



## ORIGINAL ARTICLE

# Pattern of astigmatism in a clinical setting in Maldives<sup>☆</sup>



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### KEYWORDS

Astigmatism;  
Maldives;  
Omega-fatty-acids;  
Sea foods;  
Vector analysis

### Abstract

**Background:** Patterns of refractive errors have never been reported in Maldives. This study aims to dissect astigmatism and provide a general view in context of this island country.

**Methods:** A clinic based cross sectional study was designed with 277 patients, aged  $\geq 3.5$  years and with a primary astigmatism of  $\geq -1.00$  diopters (D). They underwent complete eye examination and a vector analysis was done.

**Results:** Mean age was 28.58 (SD 19.15) years. Astigmatic magnitude depended on age ( $p < 0.05$ ) but not on gender ( $p > 0.05$ ). Severity of visual impairment after refractive correction was very less, with only 2.2% having visual acuity  $\leq 6/60$ . Mean spherical, spherical equivalent and astigmatic refraction were  $-1.35$  (SD 2.94 D),  $-2.40$  (SD 3.04) and  $-2.12$  (SD 1.11 D), respectively. Between fellow eyes, refractive and corneal astigmatism highly correlated (0.83 and 0.73). Fifty eyes (18.1%) had an astigmatic error of  $\geq -3.00$  D which peaked in the second and third decades of life ( $p < 0.0001$ ) and was corneal in origin ( $p < 0.0001$ ). Internal J45 and J0 tended to be more negative with increasing age, showing a trend toward against the rule astigmatism. Correlation between corneal and refractive J0 and J45 were 0.88 and 0.62 ( $p < 0.0001$ ). With the rule astigmatism was more common followed by against the rule and oblique.

**Conclusion:** In conclusion, this study inferred that among patients with relatively higher magnitude of astigmatism attending to the clinics in Maldives, younger patients are affected more, which could possibly link to the environment, genetics and nutrition. The probable association between nutrition and astigmatism needs to be investigated to fill the gap in literature.

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<sup>☆</sup> This study was conducted in Eye Care Hospital, Male' City, Republic of Maldives.

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**PALABRAS CLAVE**

Astigmatismo;  
Maldivas;  
Ácidos grasos omega;  
Mariscos;  
Análisis vectoriales

**Patrón del astigmatismo en un centro clínico de Maldivas****Resumen**

**Antecedentes:** Los patrones de los errores refractivos no han sido reportados nunca en Maldivas. Este estudio trata de analizar minuciosamente el astigmatismo, así como aportar una visión genérica en el contexto de este país insular.

**Métodos:** Se diseñó un estudio clínico transversal que incluyó a 277 pacientes, de edades  $\geq 3,5$  años y con astigmatismo primario de  $\geq -1,00$  Dioptrías (D). Se les realizó un examen visual completo y un análisis vectorial.

**Resultados:** La edad media fue de 28,58 años (DE 19,15). La magnitud astigmática dependió de la edad ( $p < 0,05$ ) pero no del sexo ( $p > 0,05$ ). La severidad de la discapacidad visual tras la corrección refractiva fue muy baja, y únicamente el 2.2% reflejó una agudeza visual  $\leq 6/60$ . La media del defecto esférico, el equivalente esférico y la refracción astigmática fueron de -1,35 (DE 2,94D), -2,40 (DE 3,04) y -2,12 (DE 1,11D), respectivamente. El astigmatismo refractivo y el corneal guardaron una amplia correlación entre ambos ojos (0,83 y 0,73). Cincuenta sujetos (18,1%) reflejaron un valor de error astigmático  $\geq -3,00D$ , que se incrementó en la veintena y la treintena ( $p < 0,0001$ ), siendo corneal en origen ( $p < 0,0001$ ). Los vectores  $J_{45}$  y  $J_0$  internos tendieron a ser más negativos conforme aumentaba la edad, mostrando tendencias de astigmatismo en contra de la regla. La correlación entre los vectores  $J_0$  y  $J_{45}$  corneal y refractivo fue de 0,88 y 0,62 ( $p < 0,0001$ ). El astigmatismo a favor de la regla fue el más común, seguido del astigmatismo contra la regla y el oblicuo.

**Conclusión:** En conclusión, este estudio concluyó que de entre los pacientes astigmáticos de magnitud relativamente mayor que se presentaron en la clínica de Maldivas, los pacientes más jóvenes estaban más afectados, lo que podría estar ligado al entorno, los factores genéticos y la nutrición. Debe investigarse la posible asociación entre la alimentación y el astigmatismo, para llenar el vacío en la literatura al respecto.

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**Introduction**

Astigmatism is a clinically important condition and accounts for about 13% of the refractive errors of human eye.<sup>1</sup> Its prevalence ( $\leq 0.50D$ ) has been reported to vary with ethnicity,<sup>2</sup> age,<sup>3</sup> and sex.<sup>2</sup> In the Sydney Myopia Study, 4.8% of 6-year-old children had refractive astigmatism ( $\leq -1.00D$ )<sup>4</sup> which was similar to that reported in Finland (3.8%)<sup>5</sup> and Southern urban and rural India (3.8%)<sup>6,7</sup> as well as in Poland (4%).<sup>8</sup> The prevalence of refractive astigmatism in Australian children is much lower than that in Chinese (38.6%)<sup>9</sup> Taiwanese (14.6%)<sup>10</sup> and Singaporean children (19.2%).<sup>11</sup> This regional and ethnic variation is also found in adult populations.<sup>12</sup>

Astigmatism influences the normal visual development<sup>13</sup> and may cause amblyopia in children.<sup>14</sup> Presence of early astigmatism relates to the development of myopia, possibly through the signal driven by astigmatic blur which either aids or disrupts the emmetropization of the spherical power.<sup>15</sup> It is found that most astigmatic corneas occur in newborns with the lowest birth weight and lowest post-conceptual age.<sup>16</sup> Likewise, infants have large degrees of astigmatism which decline through emmetropization<sup>17</sup> and may remain in a small degree ( $\leq -1.00D$ ) by the age of four years.<sup>18</sup> In a longitudinal study, Gwaizda et al. indicated that 4–5 years is a time of transition for astigmatism as it changes from Against-The-Rule (ATR) to With-The-Rule (WTR). If a child does not have astigmatism in infancy, he or she is unlikely

to acquire it at a later age, at least up to 4–6 years of age.<sup>19</sup>

Family studies have supported the role of genetics in astigmatism.<sup>12</sup> Clementi and colleagues defined the genetic model for corneal astigmatism and provided an evidence for Single Major Locus (SML; a multifactorial transmissible component) inheritance.<sup>20</sup> The genes in myopia twin study (GEM) supported a strong genetic component in astigmatism<sup>21</sup> which demonstrated a genetic component to corneal curvature. Valluri and colleagues reported a stronger role for environmental factors.<sup>22</sup>

The trends of refractive errors and other ocular diseases are unknown in Maldives which is an island country of Islamic religion. Most of the patients here present to the clinic with relatively higher magnitude of astigmatism. This study was designed to investigate astigmatism in relation to age and gender, and it is expected that the reports of present study form the baseline evidence for further cohort studies to explain the possible etiology of the high magnitude astigmatism in this island country.

**Methods and methodology**

This is a cross sectional, descriptive study carried out in Eye Care Hospital, Maldives. Patients satisfying the inclusion criteria were included randomly over a period of 3 months since July 2013. The tenets of the declaration of Helsinki were adhered to and the informed consent was taken

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