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Examining Visual Impacts of Astigmatism in The Corporate Workspace: A Research Study

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ABSTRACT

Aim: The study aimed to analyse the effects of uncorrected astigmatism on the visual functions of corporate staff in Jaipur, India, by ascertaining the lowest degree of astigmatism impacting visual performance.

Methods: The study enrolled 1834 adults divided into three age groups. Informed consent was obtained. Data collection adhered to Institutional Review Board protocols at corporate locations in Jaipur, India. Visual acuity was assessed using log MAR charts, and refractive errors were corrected.

Result: In this study astigmatism among youth using cross-sectional methods and clinical tools. Participants were grouped by refractive error. The initial analysis compared demographics and vision status. Secondary ANCOVA found no significant VMI/VMIp score differences by astigmatism severity. Astigmatism was more prevalent in the <1.00D Cyl category, suggesting awareness gaps. There was no statistically significant distinction observed between WTR and ATR findings, indicating a comparable distribution of results (p = .668). This suggests that the prevalence or characteristics of WTR and ATR astigmatism were not significantly different within the studied population.

Conclusion: The analysis underscores early diagnosis's importance and the impact of uncorrected astigmatism on visual-motor tasks. Providing spectacles improved work efficiency, advocating for interventions to enhance productivity and well-being in corporate environments.

Keywords: Astigmatism, Binocular, Refractive Error, Visual Acuity, Visual Performance

1. INTRODUCTION

Astigmatism is one of the uncorrected refractive abnormalities that severely reduces both close and distant vision. This makes reading and driving difficult and seriously lowers an individual's quality of life. Regarding the significant incidence of astigmatism, there is a substantial knowledge gap about the impact of uncorrected astigmatic refractive defects despite extensive studies on spherical refractive blur [1]. Astigmatism is a condition that causes abnormalities in the cornea or lens curvature of the eye to distort incoming light rays. However, astigmatism has not received much attention in studies, which provides a major information gap about its effects on visual health and well-being [2].

Particularly in the fast-paced corporate world of today, when good eyesight is essential for maximum performance and work satisfaction, visual acuity is critical for productivity and wellness. As one of the most prevalent optical abnormalities in the world, astigmatism's precise effects on persons in corporate settings are still largely unresolved [3].

Uncorrected astigmatism may greatly lower productivity, increase pain, and cause visual fatigue among personnel working in the corporate sector, where there is a strong need for accuracy and extended visual engagement. Individuals with uncorrected astigmatism may find it difficult to concentrate on tasks that need prolonged attention, such as reading reports or analysing data, which might have an adverse effect on group and organisational productivity. In order to maximise production and promote employee well-being, it is essential to acknowledge the significance of visual acuity in the corporate setting and to address the difficulties that arise from astigmatism [4].

Furthermore, the effects of uncorrected astigmatism go beyond the office and have an impact on a variety of facets of peoples' everyday life. When eyesight is impaired, tasks like reading and driving become difficult and may be dangerous for both personal growth and safety [5]. Preventive measures, early identification via routine eye exams, and equal access to corrective solutions like prescription eyeglasses or contact lenses are all necessary components of a complete strategy to address uncorrected astigmatism [6]. uncorrected astigmatism has a

substantial impact on visual health, productivity, and quality of life, yet it is a problem that is often disregarded [7]. So, this study aimed to enhance knowledge of occupational health and ergonomics to create inclusive, productive workplaces with optimal visual well-being in the corporate sector, focusing on understanding the effects of astigmatic blur on functional measures of visual performance through experiments on astigmatic individuals at work.

2. METHODS

2.1 Study Participants

The study possessed 1834 adult participants, with an average age of 23.92 years and a standard deviation of 7.49 years. The participants' ages ranged from 18 to 35 years. The participants were categorised into three categories according to their age. Before the study session, participants and parents provided their informed consent.

2.2 Data Collection

The information required for the study was gathered and evaluated in compliance with the norms and procedures of the Board of Institutional Review. The investigation was carried out in Jaipur, Rajasthan, India, at several corporate locations Written informed consent was obtained from the employee before testing. Previous research findings have consistently highlighted a significant occurrence of with-the-rule (WTR) astigmatism among employees working in corporate offices. This observation underscores a notable prevalence of astigmatism within the corporate workforce. Additionally, previous studies have indicated that individuals with astigmatism in such settings often exhibit symptoms that suggest the condition may have originated from a young age [8].

2.3 Visual Acuity Assessment Procedure

Binocular visual acuity was measured without any corrections at a distance of 4 metres employing log MAR letter acuity charts. The last acuity measurement was taken as the smallest Log MAR line where the participant could accurately identify at least 6 out of 7 letters. After the measurement of visual clarity, the auto-refraction findings were modified according to the requirement using subjective refinement to establish the highest probable visual clarity with the most suitable correction. Participants who satisfied any of the following criteria were given recommendations: Astigmatism with a magnitude of 1.00 D or higher in either eye.

2.3 Statical analysis

The statistical assessments were performed using IBM Corp.'s Quantitative Programme for the Social Sciences, which is also referred to as SPSS, Version 26.0. Using a repeated-measures analysis of variance (ANOVA) in conjunction with the Fisher least significant-difference (LSD) post hoc test to perform several comparisons, the impact of various astigmatism degrees and orientations was examined. A statistically significant P value was defined as one that was less than 0.05.

3. RESULT

The study was done in……., India, on astigmatism among youngsters. A variety of clinical instruments, including a television setup, phoropter, and stereo acuity chart, were used in the cross-sectional design study.

3.1 Categorization of Participants According to Refractive Error

The participants were separated into two groups according to their estimated refractive error: a group for control (individuals who did not meet the requirements for a glasses prescription, which consisted of hyperopia less than 2.50 D on any axis in either eye, myopia less than 0.75 D on any meridian in both eyes, and astigmatism less than 1.00 D in both eyes) or a group for bilateral astigmatism (individuals who had astigmatism of 1.00 D or more in both eyes). Participants who had retinal abnormalities, the condition (>1.50 D spherical comparable or >1.50 D astigmatism), or myopic aberration and did not match the requirements for either the unaffected group or the bilateral aberration group were not included in the assessments.

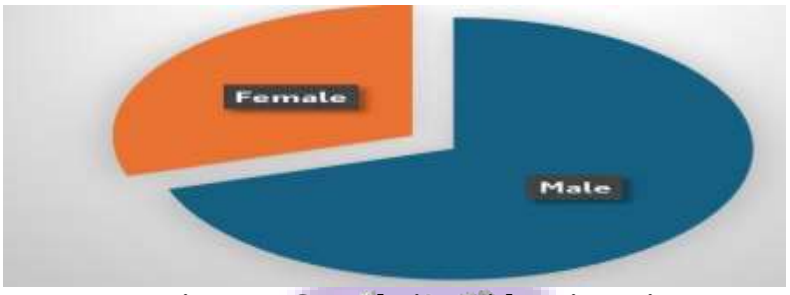

Figure 1: Sex relation with astigmatism

3.2 Visual acuity adjustment and secondary ANCOVA assessment

The secondary ANCOVA analyses aimed to control for visual acuity and standardize assessments across different testing conditions and participant groups. Participants' visual acuity during VMI/VMIp testing was represented by an additional variable, considering uncorrected visual acuity for some and best-corrected visual acuity for others. This comparison helped discern potential differences in VMI and VMIp scores linked to varying levels of astigmatism severity. Further ANCOVA analyses focused on youth with astigmatism, categorizing them into moderate or high astigmatism groups, with age as a covariate. The majority exhibited with-the-rule (WTR) astigmatism, with a prevalence of <1.00D Cyl being particularly high, possibly indicating a lack of awareness regarding clear vision. The p-value of .668 indicated no significant differences between severity groups, contributing to the overall understanding of astigmatism impact.

Table 1- Post Hoc Tests (Tukey HSD)

(I) Cyl_ANOVA		Mean Difference (I-J)	Sig.
< 1.0 D	1.0 - 2.0 D	-.97342*	.000
	> 2.0 D	-2.55878*	.000
1.0 - 2.0 D	< 1.0 D	.89772*	.000
	> 2.0 D	-1.72486*	.000
> 2.0 D	< 1.0 D	2.60258*	.000
	1.0 - 2.0 D	1.59286*	.000
*. The mean difference is significant at the 0.05 level.			

The figures provided depict the mean Visual Motor Integration (VMI) scores among participants under different conditions. In Figure 2, the mean VMI scores are presented, while in Figure 3, the mean VMIp scores are displayed. The data includes standardized scores for three groups: individuals with low refractive error (the control group) tested without correction, individuals with bilateral astigmatism tested with correction, and individuals with bilateral astigmatism tested without correction. In both figures, the control group has the highest mean VMI score, followed by the corrected astigmatism group, with the uncorrected astigmatism group having the lowest mean score. This pattern implies that uncorrected astigmatism has a negative impact on visual-motor integration compared to the control group. Correcting astigmatism seems to improve VMI scores, though not to the level of the control group.

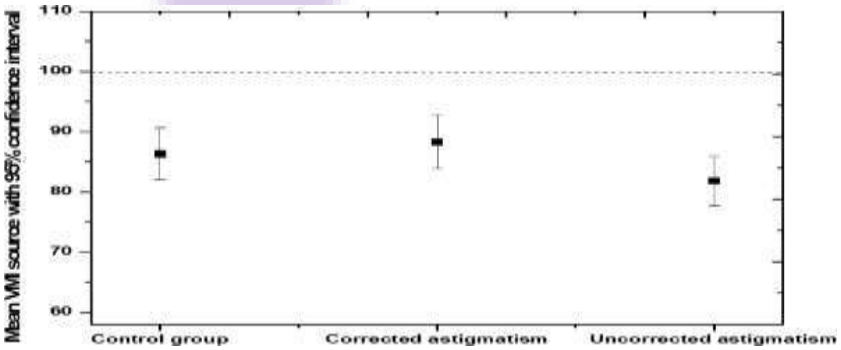

Figure 2: Mean VMI

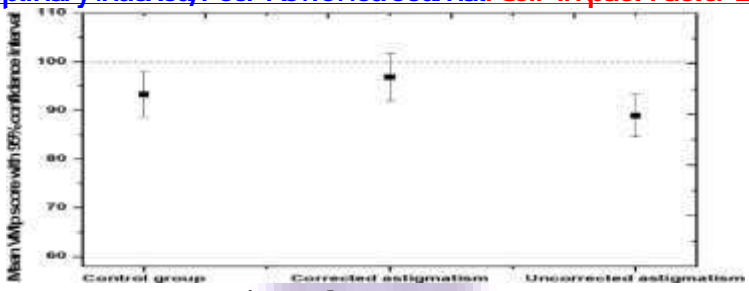

Figure 3: Mean VMIp

4. DISCUSSION

Astigmatism is the most common refractive error in human beings. The present study was a cross-sectional study investigating the visual impacts of astigmatism in the corporate workspace. Additionally, few studies worldwide have focused on the impact of astigmatism similar to the study. This cross-study consistency highlights the significant frequency of astigmatism in corporate employees, indicating an increase that overcomes situational or regional distinctions. Furthermore, the finding that people with astigmatism in comparable settings often show signs indicating the beginning of the condition supports the previous research conducted by Wildsoet CF et al., 2019 [9]. This emphasises the significance of identifying and addressing the issue at an early stage. The logMAR visual acuity charts are used as the gold standard for clinical research due to the chart construction and design advantage over the traditional Snellen chart similarly used by Hazel CA et al., 2002 [10].

Although the criteria for indicating corrective measures based on the severity of astigmatism are well-defined in this study, it would be beneficial to confirm them against established clinical standards support the previous research conducted by as shown by Elam AR et al., (2022) in order to improve the reliability of recommendations and treatment findings [11]. IBM Corp.'s SPSS software is often used for statistical analysis, specifically to conduct repeated-measures ANOVA and the Fisher least significant-difference (LSD) post hoc test. This strategy corresponds with the approach that has been used in another research, such as the one conducted by Wertheimer CM et al., (2020) [12]. Future research could investigate alternative analytical techniques, such as mixed-effects models, to better understand the impact of different degrees and orientations of astigmatism. This approach, as suggested by Namba H et al., (2022), would help account for potential confounding variables and allow for longitudinal assessments to assess changes over time [13]. A visual comparison of VMI and VMIp scores across the different groups and conditions, providing insight into the impact of refractive error and correction on visual-motor integration abilities similarly conducted by Tripathi H et al., (2019) [14].

In conclusion, the approach described in this research paper has various strengths, such as a substantial sample size, standardised assessment procedures, and appropriate statistical analysis. However, when comparing it to similar studies conducted by Elam AR et al., [11] Wertheimer CM et al., [12] and Namba H et al., [13] certain areas for improvement and potential directions for future research become apparent. Studies may improve the accuracy and reliability of their results on astigmatism prevalence and management solutions in corporate contexts by incorporating knowledge from current literature and using effective methods used in similar studies. This will lead to a more comprehensive understanding of a subject.

5. CONCLUSION

In conclusion, this study contributes significantly to the body of knowledge surrounding astigmatism and its visual impacts within the corporate environment, a topic that has not been extensively explored. It corroborates the widespread prevalence of astigmatism amongst corporate employees, as suggested by cross-study consistency, underlining the importance of early detection and intervention. Leveraging the methodological robustness of logMAR visual acuity charts, the study aligns with established clinical research practices and provides well-defined criteria for corrective measures. However, for enhanced reliability of recommendations

and outcomes, these criteria would benefit from validation against the established clinical standards. Overall, this study lays a solid foundation for future research, which can expand upon these findings to refine our understanding of astigmatism's prevalence and management in the corporate sector, ultimately leading to more informed and effective interventions.

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