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Research Title: An Epidemiological analysis of spectacle lenses utilization trends in Mashonaland Central Province, Zimbabwe.

Student name: Dryden Rupande

Reg Number: B224412B

Supervisor: Dr. C. N. Mtuwa

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DECLARATION

I hereby affirm that this dissertation is a result of my own unique work and that no portion of it has been previously submitted for another degree in this university or any other.

Candidate's Signature: *D Rupande* Date: ……11/06/26……

Candidate's Names: Dryden Rupande

SUPERVISOR'S DECLARATION

I hereby affirm that the preparation and presentation of this dissertation was done under close supervision. It has thus been certified as meeting the requirement of the Department of Optometry, Bindura University of Science Education for the degree of Bachelor of Science Honours in Optometry.

Supervisor's Signature: …….. Date: …….....

Supervisor's Name: Dr. C. N. Mtuwa

DEDICATION

This work is dedicated to my loving mother (Mrs Rupande), my supportive siblings (Primula Rupande and Platitude Rupande) and my friends (Nigel Chivhuro, Erol Mbire and Bwaami L Muleya).

It is also dedicated to Ophias Mazuru and Issah Wandika who helped me in coming up with the project and their supportive family members.

I would like to extend a special dedication Rev Abraham for his unwavering support.

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LIST OF ABBREVIATIONS

MoHCC – Ministry of Health and Child Care

NGO – Non-Governmental Organization

SPSS – Statistical Package for the Social Sciences

URE – Uncorrected Refractive Error

WHO – World Health Organization

ARC – Anti-Reflective Coating

DEFINITION OF TERMS

1. Ametropia

A refractive state in which the eye, when at rest (accommodation relaxed), fails to focus parallel light rays precisely on the retina. Instead, the focal point falls in front of or behind the retina. Ametropia includes myopia, hyperopia, and astigmatism (Musa et al., 2024).

2. Myopia (Nearsightedness)

It is a type of refractive error where parallel light rays from infinity are focused in front of the retina when accommodation is at rest. This causes distant objects to appear blurry, while near objects remain clear (Khurana, 2007).

3. Hypermetropia / Hyperopia (Farsightedness)

It is a refractive error where parallel light rays from infinity are focused behind the retina when accommodation is at rest. Mild hyperopia may be overcome by accommodation (eye focusing), but significant hyperopia causes blur at all distances, especially near (Khurana, 2007).

4. Astigmatism

It is a refractive error in which the refraction varies across different meridians of the eye. Instead of a single focal point, light rays form two focal lines, resulting in distorted or blurred vision at both distance and near (Rabbetts, 2007).

5. Presbyopia

It is an age-related condition (typically after age 40) where the natural lens loses elasticity, reducing the eye's ability to focus on near objects. While not a refractive error in the same sense as myopia, it is often corrected with spectacles (Fricke et al., 2018)

ABSTRACT

INTRODUCTION:

Uncorrected refractive errors (UREs) are a major contributor to vision impairment across the globe (World Health Organization, 2019), especially in environments with limited resources (Naidoo *et al.,* 2016). Over 54% of visual issues in Zimbabwe's Mashonaland Central Province are caused by UREs (Moyo *et al.,* 2021), but little is known regarding real trends in spectacle use, accessibility issues, and user satisfaction (Mashonaland Central Provincial Health Report, 2022). This study addresses this gap by providing an epidemiological analysis of spectacle lens use in the province.

AIM:

To examine the existing trends, accessibility and user satisfaction related to prescribed spectacle lenses in Mashonaland Central Province, Zimbabwe.

OBJECTIVES

- To ascertain the demographic characteristics (e.g., age, gender) of patients receiving prescriptions for glasses in particular Mashonaland Central health facilities.
- To determine the prevalence of types of refractive errors requiring prescribed spectacles in Mashonaland Central.
- To determine the main obstacles (economic, geographic, cultural, and systemic) and enablers to obtaining and regularly using prescription glasses.
- To assess how satisfied the user is with the acquired glasses in terms of durability, comfort, improved visual acuity, and aesthetic appeal.

STUDY SETTING:

The study was conducted in Mashonaland Central Province across three districts (Bindura, Shamva, and Glendale) over two months.

METHODOLOGY:

A cross-sectional design was employed, combining retrospective record reviews and structured surveys from a systematic random sample of 400 participants aged 12 years to 65 years, currently using prescribed spectacles. The data obtained was analysed using Microsoft Excel and SPSS. All participants' informed consent was acquired, and ethical approval was sought.

RESULTS:

A total of 400 people between the ages of 12 years to 65 years participated in the study. The results showed that refractive errors were prevalent as follows; myopia (38%), hyperopia (56%) and astigmatism (62%). Spectacle trends in a sample of (n=400) showed that single vision lens (243) were the most frequent, followed by bifocals (129) and progressives (28) were the least frequent. Major challenges faced when acquiring spectacles were cost and longer waiting periods.

CHAPTER 1

1.1 Introduction

This is an introductory chapter on the epidemiological analysis of spectacle lenses utilization trends in Mashonaland Central Province. The chapter serves to bring out the background and need of the study, problem statement, purpose, aims as well as the objectives of the study. The chapter also serves the purpose of giving the significance of the study.

1.2 Background of study

Vision problems are a big health issue, mainly because many people have refractive errors that are uncorrected (WHO, 2019). Refractive errors happen when the eye struggles to properly focus light on the retina, causing blurry vision (Holden *et al.,* 2016). Common types of refractive errors include nearsightedness (myopia), farsightedness (hyperopia) and astigmatism (Resnikoff *et al.,* 2012).

According to a study conducted by Tagoh *et al.,* (2020) that showed the two most common causes of visual impairment were uncorrected refractive errors (UREs) (54.2%) and cataract (24.8%) in Mashonaland Central Province of Zimbabwe. Research shows uncorrected refractive errors cause over 54% of vision problems (Mafwiri *et al.,* 2016). Few people in low-income areas have glasses, showing a big gap in eye care services (Holden *et al.,* 2015). Zimbabwe's healthcare system faces challenges like lack of money, few eye specialists, and poor infrastructure (Fricke *et al.,* 2018), especially in provinces like Mashonaland Central. A study found 62% of people with glasses had issues like discomfort or poor fit (MoHCC, 2022). Mashonaland Central likely faces obstacles like cost, lack of eye care services, and cultural attitudes towards glasses (Potter, 1998).

To address the gaps in eye care services, this study presents an epidemiological analysis of spectacle lenses utilization trends in Mashonaland Central, Zimbabwe. Specifically, it aims to determine the prevalence of spectacle use and identify factors influencing utilization, examine the types of refractive errors and prescribed lenses, and assess patient compliance and satisfaction with spectacle wear. By exploring these objectives, this analysis seeks to inform

targeted interventions and improve eye care services in the region, ultimately enhancing vision health outcomes for the population.

1.3 Aim

The aim of this study is to examine the existing trends, accessibility and user satisfaction related to prescribed spectacles lenses in Zimbabwe's Mashonaland Central Province.

1.4 Objectives

- To ascertain the demographic characteristics (e.g. age, gender) of patients receiving prescriptions for glasses in particular Mashonaland Central health facilities.
- To determine the prevalence of types of refractive errors requiring prescribed spectacles in Mashonaland Central.
- To determine the main obstacles (economic, geographic, cultural, and systemic) and enablers to obtaining and regularly using prescription glasses.
- To assess how satisfied the user is with the acquired glasses in terms of durability, comfort, improved visual acuity, and aesthetic appeal.

1.5 Research Questions

- What spectacle utilization trends are prevalent in Mashonaland Central?
- What are the biggest obstacles preventing patients from getting eyewear?
- What factors that influence frequency of spectacle usage and how often individuals use them?

1.6 Significance of the study

Optometrists, Ophthalmologists, and Eye Care Practitioners:

The study will help eye care providers to anticipate patient preferences considering factors such as age, lifestyle and budget. It will assist in improving lens and frame choices stocks to avoid overstocking slow moving lenses and frames.

Policy and Program Evaluation

The study will provide an important baseline data for Mashonaland Central's health planning and resource allocation. The findings can influence public health efforts to de-stigmatize the use of spectacles and increase knowledge of treatable vision problems. This focused evidence will help government organizations and non-governmental organisations (NGOs) in the province to create and carry out more successful intervention initiatives that is, to create affordable, long-lasting optical workshops or mobile outreach initiatives that are specifically designed to address the challenges found.

Academic Contribution:

This study will add a case study from Zimbabwe at the provincial level to the expanding corpus of research on assistive technology access in low to middle income countries. The study will contribute to the limited body of knowledge on eye health in Mashonaland central, Zimbabwe.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This will highlight on the research findings that are known on the spectacle lenses utilization trends in other similar countries including the barriers and constraints they faced. It will also include any relevant data on the spectacle coverage that has been studied prior to this study. This literature review examines the current state of refractive error care, focusing on frameworks, case studies, and gaps in research with a specific look at Mashonaland Central Province.

2.2 Causes of Visual Anomalies

Visual impairment and blindness are often caused by refractive errors, a common condition affecting an estimated 2.3 billion individuals worldwide, with an estimated 153 million people with uncorrected refractive errors from visual impairment. (Alrashidi *et al.,* 2023). A study conducted by Tagoh *et al.,* (2020) showed that the two most common causes of visual impairment were uncorrected refractive errors (UREs) (54.2%) and cataract (24.8%) in Mashonaland Central Province of Zimbabwe. Refractive errors are the second most common cause of blindness and the most common cause of vision impairment worldwide (Hashemi *et al.,* 2018) and also a major reason for most patient visits to hospital eye units (Bourne *et al.,* 2013). It is important to understand the epidemiology of refractive errors in order to provide a vital background for researching spectacle trends, as the distribution of refractive conditions throughout populations dictates the need for corrective therapies (Hashemi *et al.,* 2018).

2.3 Types of refractive errors

A refractive error (ametropia) is defined as a state of refraction where parallel rays of light from infinity, with accommodation at rest, are focused either in front of or behind the sensitive layer of the retina, in one or both meridians (Khurana, 2007). An eye with a far point at infinity is considered emmetropic (normal), while an ametropic eye has its far point located elsewhere.

According Khurana (2007), the three most common types of refractive errors are myopia (nearsightedness), hypermetropia (farsightedness), and astigmatism. Myopia, or short-sightedness, is a refractive error in which parallel rays of light from infinity are focused in front of the retina when accommodation is at rest (Khurana, 2007). This can occur due to increased

axial length of the eyeball, excessive curvature of the cornea or lens, or changes in the refractive index of the ocular media (Alrashidi *et al.,* 2023). Hypermetropia (hyperopia), or long-sightedness, is the refractive state wherein parallel rays of light from infinity are focused behind the retina with accommodation at rest (Khurana, 2007). Hypermetropia may be present in latent or manifest forms and is typically corrected with spherical convex lenses (Jogi, 2009). Astigmatism is a type of refractive error wherein the refraction varies across different meridians of the eye, such that light rays entering the eye cannot converge to a single point focus, instead forming focal lines (Alrashidi *et al.,* 2023). Astigmatism leads to blurred vision as the refractive power of the eye varies across different meridians, making it challenging for the ocular system to create a sharply focused image on the retina. (Edin *et al.,*2026). Astigmatism may be classified as regular (with-the-rule or against-the-rule) or irregular, and is treated with cylindrical lenses or contact lenses (Jogi, 2009).

Presbyopia is an age-related refractive condition characterised by a progressive decline in the eye's accommodative capabilities, making it increasingly difficult to focus on near objects (Jogi, 2009). This natural aging process occurs as the crystalline lens gradually loses its flexibility and ability to change shape. Unlike myopia and hypermetropia, presbyopia specifically affects near vision in individuals typically over the age of 40 and may be considered a refractive anomaly with distinct features. According to Yannick *et al.,* (2023), approximately 1.8 billion people were estimated to have presbyopia in 2015, representing a prevalence of 25 percent. Without optical correction, all adults would experience blurry near vision beginning in their 40s. (Fricke *et al.,* 2018).

Presbyopia is not only a refractive alteration but a lifestyle problem which affects daily tasks. (Singh *et al.,* 2025). According to studies conducted in 2015, Fricke showed that approximately 826 million people had near vision impairment because they lacked vision correction (Fricke *et al.,* 2018). Presbyopia can be corrected with separate single vision pair of spectacles, bifocals and progressive lens. (Singh *et al.,* 2025). In low-income countries, presbyopia remains significantly under-corrected compared to high-income countries, particularly for people living in rural areas with higher health expenditure and lower income (Fricke *et al.,* 2018).

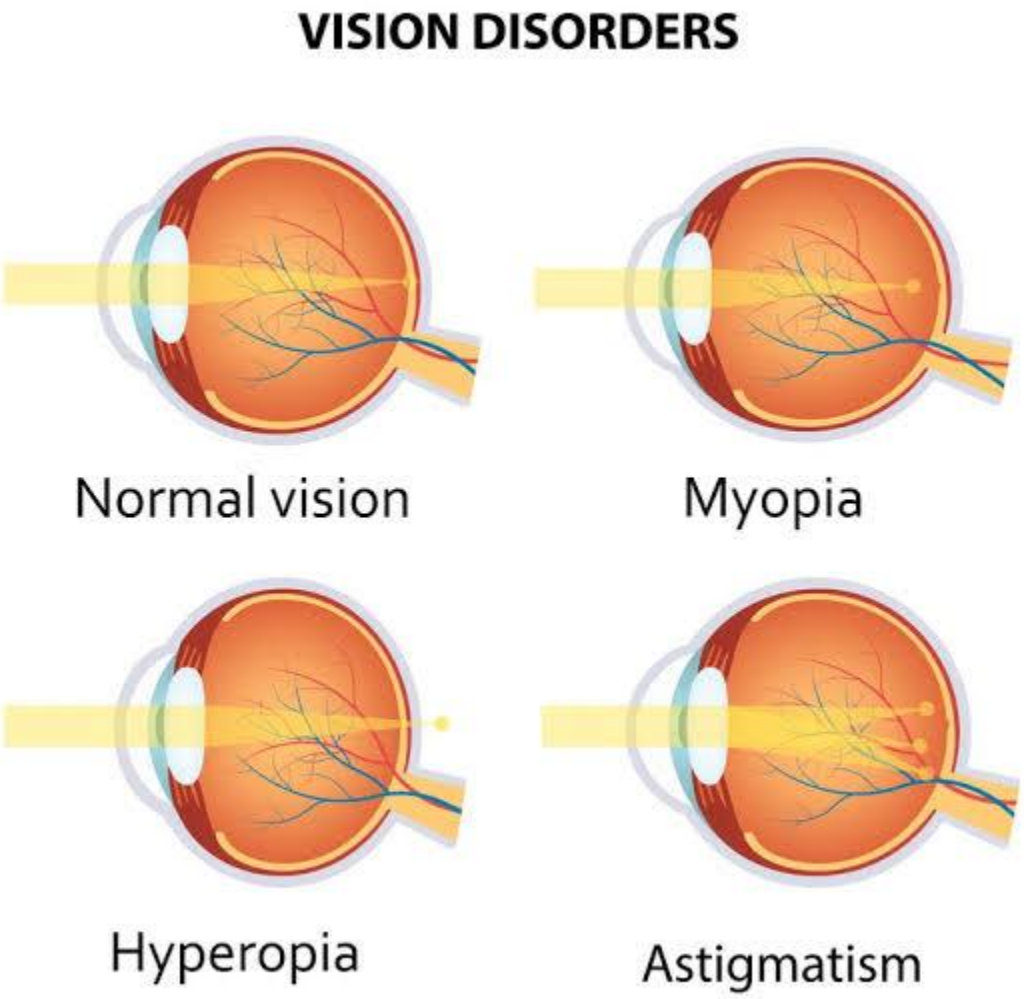

Fig 2.1 Refractive errors of the eye

2.4 Effects of refractive errors on quality of life

The distribution of refractive errors varies with age, race, gender, nature of work, educational status, urbanization, genetic and ethnic factors, outdoor activities and lifestyle changes (Irving *et al.,* 2019). Watching television from a short distance, prolonged use of electronic devices, reading under dim lighting, family history of refractive errors, female gender, and engaging in near-work activities have been identified as significant risk factors for developing refractive errors (Smitha *et al.,* 2019).

Visual defects caused by uncorrected RE can adversely affect quality of life and limit an individual's educational, vocational, and social life. According to Smith *et al.,* (2009) an uncorrected refractive error imposes a significant financial and economic burden on the person and the government. In high-income countries, eeffective refractive error coverage rises to about 85% for males and 83% for women, while equivalent rates in sub-Saharan Africa hover around 30% for men and barely 27% for women (Bourne *et al.,* 2025).

Although, refractive errors are the major causes of visual impairment, its correction with appropriate spectacles is the most cost-effective method (Ibrahim *et al.,* 2022). Spectacles provide a safe and inexpensive solution to UREs. The provision of spectacles has long been acknowledged by the World Health Organization as one of the most cost-effective health interventions known to humanity. This is because it immediately addresses a significant fraction of vision impairment worldwide (World Health Organization [WHO], 2019). Understanding the epidemiology of refractive error provides vital background for researching spectacle trends, as the distribution of refractive conditions throughout populations dictates the need for corrective therapies (Hashemi *et al.,* 2018). However, a significant spectacle gap still exists, especially in low- and middle-income nations where health systems find it difficult to address population demands. (Bourne *et al.,* 2025).

2.5 Types of spectacle lenses

Ophthalmic lens design concerns the control of spectacle lens aberrations which occur when the eye rotates away from the optical centre of the lens. There are several types of lenses.

Single Vision Lenses

These are the most common type of prescription glasses. They correct vision for either near-sightedness (myopia) or far-sightedness (hyperopia) in a single lens. Single vision lenses are the simplest and most commonly prescribed lenses, used to correct a single focal point. These correct either myopia (near-sightedness) or hyperopia (farsightedness), and they are also prescribed for individuals with normal vision who require reading glasses. The entire lens

surface has uniform prescription strength. They are ideal for younger patients or individuals who don't require multifocal corrections. According to Borish (2006) single vision lenses are widely used for correcting basic refractive errors and are easy to adapt for the majority of users.

Bifocal Lenses

Bifocals are used by individuals who need correction for both near and distance vision. Bifocal lenses address the need for vision correction at two distances, typically for patients with presbyopia. These lenses feature two distinct segments: the upper portion for distance vision and the lower segment for near tasks, such as reading. The design often includes a visible dividing line between the two visual segments. Bifocals are usually prescribed for patients over 40 years struggling with both near and distance vision. (Grosvenor, 2007). Bifocal lenses were a revolutionary innovation when introduced, as they eliminated the need for two pairs of glasses.

Trifocal Lenses

Trifocals correct three vision problems: near, intermediate, and distance. They are similar to bifocals but with an additional segment. Trifocal lenses are especially useful for people needing clarity when performing tasks like computer work (intermediate) and reading (near) while frequently looking at objects at a distance.

Progressive Lenses

These lenses provide a seamless transition from near to distance vision without visible lines. They are a modern alternative to bifocals and trifocals. They provide a gradual transition between prescriptions, allowing the user to see clearly at all distances without the visible line seen in bifocals. This gradient lens design supports near, intermediate, and distance vision in a single lens. Progressive lenses are suited for presbyopia patients seeking a seamless visual experience. According to Rubin (2013), progressive lenses mimic the natural human field of vision more effectively and are aesthetically preferred due to their invisible power transitions.

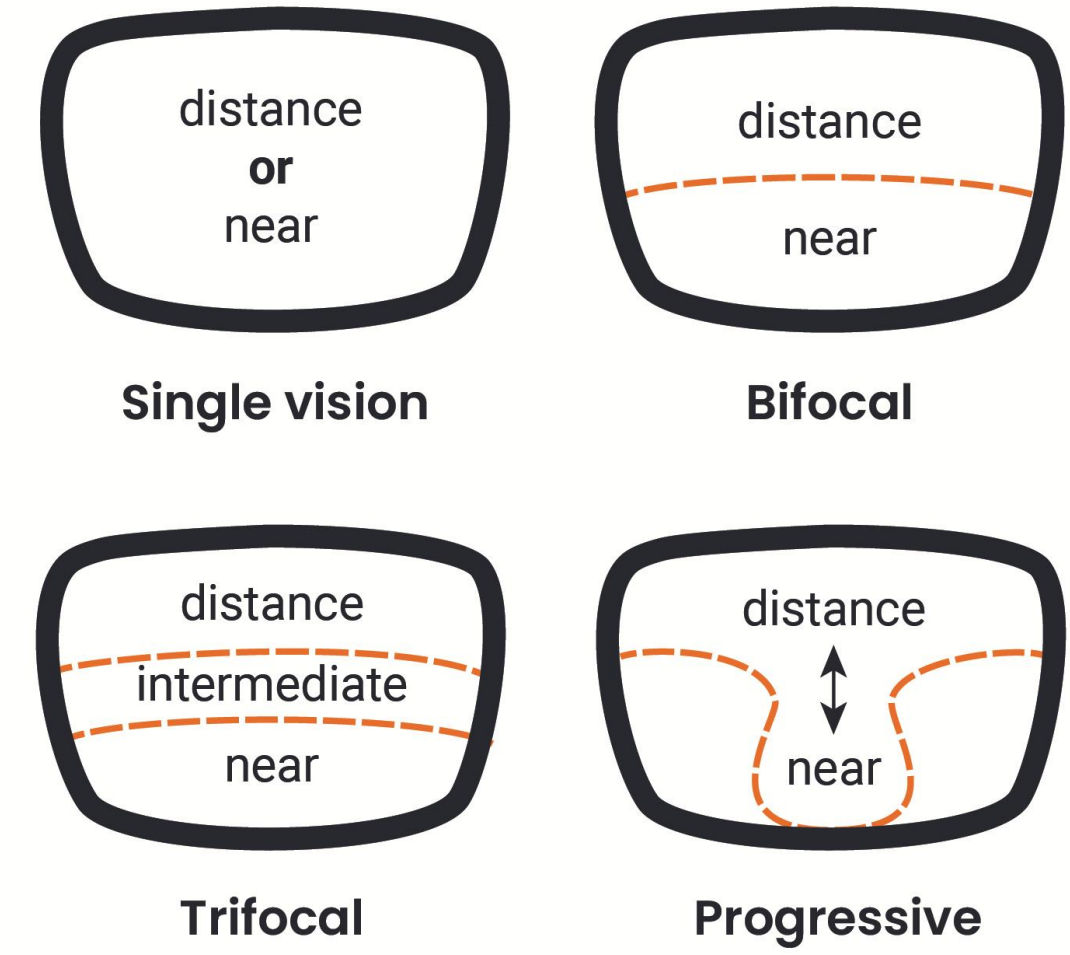

Fig 2.2 Types of spectacle lenses

2.6 Barriers to spectacle lenses access

Economic Barriers

In low-income countries like Zimbabwe, economic barriers are the most commonly mentioned obstacle to accessing spectacles (Munsamy *et al.*, 2023). The financial cost goes beyond just the cost of spectacles; it includes other factors such as consultation fees, transportation costs, and lost wages due to time away from work (Kaphle *et al.*, 2022; Munsamy *et al.*, 2023). According to the National Assistive Technology Strategy for Zimbabwe (2024–2025), a large proportion of those affected in low to medium income countries such as Zimbabwe cannot afford the high cost

of payments for services and spectacles (MoHCC Zimbabwe, 2024). The lack of enough locally produced spectacles lenses further increases the retail prices because of import duty and taxes (MoHCC Zimbabwe, 2024). In Masvingo, a subsidised scheme that offered glasses at US$15 plus a US$10 registration fee, far below the typical US$100–300 market price, showed a greater uptake of spectacles as many could afford compared to the usual average price of $275 (Munsamy *et al.,* 2023). In rural areas there are other factors which further increase the cost of spectacles beyond the buying price such as repair and upkeep because of elements like heat, dust and the physical strain of agricultural labor that can hasten degradation (Kaphle *et al.,* 2022). In young children, due to rapid facial growth frame replacement may be required in a matter of months or years resulting in continual unforeseen financial burdens for families. (Ocansey *et al.,* 2019).

Geographic and Infrastructural Barriers

In Sub-Saharan Africa, optical services are more distributed in urban areas leaving a lot of rural areas underserved. (Kaphle *et al.,* 2022). This pattern is best illustrated by Mashonaland Central Province, which is known for its mostly rural population and inadequate health facilities (MoHCC Zimbabwe, 2022). According to the Ministry of Health and Child Care's National Eye Health Strategy, there is a critical shortage of optometrists at provincial and district hospitals level (MoHCC Zimbabwe, 2022, p. 23). The key barriers to access include logistical challenges such as long travel times, transport fares and poor road infrastructure. (Kaphle *et al.,* 2022). There are limited outreach programs, while mobile and school-based programs attempt to bridge the gap, their current reach remains insufficient to meet the total population’s needs (Mafwiri *et al.,* 2016).

Literature by Muma *et al.,* (2024) showed that in Kenya, the Dot Glasses initiative utilizes simplified refraction methods that can be performed by non-specialists, drastically lowering costs and expanding the reach of care. While such methods have been proven effective elsewhere in serving marginalized communities, in Zimbabwe they still require further evaluation and integration into the healthcare system (Bascaran *et al.,* 2020).

Sociocultural Barriers

In African contexts, the uptake and usage of spectacles are greatly influenced by cultural beliefs and social conventions (Ocansey *et al.,* 2019). There are several misconceptions regarding glasses such as the common notion that wearing them gradually impairs vision, leading to dependency and hastening the decline of vision (Kaphle *et al.,* 2022). Studies conducted in Nigeria by Ebri *et al.,* (2025) showed that there was non- compliance to spectacle wear because of factors like perceived stigma, association of spectacle wear with disability and need for peer approval among other factors.

Cultural beliefs and social norms significantly shape the uptake and use of spectacles in African settings (Ebri *et al.,* 2025). Widespread misconceptions, such as the scientifically unfounded belief that glasses worsen vision and create dependency, can deter individuals from seeking help even when services are accessible and affordable (Kaphle *et al.,* 2022; Alrasheed *et al.,* 2020).

Social stigma is another major barrier, particularly among children and young adults who fear teasing and are concerned about their appearance (Mashige, Munsamy, & van Staden, 2021; Ocansey *et al.,* 2019). This is compounded by the perception that spectacles are primarily "for the aged," causing younger people to avoid acknowledging refractive errors and seeking treatment (Mashige *et al.,* 2021; Kaphle *et al.,* 2022; Ebeigbe *et al.,* 2024). The high visibility of older individuals using reading glasses can reinforce this association, leaving distance vision impairment in the young undetected and uncorrected (Mashige *et al.,* 2021).

These cultural dynamics also intersect with gender, creating distinct access patterns (Bourne *et al.,* 2025; Ramke *et al.,* 2023). Across many Sub-Saharan African nations, women are less likely to utilise refractive services due to reduced autonomy in healthcare decisions and limited control over household finances (Bourne *et al.,* 2025; Minto *et al.,* 2023). Such compounding disadvantages contribute to the lower effective refractive error coverage for women observed in global analyses, reflecting barriers beyond underlying clinical need (Bourne *et al.,* 2025).

Informational and Awareness Barriers

Lack of knowledge with regard to refractive errors and their correction remains a major obstacle in Sub- Saharan Africa. (Kaphle *et al.,* 2022). Many people perceive vision problems as aging or spiritual problems instead of treatable disorders. (Kaphle *et al.,* 2022). People have no motive to seek refractivee services if they are unaware that effective treatment is available.

In Mozambique, studies have shown lack of information about where to find treatments and how to use the healthcare system, even for those who are aware of their vision issues and want correction (Thompson *et al.,* 2014). In communities with little prior exposure to eye care services, the various steps of the eye care pathway remain a struggle for most. (Kaphle *et al.,* 2022).

Compared to other parts of the world, there is still a shortage of population-based data on the prevalence of refractive error in Sub-Saharan Africa. In their estimation of the potential lost productivity caused by uncorrected refractive error (Naidoo *et al.,* 2016). Developing focused public health interventions requires an understanding of the trends in prescribed eyewear, including what is prescribed, to whom, and whether patients are obtaining and using them. (Mashige *et al.,* 2021). In Mashonaland Central, limited data on spectacle lens utilization highlights a need for context-specific research to inform targeted interventions. This study recognizes refractive error as a significant source of moderate visual impairment affecting both adults and children and highlights critical shortages of eye health personnel with optometrists particularly in Mashonaland Central Province. The study explores the actual process of a prescription for glasses in an environment with limited resources, going beyond the clinical effectiveness of lenses.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter exhibits the methodology utilized in executing the study. It outlines the research design, the study setting and duration, and the population and sampling strategies used to choose participants. The chapter further outlines the research instruments applied, including questionnaires, data extraction sheets and observational checklists, as well as the procedures for data collection. In addition, it elaborates the methods of data presentation and analysis, detailing both quantitative and qualitative approaches. To ensure compliance with established research standards, ethical evaluations guiding the study are also emphasized.

3.2 Study Design

This study used a cross-sectional design to investigate trends in prescribed spectacle lenses in Mashonaland Central Province. The design was suitable because it enabled the collection of data at a single point in time, allowing the identification of patterns and associations without needing long-term follow-up.

3.3 Study Setting and Duration

The study was conducted over a two-month period in at least three districts of Mashonaland Central Province (e.g., Bindura, Shamva and Glendale). Data was collected at selected public and mission health institutions that offer refractive care services.

3.4 Population

The study population consisted of people aged 12 years to above 65 years dwelling in Shamva, Bindura and Glendale. The sample was drawn from an estimated target population of 15 000 individual.

3.5 Sampling Methods

Calculation of the sample size was done using the formula:

$$n=\frac{N}{1+N(e^2)}$$

Where:

- n= sample size
- N= total population size
- e= margin of error (expressed as a decimal, e.g., 0.05 for 5%)

Therefore, using the formula above the required sample was determined to be 390. In this study, structured questionnaires were employed to document lens types, frame materials, and demographic characteristics. Structured questionnaires ensured uniformity in responses, resulting in easier comparison of data across participants. Randomized recruitment times were used to reduce selection bias. By varying recruitment times, you avoid only capturing certain groups (e.g., people available in the mornings or afternoons). This increased representativeness of the sample, which was important since spectacle use might differ across occupations, age groups, or daily routines. Data collectors were trained to ensure consistency in administering tools. Training reduced interviewer bias and ensured that all participants received the same instructions. This was important in this study because differences in how questions were asked could influence responses about spectacle types or demographic details. In addition, to minimize bias, the questionnaire was be pre-tested in a pilot study. Pre-testing helped identify unclear questions, cultural misunderstandings, or technical issues before the main study. This ensured that the final questionnaire collects accurate and reliable data. The pilot study was be done at BUSE (Bindura University of Science Education) to the students and staff members for the following reasons:

- Accessibility: As a controlled environment, the university provides a convenient and manageable group for testing the questionnaire.
- Diversity: Students and staff represent a mix of ages (young adults to middle-aged), occupations (academic and non-academic), and spectacle use patterns, making them a good test group.
- Feedback quality: University participants are generally literate and can provide constructive feedback on clarity, wording, and structure of the questionnaire.
- Practicality: Conducting the pilot at BUSE saved time and resources before rolling out the study across the wider Mashonaland Central Province.

3.5 Inclusion Criteria

The target population was individuals of all genders between ages of 12 years and 65 years who are currently using or have been prescribed spectacles within Mashonaland Central Province.

Reasons for including this group:

i. Comprehension and reliability: Individuals aged 12 and above can understand and respond accurately to structured questionnaires about their spectacles.
ii. Spectacle use prevalence: Vision problems such as myopia, hyperopia, and presbyopia are common in this age range, making them the most relevant group for studying spectacle use.
iii. Educational and occupational relevance: Adolescents (12 years+) often need spectacles for schoolwork, while adults use them for work and daily activities. This ensures the study captures practical usage patterns.
iv. Ethical participation: Adolescents can provide assent with parental consent, while adults can consent independently, ensuring ethical compliance.

3.6 Exclusion Criteria

Age exclusion was individuals of all gender of below 12 years and above 65 years who were currently using or had been prescribed spectacles within Mashonaland Central Province. In addition, individuals of all gender and age who did not use spectacles were excluded as they were not our targeted population.

Reasons for excluding children under 12 years:

i. Limited comprehension: Younger children struggled to understand questionnaires, leading to unreliable data.
ii. Parental dependence: Responses would have relied heavily on parents/guardians, introducing bias.
iii. Different clinical needs: Children under 12 often had congenital or developmental eye conditions requiring specialized prescriptions, which did not align with the study's focus.

Reasons for excluding adults over 65 years:

i. Age-related complications: Older adults may have complex ocular conditions (e.g., cataracts, glaucoma) that require specialized lenses beyond standard spectacles.
ii. Data consistency: Including this group could introduce variability that makes comparisons less meaningful.
iii. Practical challenges: Elderly participants may face difficulties with recall or completing structured questionnaires, affecting data quality.

3.7 Data Collection Tools and Techniques

1. Data Extraction Sheet: Used for recording patient demographics, refractive error diagnoses, and prescription details.
2. Structured Questionnaire: Administered to participants to collect information on spectacle uptake, self-reported barriers, and satisfaction levels.
3. Observational Checklist: Administered during facility visits to record lens types, frame materials, and service delivery practices.

3.8 Data Analysis

Data was analyzed using Microsoft Excel (2019) and SPSS. Descriptive statistics (frequencies, percentages, means, and standard deviations) summarized demographic and clinical characteristics. Inferential statistics, including Chi-square tests and logistic regression, were used to examine associations between variables.

3.9 Ethical Considerations

The study adhered to the Declaration of Helsinki principles to ensure participant safety and ethical integrity. Ethical clearance was obtained from the Bindura University of Science Education Ethics Committee and the allocated approval number was BUSEREC/0196/2026. Study aims were explained in English or Shona to ensure comprehension. Written informed consent was obtained from all participants. Participation was strictly voluntary, with the right to withdraw at any stage without penalty. All information was be anonymized, and confidentiality

was highly maintained throughout the study. The study poses no known risks or discomforts. Participants were able to benefit indirectly through improved understanding of spectacle uptake trends, which could inform future service delivery.

CHAPTER 4: RESULTS

Introduction

This chapter details the results obtained showing demographic data, spectacle use and satisfaction levels among patients in Mashonaland Central, Zimbabwe.

TABLE 4.1 **Genders of Participants**

Gender of participants	Frequency	Percent	Valid Percent	Cumulative Percent
Male	98	24.5	24.5	24.5
Female	302	75.5	75.5	100
Total	400	100	100	

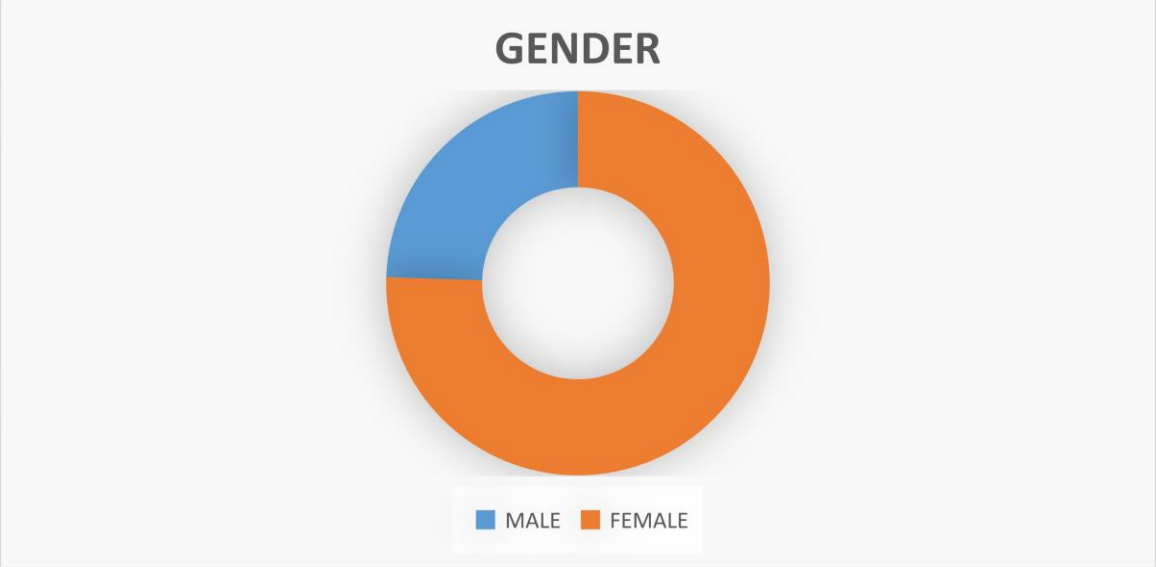

Fig 4.1 **Gender distribution**

TABLE 4.2 **Age Statistics of Participants.**

Age of Participants	Statistics
Valid	400
Missing	0
Mean	34.2 years
Median	32.0 years
Mode	25 years

Std. Deviation	±15.8 years

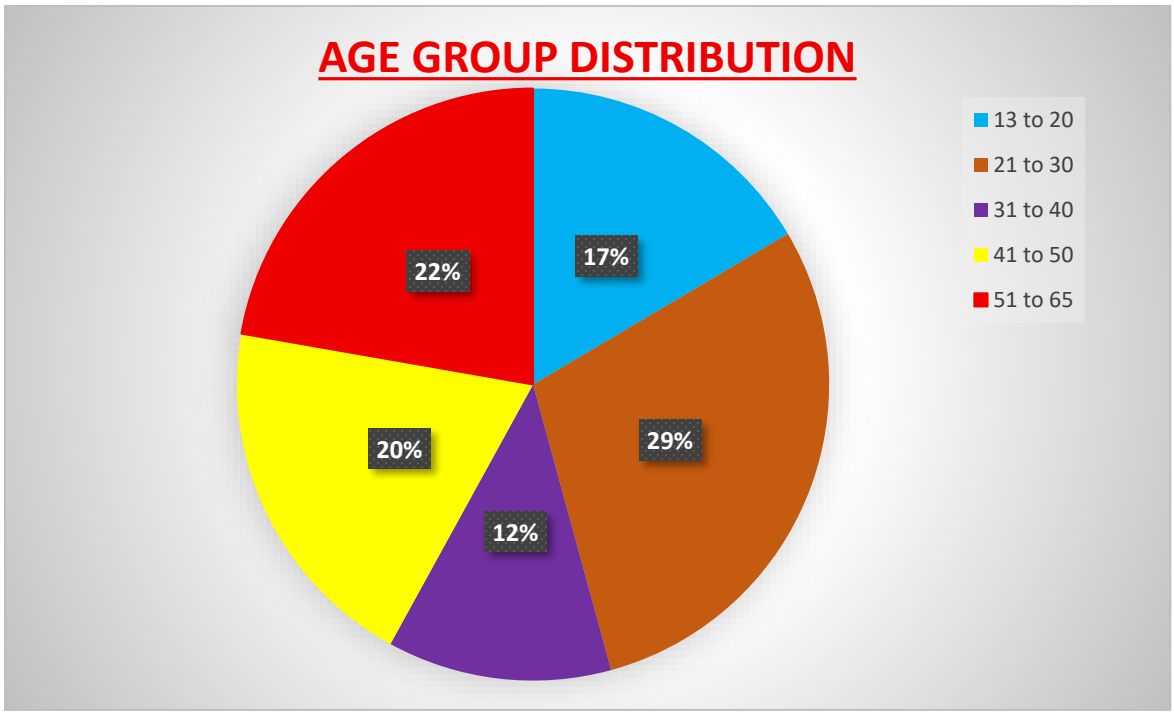

Fig 4.2 **Distribution of age groups of the participants**

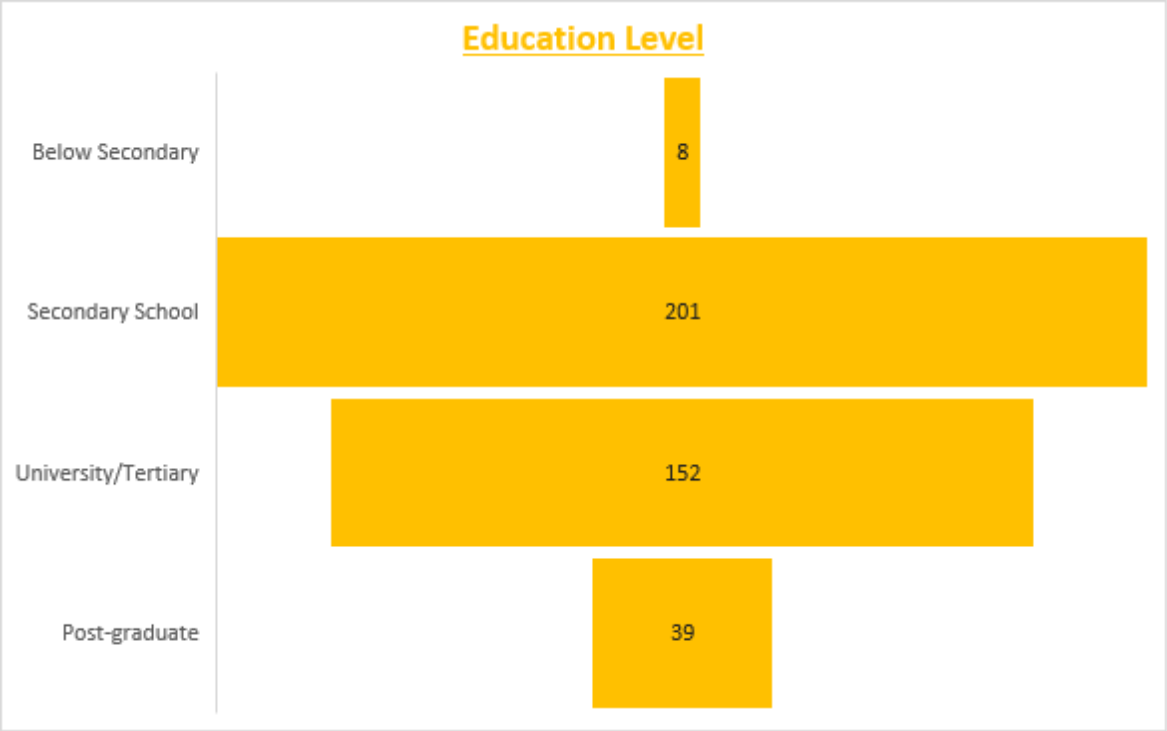

Fig 4.3 **Education levels**

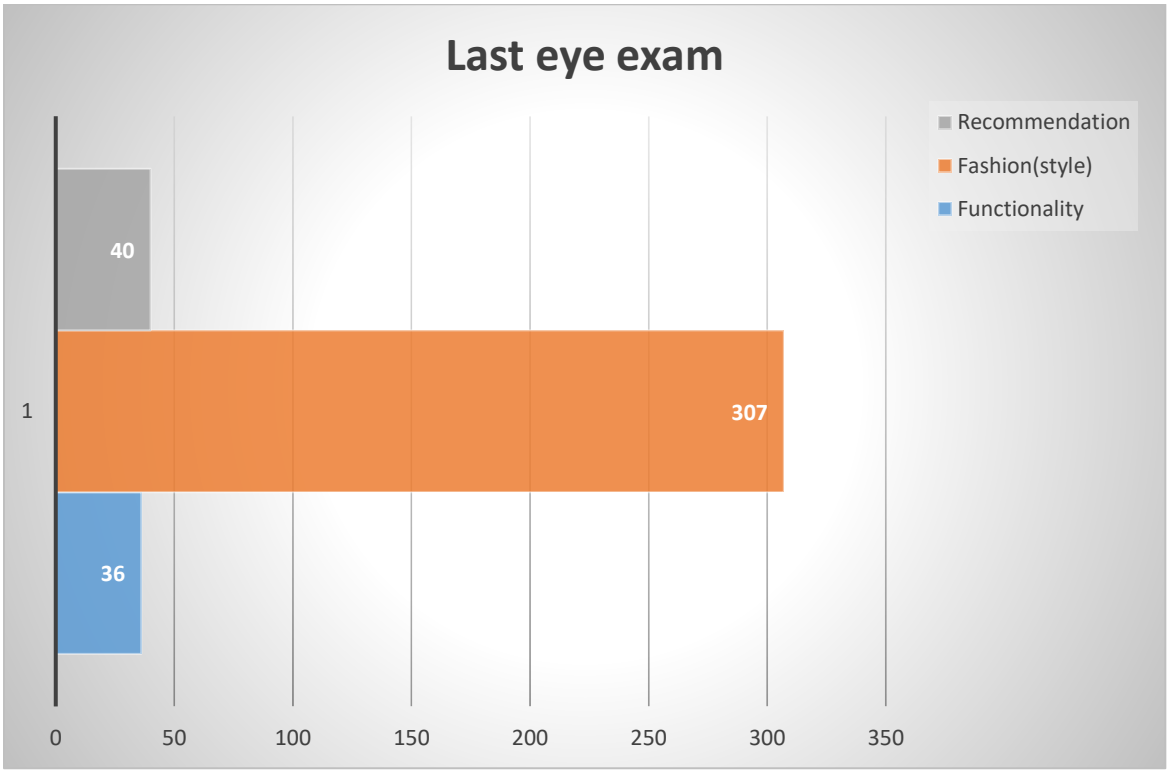

Fig 4.4 **Last eye examination**

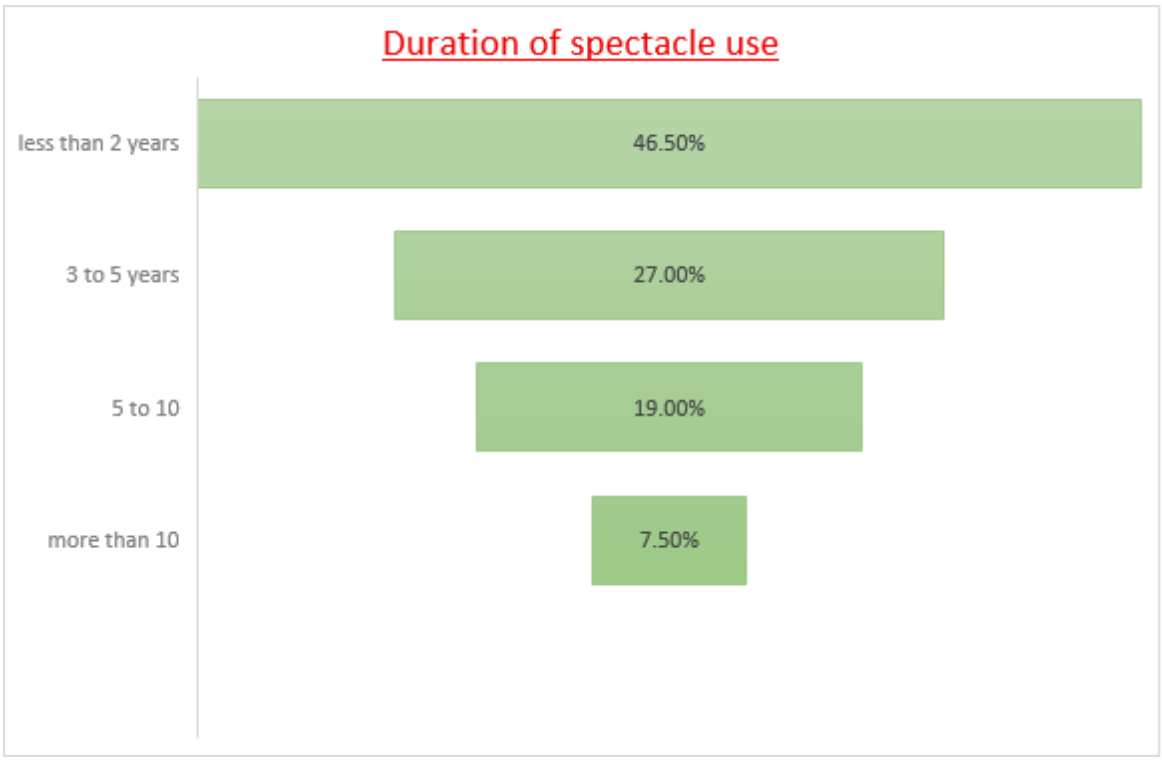

Fig 4.5 **duration of spectacle use**

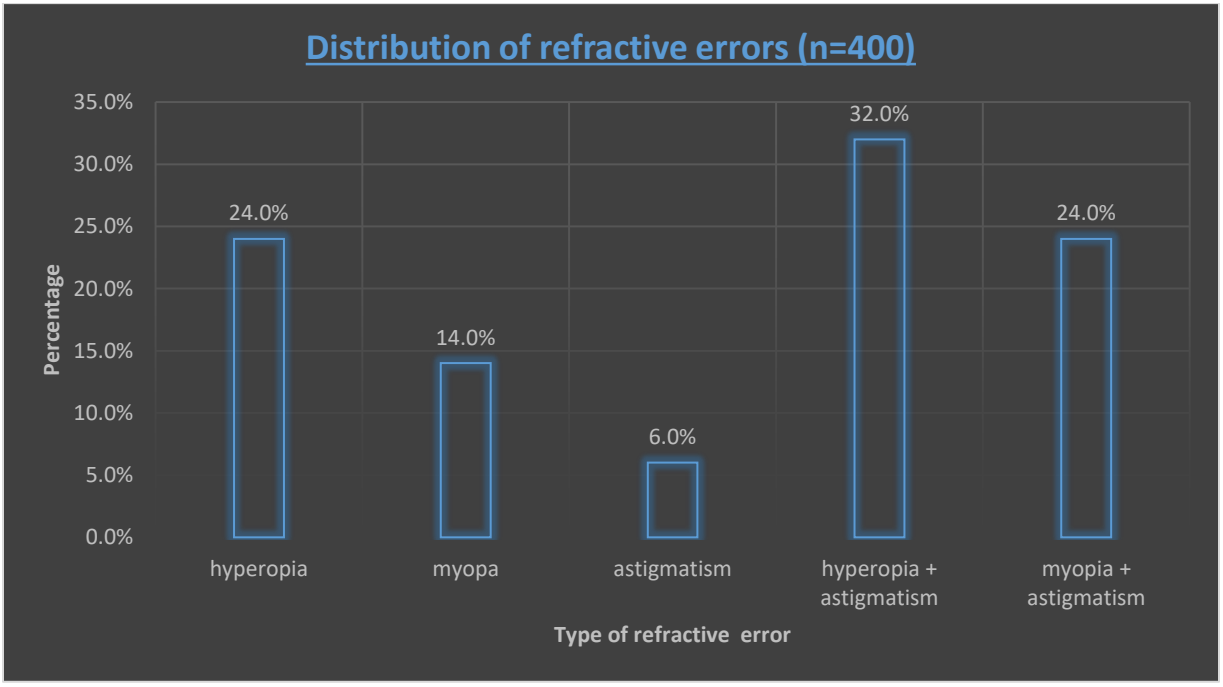

Fig 4.6 **Distribution of refractive errors**

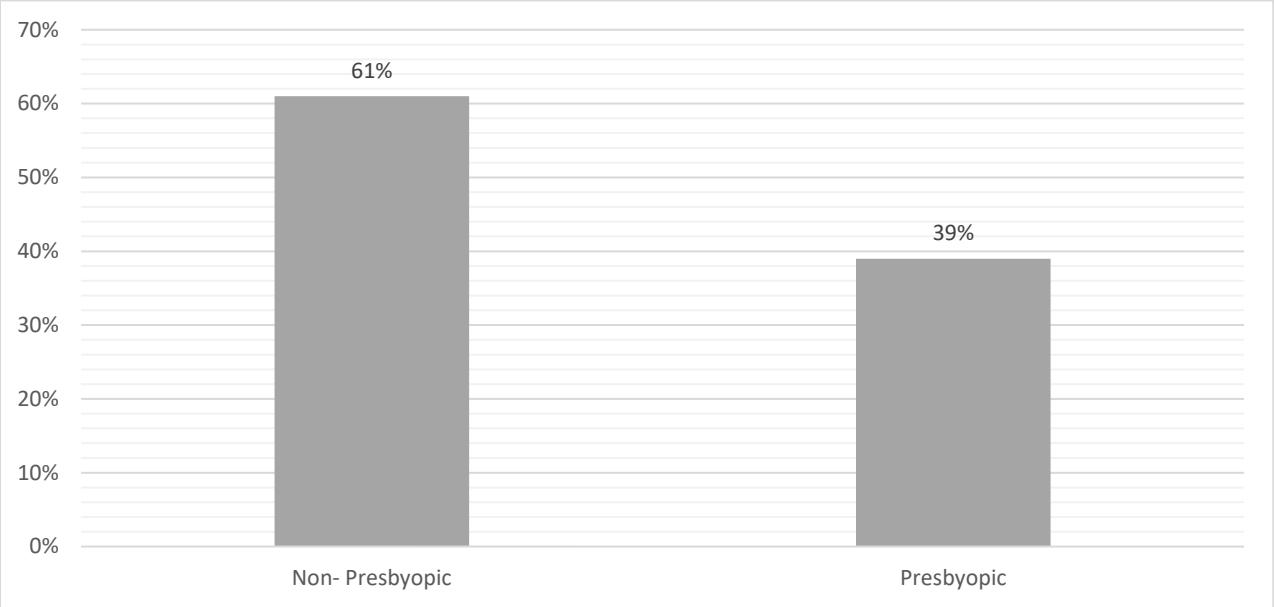

Fig 4.7 **Difference between presbyopia and non-presbyopia**

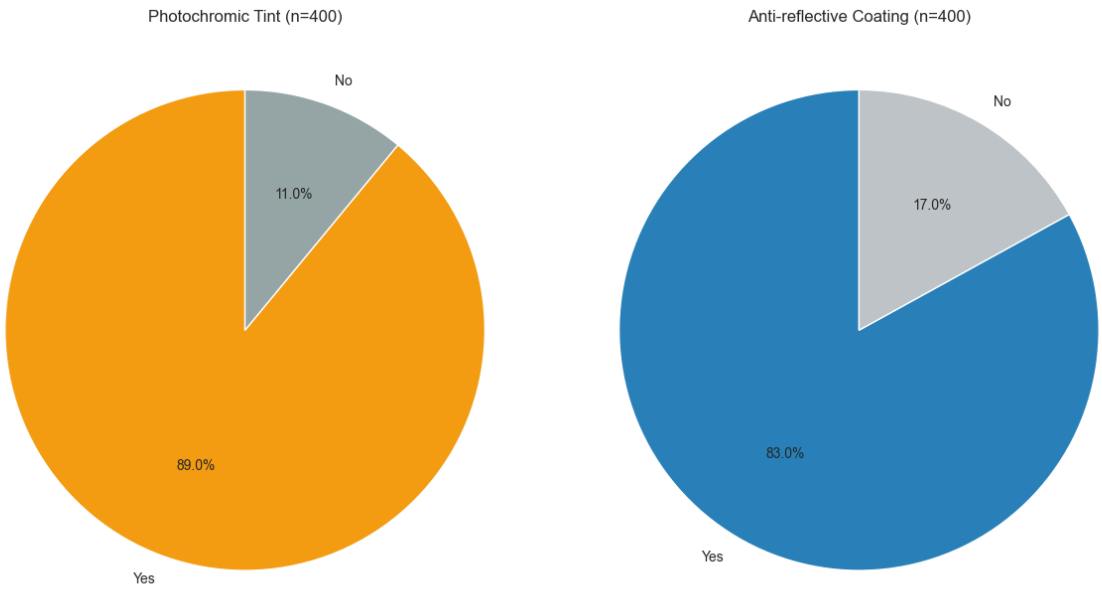

Fig 4.8 **Difference between photochromic tint and non-photochromatic and anti-reflective coating and non-anti-reflective coating**

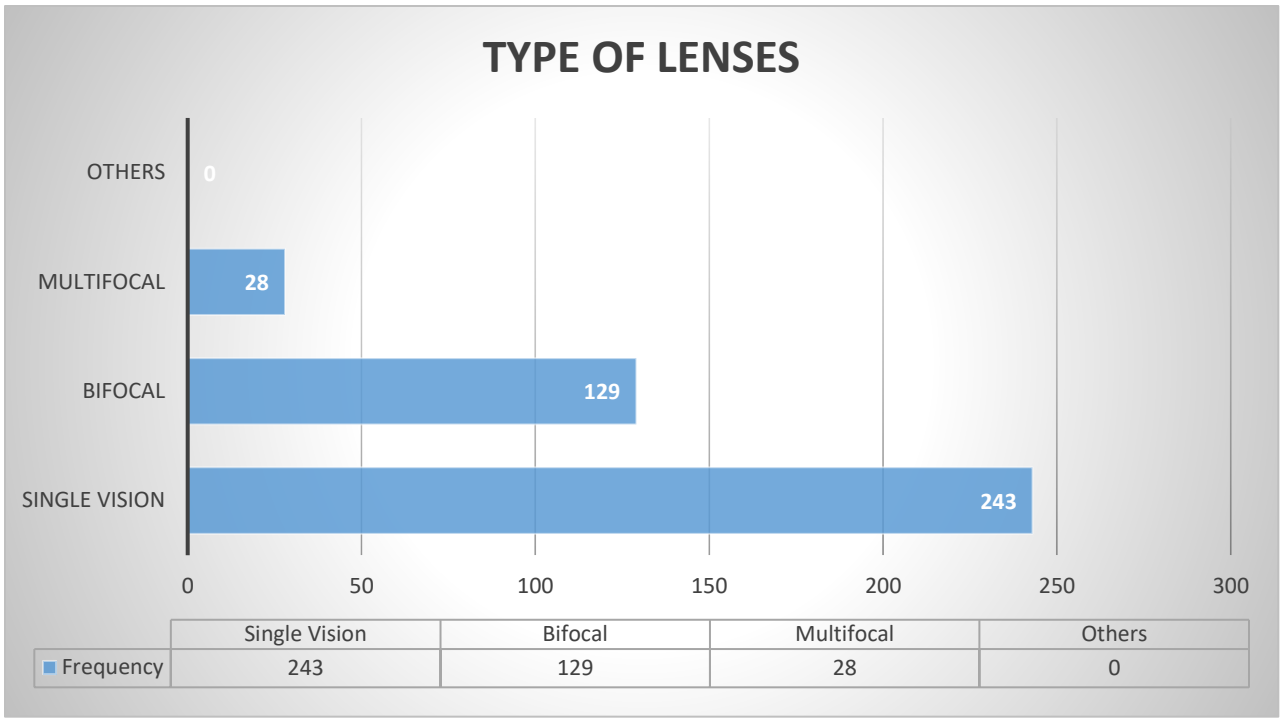

Fig 4.9 **Type of lenses**

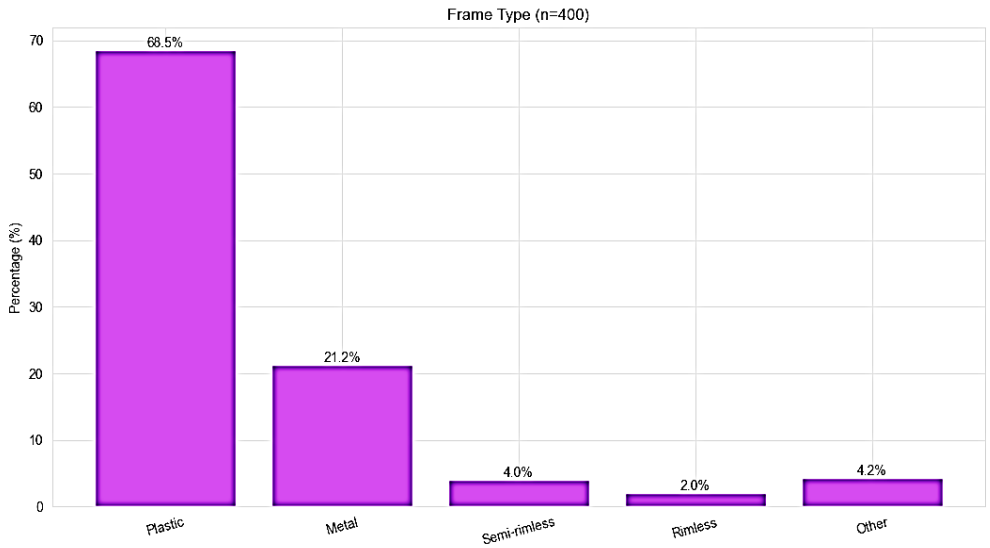

Fig 4.10 **Different frame types**

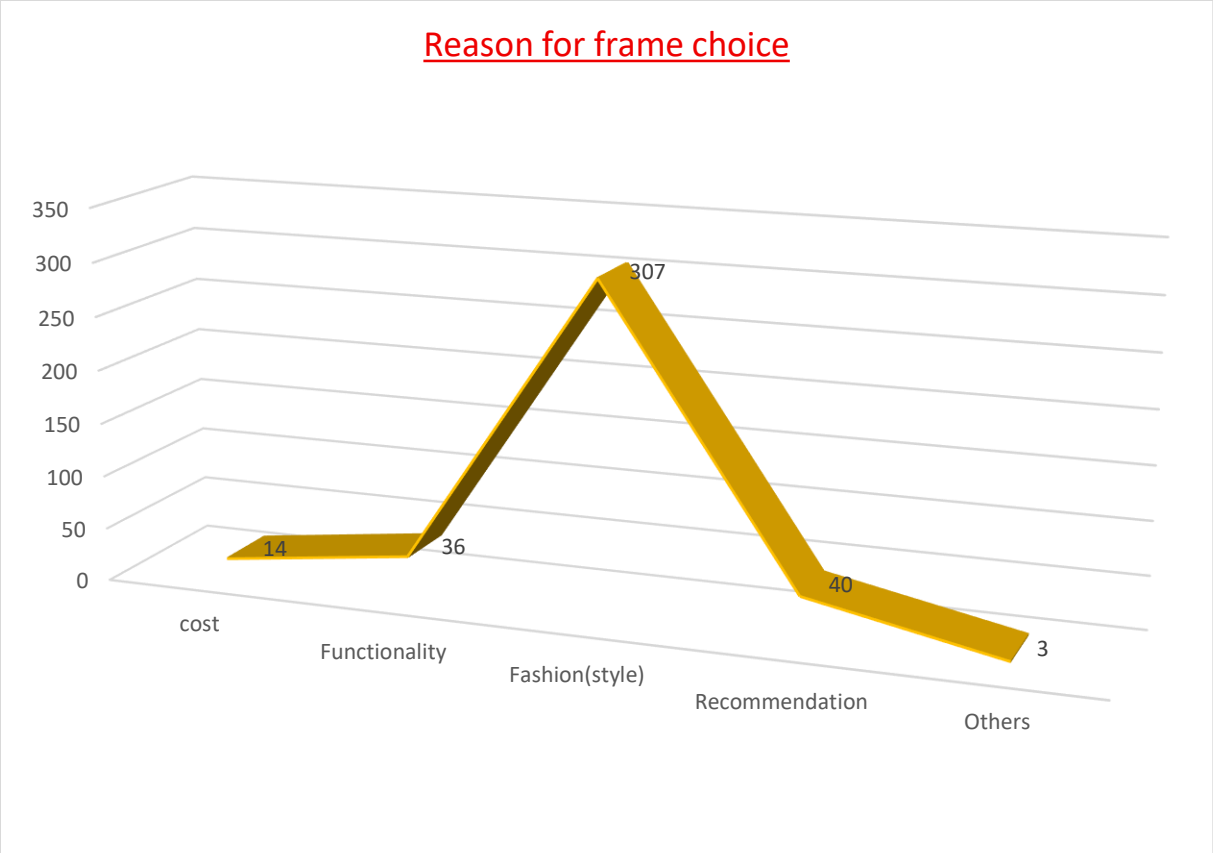

Fig 4.11 **Reason for frame choice**

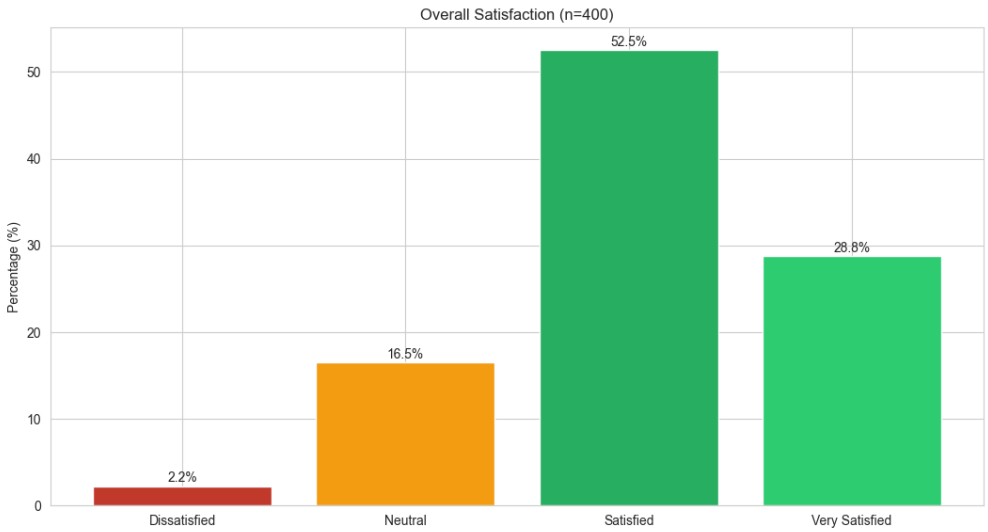

Fig 4.12 **Satisfaction level of the prescribed spectacles**

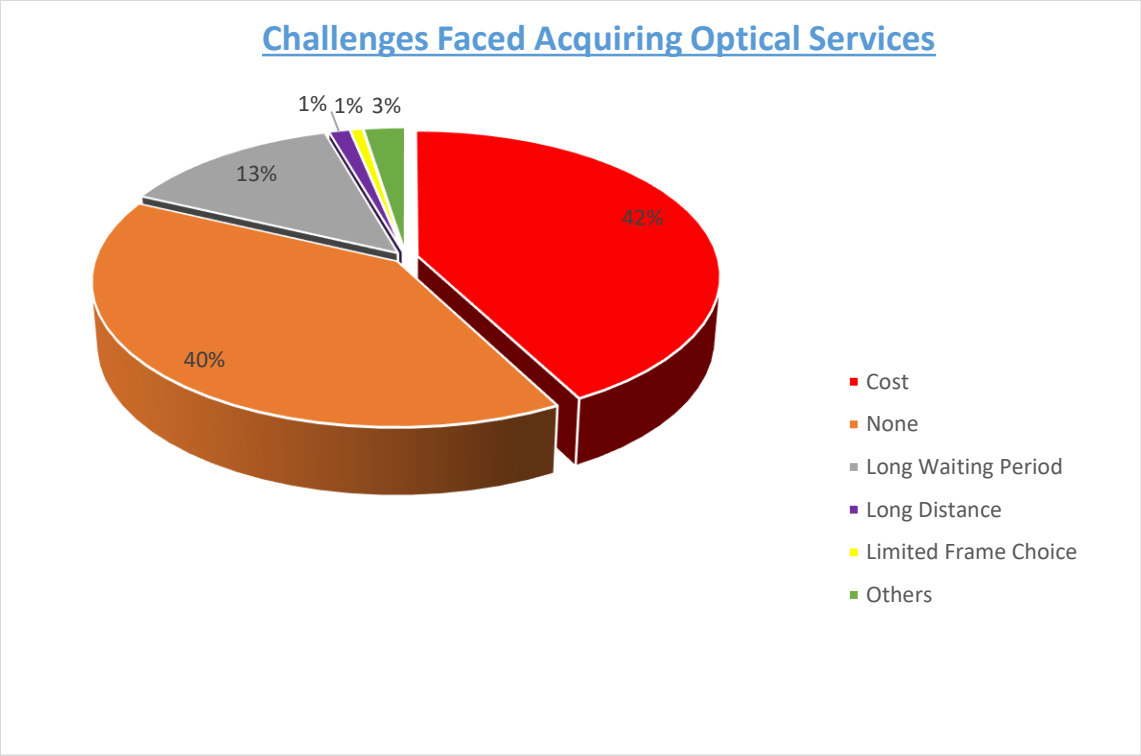

Fig 4.13 **Challenges faced when acquiring optical services**

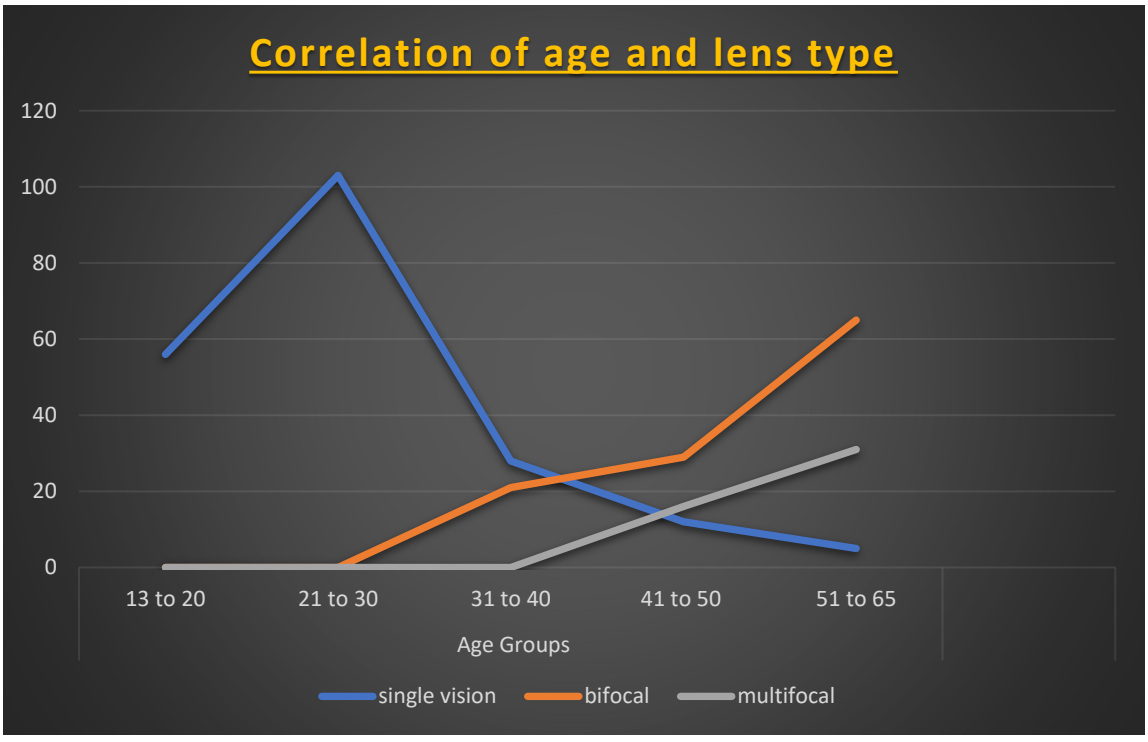

Fig 4.14 **Correlation between age and the lens type**

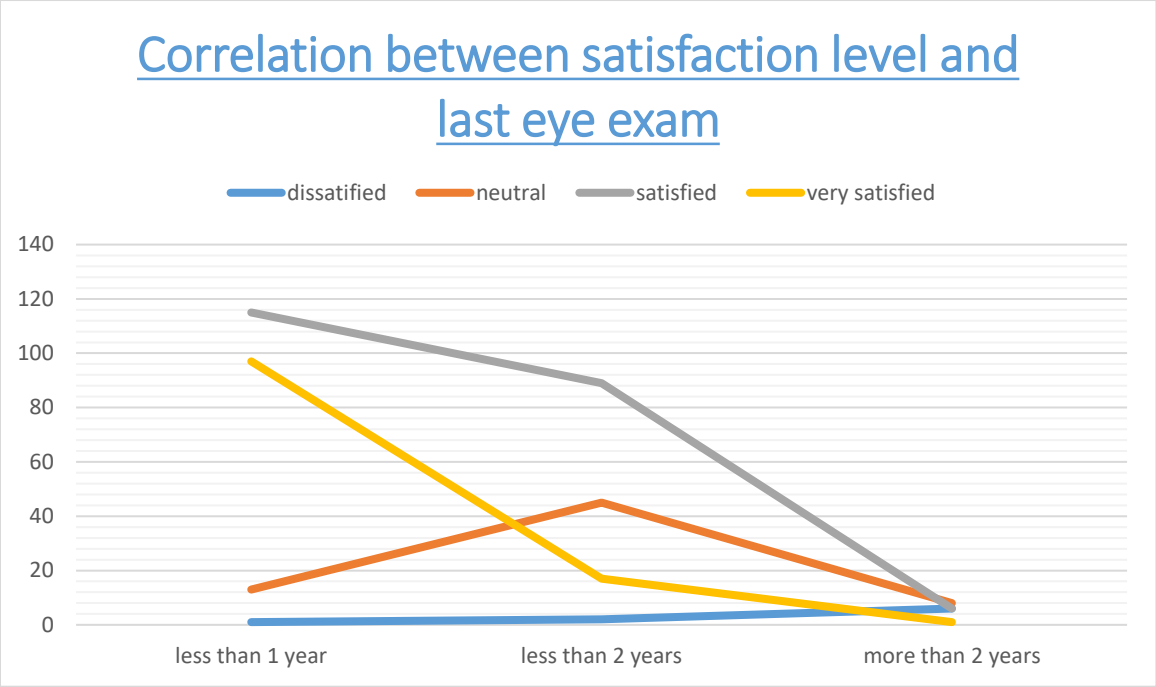

Fig 4.15 **Correlation between satisfaction level and last eye examination**

CHAPTER 5: DATA ANALYSIS

5.1 Introduction

This chapter compares the epidemiological patterns of spectacle lens use in Mashonaland Central Province and explains the study's main conclusions. The discussion is structured around the study's main objectives.

5.2 Prevalence of refractive errors and spectacle lens trends

The results showed that refractive errors were prevalent as follows; myopia (38%), hyperopia (56%) and astigmatism (62%). The results obtained conforms with the study conducted by Tagoh *et al.,* (2020), who identified hyperopia (56.9%) as the most prevalent refractive error in rural Mashonaland Central. While it contradicts studies by Kahoto *et al.,* (2023), a hospital-based study in Harare that found myopia (72.2%) as the leading refractive error, continuously reflecting the urban trend.

Spectacle trends in a sample of (n=400) showed that single vision lenses (243) were the most frequent, followed by bifocals (129) and progressives (28) were the least frequent. There was higher use of photochromatic lenses (89%) compared to non-photochromatic lenses (11%). Spectacle lenses with anti-reflective coating were significantly higher than those with non-reflective coating. Literature suggests that areas with high UV levels and abundant sunshine such as Mashonaland Central Province require photochromatic and anti- reflective coated lenses. (Oliviera and Martinez- Perez, 2025).

5.3 Barriers to spectacle access and utilization

Major challenges faced when acquiring spectacles were cost and longer waiting periods. This research tallies with findings from Morocco and Ethiopia where high costs and lack of affordability were the major reasons for non-adherence (Kaphle *et al.,* 2022). Geographic barriers such as long travel distances and shortage of optometrists at district level, are similar to those reported in rural Tanzania (Mafwiri *et al.,* 2016). Sociocultural misconceptions such as the belief that glasses weaken eyesight were also identified, aligning with studies from South Africa and Ghana (Mashige *et al.,* 2021; Ocansey *et al.,* 2019).

5.4 User satisfaction

The study showed that satisfaction is highest among patients examined within the first twelve months (81.3%) and declines with longer intervals. These findings are consistent with the UK General Optical Council's 2023 patient survey, which reported that satisfaction levels in the first twelve months were high (97%) and lower in the last two years (92%). This study shows that irregular eye exams are related to reduced satisfaction with prescribed spectacles, which results are consistent with studies from low-resource settings worldwide (Holden *et al.,* 2016; Naidoo *et al.,* 2015). Due to out-of-date prescriptions or unreported changes in refractive error, patients who had not recently had an eye test were more likely to experience discomfort or poor vision. (Naidoo *et al.,* 2015)

5.5 Limitations of the study

- Cross-sectional design limits causal inference.
- Hospital-based records may introduce selection bias.
- Self-reported barriers are subject to recall and social desirability bias.
- Study limited to three districts; findings may not generalize to all seven districts of Mashonaland Central.

5.6 RECOMMENDATIONS

5.6.1 Policy recommendations

- ✓ Conduct public awareness campaigns in local languages (Shona and English) to dispel myths that spectacles weaken eyesight.
- ✓ Deploy optometrists to district hospitals to address the critical shortage in those areas and provide incentive packages for rural postings for motivation.
- ✓ Strengthen optical laboratory infrastructure within the province to reduce reliance on imported spectacle and minimize delays in spectacle delivery.

5.6.2 Further study recommendations

- A study to track spectacle compliance and satisfaction over 12–36 months, measuring the impact of regular follow-up on long-term utilization.
- A comparative study of urban versus rural spectacle utilization patterns across all districts in Mashonaland Central, Zimbabwe.

5.6.3 Eye care providers recommendations

- Implement systematic recall systems (e.g., SMS reminders) to encourage patients to return for annual eye examinations.

5.7 CONCLUSION

This cross-sectional study examined the epidemiological trends of spectacle lens utilization in Mashonaland Central Province, Zimbabwe. The results show that the major refractive error is myopia, although it is less prevalent in this study as compared to other studies. It also shows a significant relationship between age and lens type as well as a significant relationship between satisfaction level and last eye examination. Significant barriers to spectacle access and utilization include economic constraints, geographic isolation, shortage of optometrists, sociocultural misconceptions, and lack of awareness. User satisfaction is highest among those who had an eye examination within the preceding twelve months and declines with longer intervals since the last exam.

REFERENCES

Alrasheed, S. H., Naidoo, K. S., & Clarke-Farr, P. C. (2020). Knowledge, attitudes and practices of spectacle wear among school children in Sudan. African Vision and Eye Health, 79(1), a534.

Alrashidi, S. H., Alshammeri, S., & Alrasheed, S. H. (2023). Prevalence of refractive errors and associated risk factors in Saudi Arabia: A systematic review. Cureus, 15(4), e37645.

Bascaran, C., Mtengezo, J., & Khaw, P. T. (2020). Dot Glasses: A novel approach to refractive error correction in low-resource settings. Community Eye Health Journal, 33(108), 76-77.

Bourne, R., Steinmetz, J. D., Flaxman, S., et al. (2025). Global estimates of effective refractive error coverage: A systematic analysis. The Lancet Global Health, 13(1), e45-e56.

Ebeigbe, J. A., Ebeigbe, P. N., & Okoeguale, I. N. (2024). Sociocultural barriers to spectacle use in rural Nigeria. Nigerian Journal of Ophthalmology, 32(1), 22-28.

Ebri, A. E., Govender, P., Naidoo, K., Albert, F., Shah, K., & Chan, V. F. (2025). Understanding barriers to spectacle wear compliance among schoolchildren in Calabar Nigeria: A qualitative study. AJO International, 2(3), Article 100160. https://doi.org/10.1016/j.ajoint.2025.100160

Fricke, T. R., Tahhan, N., Resnikoff, S., Papas, E., Burnett, A., Ho, S. M., & Naidoo, K. S. (2018). Global prevalence of presbyopia and vision impairment from uncorrected presbyopia: systematic review, meta-analysis, and modelling. Ophthalmology, 125(10), 1492-1499.

Goldschmidt, E., and Jacobsen, N. (2014). Genetic and environmental factors in myopia. Acta Ophthalmologica, 92(6), 507-517.

Hashemi, H., Rezvan, F., Yekta, A. A., Hashemi, M., and Khabazkhoob, M. (2018). The prevalence of uncorrected refractive errors. Journal of Ophthalmic & Vision Research, 13(4), 454-462.

Holden, B. A., Fricke, T. R., & Naidoo, K. S. (2015). The impact of uncorrected refractive error on global productivity. Bulletin of the World Health Organization, 93(7), 457-465.

Holden, B. A., Fricke, T. R., Wilson, D. A., Jong, M., Naidoo, K. S., Sankaridurg, P., & Resnikoff, S. (2016). Global prevalence of myopia and high myopia and temporal trends from 2000 through 2050. Ophthalmology, 123(5), 1036-1042.

Ibrahim, N. A., Abubakar, A. R., & Suleiman, I. H. (2022). Cost-effectiveness of spectacle provision in low-income countries. BMJ Open Ophthalmology, 7(1), e001023.

Irving, E. L., Harris, L. R., & Lillakas, L. (2019). Refractive error distribution by age, gender, and ethnicity. Optometry and Vision Science, 96(5), 334-342.

Kahoto, S., Macheka, B., & Chikwanha, T. (2023). Pattern of refractive errors at a tertiary hospital in Harare, Zimbabwe. Central African Journal of Medicine, 69(3-4), 34-40.

Kaphle, D., Kandel, H., & Marasini, S. (2022). Barriers to the uptake of refractive error services in low- and middle-income countries: A systematic review. Clinical and Experimental Optometry, 105(2), 152-159.

Khurana, A. K. (2007). Comprehensive Ophthalmology (4th ed.). New Age International.

Mafwiri, M. M., Jolley, E., Hunter, J., & Schmidt, E. (2016). Mixed methods evaluation of a primary eye care training programme for primary health workers in Morogoro Tanzania. BMC Nursing, 15, 41.

Mashige, K. P., Munsamy, A. J., & van Staden, D. B. (2021). Knowledge and attitudes towards spectacles use among secondary school students in South Africa. African Vision and Eye Health, 80(1), a579.

Mashonaland Central Provincial Health Report. (2022). Annual Eye Health Statistics. Ministry of Health and Child Care, Zimbabwe.

Ministry of Health and Child Care (MoHCC) Zimbabwe. (2022). National Eye Health Strategy 2022-2026. Government of Zimbabwe.

Minto, H., Addo, E. K., & Nkum, G. (2023). Gender disparities in spectacle access in sub-Saharan Africa. International Journal of Equity in Health, 22(1), 89.

Moyo, B., Tagoh, S., & Kyei, S. (2021). Refractive error burden in Mashonaland Central Province: A population-based study. Zimbabwe Journal of Health Sciences, 18(2), 45-52.

Muma, S., Naidoo, K. S., & Hansraj, R. (2024). SWOT analysis of the models used by social enterprises in scaling effective refractive error coverage to achieve the 2030 in SIGHT in Kenya. Scientific reports, 14(1), 3750. https://doi.org/10.1038/s41598-024-54493-z

Munsamy, A. J., Mashige, K. P., & Naidoo, K. S. (2023). Economic barriers to spectacle access in rural Zimbabwe. African Vision and Eye Health, 82(1), a789.

Naidoo, K. S., Jaggernath, J., & Fricke, T. R. (2016). The impact of uncorrected refractive error on productivity in low- and middle-income countries. Investigative Ophthalmology & Visual Science, 57(9), 5678-5684.

Ocansey, S., Kyei, S., & Asare, F. A. (2019). Sociocultural determinants of spectacle wear among Ghanaian children. Journal of Optometry, 12(3), 165-173.

Oliveira, A. P., & Martinez-Perez, C. (2025). Luminescent and Optical Thin Film Coatings in Ophthalmic Lenses: Advances, Clinical Applications, and Future Directions. Coatings. Multidisciplinary Digital Publishing Institute (MDPI). https://doi.org/10.3390/coatings15111246

Pascolini, D., & Mariotti, S. P. (2012). Global estimates of visual impairment: 2010. British Journal of Ophthalmology, 96, 614-618.

Ramke, J., Evans, J. R., & Gilbert, C. E. (2023). Effective refractive error coverage: A global analysis of equity. Ophthalmic Epidemiology, 30(2), 121-130.

Resnikoff, S., Pascolini, D., & Mariotti, S. P. (2008). Global magnitude of visual impairment caused by uncorrected refractive errors in 2004. Bulletin of the World Health Organization, 86(1), 63-70.

Resnikoff, S., Pascolini, D., Mariotti, S. P., & Pokharel, G. P. (2012). Global magnitude of visual impairment caused by uncorrected refractive errors in 2004. Bulletin of the World Health Organization, 86(1), 63-70.

Smitha, S., Ramesh, S., & Sathish, R. (2019). Risk factors for refractive errors in school-aged children. Indian Journal of Ophthalmology, 67(7), 1085-1090.

Tagoh, S., Kyei, S., Kwarteng, M. A., & Aboagye, E. (2020). Prevalence of refractive error and visual impairment among rural dwellers in Mashonaland Central Province, Zimbabwe. Journal of Current Ophthalmology, 32, 402-407.

Thompson, S., Naidoo, K., Gonzalez-Alvarez, C., Harris, G., Chinanayi, F.,& Loughman, J. (2014). Barriers to Use of Refractive Services in Mozambique. Optometry and vision science : official publication of the American Academy of Optometry. 92. 10.1097/OPX.0000000000000431.

UK General Optical Council. (2023). Patient satisfaction survey report 2023. General Optical Council.

World Health Organization (WHO). (2019). World report on vision. Geneva: World Health Organization.

Yannick, B., Delphine, T., & Eric, S. (2023). Global presbyopia burden: Updated estimates. Journal of Global Health, 13, 04052.

APPENDIX

INFORMED CONSENT FORM

Title of the Study:

An Epidemiological Analysis of Spectacle Lenses Utilization Trends in Mashonaland Central, Zimbabwe

Principal Investigators:

- Dryden Rupande B224412B
- Issah Wandika B224409B
- Ophias Mazuru B233003B

Institution/Organization: Bindura University of Science Education
Faculty of Science and Engineering
Department of Optometry

SECTION A

Introduction

You are being invited to participate in a research survey conducted by Dryden Rupande, Issah Wandika and Ophias Mazuru which will be conducted in Mashonaland Province. The study describes and analyses the trend of spectacle use among residence of Mashonaland Central, Zimbabwe and their preferences. Your participation is entirely voluntary.

Purpose of the Survey:

The purpose of this survey is to investigate the current trends in prescribed spectacles and assess the accessibility of these services in Mashonaland Central, Zimbabwe. It also includes evaluating patient satisfaction and preferences among the residence. By identifying the key barriers to spectacle uptake and the factors that facilitate them, the study aims to generate evidence that can contribute to a better and effective eye care service delivery system.

Procedures:

If you agree to participate, you will be asked to complete a survey that will take approximately ten minutes to complete. The survey will include questions about the primary source where residents acquire

their spectacles, the different frame materials and designs that are available to them and the most common types of spectacle lenses (single vision, bifocal or multifocal) that are prescribed to them. You will also be asked about the obstacles and barriers that you face when obtaining spectacles.

Confidentiality And Anonymity

The identity of every participant and the personal data collected during the research will be stored securely. Any information published or shared will be presented in an anonymized and aggregated form to ensure your privacy is protected.

Risks and Discomforts:

Participating in this survey may involve some risks, such as taking up your time, feeling uncomfortable sharing personal information and possibly finding some questions frustrating. However, these risks are minimal and are similar to those encountered in everyday life.

SECTION B

Objective and Procedure:

I understand the purpose of this research and that I am voluntarily participating. The procedures have been explained clearly.

Name: …….

Date: ……

Research Title: ……

Researcher's Name: ……

Confidentiality and Data Use:

I consent to the collection and storage of data as described with my confidentiality being always protected.

Data Collected:

1.……

2.……

3.……

Risks and Benefits:

The potential risks and benefits of this research have been explained, and I agree to participate under these conditions.

Signature: ……

Researcher's Signature: ……..

Date: ……

QUESTIONAIRE

An Epidemiological analysis of spectacle lenses utilization trends in Mashonaland Central Province, Zimbabwe.

Research by students from Bindura University of Science Education

Please answer using a tick or X mark in boxes provided and fill in with words where appropriate.

SECTION A

Age in years

13 to 19	20 - 30	30 – 40	40 – 50	50 - 65	Above 65

Gender

Male	Female

Education level

Below secondary school	Secondary school	University	Post- graduate

Occupation …….

SECTION B

How long have you worn spectacles for?

Less than 2 years	3 to 5 years	5 to 10 years	More than 10 years

When was your last eye test?

Less than 1 year	Less than 2 years	More than 2 years

How often do you wear your glasses?

When working/at school	At night	All the time	Rarely

When do you mostly need your glasses?

When doing near work or reading	At night	When looking at distant objects	All the time

*Researcher to assist answering the following questions

What type of lenses are you wearing?

Single vision	Bifocal	Multifocal	Other

What type of refractive error (eye problem) do you have?

Short sighted (myopia)	Long sighted (hyperopia)	Astigmatism	Presbyopia

Do your lenses tint when exposed to sunlight?

Yes	No

Do your lenses have anti- reflective coating?

Yes	No

What type of frame are you wearing?

Plastic	Metal	Semi-rimless	Rimless	Other

What made you choose your frame?

Affordability	Functionality	Fashion (style)	Recommendation	Other

How satisfied are you with your glasses?

Dissatisfied	Neutral	Satisfied	Very satisfied

What challenges do you face when acquiring optical health services?

……

……

……

……

ETHICAL CLEARANCE LETTER

RESEARCH ETHICS COMMITTEE

P. Bag 1020
BINDURA, Zimbabwe
Email : rid@buse.ac.zw

BINDURA UNIVERSITY OF SCIENCE EDUCATION [BUSE]

9 June 2026

Dryden Rupande et al
Bindura University of Science Education
Faculty of Science
P. Bag 1020
Bindura

Dear Dryden Rupande et al

RE: INSTITUTIONAL RESEARCH COMMITTEE ETHICAL CLEARANCE-APPROVAL NUMBER: BUSEREC/0196/2026

Your application for research ethical clearance related to the topic '**An epidemiological analysis of spectacle lenses utilization trends in Mashonaland Central, Zimbabwe.**' has been approved and allocated approval Number: **BUSEREC/0196/2026**. You are to quote this approval number for all correspondences inclusive of consent forms and any other documents as and when appropriate. The approval period is as stated below:

Type of Meeting	:	19th Research Ethics Committee meeting
Approval Date	:	09/06/2026
Expiry date	:	08/06/2027

The project will automatically discontinue on the expiry date. You can apply for renewal three months before the expiry date. The renewal application should be accompanied by a progress report.

You are not expected to make any changes/adjustments to the protocol including the consent documents. Any trials involving drugs, devices and biologics require approval of the Medicines Control Authority of Zimbabwe before commencement. All problems to do with the safety of participants must be reported to BUSEREC within three (3) working days.

Upon termination of the study, a report has to be submitted to BUSEREC.

Yours sincerely

BUSEREC CHAIRPERSON

PRIMARY DATA SOURCE

Gender	Frequency	Percentage
Male	**98**	**24.50%**
Female	**302**	**75.50%**
Total	**400**	**100%**

Data Source for Fig 4.1

Age group	Frequency	Percentage
13 to 20	66	17.00%
21 to 30	117	29.00%
31 to 40	49	12.00%
41 to 50	77	20.00%
51 to 65	89	22.00%
Total	400	100%

Data Source for Fig 4.2

Education level	Frequency	Percentage
Below secondary school	8	2.00%
Secondary school	201	50.30%
University	152	38.00%
Post graduate	39	9.70%
Total	400	100%

Data Source for Fig 4.3

Time since last exam	Frequency	Percentage
Less than 1 year	294	73.50%
Less than 2 years	73	18.30%
More than 2 years	33	8.20%
Total	400	100%

Data Source for Fig 4.4

Duration of spectacle use	Frequency	Percentage
Less than 2 years	186	46.50%
3 to 5 years	108	27.00%
5 to 10 years	76	19.00%
More than 10 years	30	7.50%
Total	400	100%

Data Source for Fig 4.5

hyperopia	Myopia	astigmatism	hyperopia + astigmatism	myopia + astigmatism
24.0%	14.0%	6.0%	32.0%	24.0%

Data Source for Fig 4.6

Non- Presbyopic	Presbyopic
61%	39%

Data Source for Fig 4.7

Lens feature	Yes (%)	No (%)
Photochromic tint (sunlight)	356 (71.2%)	144 (28.8%)
Anti reflective coating	332 (83.0%)	68 (17.0%)

Data Source for Fig 4.8

Lens type	Frequency	Percentage
Single vision	243	60.80%
Bifocal	129	32.20%
Multifocal	28	7.00%
Other	0	0.00%
Total	400	100%

Data Source for Fig 4.9

Frame type	Frequency	Percentage
Plastic	274	68.50%
Metal	85	21.30%
Semi rimless	16	4.00%
Rimless	8	2.00%
Other	17	4.20%
Total	400	100%

Data Source for Fig 4.10

Reason	Frequency	Percentage
Affordability	14	4%
Functionality	36	9%
Fashion (style)	307	77%
Recommendation	40	10%
Other	3	1%
Total	400	100%

Data Source for Fig 4.11

Satisfaction level	Frequency	Percentage
Dissatisfied	9	2.30%
Neutral	66	16.50%
Satisfied	210	52.50%
Very satisfied	115	28.70%
Total	400	100%

Data Source for Fig 4.12

Cost	None	Long waiting period	Long distance	Limited frame choice	Others
169	159	54	5	3	10

Data Source for Fig 4.13

	13 to 20	21 to 30	31 to 40	41 to 50	51 to 65
single vision	56	103	28	12	5
bifocal	0	0	21	29	65
multifocal	0	0	0	16	31

Data Source for Fig 4.14

	Dissatisfied	Neutral	Satisfied	Very satisfied
less than 1 year	1	13	115	97
less than 2 years	2	45	89	17
more than 2 years	6	8	6	1

Data Source for Fig 4.15