

“Assessment of refractive error in young adults in shivbari Bikaner”

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ABSTRACT

Background: Refractive errors are among the most common causes of visual impairment worldwide and are particularly prevalent among young adults due to increasing near work and digital screen exposure. Early detection and correction are essential to prevent long-term visual complications and improve quality of life. This study was conducted to evaluate the refractive status of young adults in Shivbari, Bikaner, Rajasthan.

Aim and Objectives: Aim: To assess the prevalence of refractive errors among young adults in Shivbari, Bikaner.

Objectives: To determine the occurrence, types (myopia, hypermetropia, astigmatism), and severity of refractive errors; to analyze their distribution based on gender; to identify undiagnosed cases; and to detect individuals requiring refractive correction.

Materials and Methods: A hospital-based cross-sectional observational study was conducted at Getwell Eye Hospital, Bikaner, over a period of 6 months (October 2025–March 2026). A total of 200 participants aged 18–35 years were included based on predefined inclusion and exclusion criteria. Each subject underwent a comprehensive optometric examination. Distance visual acuity was assessed using a Snellen chart under standard illumination. Objective refraction was performed using an autorefractometer, followed by subjective refraction to determine final correction and best corrected visual acuity (BCVA). All findings were recorded in a structured data collection sheet and analyzed statistically.

Results: The study revealed a high prevalence of refractive errors among young adults, with myopia being the most common type, followed by astigmatism and hypermetropia. A considerable proportion of participants were found to have previously undiagnosed refractive errors. Gender-wise distribution showed slight variation, but refractive errors were prevalent in both males and females. Most cases were mild to moderate in Severity, and a significant number of individuals required corrective lenses.

Conclusion: Refractive errors are highly prevalent among young adults in Shivbari, Bikaner, with a substantial number of undiagnosed cases. Regular screening and timely correction are essential to prevent visual impairment and improve productivity. Public awareness and accessible eye care services are recommended to address this growing concern.

Keywords: Refractive Error, Myopia, Hypermetropia, Astigmatism, Young Adults, Visual Acuity, Bikaner

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Introduction

Introduction to Vision and Visual System

The human eye is a highly specialized sensory organ that responds to visible light and enables the perception of the surrounding environment. It plays a fundamental role in human survival, communication, learning, and daily functioning (1). Among the five senses, vision contributes the largest proportion of sensory input, making it the most dominant modality for interpreting environmental stimuli (2).

Vision is a complex neurophysiologic process involving the interaction between the eye and the brain. Light rays reflected from objects enter the eye, are refracted by optical components, and ultimately form an image on the retina. This image is then transmitted via the optic nerve to the visual cortex for interpretation (3). Any disruption in this pathway, particularly in the refractive components, leads to impaired vision.

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Uncorrected visual impairment has significant consequences on educational performance, occupational productivity, and overall quality of life. Recognizing its importance, the World Health Organization (WHO) has identified visual health as a global priority under initiatives such as *Vision 2020: The Right to Sight*, which aims to eliminate avoidable blindness (4).

Introduction to Vision

The human eye is a complex sensory organ responsible for vision, which allows individuals to perceive and interpret the surrounding environment through light stimuli. Vision plays a dominant role among all sensory systems, contributing significantly to learning, mobility, communication, and quality of life (1). It is estimated that a major proportion of sensory

information received by humans is visual in nature, making it crucial for daily functioning and survival (2). Vision is a coordinated process involving the optical system of the eye and neural processing in the brain. Light rays reflected from objects enter the eye, are refracted by the cornea and crystalline lens, and form an image on the retina. This image is then converted into electrical signals and transmitted to the brain via the optic nerve, where it is interpreted as visual perception (3).

Any disruption in the optical pathway, particularly in the focusing mechanism, results in visual impairment. Among such disturbances, refractive errors are the most common and easily correctable causes of visual impairment worldwide.

Global Burden of Refractive Errors

Refractive errors are among the most common ocular disorders affecting individuals of all age groups worldwide. According to WHO reports, uncorrected refractive errors account for approximately **43% of global visual impairment**, making them the leading cause of visual disability and the second leading cause of blindness globally (5).

These conditions arise due to abnormalities in the refractive components of the eye, including the cornea, crystalline lens, and axial length. When the optical system fails to focus light precisely on the retina, blurred

vision occurs, significantly impacting daily activities (6). Despite being easily diagnosable and correctable, refractive errors remain a major public health concern, particularly in developing countries where access to eye care services is limited.

Refractive errors are a leading cause of visual impairment globally. According to epidemiological studies, they account for a significant proportion of visual disability and are considered a major public health issue. Globally, refractive errors contribute to a large percentage of visual impairment cases, particularly in developing countries where access to eye care services is limited (5).

In India, studies have reported that more than **50% of adults may have some form of refractive error**, with myopia and hypermetropia being the most common types. Additionally, global meta-analyses indicate that the prevalence of refractive errors in adults includes approximately **26.5% myopia, 30.9% hyperopia, and 40.4% astigmatism**.

Despite being correctable with simple interventions such as spectacles, refractive errors remain uncorrected in many populations, leading to reduced productivity, poor academic performance, and decreased quality of life.

1.4 Concept of Emmetropia (Normal Vision)

Emmetropia refers to the normal refractive condition of the eye in which parallel rays of light from distant objects are focused precisely on the retina when accommodation is relaxed. This results in clear and sharp vision without the need for corrective lenses (7).

In this condition, there is an optimal balance between the corneal curvature, lens power, and axial length of the eye.

An emmetropia eye provides clear vision without the need for corrective lenses and demonstrates normal visual acuity during standard eye examinations

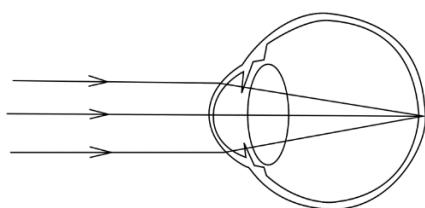
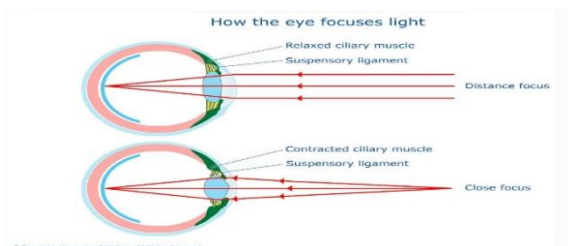


FIGURE 1.1 EMMETROPIC EYE



EYE

FIGURE 1.1 EMMETROPIC

In emmetropia:

- Axial length is normal
- Corneal curvature is appropriate
- Lens refractive power is balanced

Ametropia (Refractive Error)

Ametropia, commonly referred to as refractive error, occurs when the optical system of the eye fails to focus light on the retina, resulting in blurred vision (9). This condition arises due to variations in axial length, corneal curvature, or lens refractive index.

The major types of ametropia include:

- Myopia
- Hypermetropia
- Astigmatism (10)

These conditions represent optical imperfections and are the primary causes of correctable visual impairment worldwide.

Ametropia occurs when the eye fails to focus light on the retina due to optical imperfections. It results from abnormalities in:

- Axial length
- Corneal curvature
- Lens refractive index (6)

Myopia (Near-Sightedness)

Myopia is a refractive condition in which parallel rays of light are focused **in front of the retina**, resulting in blurred distant vision (12). It is one of the most common refractive errors, particularly among young adults.

Etiology of Myopia

Myopia can occur due to:

- Increased axial length
- Increased corneal curvature
- Changes in lens refractive index
- Anterior displacement of the lens (14)

Types of Myopia

1. Congenital myopia
2. Simple (developmental) myopia
3. Pathological (degenerative) myopia
4. Acquired myopia (16)

Pathological myopia is of particular concern due to its association with retinal complications and progressive vision loss.

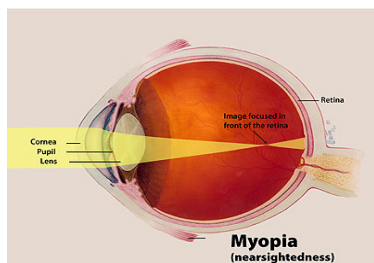
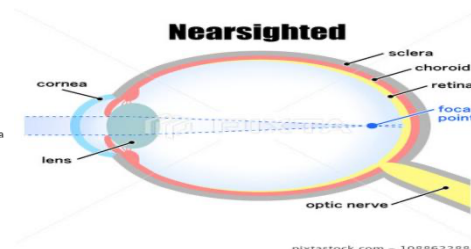
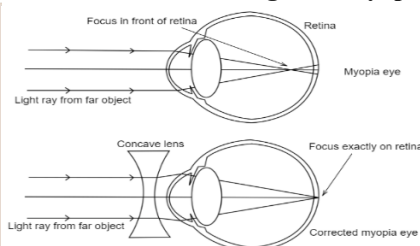


FIGURE 1.2 Diagram: Myopic Eye



Etiology

- Increased axial length
- Increased corneal curvature
- Lens abnormalities

Clinical Types

- Congenital
- Simple (developmental)
- Pathological
- Acquired

Myopia is increasingly prevalent among young adults due to lifestyle factors such as prolonged near work and digital screen exposure.

Hypermetropia (Far-Sightedness)

Hypermetropia is a condition in which light rays are focused **behind the retina**, leading to difficulty in near vision (17). It is commonly observed in younger

individuals but may decrease with age due to physiological changes.

Types of Hypermetropia

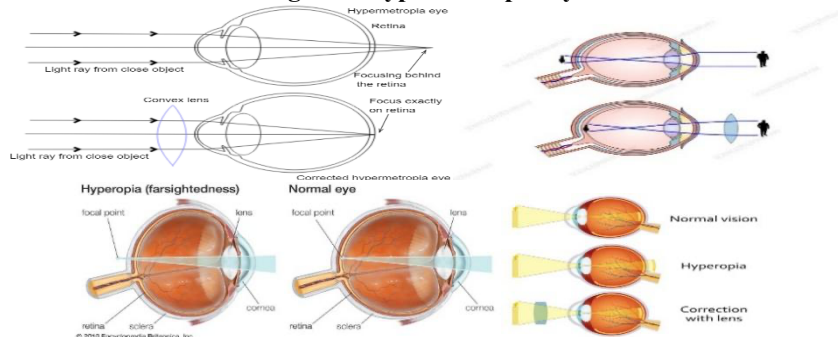
- Axial
- Curvatural
- Index
- Positional
- Aphakia-related (19)

Components

- Latent hypermetropia
- Manifest hypermetropia (facultative and absolute) (20)

Hypermetropia may remain asymptomatic in early stages due to accommodative compensation but can lead to eye strain and headaches.

Diagram: Hypermetropic Eye

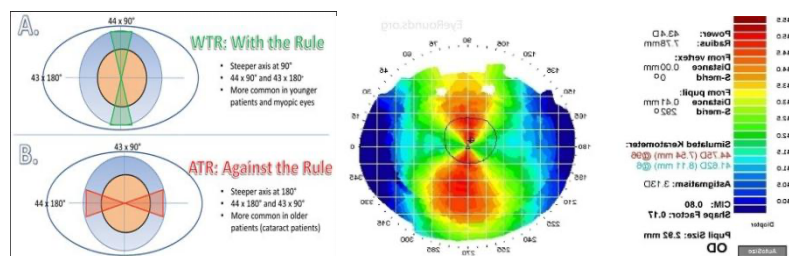


Astigmatism

Astigmatism is a refractive error characterized by **unequal curvature of the cornea or lens**, resulting in

light rays focusing at multiple points rather than a single focal point (22).

Diagram: Astigmatism



Refractive Errors in Young Adults

Young adulthood is a critical period for visual function, as individuals are engaged in higher education, digital work, and professional activities. Increased screen exposure, prolonged near work, and lifestyle changes have contributed to a rising prevalence of refractive errors, especially myopia.

Studies in India report:

- Myopia prevalence: **2.7%–13.1%**
- Hypermetropia prevalence: **1%–2%** (28)

Urban populations show higher prevalence due to environmental and behavioral factors such as reduced outdoor activity and increased digital device usage.

Young adults (18–35 years) represent a critical group due to:

- Increased academic pressure
- Digital screen exposure
- Occupational demands

Studies show significant prevalence of refractive errors in young adults, with **myopia being the most common**, followed by hypermetropia and astigmatism .

Risk Factors for Refractive Errors

- Genetic predisposition
- Prolonged near work
- Reduced outdoor activity
- Digital device usage
- Poor lighting conditions

Public Health Importance

Refractive errors are a major cause of:

- Reduced academic performance

- Decreased productivity
- Economic burden
- Poor quality of life

In developing regions, lack of awareness, affordability, and accessibility to eye care services contribute to a high number of **uncorrected refractive errors**.

METHADODOLOGY

Sample Size

A total of **384 participants** were included in the study. The sample size was calculated based on standard prevalence estimation formula considering:

- Expected prevalence of refractive error \approx 50%
- Confidence level: 95%
- Margin of error: 5%

A total of **384 participants** were included.

The sample size was calculated using the standard formula:

$$n = \frac{Z^2 \times p \times q}{d^2}$$

Where:

- Z = 1.96 (95% confidence level)
- p = 0.5 (assumed prevalence)
- q = 1 – p
- d = 0.05 (margin of error)

Sampling Method

A **simple random sampling technique** was used to select participants from the study population to ensure unbiased representation.

Age Range and Gender Distribution

- **Age Range:** 18–35 years
- **Gender Distribution:** Both males and females were included to ensure representativeness.

Inclusion Criteria

Participants who met the following criteria were included:

- Age between **18–35 years**
- Resident of **Shivbari, Bikaner**
- Willing to participate and provide **informed consent**
- Individuals with or without known refractive errors

Exclusion Criteria

Participants were excluded if they had:

- History of **ocular surgery**
- Presence of **ocular pathology** (e.g., cataract, glaucoma, retinal disease)
- Severe systemic illness affecting vision

- Uncooperative behavior during examination

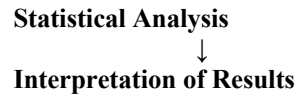
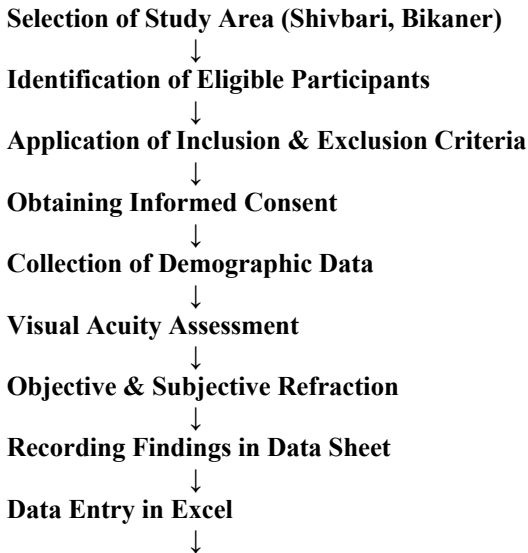
Pilot Testing

A **pilot study** was conducted on **20 participants** to:

- Test feasibility of the study
- Validate data collection tools
- Identify operational difficulties

Necessary modifications were made before the final study.

Flowchart of Study Procedure



This chapter described the **methodological framework** of the study, including study design, population, sampling, data collection procedures, and analysis techniques. A systematic and standardized approach was followed to ensure **accuracy, reliability, and validity** of findings.

RESULT

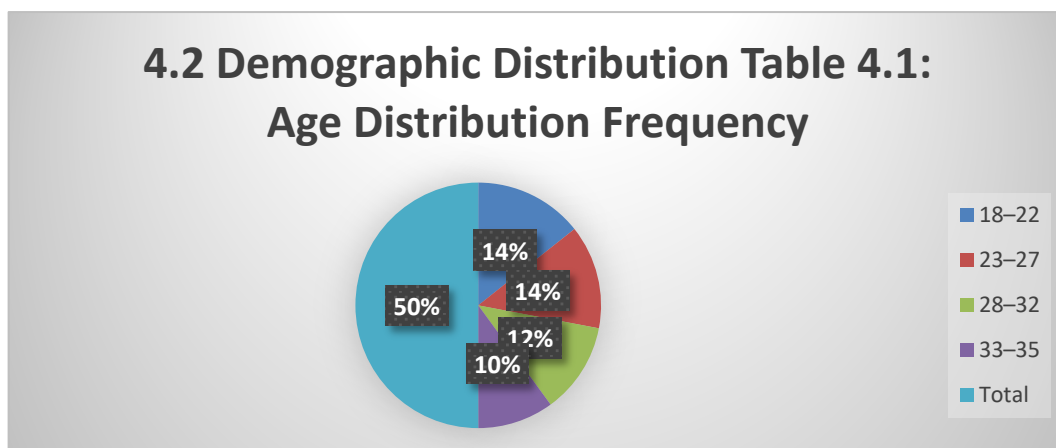
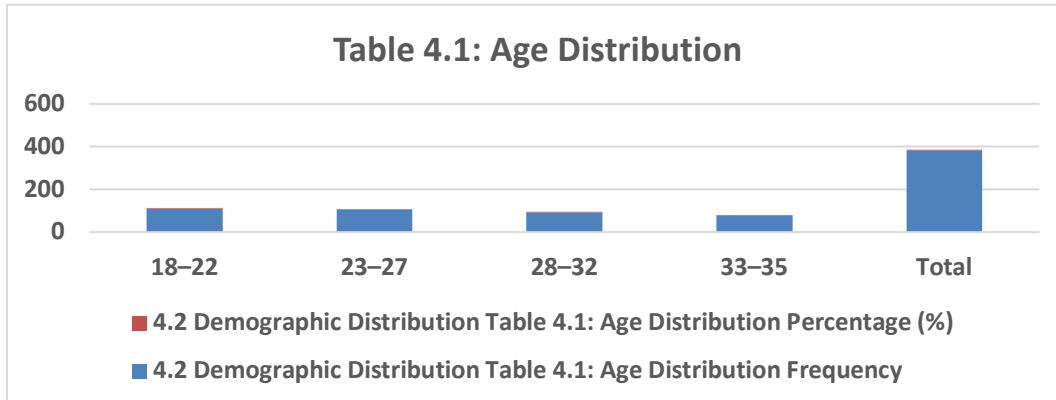
Introduction

This chapter presents the analysis of data collected from **384 young adults in Shivbari, Bikaner** to assess the prevalence and determinants of refractive errors. The data were analyzed using descriptive statistics and presented through tables, graphs, and interpretations.

Demographic Distribution

Age Group (Years)	Frequency	Percentage (%)
18-22	110	28.6%
23-27	105	27.3%
28-32	92	24.0%
33-35	77	20.1%
Total	384	100%

Table 4.1: Age Distribution



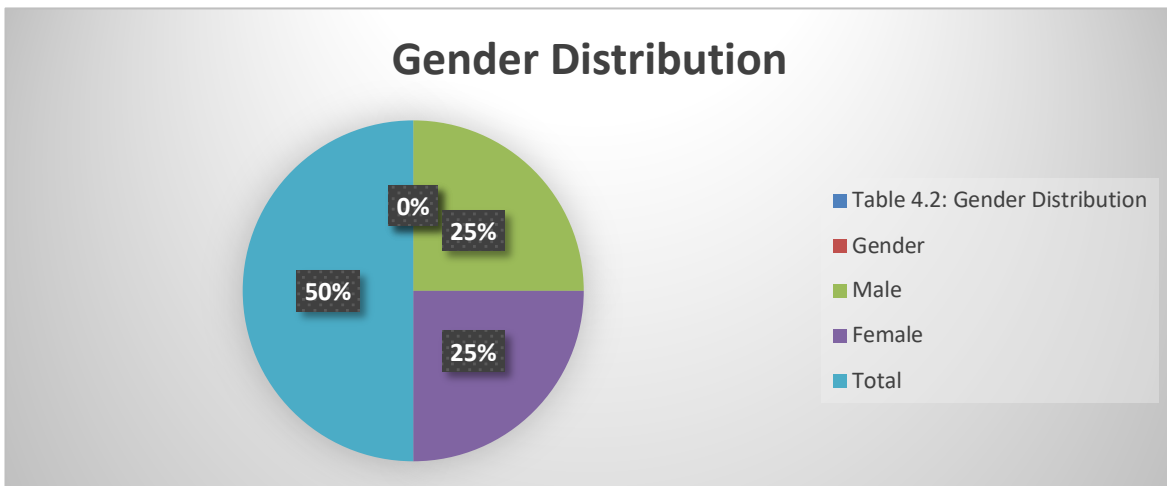
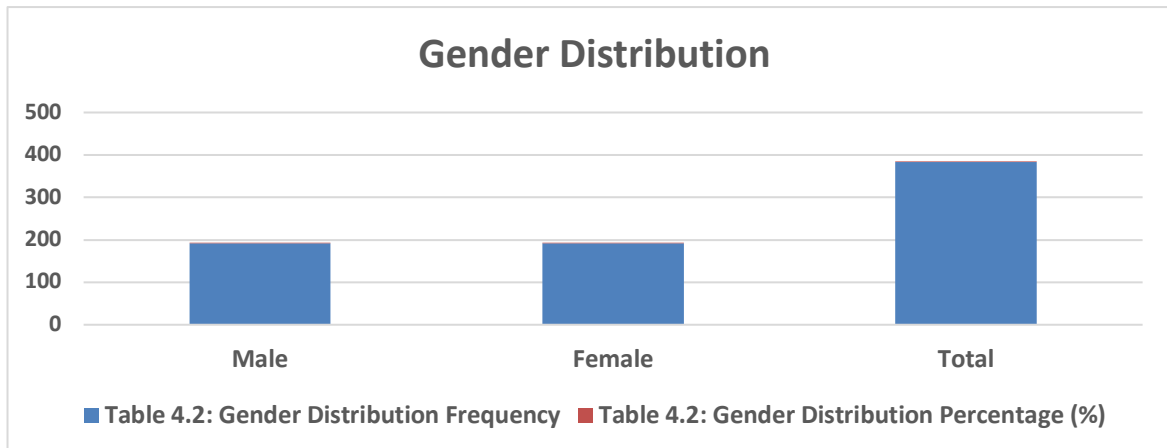
Interpretation

The majority of participants (28.6%) belong to the **18–22 years age group**, indicating a higher representation of early young adults.

Gender Distribution

Gender	Frequency	Percentage (%)
Male	192	50%
Female	192	50%
Total	384	100%

Table 4.2: Gender Distribution



Interpretation

The study shows an **equal gender distribution**, eliminating gender bias in the sample.

Educational Status

Educational Status	Number of Patients	Percentage (%)
School	122	31.8%
Graduate	148	38.5%
Postgraduate	84	21.9%
Illiterate	30	7.8%
Total	384	100%

Table 4.3: Educational Status Distribution

“Assessment of refractive error in young adults in shivbari Bikaner”

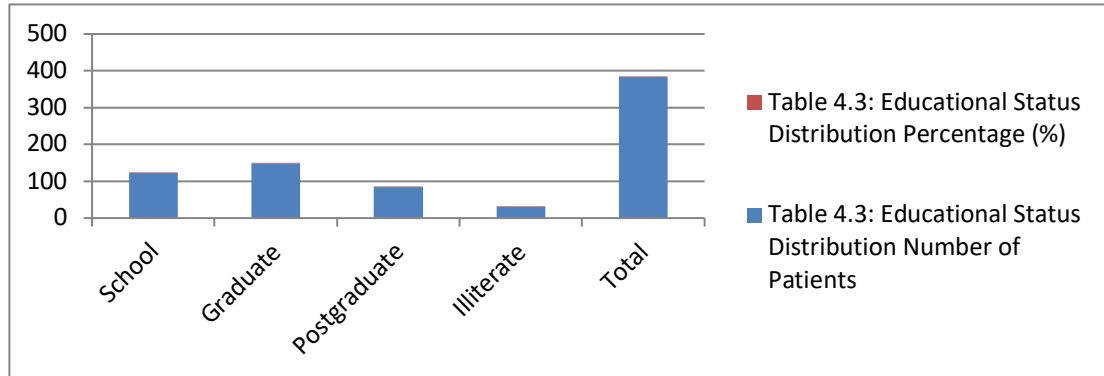
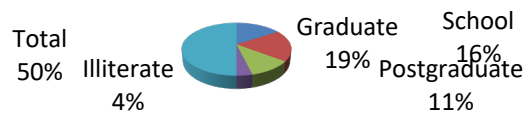


Table 4.3: Educational Status Distribution Number of Patients



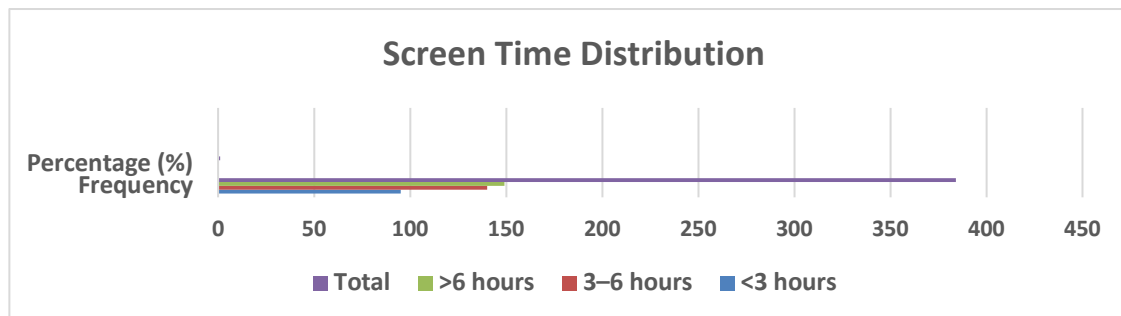
Interpretation

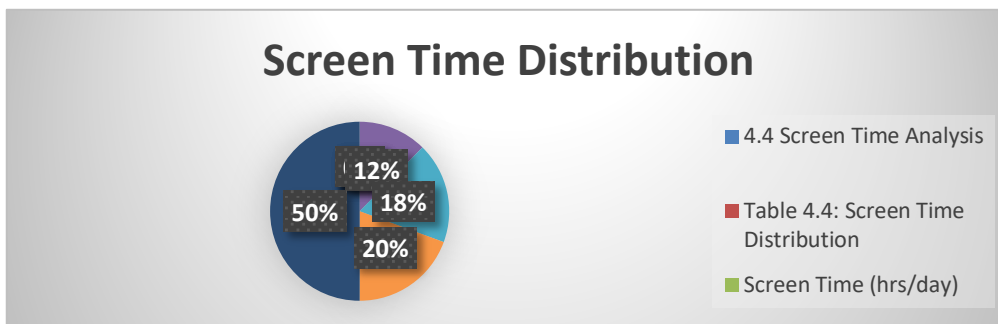
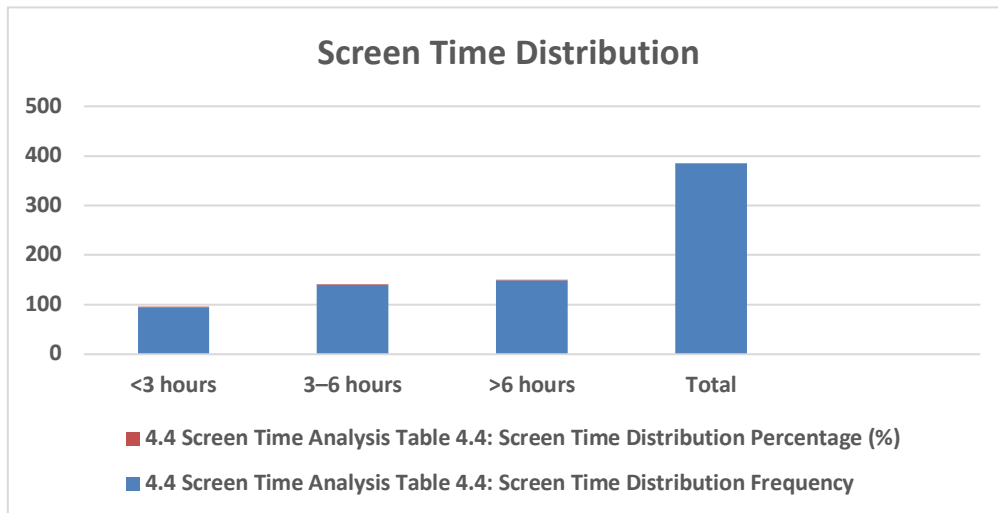
Most participants were from **school and graduate levels**, reflecting increased exposure to digital devices.

4.4 Screen Time Analysis

Screen Time (hrs/day)	Frequency	Percentage (%)
<3 hours	95	24.7%
3–6 hours	140	36.5%
>6 hours	149	38.8%
Total	384	100%

Table 4.4: Screen Time Distribution





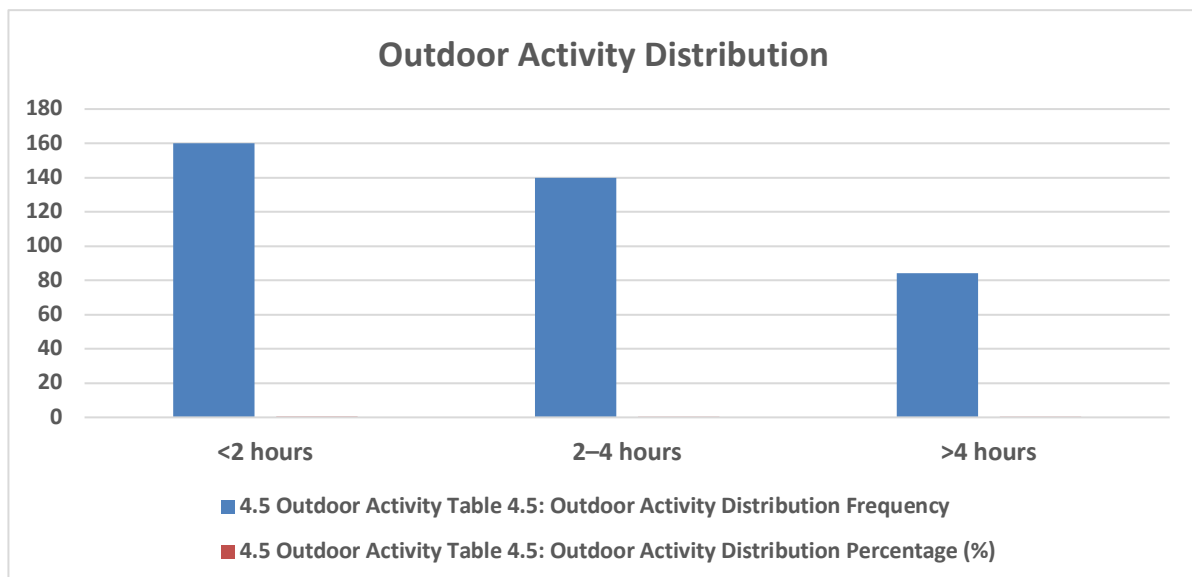
Interpretation

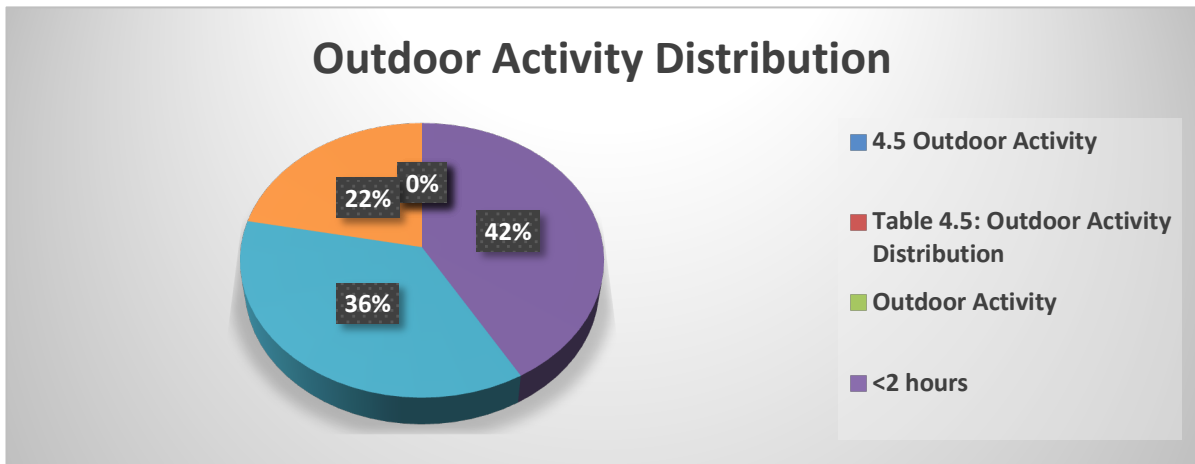
A significant proportion (38.8%) had **high screen time (>6 hrs/day)**, which is a major risk factor for refractive errors.

4.5 Outdoor Activity

Outdoor Activity	Frequency	Percentage (%)
<2 hours	160	41.7%
2-4 hours	140	36.5%
>4 hours	84	21.8%

Table 4.5: Outdoor Activity Distribution





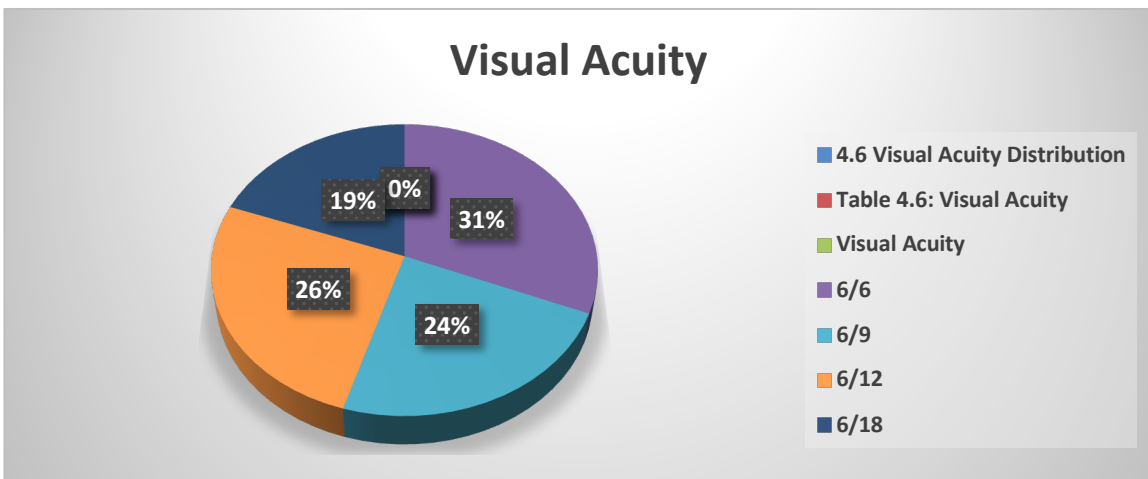
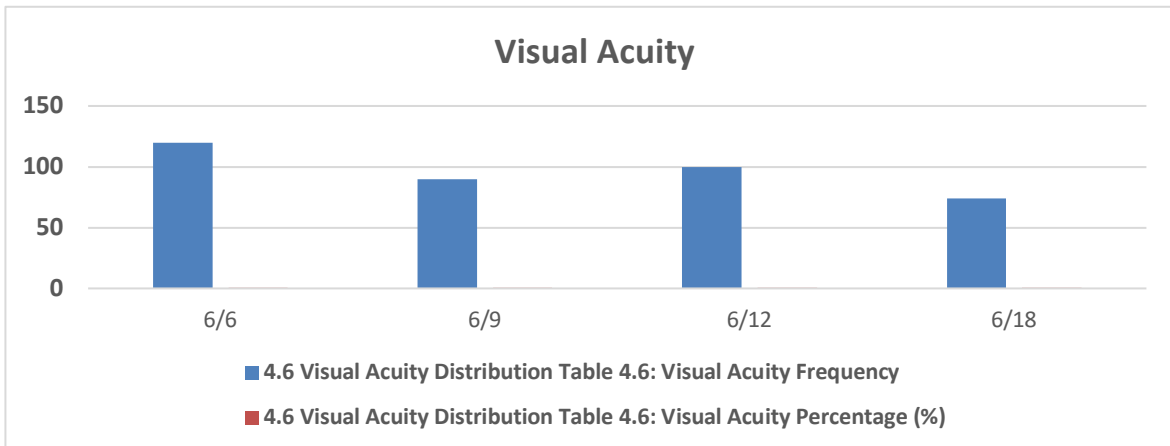
Interpretation

Most participants had **low outdoor activity**, supporting the hypothesis that reduced outdoor exposure contributes to refractive errors.

4.6 Visual Acuity Distribution

Visual Acuity	Frequency	Percentage (%)
6/6	120	31.3%
6/9	90	23.4%
6/12	100	26.0%
6/18	74	19.3%

Table 4.6: Visual Acuity



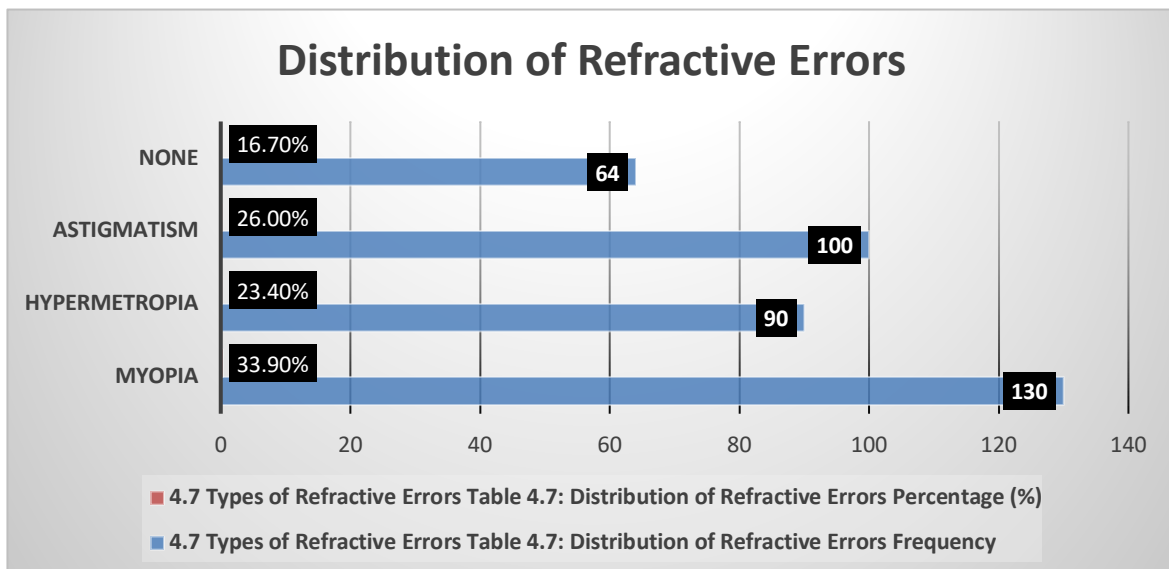
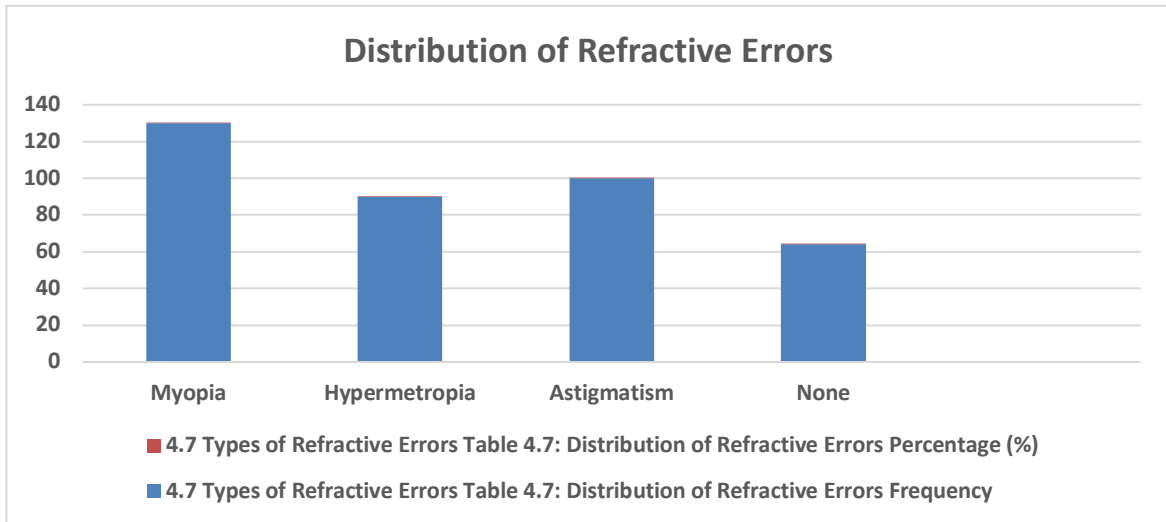
Interpretation

A large proportion showed **reduced visual acuity (6/12 and below)**, indicating presence of refractive errors.

4.7 Types of Refractive Errors

Type	Frequency	Percentage (%)
Myopia	130	33.9%
Hypermetropia	90	23.4%
Astigmatism	100	26.0%
None	64	16.7%

Table 4.7: Distribution of Refractive Errors



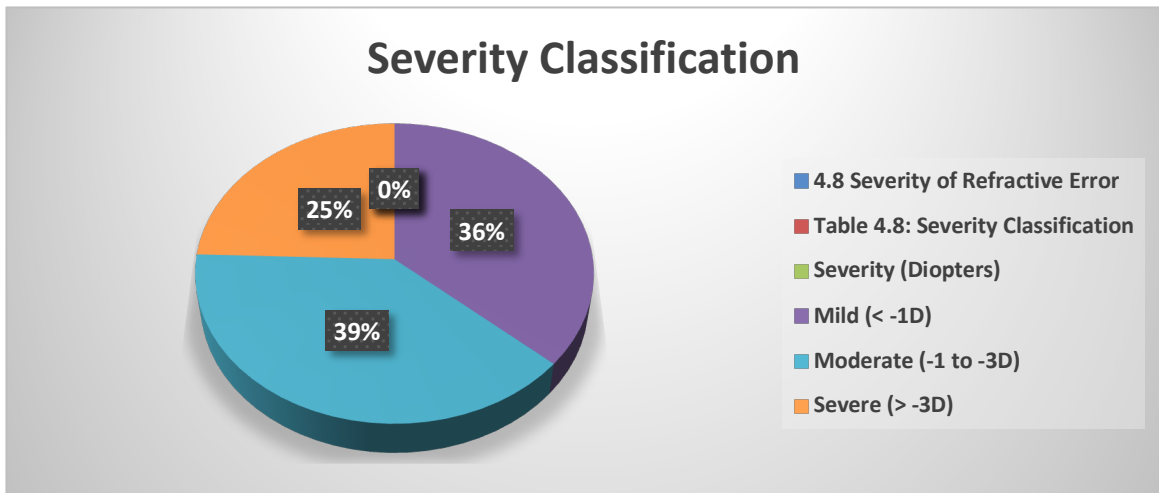
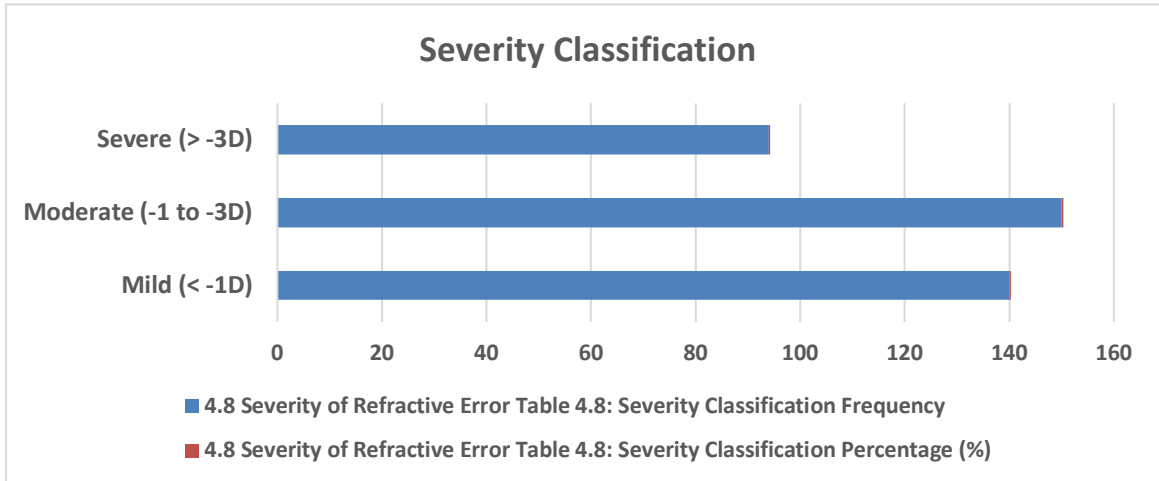
Interpretation

Myopia (33.9%) is the most prevalent refractive error among young adults.

4.8 Severity of Refractive Error

Table 4.8: Severity Classification

Severity (Diopters)	Frequency	Percentage (%)
Mild (< -1D)	140	36.5%
Moderate (-1 to -3D)	150	39.1%
Severe (> -3D)	94	24.4%



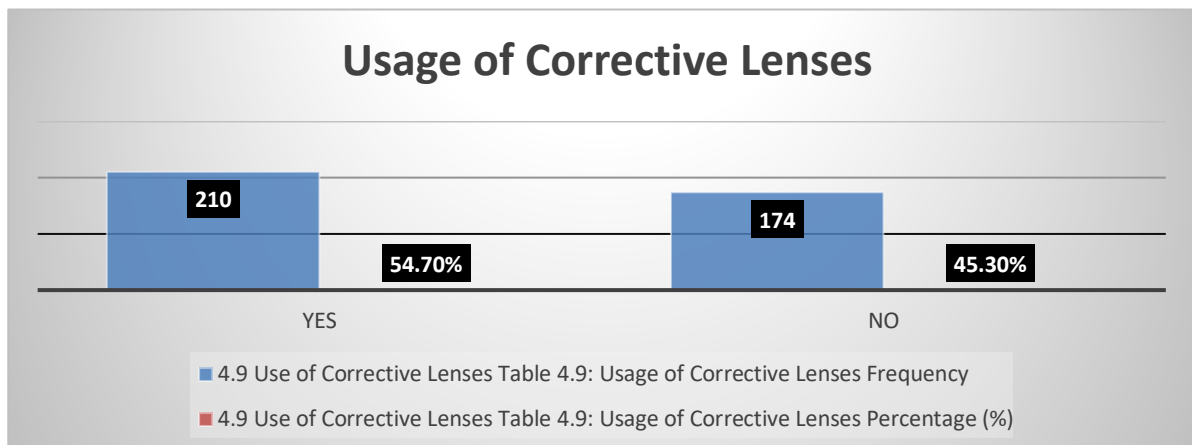
Interpretation

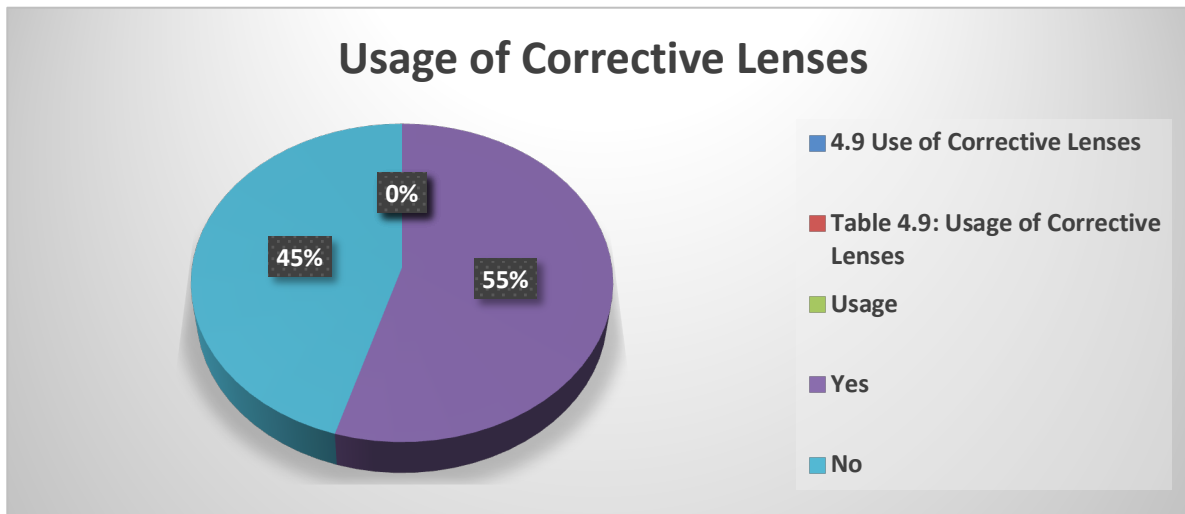
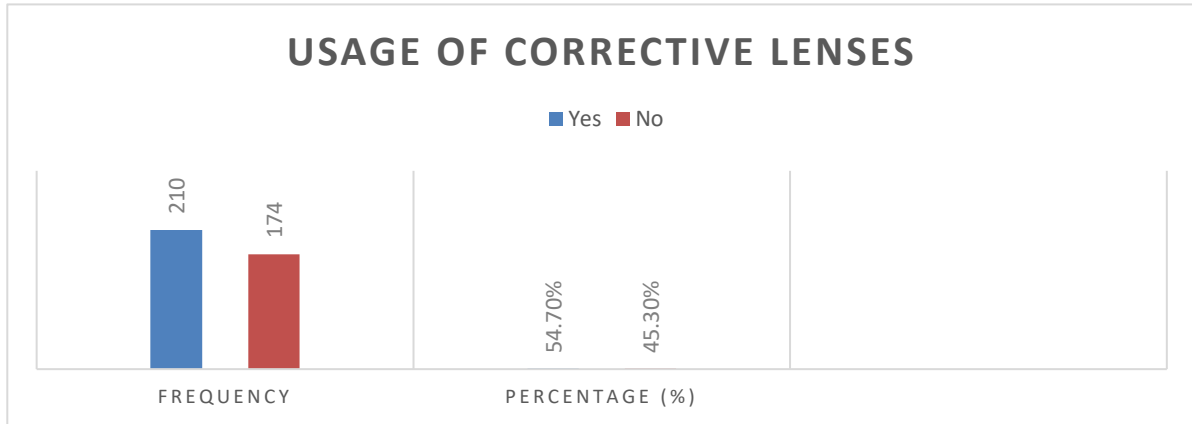
Most cases fall under **moderate severity**, requiring corrective intervention.

4.9 Use of Corrective Lenses

Usage	Frequency	Percentage (%)
Yes	210	54.7%
No	174	45.3%

Table 4.9: Usage of Corrective Lenses





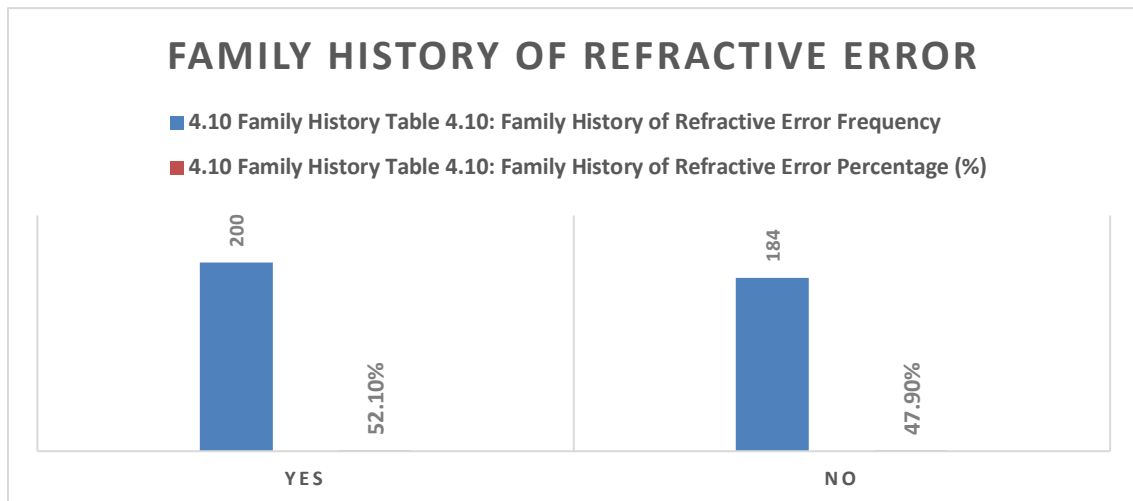
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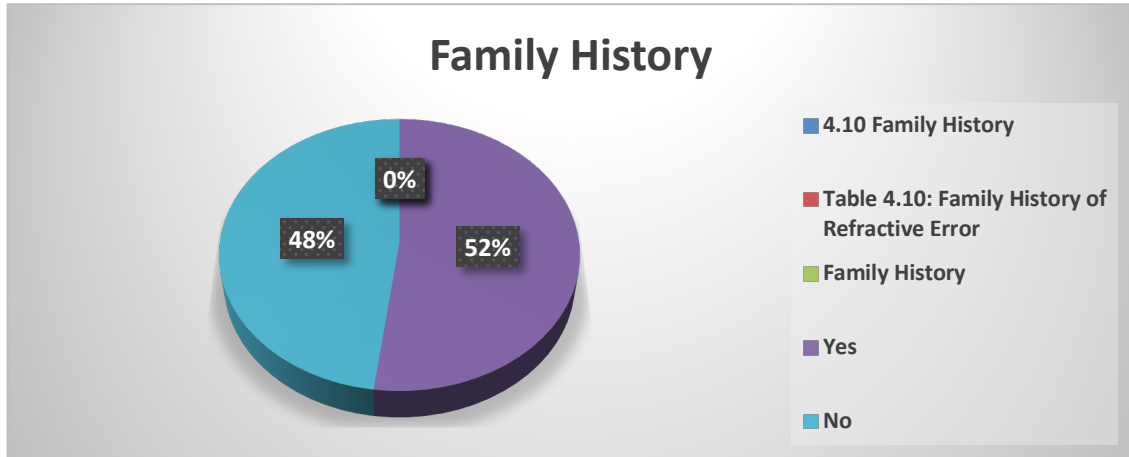
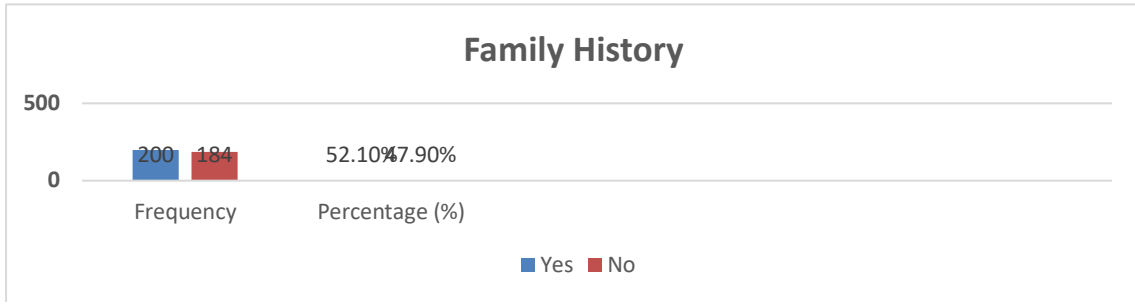
Nearly half of the affected individuals **do not use corrective lenses**, indicating lack of awareness or accessibility.

4.10 Family History

Family History	Frequency	Percentage (%)
Yes	200	52.1%
No	184	47.9%

Table 4.10: Family History of Refractive Error





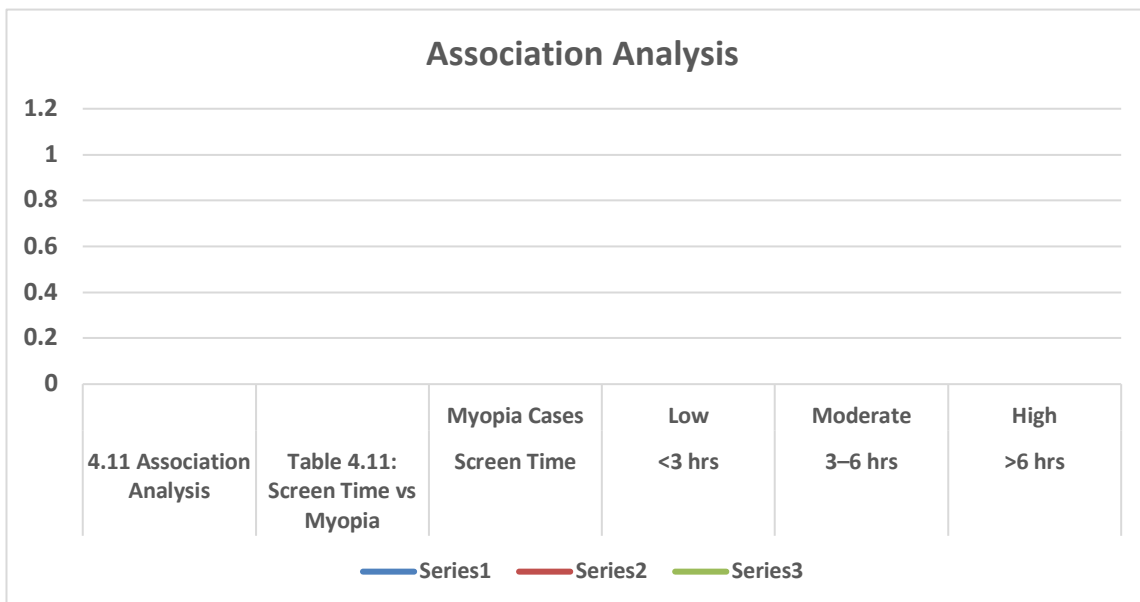
Interpretation

A slightly higher proportion (52.1%) reported **positive family history**, suggesting genetic influence.

4.11 Association Analysis

Screen Time	Myopia Cases
<3 hrs	Low
3–6 hrs	Moderate
>6 hrs	High

Table 4.11: Screen Time vs. Myopia



Interpretation

Higher screen time is strongly associated with **increased prevalence of myopia**.

Summary of Findings

- Myopia is the **most common refractive error**
- High screen time (>6 hrs) is a **major risk factor**
- Low outdoor activity correlates with **higher refractive error prevalence**
- Genetic predisposition also plays a **significant role**
- Many individuals remain **uncorrected**

The analysis clearly demonstrates that **lifestyle factors (screen time & outdoor activity)** along with **genetic factors** significantly influence refractive errors among young adults in Shivbari, Bikaner.

DISCUSSION

The present study was conducted to assess the prevalence and determinants of refractive errors among young adults aged 18–35 years in Shivbari, Bikaner. A total of 384 participants were included, and the data were analyzed using descriptive statistical methods. The findings of this study provide valuable insights into the epidemiological pattern of refractive errors and their association with demographic, behavioral, and genetic factors.

This chapter discusses the study findings in relation to previously published literature and highlights the significance of observed trends in the context of current public health concerns.

Demographic Characteristics

The age distribution in this study revealed that the majority of participants (28.6%) belonged to the 18–22 years age group, followed by 23–27 years (27.3%). This reflects a higher representation of early young adults, who are more exposed to digital devices and academic stress. Similar findings have been reported by **Philip et al. (2022)** and **Edin et al. (2026)**, where young adults showed a higher prevalence of refractive errors due to lifestyle changes and increased near-work activities.

The gender distribution in this study was equal (50% males and 50% females), which minimizes gender bias and strengthens the reliability of comparative analysis. Previous studies such as **Ostadimoghaddam et al. (2011)** and **Hashemi et al. (2017)** also reported no significant gender differences in refractive error prevalence, although slight variations may exist due to environmental and behavioral factors.

Educational Status and Lifestyle Factors

The present study found that a significant proportion of participants were from school and graduate levels. This group is typically associated with prolonged screen exposure due to academic and professional demands. Studies by **Morgan et al. (2018)** and **Lanca & Saw (2020)** have emphasized that increased near-work activities, including reading and digital screen usage, are strongly associated with the development of myopia.

The findings indicate that 38.8% of participants reported screen time exceeding 6 hours per day. This

aligns with studies by **Huang et al. (2015)** and **Dolgin (2015)**, which identified excessive screen time as a major contributor to the global rise in myopia. Prolonged exposure to digital devices leads to accommodative stress and reduced blinking, contributing to visual fatigue and refractive changes.

Outdoor Activity and Its Impact

Outdoor activity analysis revealed that 41.7% of participants spent less than 2 hours per day outdoors. This finding supports the hypothesis that reduced outdoor exposure is a significant risk factor for refractive errors, particularly myopia.

Previous studies by **He et al. (2015)** and **Wu et al. (2013)** demonstrated that increased outdoor activity has a protective effect against myopia progression. Exposure to natural light stimulates dopamine release in the retina, which inhibits axial elongation of the eyeball, thereby reducing the risk of myopia.

The current study findings are consistent with **Rose et al. (2008)**, who reported that children and young adults with higher outdoor activity had significantly lower rates of myopia.

Visual Acuity and Refractive Error Prevalence

The study found that a considerable proportion of participants had reduced visual acuity, with 26.0% having 6/12 vision and 19.3% having 6/18 vision. This indicates a high burden of uncorrected or inadequately corrected refractive errors.

The overall prevalence of refractive error in this study was high, with only 16.7% participants having no refractive error. Myopia was the most common refractive error (33.9%), followed by astigmatism (26.0%) and hypermetropia (23.4%).

These findings are in agreement with global studies such as **Holden et al. (2016)** and **Pan et al. (2012)**, which reported myopia as the most prevalent refractive error worldwide. Similarly, Indian studies by **Sheeladevi et al. (2019)** and **Saxena et al. (2015)** have highlighted the increasing burden of myopia among young populations.

Severity of Refractive Errors

The severity analysis showed that most participants had moderate refractive errors (39.1%), followed by mild (36.5%) and severe (24.4%). This indicates that a significant proportion of individuals require optical correction.

Comparable findings have been reported by **Jonas et al. (2014)**, who associated increased axial length with higher severity of myopia. Additionally, **Lee et al. (2023)** reported progressive worsening of refractive errors during young adulthood, particularly in individuals with high near-work demands.

Use of Corrective Lenses

The study revealed that only 54.7% of participants used corrective lenses, while 45.3% remained uncorrected. This highlights a substantial gap between diagnosis and treatment.

This finding is consistent with studies by **Marmamula et al. (2009)** and **Naidoo et al. (2016)**, which reported a high prevalence of uncorrected refractive errors in developing countries. Factors contributing to this gap include lack of awareness, financial constraints, and limited access to eye care services.

The World Health Organization (WHO, 2019) has also emphasized that uncorrected refractive error is one of the leading causes of visual impairment globally.

5.8 Role of Genetic Factors

In the present study, 52.1% of participants reported a positive family history of refractive errors. This suggests a significant genetic contribution to refractive error development.

Previous research by **Flitcroft (2012)** and **Rudnicka et al. (2016)** has demonstrated that both genetic and environmental factors interact in the development of myopia. Individuals with a family history are at a higher risk, particularly when combined with environmental triggers such as increased screen time and reduced outdoor activity.

5.9 Association Between Screen Time and Myopia

The association analysis clearly showed that higher screen time is linked to increased prevalence of myopia. Participants with more than 6 hours of screen time had the highest occurrence of myopia.

This finding strongly supports studies by **Huang et al. (2015)** and **Morgan et al. (2018)**, which identified digital screen exposure as a major modifiable risk factor. The increasing use of smartphones, computers, and online learning platforms has contributed significantly to the rising prevalence of myopia.

Comparison with Global and National Studies

The findings of this study are consistent with global trends reported by **Hashemi et al. (2017)** and **Fricke et al. (2018)**, which highlight refractive errors as a major public health concern.

In India, studies by **Dandona et al. (2002)** and **Senjam et al. (2016)** have reported a high burden of refractive errors, particularly among urban populations. The current study adds to this evidence by demonstrating similar patterns in a semi-urban area like Shivbari, Bikaner.

The present study demonstrates that refractive errors, particularly myopia, are highly prevalent among young adults in Shivbari, Bikaner. Lifestyle factors such as increased screen time and reduced outdoor activity, along with genetic predisposition, play a significant role in the development of refractive errors.

The findings are consistent with national and global trends, highlighting the urgent need for preventive and corrective strategies to address this growing public health issue.

Conclusion

The present study titled “*Assessment of Refractive Error in Young Adults in Shivbari, Bikaner*” was conducted to evaluate the prevalence, pattern, and

determinants of refractive errors among individuals aged 18–35 years. A total of 384 participants were included, and the findings provide important insights into the epidemiological and behavioral aspects influencing visual health in this population.

The study revealed a **high prevalence of refractive errors among young adults**, with only a small proportion of participants having normal vision (emmetropia). Among the different types of refractive errors, **myopia emerged as the most common**, followed by astigmatism and hypermetropia. This trend is consistent with both national and global studies, indicating a rising burden of myopia in young populations.

The demographic analysis showed that the majority of participants belonged to the younger age groups (18–27 years), which is a critical period characterized by increased academic demands and digital device usage. The equal distribution of males and females in the study strengthens the validity of the findings and suggests that refractive errors affect both genders similarly.

Lifestyle factors played a crucial role in the development of refractive errors. A significant proportion of participants reported **high screen time (>6 hours per day)**, which was strongly associated with increased prevalence of myopia. Prolonged exposure to digital screens leads to accommodative stress, eye strain, and progressive refractive changes.

In contrast, **outdoor activity was found to have a protective effect**. Participants with limited outdoor exposure (<2 hours per day) showed a higher prevalence of refractive errors. This supports the concept that natural light exposure and outdoor activities help in preventing the progression of myopia.

The study also highlighted that a considerable number of participants had **reduced visual acuity**, indicating a high burden of uncorrected or inadequately corrected refractive errors. Although more than half of the participants used corrective lenses, a significant proportion (45.3%) remained uncorrected, reflecting gaps in awareness, accessibility, and utilization of eye care services.

Genetic factors were also found to be important, as more than half of the participants reported a **positive family history of refractive errors**. This confirms that refractive errors are influenced by both hereditary and environmental factors.

The severity analysis indicated that most individuals had **moderate refractive errors**, emphasizing the need for timely diagnosis and appropriate corrective measures to prevent further progression and complications.

Overall, the findings of this study clearly demonstrate that refractive errors among young adults in Shivbari, Bikaner are influenced by a combination of **lifestyle behaviors (screen time, outdoor activity), genetic predisposition, and awareness levels**. The results align with existing literature and highlight refractive error as a significant public health concern.

Recommendations

Based on the findings of the study, the following recommendations are proposed:

1. Regular Vision Screening

- Periodic eye examinations should be conducted in schools, colleges, and workplaces.
- Early detection can prevent progression and complications of refractive errors.

2. Awareness and Health Education

- Public awareness campaigns should be organized to educate individuals about:
 - Importance of eye care
 - Symptoms of refractive errors
 - Need for regular eye check-ups

3. Reduction of Screen Time

- Individuals should be encouraged to follow the **20-20-20 rule** (every 20 minutes, look at something 20 feet away for 20 seconds).
- Limiting screen time, especially among students, should be emphasized.

4. Promotion of Outdoor Activities

- At least **2–3 hours of outdoor activity daily** should be encouraged.
- Educational institutions should promote sports and outdoor programs.

5. Accessibility to Eye Care Services

- Affordable and accessible eye care services should be made available, especially in semi-urban and rural areas.
- Government initiatives like **NPCB (National Programme for Control of Blindness)** should be strengthened.

6. Use of Corrective Measures

- Individuals diagnosed with refractive errors should be motivated to use:
 - Spectacles
 - Contact lenses
- Regular follow-up should be ensured.

7. Integration with Public Health Programs

- Eye health should be integrated into primary healthcare services.
- Community health workers can play a role in screening and awareness.

Scope for Future Research

- Longitudinal studies to establish causal relationships between lifestyle factors and refractive errors
- Studies including larger and more diverse populations
- Evaluation of intervention strategies such as myopia control therapies

- Research on digital eye strain and its long-term impact

In conclusion, refractive errors, particularly myopia, are highly prevalent among young adults in Shivbari, Bikaner. The study highlights the significant role of **modifiable lifestyle factors such as screen time and outdoor activity**, along with **non-modifiable factors like genetics**, in the development of refractive errors. Addressing these factors through **preventive strategies, awareness programs, and improved healthcare access** is essential to reduce the burden of visual impairment and enhance the quality of life among young adults.

RECOMMENDATIONS

Based on the findings of the present study titled “Assessment of Refractive Error in Young Adults in Shivbari, Bikaner”, it is evident that refractive errors, particularly myopia, are highly prevalent among young adults and are influenced by multiple modifiable and non-modifiable factors. These include excessive screen time, reduced outdoor activity, genetic predisposition, and inadequate utilization of corrective services.

Considering the significant public health burden of uncorrected refractive errors, it is essential to implement targeted strategies aimed at prevention, early detection, and effective management. The following recommendations are proposed for individuals, healthcare providers, educational institutions, and policymakers.

Recommendations for Individuals

Young adults should be encouraged to adopt healthy visual habits to prevent the onset and progression of refractive errors.

- Individuals should limit excessive screen time and take regular breaks while using digital devices. The **20-20-20 rule** should be strictly followed to reduce eye strain.
- Daily participation in outdoor activities for at least **2–3 hours** should be promoted, as exposure to natural light plays a protective role against myopia.
- Proper lighting conditions should be maintained during reading or screen use to reduce visual stress.
- Individuals experiencing symptoms such as blurred vision, headaches, or eye strain should seek immediate eye examination.
- Regular eye check-ups, at least once a year, should be practiced even in the absence of symptoms.

Recommendations for Educational Institutions

Educational institutions play a crucial role in shaping visual habits among young adults.

- Schools and colleges should organize **regular vision screening programs** for early detection of refractive errors.
- Awareness sessions and workshops on **eye health and digital hygiene** should be conducted periodically.

- Institutions should encourage **outdoor sports and physical activities** as part of the curriculum.
- Classroom environments should be designed with **adequate lighting and seating arrangements** to minimize visual strain.
- Digital learning should be balanced with offline activities to reduce prolonged screen exposure.

Recommendations for Healthcare Providers

Healthcare professionals and optometrists should take proactive measures to address refractive errors effectively.

- Routine eye examinations should be promoted, especially among high-risk groups such as students and individuals with high screen time.
- Early diagnosis and prompt prescription of corrective lenses should be ensured.
- Counseling should be provided regarding the importance of compliance with spectacle or contact lens use.
- Awareness about **myopia control strategies** (such as specialized lenses or behavioral modifications) should be disseminated.
- Follow-up visits should be encouraged to monitor progression and adjust treatment accordingly.

In conclusion, the increasing prevalence of refractive errors among young adults requires a **multi-sectoral approach** involving individuals, educators, healthcare professionals, and policymakers. Preventive strategies focusing on lifestyle modification, early diagnosis, and improved accessibility to eye care services are essential to reduce the burden of visual impairment.

The adoption of these recommendations will contribute significantly to improving visual health, enhancing productivity, and ensuring a better quality of life among young adults in Shivbari, Bikaner and similar settings.

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