unequivocally shaded. IPE assumes significant part in giving tone to iris and it is missing or present in little add up to dazzle the eye variety in albinism. Where the upper lying stroma is flimsy and this layer have some communication in designing. Because of the IPE's dim shading, which can retain entering light in eyes with an exceptionally slight stroma, the white collagen strands in the further cell layers of the stroma will take on a dark color.<sup>16</sup>

In spite of the fact that it has sometimes been noticed that lighter iris tone are most often found among Europeans. As indicated by certain reports, Asian iris might have less melanocytes in general than those of African or European plunge because of a more modest iris region or a rather lower melanocyte thickness.<sup>17</sup> Eagle's and Imesch's studies revealed that variable quantities and characteristics of the melanosome particles, which the melanin pigment is packed within these cells, are the cause of variances in how eye colour is perceived. Rather than skin and hair, where melanin is constantly produced and discharged, melanosomes are held and limit the melanocyte cytoplasm in the iris stroma. Compound exploration has likewise been finished to look at the nature of the melanin in various eye tones.<sup>18</sup>

Blue iris has been accounted for to contain next to no shade, while other eye tones have eumelanin and pheomelanin structures. Strikingly, the sum and kind of melanin have additionally been connected to iris tone, with more obscure eyes showing

altogether higher eumelanin to pheomelanin proportions and lighter eyes showing to some degree higher pheomelanin levels. Consequently, a scope of eye tints are conceivable in light of the fact that to varieties in the amount, quality, and bundling of the melanin shade.<sup>18</sup>

Most of the individuals had light brown and dark brown iris colour eye, with only a few having light iris colour eye. Other Iranian research, Hashemi et al in 2010, revealed that after complete eye examination, medium brown was the most common colour of eye in Tehran. Even when other known myopia-related risk factors were taken into consideration, the study by Faisal Rashid and his colleagues found that darker iris colours were associated with increased myopia-related refractive errors.<sup>20</sup>

According to another study of hashemi and jalil disclosed in their study, about 90% of the individuals had dark brown and medium brown eyes. And the individual with green iris colour had more risk of hyperopia as compared to brown iris coloured individual. So individual with green iris colour should be examined more carefully during screening of the eye. Children and teenagers' ocular risk factors for astigmatism are not well understood by the general public. According to recent studies, astigmatism is linked to a darker iris colour. This phenomenon should be caused by a relationship between iris colour, myopia, and astigmatism. First and foremost, myopia prevalence and severity are directly correlated with astigmatism according to Fan et al.<sup>21</sup>

Small sample size is major limitation of this study. Author propose a population based study to cement or modify the findings of current study.

**Conflict of Interest:** None to declare

**Ethical Approval:** The study was approved by the Institutional Review Board / Ethical Review Board No. REC UOL 196.01.2024

**Authors' Contribution:**

Mishal Armia: Concept Design, Data Collection  
Shiza Khalid: Data Collection, Literature Review  
Iqra Akhlaq: Data Collection and Analysis  
Iqra Taj: Literature Review, Drafting  
Zohra Batool: Literature and Critical Review

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