PREVALENCE OF REFRACTIVE ERRORS AND USE OF PRESCRIPTION SPECTACLES AMONG PUBLIC SECONDARY SCHOOL TEACHERS IN ABEOKUTA SOUTH LOCAL GOVERNMENT AREA, OGUN STATE, NIGERIA

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CERTIFICATION

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DEDICATION

I dedicate this work to my Saviour the Lord Jesus Christ who granted me journey mercies and kept me alive during the course of this project.

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ABSTRACT

Uncorrected Refractive Errors (REs) constitute an important cause of poor vision globally. In Nigeria, the prevalence of REs and use of prescription spectacles to ameliorate the attendant problems have not been fully explored among secondary school teachers. This study was therefore aimed at determining the prevalence of REs and use of prescription spectacles among public secondary school teachers in Abeokuta South Local Government Area (LGA), Ogun state.

A descriptive cross-sectional study was adopted and a five-stage random sampling technique was used to select 500 teachers. Data were collected using a semi-structured questionnaire which included a 100-point knowledge scale on RE, questions on demographic characteristics, family history, prescription spectacle use and perception of prescription spectacles. Knowledge scores ranged from 0-40, 41-55 and 56-100 rated as poor, fair and good respectively. Eye examination was conducted on 282 (179 females and 103 males) out of the 500 teachers who consented to be screened using a combination of standardized Snellens'charts, ophthalmoscopes, retinoscopes, penlights and trial lenses. Data were analysed using descriptive, student t-test, chi-square and Pearson's correlation statistics at 5% significant level.

The mean age of the respondents was 38.9 ±9.5 years, 95.5% were Yorubas and 63.2% were females. Nearly all (99.8%) had heard of prescription spectacles. Respondents' mean knowledge score was 31.7 ±13.1 and the mean scores for males and females were 32.4 ±13.0 and 31.3 ±13.3 respectively with no significant difference. Of the respondents screened, 95.4% had REs in form of hyperopia (6.4%), presbyopia (5.3%), myopia (1.4%), astigmatism (1.1%) and a combination of REs (81.2%). There was a positive linear relationship between age and the degree of presbyopia (r^2= 0.90). Of the respondents with REs, 74.3% had close family members who used prescription spectacles. About half (56.1%) of the respondents with REs had no spectacles; of this 53.6% had never visited an eyecare specialist and 61.5% would prefer other 'treatment' options to the wearing of spectacles. The perceived barriers to the use of prescription spectacles included lack of knowledge of the health condition of their eyes (53.6%), inadequate access to an eye doctor (68.2%) and the perception that spectacles adversely affects one's beauty (58.4%). The leading misconceptions about spectacles among the

respondents were that regular use could lead to sunken eyes (60.2%) and dependence (53.4%).

The prevalence of refractive error was high among the teachers yet few of them use prescription spectacles. Misconceptions that could serve as barriers to the adoption of the use of prescription spectacles exist. School-based eye health education programmes are needed to address these challenges.

Keyword: Refractive errors, Prescription spectacles, Public school teachers

Word count: 417

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LIST OF ACRONYMS

AP	Absolute Presbyopia
ASLGA	Abeokuta South Local Government Area
AT	Arts
ATR	Against-the-rule
ANLGA	Abeokuta North Local Government Area
BCVA	Best Corrected Visual Acuity
Dcyl	Dioptre cylinder
Ds	Dioptre sphere
FP	Functional Presbyopia
FMC	Federal Medical Centre
GH	Government Hospital
ICD	International Classification of Diseases
IP	Incipient Presbyopia
ISO	International Standard Organization
LGA	Local Government Area
LV	Low Vision
MVI	Moderate Visual Impairment
NGO	Non-governmental Organization
NR	No Response
OA	Oblique Astigmatism
PAL	Progressive Addition Lenses
PE	Physical Education
PHC	Primary Health Centre
PS	Prescription Spectacles
PVA	Presenting Visual Acuity
RE	Refractive Error
SC	Science
SE	Spherical Error
SH	State Hospital
SHH	Sacred Heart Hospital
SP	School Premises
SS	Social Science

SVI	Severe Visual Impairment
SVSL	Single Vision Spherical Lenses
URE	Uncorrected Refractive Error
VA	Visual Acuity
VI	Visual Impairment
VN	Vocational
WHO	World Health Organization

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Refractive Error (RE) is a condition of the eye in which incident parallel rays of light are brought to a focus in front or at the back of the retina resulting in blurry images. Normally, when parallel rays of light reaches the eye they are refracted by the cornea and lens unto the retina at the back of the eye to create clear images (Grosvenor, 2007; Keirl, 2007; Rosenfield, 2006). There are four types of RE namely: myopia, hyperopia, astigmatism and presbyopia. They can easily be diagnosed, measured and corrected with spectacles or other refractive corrections such as contact lenses and refractive surgical procedures to attain normal vision. Uncorrected Refractive Error (URE) has been identified as the commonest cause of avoidable Visual Impairment (VI) followed by cataract and glaucoma (World Health Organization (WHO), 2014; Abdull, Sivasubramaniam, Murthy, Gilbert, Abubakar, Ezelum and Rabiu, 2009; Holden, Fricke, Ho, Wong, Schlenther, Cronje, Burnett, Papas, Naidoo and Frick, 2008; Ajaiyeoba, Isawumi, Adeoye and Olulcye, 2007). Visually disabling RE affects a significant proportion of the global population, occurring in both genders, at all ages and in all ethnic groups (International Agency for the Prevention of Blindness (IAPB) and World Health Organization (WHO), 2006-2011; Logan, 2009; Zadnik and Mutti, 2006; Holden and Resnikoff, 2002).

WHO (2014) estimates that 285 million people were visually impaired globally. It was noted that 246 million of this had Low Vision (LV) (63% over 50 years of age) and 39 million were estimated to be blind. About 90% of the world's visually impaired live in developing countries including Nigeria. Eighty percent of all visual impairment can be avoided or corrected (WHO, 2014). The simplest and most cost-effective management for visual impairment caused by RE is the use of prescription spectacles (Cochrane, du Toit and Le Mesurier, 2010). In response to this, the WHO in partnership with the International Agency for the Prevention of Blindness (IAPB) in 1999 launched "VISION 2020: The Right to Sight Initiative" with the objective of assisting member states in eliminating avoidable blindness by the year 2020. The global target is to ultimately

reduce blindness prevalence to less than 0.5% in all countries, or less than 1.0% in any community.

Nearsightedness (or myopia as it is medically termed) is a condition in which close objects are seen clearly, but objects farther away appear blurred (Franklin, 2007; Haine, 2006). Myopia occurs if the eye's axial length is longer than normal or the cornea is steeper than normal (having excessive power). As a result, incident parallel rays of light entering the eye focus in front of the retina, the light sensitive part of the eye, rather than directly on the retina, causing blurred vision (Grosvenor, 2007; Rosenfield, 2006; Goss, Grosvenor, Keller, Marsh-Tootle, Norton and Zadnik 2006).

Farsightedness or hyperopia is a condition in which distant objects are usually seen clearly but close ones do not come into proper focus (Moore, Augsburger, Ciner, Cockrell, Fern and Harb, 2008; Grosvenor, 2007; Rosenfield, 2006). It occurs if the eye's axial length is shorter than normal (Moore, Augsburger, Ciner, Cockrell, Fern and Harb, 2008; Khurama, 2008; Lens, Nemeth and Ledford, 2008; Keirl, 2007; Rosenfield, 2006) and or whose cornea is flatter than normal (Khurama, 2008; Keirl, 2007; Grosvenor, 2007; Rosenfield, 2006) or in combination with insufficient crystalline lens power (Moore, Augsburger, Ciner, Cockrell, Fern and Harb, 2008). This causes incident rays of light entering the eye from a close distance to focus behind the retina instead of directly on it.

In astigmatism, the surface of the cornea or lens has a different curvature in one direction (meridian) than another. The cornea is oval-shaped instead of having a perfectly round shape. As a result, the eye will focus light rays on two points on the retina rather than just one point causing only a part of the object to be seen clearly at any distance (Keirl, 2007; Grosvenor, 2007). The problem is similar with the case of the lens. Reasons for the irregular curvature is unknown, but likelihood of developing astigmatism is inherited (Grosvenor, 2007).

Presbyopia is age-related loss of accomodation (Mancil, Bailey, Brookman, Campbell, Cho, Rosenbloom and Sheedy, 2010; Grosvenor, 2007; Keirl, 2007; Franklin, 2007; Cliffreda, 2006). It is the most common physiological change occurring in the aduh eye and is thought to cause universal near vision impairment with advancing age - generally affecting those 37 years and above (Patel and West, 2007; Cliffreda, 2006). These

changes occur within the proteins in the natural lens of the eye leading to a gradual thickening and loss of flexibility of the lens. As a result, the eye is unable to focus close objects clearly. The change also takes place in the muscle fibres surrounding the lens (Mancil, Bailey, Brookman, Campbell, Cho, Rosenbloom and Sheedy, 2010).

Presbyopia is not simply an inconvenience. It has significant effects on quality of life, particularly on the lives of teachers, whose work involves mostly reading and writing (Kumah, Lartey and Amoah-Duah, 2011). In Nigeria where most of the markings of examination scripts and evaluation of student work in class are done manually, a teacher might not perform efficiently if he/she is unable to read and mark correctly. Presbyopia, like other types of RE, can be corrected with the use of prescription spectacles, a simple and cost-effective intervention in eye care (Hookway, 2007). Teachers who do alot of close work need to use much of their vision and so need a full spectacle correction for maximum performance (Patel, Munoz, Burke, Kayongoya, Mc Hiwa, Schwarzwalder, West, 2006; Kumah, Lartey and Amoah- Duah, 2011).

Spectacles or 'eyeglasses' are frames bearing lenses worn in front of the eye, usually to enhance vision (Ramke, Williams, Ximenes.L, Ximenes.D, Palagyi and du Toit, 2007; Holden, Sulaiman and Knox, 2000; Dandona, Dandona, Kovai, Giridhar, Prasad and Srinivas, 2002; Jayanand, 2002; Michon and Michon, 2006; Piipo and Coats, 2002). Prescription spectacles are the primary choice of correction for persons with all types of RE.

Various factors are responsible for RE remaining uncorrected. These include lack of awareness and recognition of the problem at personal and family level as well as at the community and public health level; non-availability of refractive services and poor demand for and or inability to afford refractive services (Resnikoff, Pascolini, Mariotti and Pokharel, 2008; Fotouhi, Hashemi, Raissi and Mohammad, 2006). Also included is non-compliance with the use of prescription spectacles (Congdon, Zheng, Sharma, Choi, Song, Zhang, Wang, Zhou, Li, Liu, Liu and Lam, 2008; Sharma and Singh, 2008; Hookway, 2007; Fotouhi, Hashemi, Raissi and Mohammad, 2006; Fylan, Grunfeld, Tarrey and Donaldson, 2005).

A study conducted in Gambia has shown that the people needing RE services are mostly literate adults including teachers (Faal and Qureshi, 2007). Uncorrected Refractive Error (URE) in a teacher can make the teacher less productive causing severe social and economic effects on the individual and the community. A teacher wearing the appropriate correction will have optimal and comfortable vision. This will improve his/her productivity significantly resulting in a good quality of life. A well-informed teacher is more likely to have an eye examination and receive spectacles; he or she will understand the plights of school children with URE or undercorrected RE. It has been noted that URE is the principal cause of VI or reduction in vision in school-age children (He, Huang, Zheng, Huang and Ellwein, 2007; Ntim-Amponsah and Ofosu-Amaah, 2007; Goh, Abqariyah, Pokharel and Ellwein, 2005; Dandona, Dandona, Srinivas, Sahare, Narsaiah, Munoz, Pokharel and Ellwein, 2005; He, Xu, Yin and Ellwein, 2005). Well-informed teachers can enlighten members of their local community about the benefits of wearing prescription spectacles and correct any wrong belief or misconception about the use of spectacles.

In some countries including Nigeria, teachers are known to be important opinion leaders as well as credible sources of information and motivation relating to the adoption of innovations in communities. Based on this, teachers can be trained and motivated to carry out eye health promotion activities in their communities, and screen school children to identify those with RE (Muhammad, Mnishanu, Jabo and Rabiu, 2010; Jose and Sachdeva, 2009; Kalua, Patel, Muhit and Courtright, 2008; Kalua, 2007; Mahande, Tharaney, Kirumbi, Ngirawamungu, Geneau, Tapen and Courtright, 2007; Muhit, 2007; Cano, 2005). In order to plan for the involvement of teachers in the promotion of the adoption of eye care services including acceptance of prescription spectacles, a formative research that will reveal the prevalence of RE among the teachers, their knowledge, perceptions, beliefs and practices relating to RE and spectacle use is crucial.

1.2 Statement of the Problem

The World Health Organisation (2014) has estimated that 43.0% of the 285 million visually impaired globally is due to uncorrected refractive errors (myopia, hyperopia and astigmatism). In Africa, about 26.3 million people were estimated to be with VI and about 5.9 million were blind. The number of individuals experiencing disability caused by uncorrected presbyopia was 410 million people in 2005, out of this 386 million, 94%

lived in developing countries (Holden, Fricke, Ho, Wong, Schlenther, Cronge, Burnett, Papas, Naidoo and Frick, 2008). The global number of individuals who would have a disability due to uncorrected presbyopia is predicted to rise to 563 million people by 2020 if there is no intervention to make spectacles accessible to those who need them. (Holden, Fricke, Ho, Wong, Schlenther, Cronge, Burnett, Papas, Naidoo and Frick, 2008).

The estimated prevalence of blindness in Nigeria is 0.78% and about 2.8 million people are with LV. Uncorrected refractive error is a cause of VI in 2.46 million adults and it is projected to rise to 3.4 million by 2020 (Abdull, Sivasubramanian, Murthy, Gilbert, Abubakar, Ezelum and Rabiu, 2009).

Untreated RE may not be life-threatening but can be quality-of-life threatening by negatively affecting academic achievement, social adjustment, and economic survival (Toit and Brian, 2010; Resnikoff, Pascolini, Mariotti and Pokharel, 2008). Compared to the other causes of VI, RE develops at a younger age. If left uncorrected, RE is responsible for significantly more blind years than most other causes.

Undetected, uncorrected or under-corrected RE particularly Presbyopia is especially a problem among the adult population. Presbyopia does not only interfere with reading and writing but also with other near vision tasks such as sewing, cutting finger nails, cooking food, sorting rice and adjusting lamps. Clearly Presbyopia poses an important public health challenge, because it affects older peoples' ability to maintain their independence (Patel and West, 2007).

There have been more studies on RE and its treatment compliance in children than in adults but URE affects more of the adult population (Emerole, Nneli and Osin, 2013; WHO, 2011; Patel, Munoz, Burke, Kayongoya, McHiwa, Schwarzwalder and West, 2006). Few studies have been undertaken to determine the prevalence of RE among secondary school teachers. In addition, their pattern of use of prescription spectacles has not been well studied. This study was therefore designed to determine the prevalence of RE and pattern of use of spectacles among public secondary school teachers in Abeokuta South Local Government Area (LGA), Ogun state, Nigeria.

1.3 Justification of Study

School teachers have been found to be effective key informants and agents of change in the delivery and uptake of eyecare services in their local communities including the schools where they work (Muhammad, Maishanu, Jabo and Rabiu, 2010; Jose and Sachdeva, 2009; Kalua, Patel, Muhit and Courtright, 2008; Kalua, 2007; Mabande, Tharaney, Kirumbi, Ngirawamungu, Geneau, Tapert and Courtright, 2007; Muhit, 2007; Cano, 2005). The results of this study will be useful to both governmental and Non Governmental Organizations (NGOs) in planning intervention programmes aimed at meeting the eye care needs and challenges of school teachers. This study has the potential for yielding needed information for developing eye care services in secondary schools within the context of the school health programme.

1.4 Research questions

The questions formulated to guide the study were as follows;

1. What is the prevalence of RE among the public secondary school teachers?
2. What are the public secondary school teachers' level of knowledge on RE?
3. What are the public secondary teachers' perceptions of wearing prescription spectacles?
4. What are the public secondary teachers' practices relating to the use of prescription spectacles?
5. What are the perceived barriers to the use of prescription spectacle among the teachers?.

1.5 Objectives

1.5.1 Broad Objective

The broad objective of this study was to determine the prevalence of REs and use of prescription spectacles among public secondary school teachers in Abeokuta South Local Government Area, Ogun state.

1.5.2 Specific Objectives

The specific objectives were to;

1. Determine the prevalence of refractive error among the public secondary school teachers in Abeokuta South Local Government Area;
2. Assess the teachers' level of knowledge on refractive error,

3. Determine perceptions relating to the use of prescription spectacles among the teachers;
4. Identify practices relating to the use of prescription spectacles among the teachers;
5. Determine the perceived barriers to spectacle use by the teachers.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Conceptual Clarifications on Refractive Errors and Prescription Spectacles

2.1.1 Refractive errors

The eyes, the windows of the body, have optical elements that refract light rays from an object and focus them on the retina of the eyes. These optical elements of the eye, the cornea and crystalline lens, provide two thirds and one third of the eyes' focusing power respectively (Grosvenor, 2007). For an eye to have a clear and comfortable vision, the cornea and lens must refract incoming light rays by the correct amount and the eyeball must be of the correct axial length (distance between the cornea and retina), so that the light rays will converge and focus on the retina.

Light rays coming from an object at a short distance are focused behind the retina. However the crystalline lens of the eye is able to increase its focusing power or convexity so that the light rays are further converged and brought to a focus on the retina. This process is called accomodation (Grosvenor, 2007). An eye with the optical ability to focus parallel light rays from an object at infinity (farther than 6 meters) directly on the retina with accomodation relaxed is refered to as an emmetropic eye. Conversely, when parallel rays of light are not focused on the retina with accomodation relaxed, it is referred to as ametropia or the eye is said to have a refractive error.

Myopia which occurs when the axial length of the eyeball is longer than normal/or when the refractive power of the eye is too high could be inherited. If one or both parents are nearsighted, there is an increased chance their children will be nearsighted (Grosvenor, 2007; Zadnik and Mutti, 2006; Marsh-Tootle and Frazier, 2006; Goss, Grosvenor, Keller, Marsh-Tootle, Norton and Zadnik, 2006). Also individuals who spend considerable time reading, working on a computer, or doing other intense close visual work maybe more likely to develop nearsightedness (Grosvenor, 2007; Zadnik and Mutti, 2006; Marsh-Frazier, Goss,

Generally, myopia first occurs in school-age children but it can develop in adults due to visual stress (Goss, 2006; Grosvenor, Keller, Marsh-Tootle, Norton and Zadnik, 2006; Zadnik and Mutti, 2006), nuclear cataract (Kanski, 2011; Grosvenor, 2007; Ketil,

2007; Swanson, 2006) or health conditions such as diabetes (Grosvenor, 2007; Schifanella and Karkkainen, 2006). It is equally common among men and women. Myopia is associated with blurred distant vision and squinting when driving, playing sports or looking at distant objects (Grosvenor, 2007). It can be classified by the degree (amount) into low (>-3.00Diopter sphere [Ds]), medium (-6.00 to -3.00Ds) and high (<-6.00Ds) (Qureshi, Jan, Pandit and Andrabi, 2007; Goss, Grosvenor, Keller, Marsh-Tootle, Norton and Zadik, 2006).

Hyperopia which occurs when the eyeball is shorter than normal and or the refractive power of the eye is too low often runs in families (Moore, Augsburger, Ciner, Cockrell, Fern and Harb, 2008; Grosvenor, 2007; Rosenfield, 2006). Most newborn infants have mild hyperopia, but normal growth of the eyes (mainly the optical system: cornea, lens and axial length) leads to a gradual decrease in the level of hyperopia through a process called emmetropization (Logan, 2009; Lens, Nemeth and Ledford, 2008; Moore, Augsburger, Ciner, Cockrell, Fern and Harb, 2008; Silvestri, 2007; Goss, 2006; Marsh-Tootle and Frazier, 2006; Zadnik and Mutti, 2006).

Hyperopia is likely to persist throughout childhood when in moderate or high amounts. Young persons with hyperopia do not present with asthenopic complaints because they have sufficient accomodative reserve to maintain clear retinal images. However as they grow older with the accomodative reserve diminishing with age, the vision will be blurred especially at near. Eyestrain, fatigue and or headache after close work, aching or burning eyes usually result from uncorrected hyperopia (Khurana, 2008; Moore, Augsburger, Ciner, Cockrell, Fern and Harb, 2008; Lens, Nemeth and Ledford, 2008; Grosvenor, 2007; Rosenfield, 2006).

It can be classified by degree into low (<+2.00Ds), medium (+2.25 to +5.00Ds) and high (>+5.00Ds) (Moore, Augsburger, Ciner, Cockrell, Fern and Harb, 2008). Mark Rosenfield (2006) classified hyperopia by degree into low (<+3.00Ds), medium (>+3.00 to +5.00Ds) and high (>+5.00Ds).

Astigmatism may occur in children and adults, and is fairly common (Grosvenor, 2007; Goss, 2006). It is usually congenital but can develop after an eye operation (Atio and Acosta, 2011; Susic, Brajkovi and Kalauz-Surac, 2007; Nag, Henni, Foster, Evans, Pradhan, Johnson and Wormald, 2001). It frequently occurs together with myopia and

hyperopia (Moore, Augsburger, Ciner, Cockrell, Fern and Hurb, 2008; Goss, Grosvenor, Keller, Marsh-Tootle, Norton and Zadnik, 2006; Rosenfield, 2006). People with uncorrected astigmatism often experience blurred or distorted vision at all distances, headaches, excessive squinting and eyestrain especially after focusing for long periods, as in reading from a paper or a computer monitor (Keirl, 2007; Garcia and Weaver, 2004).

Rosenfield (2006) classified astigmatism by orientation of the axis (meridian). The classification is as follows; With-the-Rule astigmatism (WTR), Against-the-Rule astigmatism (ATR) and Oblique Astigmatism (OA). When the meridian with the least refractive power lies between 20° and 160°, it is called WTR astigmatism. When it lies between 70° and 110°, it is called ATR astigmatism. Oblique astigmatism is when the meridian with the least refractive power lies either between 20° and 70° or between 110° and 160°. Rosenfield (2006) also noted that the corneal meridian with the least refractive power is the meridian with the larger or flatter radius of curvature and the same orientation whh the axis of the correcting cylinder. The meridian, having the most refractive power, is that with the smaller or steeper radius of curvature.

Presbyopia is first clinically reported between 40 and 45 years of age, with its peak onset between ages 42 and 44 years (Cluffreda, 2006). Generally it occurs in females earlier before 40 years (Nirmalan, Krishnaiah, Shamanna, Rao and Thomas, 2006). It progresses gradually over a number of years. From approximately age 52 years and above, the prevalence of presbyopia is considered to be essentially 100%. However, its prevalence across all ages in most population is 31% (Cluffreda, 2006; Ninnalan, Krishnaiah, Shamanna, Rao and Thomas, 2006). When people develop presbyopia, they find they need to hold books, newspapers and other reading materials at arms length in order to focus properly. They develop headaches, eyestrain, feel fatigued when they perform near work such as embroidery or handwriting (Mancil, Bailey, Brookman, Campbell, Cho, Rosenbloom and Sheedy; Grosvenor, 2007; Keirl, 2007; Franklin, 2007; Cluffreda, 2006).

The types of presbyopia are incipient, functional, absolute, pre-mature and nocturnal presbyopia (Mancil, Bailey, Brookman, Campbell, Cho, Rosenbloom and Sheedy, 2010). Incipient Presbyopia (IP) is also known as borderline, beginning or pre-presbyopia. It is the earliest stage at which symptoms (usually mild) begin to manifest. People with IP

require extra effort to read and may prefer to remain uncorrected. Functional Presbyopia (FP) occurs when there is a gradual decline in accommodative amplitude. Symptoms usually have developed. People with FP find it increasingly difficult to read tiny prints at close distance or focus on fine detail. In Absolute Presbyopia (AP), no accomodative ability remains. People with AP are not able to focus on objects and images at close range (Mancil, Bailey, Brookman, Campbell, Cho, Rosenbloom and Sheedy, 2010). Pre-mature presbyopia affects people below the age of 40 years. It occurs when the accomodative ability becomes insufficient for the patient's usual near vision task due to environmental, nutritional, diseaserelated or drug-related causes (Mancil, Bailey, Brookman, Campbell, Cho, Rosenbloom and Sheedy, 2010). Nocturnal presbyopia is the condition in which near vision difficulties result from an apparent decrease in the amplitude of accomodation in dimlight (Glassen and Kaufman, 2003).

2.1.2 Prescription spectacles

The types of lenses used to correct refractive errors are the spherical and astigmatic lenses. The spherical lenses can be plus (convex or converging) or minus (concave or diverging) lenses. And they have same power in all meridians. Hyperopia is corrected using the plus Single Vision Spherical Lenses (SVSL) (Moore, Augsburger, Cinor, Cockrell, Fem and Harb, 2008) while myopia is corrected with minus SVSL (Goss, Grosvenor, Keller, Marsh-Tootle, Norton and Zadnik, 2006). The plus spherical lenses are also used to correct presbyopia. There are three types namely: single vision lenses or reading spectacles; bifocal lenses and Progressive Additilan Lenses (PAL) or varifocal lenses. The reading spectacles are worn for close work only and must be taken off in order to have clear distance vision. Bifocal lenses are worn to have clear distance and near vision. The PALs enable a presbyopic patient to see clearly at near, intermediate and far distances. (Mancil, Bailey, Brookman, Campbell, Cho, Rosenbloom and James, 2010; Grosvenor, 2007; Gordon and Benjamin, 2006; du Toit, 2006).

Astigmatic lenses are either plus or minus and are used to correct astigmatism. They can be cylindrical or sphero-cylindrical lenses. The latter is used to correct astigmatism that is combined with myopia, hyperopia or presbyopia (Grosvenor, 2007). The spherical power of a lens is measured in dioptres and usually written as Ds (Dioptre sphere), while the cylindrical power of a lens is written as Dcyl (Dioptre cylinder). The dioptre is the measure of lens refractive power. A large selection of lens types and frame designs are

now available for patients of all ages. They are available in a wide variety of sizes, shapes, colours and materials that not only correct for vision problems but also may enhance appearance.

Spectacles are the simplest and cheapest option for correcting REs (Holden, Sulaiman and Knox, 2000). Spherical and cylindrical lenses are put into frames to help people see better. The effective use of frames and lenses depends on their quality. The frames need to be of the highest possible quality including lenses which adhere to International Standard Organization (ISO) standards of power prism and power variation. A pair of spectacles should be light weight and attractive (Holden, Sulaiman and Knox, 2000).

2.2 Burden And Prevalence of Refractive Errors

2.2.1 Burden of Refractive Error

Refractive errors, if left uncorrected, can lead to Visual Impairment (VI) which can affect quality of life. People with visual problems are likely to fall, have a higher risk of fractures and other injuries. They may be more likely to limit or stop driving. Refractive error has been identified as an independent risk factor for increased mortality in older persons (Holden, 2007). The global economic productivity loss associated with visual impairment due to URE was estimated at approximately US$202 billion (Smith, Frick, Holden, Fricke and Naidoo, 2009).

There are four levels of visual function namely: normal vision, moderate Visual Impairment (VI) , severe VI and blindness. Visual impairment comprises of moderate VI, severe VI and blindness. Moderate and severe VI are grouped under the term Low Vision (LV) (International Classification of Diseases (ICD)-10,2006). Visual impairment for distance is defined as presenting Visual Acuity (VA) in the better eye worse than 6/18 in adults and <6/12 in children. For near VI is defined as presenting VA in the better eye worse than N_8 (WHO, 2008). Low vision is VA better than 6/18 to light perception in the better eye with the best correction. Blindness for distance is defined as presenting VA in the better eye worse than 3/60 (functional blindness is no light perception). For near blindness is presenting VA <N_{60} (WHO, 2008).

Refractive errors have been shown to be among the leading causes of VI from previous studies in Australia (Taylor, Xie, Fox, Donnl, Arnold and Keeffe, 2010; Landers,

now available for patients of all ages. They are available in a wide variety of sizes, shapes, colours and materials that not only correct for vision problems but also may enhance appearance.

Spectacles are the simplest and cheapest option for correcting REs (Holden, Sulaiman and Knox, 2000). Spherical and cylindrical lenses are put into frames to help people see better. The effective use of frames and lenses depends on their quality. The frames need to be of the highest possible quality including lenses which adhere to International Standard Organization (ISO) standards of power prism and power variation. A pair of spectacles should be light weight and attractive (Holden, Sulaiman and Knox, 2000).

2.2 Burden And Prevalence of Refractive Errors

2.2.1 Burden of Refractive Error

Refractive errors, if left uncorrected, can lead to Visual Impairment (VI) which can affect quality of life. People with visual problems are likely to fall, have a higher risk of fractures and other injuries. They may be more likely to limit or stop driving. Refractive error has been identified as an independent risk factor for increased mortality in older persons (Holden, 2007). The global economic productivity loss associated with visual impairment due to URE was estimated at approximately US$202 billion (Smith, Frick, Holden, Fricke and Knidoo, 2009).

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Refractive errors have been shown to be among the leading causes of VI from previous studies in Australia (Taylor, Xie, Fox, Dunn, Arnold and Keeffe, 2010; Landers,

Henderson and Craig, 2009) and Spain (Sainz-Gomez, Fernandez-Ribredo, Salinas-Alamán, Montanes, Berasategui, Guillen-Grima, Ruiz-Moreno and Garcia-Layena, 2010). Reports from previous studies also showed REs to be among the leading causes of VI in the United States of America (Vitale, Cotch and Sperduto, 2006) and Asia (Ramke, Brian, Mahuer, Qogonokana and Szetu, 2012; Ramke, Brian, Naduvilath, Lee and Qogonokana, 2012; AlShaaln, Bakraman, Ibrahim and Aljoudi, 2011; Soori, Ali and Nasrin, 2011 Liang, Friedman, Wong, Zhan, Sun, Wang, Duan, Yang, Wang, Zhou and Wang, 2008; Xu, Wang, Li, Wang, Cui, Li and Jonas, 2006).

Refractive errors have also been identified as one of the leading causes of VI in Africa (Kandeke, Mathenge, Giramahoro, Undendere, Ruhaqoze, Habiyakare, Courtright and Lewallen, 2012; Berhane, Worku, Bejiga, Adamu, Alemayehu, Bedri, Haile, Ayalew, Adamu, Gebre, Kebede, West and West, 2007; Oye, Kuper, Dineen, Befidi-Mengue and Foster, 2006; Melese, Alemayehu, Bayu, Girma, Haileselassie, Khandekar, Worku and Courtright, 2003) including Nigeria (Chidi-Egboka, Bolarinwa and Awoyemi, 2015; Muhammad, Alhassan and Umar, 2015; Isawumi, Ubah, Olomola and Afolabi, 2014; Rabiu, Kyari, Ezelum, Elhassan, Sanda, Murthy, Sivasubramaniam, Gilbert, Abdull, Abiose, Bankole, Entekume, Faal, Imam, Song and Abubakar, 2012; Njepuome, Onyebuchi, Onwusoro and Igbe, 2012; Abraham, Ezepue, Umeh and Ekaiem, 2010).

2.2.2 Global Prevalence of Refractive Errors (REs)

There is dearth of information on studies conducted among secondary school teachers, therefore results from studies among adults are mostly presented.

Vitale, Ellwein, Cotch, Ferris and Sperduto (2008) carried out a retrospective study to estimate the population prevalence of RE and to describe the refractive characteristics of the United States of America (USA) population. The investigators defined clinically important myopia as a spherical error (SE) of ≤-1.00Ds and high myopia as an SE of ≤-5.00Ds. Hyperopia as an SE of ≥+3.00Ds and astigmatism as a cylinder of ≤-1.00cyl. A total of 14,213 participants, aged 20 years and older were examined. Of this, 84.5% had their data analyzed. From the results, myopia was most prevalent among participants. The prevalences of myopia (SE of ≤-1.00Ds) for participants aged 20-39 years, 40-59 years and ≥60 years were reported to be 36.2% (95% CI:34.2-38.3%), 37.6% (95% CI; 35.1-40.1%) and 20.5% (95% CI; 18.3-22.8%) respectively.

They further reported the rates of myopia of SE ≤0.50Ds among the participants to be 50.2% (95% CI; 47.8-52.7%), 50.1% (95% CI; 47.8-52.4%) and 26.5% (95% CI, 24-29%) for individuals aged 20-39 years, 40-59 years and 60 years and above respectively. According to the researchers, the overall prevalence of RE increased with increasing age from 46.3% to 50.6% and 62.7% in each age group respectively.

A study was conducted in the United Kingdom among older British population (mainly caucasians) to investigate the prevalence of and demographic associations with URE. The study revealed that a total of 4,428 participants, aged 48-89 years (mean age:68±8.0 years) were examined. The investigators defined myopia as an SE of ≤-0.50Ds, hyperopia as an SE ≥+0.50Ds and emmetropia as an SE of -0.49D to +0.49D. Nearly half (49.4%) of the participants had hyperopia, 27.8% had myopia and 23.0% were emmetropic (Sherwin, Khawaja, Broadway, Luben, Ihyat, Dalzell,Wareham, Khaw and Foster, 2012).

Anton, Andraha, Mayo, Portela and Merayo (2009) conducted a population-based study to determine the prevalence of REs among adults aged 40 to 79 years in Segonia, Spain. A cohort of 569 patients underwent a complete ophthalmic examination including refraction. Myopia was defined as an SE of ≤-0.50Ds, hyperopia an SE of ≥+0.50Ds, astigmatism a cylinder of <-0.50Dcyl. Data were analyzed for 417 individuals. The estimated prevalences of (95% confidence interval) myopia, hyperopia and astigmatism in the population were 25.4% (21.5-29.8%), 43.6% (39-48.4%) and 53.5% (48.7-58.2%) respectively. According to the investigators, no significant gender difference was found in the prevalence of any REs.

Jobke, Kasten and Vorwerk (2008) carried out a study in Germany to determine the prevalence of REs in German children, adolescents and adults and their parents. Five hundred and thirty six participants were selected and examined along with their parents. Only data on 516 participants were analyzed. The investigators defined myopia as ≤-0.50Ds; hyperopia as ≥+0.50Ds; astigmatism as ≤0.50Dcyl and emmetropia between +0.25D to -0.25D. From the results, myopia was more prevalent among the parents (aged 24-65 years). Among the fathers (n=325), 63.4% were reported to be emmetropic, 20.6% were myopic and 8% were hyperopic. Among the mothers (n=156), 50.2% were emmetropic, 25.9% were myopic and 8.1% were hyperopic. Included in their summary,

the investigators reported a high correlation between the SE of the children and their parents (p=0.000).

Durkin, Tan, Casson, Selva and Newland (2007) conducted a study in remote South Australia to determine the prevalence of distance RE among Aboriginal people attending eye clinics. One hundred and eighty nine individuals (mean age: 44.8±14.5) participated in the study. Of this,78.3% had refraction performed on them and their data analyzed. According to the researchers, the prevalences of myopia (SE of <-0.50Ds), high myopia (SE of <-5.00Ds), hypermetropia (SE of >+0.50Ds) and astigmatism (<-0.50Dcyl) were 31.1%, 0.7%, 33.1% and 35.8% respectively.

Pateras (2012) conducted a study in Athens-Greece to estimate and determine the prevalence of REs in persons aged 40 to 77 years at the North suburbs. A total of 1,500 residents were examined. The investigators defined myopia, hyperopia and astigmatism as ≤-0.50Ds, ≥+0.50Ds and ≤-0.50Dcyl respectively. The investigator gave the prevalences of myopia, astigmatism and hyperopia as 42.7%, 42.3% and 14.4% respectively.

Liang, Wong, Sun, Tao, Wang, Yang, Xiong, Wang and Friedman (2009) carried out a study in Yougnian county, Hadam, China to describe the prevalence of and risk factors for myopia and other REs in a rural, adult population (aged ≥30 years). A total of 6,830 participants were examined and the data of 6,491 participants were analyzed. Myopia, high myopia and hyperopia were defined as SE of <-0.50Ds, <-5.00Ds and ≥+0.50Ds respectively. Astigmatism was defined as a cylinder of ≤-0.50Dcyl. According to the researchers, the prevalences of astigmatism, hyperopia and myopia were 28%, 22% and 21.8% respectively. Hyperopia was reported to be strongly age-related (Odds Ratio (OR) for those ≥80 years 44.4 times; for those 30-59 years, OR was 1.0). Women were more likely to be hyperopic (OR, 1.5; CI: 1.2-1.8).

The study by Lu, He, Murthy, Congdon, Zhang, Li and Yang (2011) in Yuhong district of Shenyang, China to generate a population-based data on presbyopia revealed a high percentage. The investigators defined presbyopia as binocular near vision of <N8 at 40cm with presenting distance refractive correction and improvement of near vision by at least one line with near correction. The investigators examined 1,008 eligible participants aged 40 years and above (mean age: 58.4±10.7 years). According to the investigators, the

prevalence of functional presbyopia was 67.3%. It increased from 27.6% among persons less than 50 years old to 80.2% among those aged 50-59 years and remained roughly stable after 59 years of age ($p<0.001$). They further stated that the odds of presbyopia increased by 1.09 (95% CI: 1.06-1.11) for each year's increase in age.

Reports from a population-based study in South-East district of Singapore to determine the prevalence rates of REs and pattern of ocular biometry in a multi-ethnic elderly Asian population showed that a total of 1,835 aged 55-89 years (mean age: 64.4±6.7) participated in the study. Myopia, hyperopia and astigmatism were defined as SE of ≤-0.50Ds, SE of +≥1.00Ds and a cylinder of≤-1.00Dcyl respectively. The researchers gave the prevalences of astigmatism, hyperopia and myopia among the participants as 43.5%, 41.5% and 30% respectively. Hyperopia was reported to increase with age (Tan, Chan, Wong,Gazzard,Niti, Ng and Saw, 2011).

From the study in Sumatra, Indonesia to determine the prevalence rates of REs and anisometropia, myopia had the highest prevalence than other REs. The investigators performed refractive error examinations on 1,043 adults aged ≥21 years (mean age: 36.7±2.7 years). They defined myopia, high myopia, hyperopia and astigmatism as SE of ≤-0.50Ds, SE of≤-6.0Ds, SE of ≥+0.50Ds and cylinder of≤-0.50Dcyl respectively. According to the researchers, the prevalence of myopia, astigmatism and hyperopia were 26.1% (95% CI; 23.4-28.8%), 18.5% (95% CI; 16.2-20.8%) and 9.2% (95% CI; 7.4-11.4%) respectively. High myopia was 0.8% (95% CI; 0.2-1.5%) (Saw, Gazzard, Koh, Farook, Widjaja, Lee and Tan, 2002).

Raju, Ramesh, Arvind, George, Haskaran, Paul, Kumaramanic-Kavel, McCarthy and Vijaya (2004) did a study on prevalence of REs in rural Tamil Nadu, South India among adults aged ≥39 years. Data of 2,508 eligible participants were analyzed after examination by the investigators. They defined myopia, hyperopia and astigmatism as ≤-0.50Ds, ≥+0.50Ds and ≥-0.50Dcyl respectively. From the results of the study, astigmatism, myopia and hyperopia were present in 54.8%, 26.9% and 18.7% of the participants respectively. According to the investigators, hyperopia increased with age until the age of 60 years and then decreased ($p=0.7415$). The women had a significantly higher prevalence of hyperopia than did the men ($p<0.001$). The prevalence of astigmatism was reported to increase with age ($p<0.0001$). Against-The-Rule astigmatism was said to

occur most (77.4%). The prevalences of ATR and WTR astigmatism were reported to increase and decrease with age respectively (p=0.006, p<0.001).

Report from a populationbased study in the Indian State of Andhra Pradesh revealed the prevalence, risk factors and associated population attributable risk percentage for RFs among the Indian adults. The researchers examined the eyes of 10,293 individuals from both rural and urban areas. They defined myopia, high myopia, hyperopia and astigmatism as ≤-0.50Ds, ≤-5.0Ds, ≥+0.50Ds and ≤-0.50Dcyl respectively. Data on RE were analyzed for those ≥40 years of age with phakic eyes. According to the researchers, the prevalences of myopia, high myopia, hyperopia and astigmatism were 36.5%, 4.8%, 18.1% and 38.2% respectively (Krishnaiah, Srinivas, Kharma and Rao, 2009).

Prema, George, Ve, Hemamalini, Baskaran, Kumaramanickavel, McCarthy and Vijaya (2008) conducted a study in South India to compare the prevalence of REs and factors associated with spectacle use in a rural and urban Indian population. The researchers examined and analyzed data of 5,651(3,143 rural and 2,508 urban) individuals aged >39 years. They defined myopia, high myopia and hyperopia as SE of ≤-0.50Ds, ≤-5.0Ds and ≥+0.50Ds respectively. Astigmatism as a cylinder of ≤-0.50Dcyl and emmetropia an SE of between ≥-0.50Ds to ≤+0.50Ds respectively. The prevalences of myopia, high myopia, hyperopia, astigmatism and emmetropia were 31%, 4.3%, 17.9%, 60.4% and 46.8% respectively in the rural population. In the urban population the rates were 17.6%, 1.5%, 51.9%, 59.1% and 29% respectively.

Nirmalan, Krishnaiah, Shamanna, Rao and Thomas (2006) carried out a study in South India to determine the prevalence of presbyopia in the State of Andra Pradesh. Included in the study were 5,587 persons, aged 30 years and older (mean age: 47.5±13.0 years). A person was defined by the researchers as having presbyopia if the person required an addition of at least +1.00Ds in either eye for near vision in addition to their best corrected distance correction to improve near vision to at least N$_8$. According to the researchers, the overall prevalence of presbyopia in the study population was 69.9%. They further stated that presbyopia showed an increasing trend with increasing age (p<0.0001). A higher proportion of the females (70.9%) than the males (68.9%) was reported to be presbyopic.

Bourne, Dineen, Ali, Hug and Johnson (2004) did a research in Bangladesh to determine the prevalence of REs and to investigate factors associated with RE in adults aged 30 years and above (mean age: 44±12.6 years). They defined myopia, high myopia and hyperopia as an SE of ≤-0.50Ds, <-5.0Ds and ≥+0.50Ds respectively. Astigmatism was defined as ≤-1.50Dcyl while emmetropia as an SE of between >-0.50D to <+0.50D. The data of only 11,189 were analyzed. From the results, 57.3% were reported to be emmetropic, 22.1% were myopic, 20.6% were hyperopic and 1.8% had high myopia. Hyperopia was more common in females (27.4%) than in males (15.8%). Astigmatism was present in 32.4% of the participants. Against-The-Rule astigmatism was most common (58.7%), followed by OA (29.3%) and then WTR astigmatism (12.1%). They further reported that ATR astigmatism and OA increased with age unlike WTR astigmatism.

A cross-sectional study was conducted by Otutu, Nachega, Harvey and Meyer (2012), to determine the prevalence of REs in Khayelitsha, Milnerton and Mitchell's communities in Cape town. Ninety six persons aged 17-74 years (mean age: 40.6±14.7 years) participated in the study. The researchers defined myopia, hyperopia and astigmatism in the better eye as an SE of ≤-1.00Ds, ≥+1.00Ds and ≤-0.50Dcyl. From the results of the study, the prevalence of myopia was 17.4% (95% CI: 12.65-22.15), hyperopia was 13.4% (95% CI: 9.13-17.67%) and astigmatism was 60% (95% CI: 53.86-66.14%). According to the researchers, myopia declined after age 45 years in both sexes. Hyperopia increased with increased age.

A research was conducted by Abner (2010-2011) on prevalence of presbyopia, near spectacle correction coverage and patients' acceptance of ready made spectacles among 414 adults aged ≥40 years in Swaziland. The researcher defined a person as having presbyopia if they had at least one line improvement on the near vision assessment chart with an addition of ≥+1.00Ds lens to their best corrected distance prescription where required. According to the researcher, the prevalence of presbyopia was 70%. The percentage of presbyopia was reported to increase with increasing age from 63.1% in those 40-49 years to 71.7% in those 50-59 years, to 74.3% among those aged 60-69 years and 76.7% in those 70 years and above. A higher proportion of the females (79.8%) than the males (56.1%) was said to be presbyopic.

A cross-sectional study was undertaken in Nakuru, Kenya to assess the prevalence of RE and the spectacle coverage in a population aged ≥50 years. A total of 4,414 participants were examined by the investigators. According to the investigators , myopia was more (59.5%) common than hyperopia (27.4%) among the participants. Astigmatism prevalence was not recorded (Bastawrous, Wanjiku, Foster and Kuper, 2013).

Burke, Ilesh, Munoz, Kayongoya, Mclliwa, Schwarzwalder and West (2006) carried out n population-based study on presbyopia to determine its prevalence in Kongwa town, Tanzania. They defined presbyopia as at least one line improvement on n near visual acuity chart with an addition of n plus lens or a near VA of less than N8 with the distance correction in place, if needed. A total of 1,709 participants aged 40 years and older were examined by the researchers, 62% of whom were found to be presbyopic. According to the researchers, women had 46.0% higher odds (OR; 1.46) of being presbyopic and also to have more severe presbyopia than men across all age groups. Also included among the factors associated with presbyopia was increased age.

A study was carried out in Zanzibar to assess presbyopic spectacle coverage, willingness to pay, and the impact of correcting presbyopia in individuals aged 40 years and above. The investigators defined presbyopia as near VA of <N8 at 40cm requiring at least +1.00D near addition to see clearly. They examined 381 individuals, out of which 89.2% (95% CI; 85.7-92%) were found to be presbyopic. According to the research, the mean near addition required to see N8 clearly at a comfortable working distance was 2.20Ds (range:1.50-3.00Ds), significantly higher than the mean near addition of 1.61Ds (range: 1.00-2.50Ds) required for participants to read N8 at 40cm (Laviers, Omar, Jeckla, Kassin and Gilbert, 2010).

Owusu-Ogbomo and Adofo (2011) reported a high prevalence rate of presbyopia among a study population in Ghana. The study was designed to determine the relationship between poor vision and occurrence of road traffic accidents and the barriers to uptake of RE services among 206 commercial drivers in Cape Coast. The investigators examined all participants with a mean age of 39.2±11.8 years and reported that RE was the commonest (32%) ocular finding followed by cataract (8.3%). Presbyopia was most prevalent (59%) followed by hyperopia (10.7%), myopia (5.8%) and astigmatism (7%) (Owusu-Ogbomo and Adofo, 2011).

Kumah, Larley and Amoah-Duah (2011), carried out a study in Kumasi, Ghana to determine the uptake of presbyopic correction among public senior high school teachers. They defined presbyopia as near VA <N_6. A total of 298 (197 males and 101 females) teachers, aged 35 years and above were examined. From the results of the study, 68.1% of the teachers were presbyopic. The researchers suggested that senior high school teachers, aged 35 years and above should be encouraged to go for presbyopic screening and wear their spectacles to ensure their maximun performance.

Koroye-Egbe, Ovenseri-Ogbomo and Adio (2010) carried out a retrospective study to determine the refractive error status in Bayelsa State, Nigeria. They collected data on 654 patients (mean age: 42.18±13.10 years) visiting an eye clinic of the University Teaching Hospital, Okolobiri. Myopia, hyperopia and astigmatism were defined as ≤-0.50Ds, ≥+1.00Ds and ≤-0.25Dcyl respectively. Presbyopia was indicated by use of near addition. According to the researchers, RE was observed in 54.3% of the patients. Presbyopia was present in 74.9% of the participants followed by astigmatism (45.6%), myopia (31.8%) and then hyperopia (22.5%). The investigators further stated that the minimum age at which a participant was prescribed with a reading addition was 30 years and the mean presbyopic age was 46.58±8.12 years. They also stated the Pearson's correlation coefficient showed that there was a positive correlation between age and reading addition (r=0.654; p=.000).

Another study by Kio and Ostia-Emina (2003) to determine the prevalence of REs in Warri, Delta State, Nigeria involved 509 participants aged 25-64 years. They used VA of 6/6 at 6 meters and N_5 at 0.4 meters as their standards, and 1,018 eyes of all participants were examined. According to the researchers, astigmatism was transposed to their spherical equivalents for the purpose of analysis. From the results, 752 eyes had REs. Hyperopia was reported to be most prevalent (62.5%) than myopia (37.5%). Presbyopia was observed in 26.6% of the examined eyes, out of which 63.8% were of the males. According to the researchers, presbyopia occurred in the age groups between 25 and 64 years and its rate increased with age but declined in those aged 55-64 years.

The study in Etsako West South Local Government area of South-East Nigeria to screen for [illegible] conditions among adults reported presbyopia to be highest in prevalence among other REs. Three hundred and forty two individuals aged 40-80 years (mean age:

57.8±3.58 years) were screened. The researchers used VA of 6/6 at 6 meters and N8 as their standards. From the results of the study, all participants were presbyopic (100%). In addition, hyperopia was present in 80.1%, myopia in 7.3% and then astigmatism in 3.5% of the participants. The prevalence and degree of presbyopia was reported to be higher in females than males (Alozie, 2009).

The results of a study conducted by Njepiomie, Onyebuchi, Onwusoro and Igbe (2012) among Federal Civil Servants in Abuja, Nigeria, showed that refractive errors were the leading complaint amongst the participants. As documented by the researchers, of the 88 participants (aged 25-60 years) screened, 78 (88.7%) had REs.

Oladigboju, Abah, Chinda and Anyebe (2010) carried out a study to determine the pattern of eye diseases presenting to the eye clinic of Ahmadu Bello University sick boy, Zaria, Northern Nigeria. They performed an ophthalmic examination on 1,448 patients aged 1-70 years with a mean age of 24.3±11.7 years. The researchers defined presbyopia as near VA of <N8 in those aged ≥40 years and correctable with a +1.00Ds or more. From the results of the study, presbyopia was reported to be 49.7% among those 40 years and older. The effect of UREs including presbyopia on academic activities cannot be overemphasized. Hence the importance of good eye health.

Ayanniyi, Fadamiro, Adeyemi, Folorunso and Uzukwu (2010) in their study to report the common REs among the Ekitis documented a high prevalence of presbyopia among the study population. The investigators based their selection criteria for refraction on asthenopic symptoms and visual acuity worse than 6/9 that improved with pinhole or near vision worse than N8 at 40cm but improved with test plus lenses. A total of 406 individuals (60 were teachers) with a mean age of 48±11.45 years were examined by the researchers. From the results of the study, presbyopia occurred most (87.4%) followed by hyperopia (20%), myopia (11.1%) and astigmatism (2.7%) among the participants. The least age of presbyopia was 30 years. According to the researchers, there was no association between gender and RE (p=0.894).

Adeoti and Ighewale (2008) conducted a study to determine the magnitude and pattern of REs among patients visiting Mercyland Specialist Hospital, Osogbo, South-Western Nigeria. They examined 3,601 eyes of 1,824 patients with a mean age of 35.6 years. The researchers stated that myopia was commonest in 39.2% of the examined eyes, followed by hyperopia (23.3%) and astigmatism (21.6%). They concluded by stating that RE is common in that environment and suggesting that adequate provision should be made for its correction.

Bekibele, Fawole, Bamgboye, Adekunle, Ajayi and Baiyeroju (2007) also documented a high rate of presbyopia in their study to determine the prevalence of REs and the attitude to spectacle wear among drivers of the College of Medicine, University of Ibadan, Ibadan. The researchers defined RE (myopia, hyperopia and astigmatism) as preventing vision less than 6/9 and improved with the aid of a minimum of 0.50D lenses. Presbyopia was defined as difficulty seeing near in those aged 40 years or more and correctable with plus lenses of one dioptre (1Ds) or more. Ninety-nine persons, all males aged 38-60 years (mean age: 50.1±4.8 years) were interviewed and examined. According to the researchers, 97.7% of the drivers were presbyopic and the proportion with REs (myopia, hyperopia and astigmatism) was 16.7% (95% CI: 16.6-16.8%).

Ezelum, Razavi, Selvaraj, Gilbert, Murthy, Foster, Lansingh and Abubakar (2011) carried out a study to provide data on prevalence and types of RE and spectacle-wearing rate among adults in Nigeria. Three thousand five hundred and ninety nine adults aged ≥40 years drawn from the six geopolitical zones were examined. They defined low myopia as an SE of >-0.50Ds, high myopia as ≤-5.00Ds, low hyperopia as an SE of ≥+0.50Ds, high hyperopia as >+5.00Ds and astigmatism as a cylinder of <-0.75Dcyl. According to the researchers, the prevalence of low myopia and high myopia were 16.2% (95% CI: 15.2-17.1%) and 2.1% (95% CI: 1.8-2.4%) respectively. The prevalences of low hyperopia and high hyperopia were 4.7% (95% CI: 4.0-5.4%) and 0.5% respectively. The rate of astigmatism was 62.9% (95% CI: 61.8-64.1%) and it increased significantly with age (p<0.001). Presbyopia prevalence was not documented. The investigators noted a low prevalence of myopia in Nigeria. They also stated that the distribution of RE in Nigeria appears closer to that of white and black populations in Europe and America but differs from Asian populations.

2.3 knowledge on Refractive Errors

From the results of previous studies reported earlier in this chapter, refractive errors have been identified to be among the leading causes of visual impairment in Africa, Europe, Americas and Asia. The signs and symptoms such as headache, blurred vision and eyestrain associated with uncorrected refractive error (URE) could also lead to some sort of fatigue. If untreated, the problem could cause the individual, including a school teacher to perform below optimal level. School teachers' awareness and knowledge of RE and other eye diseases and their treatment can enhance their capacity to play an important role in encouraging the general populace to seek treatment for eye problems. This would further help to reduce the burden of visual impairment and prevent blindness among the populace (Aldebasi, 2011; Chew, Reddy and Karina, 2003). An informed teacher is more likely to be sensitive to prevention programmes and to comply with recommended treatment plans. Few studies have been carried out to assess public secondary school teachers' knowledge on REs and this section presents review of literatures on studies conducted among school teachers and adults in general.

Hinkley, Schoone and Ondersma (2011) carried out a survey in Michigan, USA to examine the perceptions of teachers concerning the connection between vision problem detection, academic achievement and vision therapy intervention. One hundred and eighteen participants who had recommended a student to receive a comprehensive vision examination were asked what signs they identified as related to a student having a vision problem. According to the researchers, the responses given by the teachers are the most common signs of uncorrected or undercorrected REs, although the teachers did not attribute the signs to REs. Among the responses given, squinting (69%), and "can't see board/moving reading materials closer to see clearly" (46%) are commonly associated with myopia. Others included are headaches (25%), handwriting/copying problems (21%) and rubbing/watering eye (13%) which are commonly associated with hyperopia and astigmatism. According to the researchers, there was knowledge deficit among Michigan elementary school teachers on REs. The investigators concluded that Optometrists could help bridge this gap in knowledge and make teachers a more valuable source of recommendation for promoting eye health especially among children.

Dhull, Dhull, Hooda and Nidhi (2003) did a study in Rohtak city to assess the effectiveness of a first level screening for refractive errors by teachers in school. A

negligible sample size of nine was used for the study. Of the nine teachers, 3 each were of the languages, sports and sciences subjects. The teachers were asked about their knowledge regarding common symptoms of refractive errors and treatment methods before receiving a training on REs and how to test visual acuity in children. According to the researchers, 55.5% of the teachers (including all science teachers) were found to possess satisfactory knowledge about REs which was acquired mainly from newspapers. The researchers concluded that the science teachers had a higher level of awareness about REs and they were also found to be most effective in screening the school children for REs.

A study was carried out in Sao Paulo, Brazil to identify public school teachers' perceptions on REs occuring at school age and also to assess the knowledge of the teachers on REs. A total of 545 elementary school teachers participated in the study. According to the investigators, majority (67.4%) of the teachers did not receive orientation in three years prior to the study. The teachers were able to distinguish more accurately the symptoms of myopia (70.8%) than those of hyperopia (42.9%) and astigmatism (40.9%). The results also revealed that a significant number of the teachers were able to point out signs and behaviours which are indicative of the presence of myopia (48.5%), hyperopia (40.9%) and astigmatism (40.9%). The investigators concluded that the teachers had distorted and or insufficient knowledge about REs though their knowledge on the causes and treatment of REs was not documented (Armond, Temporini and Alves, 2001).

A cross-sectional study was conducted to assess the level of awareness and knowledge of common eye diseases (cataract, glaucoma, diabetic retinopathy and REs) among academic staff of University of Malaya. Four hundred and seventy three academic staff members (excluding Faculty of Medicine), aged 23 to 58 years participated in the study. The mean age of the male and female staff were said to be 42.7 years and 43.6 years respectively. As reported by the researchers, the awareness of myopia, hyperopia and presbyopia was in the majority (75.3%) of the participants. Of this 75.3%, 64.9% gave a reasonable description of myopia, 61.2% for hyperopia and 23% for presbyopia. They also reported that, of the 75.3%, the majority (81.3%) gave a reasonable treatment (wearing spectacles) for myopia, 72.2% for hyperopia and 34.5% for presbyopia.

Astigmatism was not included. According to the researchers, there was a significant association between the previous history of RE(s) and the awareness of RE(s) among the study population (p=0.001). Also the awareness and knowledge of RE(s) were found to be significantly associated with family history of RE(s) (p<0.001). The females were reported to be more aware and knowledgeable about REs than the males (p=0.001). The knowledge of presbyopia was said to be influenced only by female gender. The investigators concluded that educating the society on REs especially presbyopia will be an important component in the promotion of preventive ophthalmic care, and in reducing visual impairment due to URE in the society (Chew, Reddy and Kanno, 2004).

Rosman, Wong, Wong and Saw (2009) conducted a study to determine the knowledge and beliefs associated with REs and undercorrection among adults in Singapore. Five hundred and three participants aged 40 to 80 years (mean age: 53.5 years) were interviewed and screened for RE(s). The researchers defined myopia as a Spherical Diopire (SD) of at least -0.50Ds, hyperopia an SD of at least +1.00D and astigmatism a cylinder of least -1.00D in any eye. According to the researchers, 49.3% had hyperopia, 45.4% had myopia and 42.1% had astigmatism. Among those with myopia and hyperopia, 79.5% and 79.2% were reported to have heard of the terms myopia and hyperopia respectively. Most (92.3%) of those with astigmatism had not heard of the term astigmatism.

The participants' knowledge on REs was reported to be lacking. Gender was not a significant factor affecting knowledge on REs among the respondents (p=0.97). They also reported no significant difference between those with and without a previous visit to an eye doctor on awareness of myopia (p=0.146), knowledge of myopia (p=0.080), awareness of hyperopia (p=0.218) and knowledge of hyperopia (p=0.068). As reported, there was a statistical significant difference between those with and without a previous visit to an eye doctor on awareness of astigmatism (p=0.003) and knowledge of astigmatism (p=0.002). The participants who had a previous visit were more aware and knowledgeable about astigmatism. They further stated that, there was no significant difference in knowledge on myopia and hyperopia between those with undercorrection and those with a full correction (p>0.05). Regarding astigmatism, those with undercorrection had lower knowledge (p<0.05). Summarizing, the researchers also said the lack of knowledge and awareness of REs are important causes of uncorrected RE.

Aldebasi (2011) conducted a study on public awareness of RE among young adults in Riyadh, Saudi Arabia. Two thousand and thirty nine persons, aged 15 to 45 years were interviewed by the investigator. From the results, awareness on hyperopia and myopia was reported to be equally high among the three levels of education groups: it was 81%, 88% and 89% for those with basic, intermediate and high education respectively. Presbyopia was said to be known only by 11%, 22% and 24% of those with basic, intermediate and high education respectively. The investigator stated that this may be due to the fact that the sample age was low (over 70% were below age 30 years) as presbyopia becomes symptomatic especially in the mid forties.

According to Aldebasi intellect was seen as a determining factor in knowing the most common symptoms related to URE. Of those with high, intermediate and basic, 34%, 35% and 26% respectively had the idea that blurred vision, eyestrain or headaches are being due to URE(s). According to the investigator, over half (55%) of those who were parents (36.2% of the sample population) could not identify the signs and symptoms of REs. The investigator concluded that more is still required in publicity and public education to increase the level of awareness on RE.

2.4 Perceptions, Attitudes and Beliefs Relating to Refractive Errors and Prescription Spectacles

In order to correct refractive error through the use of prescription spectacles, patients must wear them appropriately. Their attitudes, perceptions and beliefs on REs, spectacles and eye health may affect their adherence with the wearing of spectacles.

2.4.1 *Perceptions of Refractive Errors and Prescription Spectacles*

Chawla and Rovers (2010) carried out a survey of patients' opinions on prescription spectacles (PS) and eye care in Chennai, India among persons aged ≥18 years (mean age: 45±8.7 years). A total of 78 patients were surveyed. As reported by the investigators, 66.7% of the patients had heard about PS. Over a quarter (29.5%) had the perception that people wear PS to better/clear their vision, 21.8% said people wear PS because they have difficulty with near vision/reading, 21.8% were of the view that PS is worn to treat "poor eye sight/bad vision" and 16.7% were of the view that PS is used to treat "headpain/eyepain/headache". Nine (11.5%) did not know why people wear PS and 5.1% disclosed that PS is worn to treat cataract, sugar-related problems and to prevent dust. The

investigators said the responses given by the participants suggest a good understanding of the indication for spectacles.

Savur (2011) carried out a study on the perceptions of REs and to investigate the associated psychological effect on youths aged 18 to 25 years in Dakshina. Kannada. Four hundred and fifty eight individuals were interviewed, out of which 48.2% were reported to have difficulty seeing. Fifty one percent of the respondents had the perception that spectacles was a cosmetic blemish and of this, 54% were females. Some (26.3%) felt that spectacles were a sign of intelligence. According to the investigator, despite a high level of education, a large number of the participants had wrong perceptions regarding REs and especially spectacle use.

A study was conducted by Yasmin and Minto (2007) in Pakistan to investigate the communities' perceptions of REs, assess socio-cultural patterns, practices and attitudes towards use of spectacles. Four hundred and seventy nine persons (of which 59% were adults) from both rural and urban communities participated in the study. According to the researcher, the females had the perception that wearing of spectacles does not make one more beautiful or handsome. The perception of most of the respondents was reported to be positive with regards to the use of spectacles by children: they said it helped children to continue their education and improved their quality of life. However some of the respondents felt that spectacle wear hindered children's participation in sport and other extracurricular activities. They further stated that the cosmetic factor and the communities' perception that the children of those who wear spectacles may inherit their eye problems were the main reasons for the discontinuation of spectacle use among females.

Adeoti (2009) conducted a study on beliefs and attitudes of people relating to the wearing of spectacles and also to document their perceptions about the use of spectacles. One hundred and ninety-eight persons (including parents, guardians and teachers) aged 15 to 80 years (mean age: 36.2±13.4 years) from secondary schools in Osogbo LGA, Osun state, Nigeria participated in the study. According to the researcher, among the 108 participants who used glasses, few (19.4%) had the perception that wearing of spectacles gave them a nice look. Only 3.7% felt it makes one look younger than one's age. Of the 76 participants who gave reasons for not using their spectacles, 23.7% did not use their spectacles because they had the perception that wearing of spectacles causes sunken eyes

He further stated that the general opinion that people have on spectacles needs to be scientifically verified.

2.4.2 *Attitudes towards Spectacle Use*

Reports from the study by Savur (2011) also documented the attitudes of the participants towards the use of PS. Despite the report that the use of PS was the most popular method (37.1%) adopted by the participants to correct their RE(s), 30.1% said the continuous use of PS would increase the power of the lens (that is progressively increase the RE). Some (23.3%) said using PS for a long time could harm the eyes or lead to early blindness. Few (6.1%) of the respondents said they would refuse to marry a person who used PS. However, 0.9% said they would reconsider their decision if the form of correction was cosmetically acceptable, that is change to contact lenses (4.1%) or refractive surgery (3.2%). According to the researcher, 18% of the respondents said they hid their spectacles before marriage and 10.6% said they felt ashamed or embarrassed using PS. The researcher concluded that a large number of the respondents had negative attitudes towards REs especially the use of spectacles, which resulted in psychological distress.

Yasmin and Minto (2007) also documented the participants' attitudes towards spectacle use in their study. They reported that 69% of the participants in the rural areas opined that using PS would cause their vision to deteriorate and so they tried to avoid it. This implies a negative attitude. Rosman, Wong, Wong, Wong and Saw (2009) in their study on knowledge and beliefs associated with REs and undercorrection among Singaporean adults documented the participants' attitude towards the use of PS. Among the 503 participants with RE, 28.6% were undercorrected. According to the researchers, a significantly higher proportion (36.4%) of those with undercorrection than those with a correct PS (26.7%) did not think their vision would be poor if they did not wear spectacles with the correct prescription ($p = 0.03$).

The study in Osogbo, South-Western Nigeria to discover beliefs and attitude of the people towards wearing PS by Adeoti (2009) revealed the following: of the 198 participants studied, 61.6% people said they would use spectacles if prescribed, 38.4% would not use spectacles if prescribed and 51.5% would not allow their children to use PS.

2.4.3 *Beliefs relating to Refractive Errors and Prescription Spectacles*

Chawla and Rovers (2010) in their survey of patients' opinions on PS and eye care in Chennai reported the beliefs of the patients on REs and use of spectacles. Among the 78 patients surveyed, 75.6% had presbyopia and 82.1% were said to require corrective lenses. According to the researchers, only 37.2% had the belief that the problem with their eyes was a RE, 17.9% believed the problem was eyepain/irritation/watering and 15.4% believed nothing was wrong with their eyes. Few (9%) did not know the problem with their eyes while 2.6% believed it was headache affecting their eyes. Only 37.2% believed PS could treat their problems. The researchers further stated that misconceptions existed among the respondents which would not make them adhere to proper use of prescribed therapy such as PS. These included the belief that headache/too much thinking (5.1%) and watching television (5.1%) may cause people to lose their vision.

Reports from the study by Savur (2011) in Dakshina revealed that less than half of the study participants had the belief that REs can be inherited. Some (31.2%) believed two individuals with REs should not get married to each other because their children would inherit the problem and 21.1% had the belief that even when only one parent had an RE, the chance is high that the children also would have it. This could explain why some (18%) of the participants hid their spectacles before marriage and 3% were rejected for marriage because they used spaectacles. The study from Saó Paulo, Brazil revealed that all teachers (100%) had the belief that all types of REs in the eye are very serious disorders (Armond, Temporini and Alves, 2001). From the results of the study in Osogbo by Adeoti (2009), 52.9% of the 102 participants would not allow their children to use PS because they believed it would worsen the existing problem and (43.1%) believed children are too young to wear PS. Few (11.8%) of the 76 participants said they would not use PS because they believed people would say unpleasant things and 3.9% would not use PS because they believed it to be a taboo and could cause deterioration of vision.

2.5 Pattern of Use of Prescription Spectacles

Prescription spectacles which are worn to enhance vision can also serve other purposes such as protection from dust and ultra violent rays, to conceal eye defects and as a fashion accessory (Ayanniyi, Adepoju, Ayanniyi and Morgan, 2010). They are the simplest, least expensive and most popular treatment option for correcting RE (Cochrane, du Toit and Le Mesurier, 2010). Despite these inherent merits, some challenges have been identified

with its use. These include non-availability or inability to afford PS by those who require them in some communities of the world including Nigeria (Ayanniyi, Adepoju, Ayanniyi and Morgan, 2010; Williams, Ximenes, Ximenes, Palagyi, du Toit and Brien, 2007; Michon and Michon, 2006). Also PS can be a source of ocular discomfort especially when incorrectly prescribed (Ayanniyi, Adepoju, Ayanniyi and Morgan, 2010). There is dearth of recent literature on the use of spectacles among secondary school teachers.

The use of prescription spectacles among the British population studied by Sherwin, Khawaja, Broadway, Luben, Hayat, Dalzell, Worcham, Khaw and Foster (2012) was reported to be high (79.4%). The use of spectacles was said to be associated with the type of RE ($p<0.001$) and the proprotion of participants using PS increased with increase in amount of the RE ($p_{trend}<0.001$). Less than half (40.8% of 4,428) said they felt good wearing their PS, 29.7% reported having excellent vision while wearing their PS and 24.2% reported good vision with their spectacles. According to the researchers, use of PS increased with increasing age ($p<0.001$), sex (female) ($p=0.034$) and retirement ($p<0.001$). The study conducted in Germany by Jobke, Kasten and Vorwerk (2008) showed a low use of PS among the adults with REs. Many (44.2%) of the 138 adults had RE(s) and of this, 32.8% were spectacle wearers. The use of PS was also found to be low among the Aboriginal people studied by Durkin, Tan, Casson, Selva and Newland (2007). Out of the 148 participants who had refraction performed on them, 3.4% were said to have a significant distance RE and only 7.8% owned distance prescription spectacles.

The study by Lu, He, Murthy, He, Congdon, Zhang, Li and Yang (2011) on presbyopia and near-vision impairment in rural Northern China documented the use of spectacles and barriers to having correction among the participants. A total of 1,008 participants aged >40 years (mean age: 58.4±10.7 years) were interviewed and examined. According to the researchers, 67.3% had presbyopia. Of the 666 participants who responded to the question on whether they had spectacles, 51.5% indicated they had spectacles. The use of PS was reported to increase with age ($p<0.001$) As reported by the researchers, worse presenting near ($p<0.001$) and distance ($p=0.024$) vision, and requiring stronger additions to achieve near vision of N8 ($p<0.001$) were factors positively associated with using presbyopic spectacle correction. Gender ($p=0.18$) and education ($p=0.99$) were included among the factors not associated with use of presbyopic correction. They further stated that the commonest barriers to wearing a presbyopic correction among the participants included

poor quality of available reading spectacles (33.1%), the perception that vision was normal (18.3%) and lack of awareness that presbyopia could be corrected (10.5%).

Reports from the Singaporean adults studied by Rosman, Wong, Tay, Tong and Saw (2009) showed that 40.1% of the 3,115 participants with RE(s) wore spectacles or contact lenses (CLs), of which only 0.8% wore CLs. The vision of 14.4% of these participants with spectacles/CLs was reported to be undercorrected. Among the 1,865 participants who did not wear PS/CLs, 24.4% were said to require a refractive correction. The investigators further stated that the proportion of the participants without correction was highest among those with myopic astigmatism (32.2%) and in those with hyperopic astigmatism (32.2%) and least in those with astigmatism only (20.8%).

The study in Dakshina by Savur (2011) among 458 participants of which 48.2% had difficulty in seeing due to RE(s) showed the use of PS to be low (37.1%) among the participants. Among those with PS, 44% said they did not encounter any problem using their spectacles, 35% said they were teased for using PS and 3% said they were rejected for marriage because they used PS. Thirty percent of the participants felt that diet, yoga and traditional medicine could cure REs. The researcher expressed the concern that a misconception like this could result in them refraining from seeking appropriate treatment. The researcher further affirmed the dissemination of information about REs through the right medium will help in dispelling the misconceptions and distorted facts.

The study in India to determine the prevalence of pre-existing URE in presbyopes who attended an out-patient eye clinic in Medical College of Bangalore documented the use of spectacles among the participants. According to the investigators, one hundred presbyopes aged >35 years were examined. Fifty-three percent had only presbyopia and 47% had both uncorrected presbyopia and other UREs. A majority (70.2%) of the 47% had never used PS and the remaining 29.8% using PS were found to be undercorrected. They further stated that the unmet need in the presbyopes was because they were not corrected for RE in their young age. They said a significant proportion of the presbyopes was found with pre-existing UREs and suggested a complete refraction (both objective and subjective) should be performed on every presbyope (Ghalak, Sowbhangya, Himamshu, Sandeep and Punjabi, 2010).

Results from the rural and urban South Indian population studied by Prema, George, Ve, Hemnamalini, Baskaran, Kumaramnickavel, Catherine and Vijaya (2008) documented a higher rate of spectacle use among the urban participants. According to the researchers, 52.9% and 17.6% of the examined urban (n=3,850) and rural (n=3,924) population used PS respectively. No significant difference in the proportion of men and women using PS in both populations was reported. Among the spectacle wearers, the use of bifocal lenses was in the majority of the urban population (OR:5.14, 95% CI; 3.31-7.98%) while the use of single vision lenses either for distance or near vision was reported to be more among the rural population (OR:1.39, 95% CI; 1.10-1.74%). The use of spectacle was said to increase with increasing age ($p<0.05$) and men were more likely to use PS in all age groups in both populations [(rural; male:female was 352:340) (urban; male:female was 1,036:1,000)]. Among those with RE(s), the use of PS was said to be more common among the hyperopes in both rural (32%) and urban (64.9%) populations.

Results of the study by Ovenseri-Ogbomo and Adofo (2011) on poor vision, REs and barriers to treatment among commercial drivers in Cape Coast Ghana showed a low prevalence of spectacle use. Of the 206 drivers examined, 32% had RE(s) and only 4.9% were said to own and wear PS. Of the 4.9%, 70% wore their PS for near work only, 20% for distance vision only and 10% wore for both distance and near (bifocal correction). Seventy percent obtained their spectacles from *roadside* vendors without having an eye examination. The investigators found out that the most reported barrier to eye care utilization was ignorance. Some (32.5%) of the respondents indicated that they were not aware of their visual problem while 11.7% could not make out time to go for an eye examination. Twenty three (11.2%) reported cost as the reason for not having an eye examination and 0.5% did not know where to have an eye examination. The investigators suggested a health education programme to address these barriers to uptake of RE services.

From the results of the study among school teachers of public senior high school in Kumasi, Ghana, 68.1% of the teachers (n=298) had presbyopia while 29.6% of this did not have a presbyopic correction. Among those who had presbyopic correction, 55.5% used reading spectacles and the remaining 44.5% used bifocals. As reported by the investigators, 90.5% of those with bifocals preferred it since opting for single vision lenses (reading spectacles) meant having to change spectacles during teaching. The

investigators recommended proper and adequate spectacle correction for presbyopic teachers to ensure maximun performance (Kumah, Lartey and Amoah-Duah, 2011).

Sherwin, Keeffe, Kuper, Islam, Muller and Mathenge (2008) did a study in Kenya to estimate the prevalence of presbyopia, the functional impairment and spectacle use among persons aged ≥50 years. One hundred and thirty eligible participants were interviewed and examined by the researchers. It was noted by the researchers that the functional presbyopia (defined as requiring at least +1.00Ds in order to read the N8 optotype) was found in 85.4% of the participants. Of this 85.4%, few (25.2%) had visited an eye care professional and only 5.4% were reading spectacles. Cost of spectacles was reported to be the main barrier to spectacle use in 62% of the participants with presbyopia.

The prevalence of spectacle use in the population from Zaria, Nigeria was very low. Out of the 1,448 patients examined, 15.8% had RE(s) and only 7.3% of those with RE(s) used PS (Abah, Chinda, Samaila and Anyebe, 2010). Results from the population from Ibadan showed a low use of PS among the presbyopic drivers. According to the researchers, 67.7% of the 97 presbyopic drivers had never worn PS while only 32.3% were current wearers of spectacles. However, 56.3% of the 17 drivers with myopia, hyperopia and astigmatism wore their PS while driving. Among those (43.8%) who required PS but denied the use while driving, three were reported to be visually impaired. The participants who were reading spectacles only were 20.2% and 11.1% were bifocals for distance and near vision. According to the researchers, the participants said wearing of spectacles would be a sign to others that something was wrong with their eyes. This could make them not to wear their PS as needed (Bekibele, Fawole, Ramgboye, Adekunle, Ajayi and Baiyeroju, 2007).

The study by Adeoti (2009) among older students, parents and teachers in Osogbo documented the use of PS among the participants. According to the investigator, most (68.3%) of the 108 participants who wore PS were females. The majority (58.3%) used their PS for reading only. The investigator noted that the good experiences from using PS indicated by the participants were good sight (52.8%) and protection from the sun (8.3%). Only 3.7% had a bad experience (headache and eyeache) which disappeared after removing the spectacles for a while. Few (3.7%) could not express their experience. Most

(61.6%) of the 198 study popoulation said they would use PS if prescribed. According to the investigator, the reasons given by those who would not use PS 'were that they did not like it (38.4%)', 'it causes sunken eyes (23.7%)', 'what will people say (11.8%)' and 'the belief that it is a taboo and causes deterioration of sight (3.9%)'. Slightly over half (51.5%) would not allow their children to wear PS because it would worsen the existing problem (52.9%) and that children are too young to wear PS (43.1%). Few (3.9%) gave no reason. The investigator further stated that age was significantly associated with the use of PS (p=0.03) or its use when prescribed (p=0.02), while gender was only significantly associated with spectacle use in the study population (p=0.006).

A study was conducted among 214 spectacle wearers (26 were school teachers) in Ilorin and Ado-Ekiti, South Western Nigeria by Ayanniyi, Adepoju, Ayanniyi and Morgan (2010). Their aim was to evaluate challenges, attitudes and practices among spectacle wearers. It was noted that, 50.5% of the participants rated their spectacle usefulness as satisfactory, 40.2% as very satisfactory, 7% as unsatisfactory and 2.3% as very unsatisfactory. The most frequent reasons for spectacle wear among the participants included reading (37.4%), distance vision (37.4%), eye protection (11%) and to cover eye defects (11%). The identified challenges to spectacle use among the participants included cost of spectacles (43%), falling/scratched/broken lenses (29.4%), the fear of spectacles damaging the eyes (23.8%), experiencing distorted vision (18.7%), the perception that frames leave an impression on the face (15%), incorrect prescription (10.7%) and heavy spectacles (7.5%).

Onabolase and Mahmoud (2009) carried out a study on 125 patients with refractive errors at the Federal Medical Centre, Owo, Nigeria. Their aim was to determine the degree of compliance of patients with spectacle wear and the factors associated with non-compliance. All participants were interviewed by the researchers but the data of only a hundred (five were school teachers) aged 21 to 75 years (mean age: 37.3 years) were analyzed. The results showed that, all (45%) respondents ≤40 years said they wore their spectacles for distance correction only. Of the remaining 55% participants aged ≥40 years, 45.5% wore reading spectacles only and 54.5% wore bifocal lenses. Majority (71%) of the respondents were said to use their PS occasionally and 29% wore theirs often. Furthermore, most (82.3%) respondents were not aware of the other methods of correcting RE. Only 17% said they were aware of other methods and 8.2% of this would

prefer spectacles. According to the researchers, lack of felt need (58%), spectacle intolerance (28%) and ignorance (14%) were identified as factors associated with spectacle wear non-compliance. The researchers recommended among others, appropriate health education on need to wear PS by those affected with REs.

A study in a Federal Government Research Institute Lagos, Nigeria, to study the pattern of ocular conditions among the workers documented the use of spectacles among the participants. Two hundred and fifty six workers with a mean age of 42.3 years were examined. According to the researchers, 48.8% of the participants had uncorrected/poorly corrected presbyopia (near VA $\leq N_8$) (Ashaye and Azusu, 2005).

2.6 Conceptual Framework: PRECEDE model

A Conceptual framework is a written or visual presentation that identifies and explains either graphically, or in a narrative form, the key factors, concepts or research variables to be studied, and clarifies relationships among the variables (McGraghie, Bordage and Shea, 2001; Miles and Huberman, 1994). Applied in health promotion fields, it guides practitioners' decision about what design, procedures, and measurement indicators to select when planning an intervention to promote health or change health behaviour (US Department of Health and human Services, 2005). The theoritical framework that may be suitable for a research depends on the unit of practice (e.g. individuals, groups, organization or community) and the nature of the health problem. For this study, the PRECEDE model was used as it offered a framework for identifying the factors that are linked to the knowledge and use of prescription spectacles in correcting refractive errors. It was first developed by Green, Kreuter and associates during the 1970s.

The PRECEDE is a planning model, not a theory (Simons-Morton, McLeroy and Wendel, 2011). It does not predict or explain factors connected to the outcomes of interest, but offers a framework for identifying intervention strategies to address these factors. In addition, the framework can be used as a guide in selecting and analyzing behavioural antecedent factor (Simons-Morton, McLeroy and Wendel, 2011). The model therefore facilitates the design of health promotion and education programmes. The PRECEDE framework guides planners through a process that starts with desired outcomes and works retrospectively to identify a blend of strategies for achieving objectives.

The PRECEDE acronym stands for Predisposing, Reinforcing and Enabling Constructs in Educational Diagnosis and Evaluation. The steps involved are as follows;

ACRONYM	THE STEPS	
P: Predisposing	Step I:	SOCIAL DIAGNOSIS
R: Reinforcing and	Step II:	HEALTH STATUS DIAGNOSIS
E: Enabling	Step III:	BEHAVIOURAL DIAGNOSIS
C: Constructs	Step IV:	EDUCATIONAL DIAGNOSIS
E: Educational	Step V:	STRATEGY PLANNING (Administrative diagnosis)
D: Diagnosis and	Step VI:	IMPLEMENTATION
E: Evaluation	Step VII:	EVALUATION

The model posits that, just as a medical diagnosis is needed to design a clinical intervention, so is an educational diagnosis to design a health promotion intervention. Educational diagnosis is separation of the factors that cause a behaviour and these factors can be organized into three salient typologies. Predisposing factors, Enabling factors and Reinforcing factors. The predisposing factors are those related to knowledge, attitude, perceptions, beliefs, nonns and culture. The enabling factors are those related to resources such as time, money, lenses, skill, supplies etc while the reinforcing factors are those related to the influence of significant others. These factors can influence behaviour positively or negatively. The adaptation of the PRECEDE framework for the use of prescription spectacles in correcting refractive errors among secondary school teachers is presented in figure 2.1

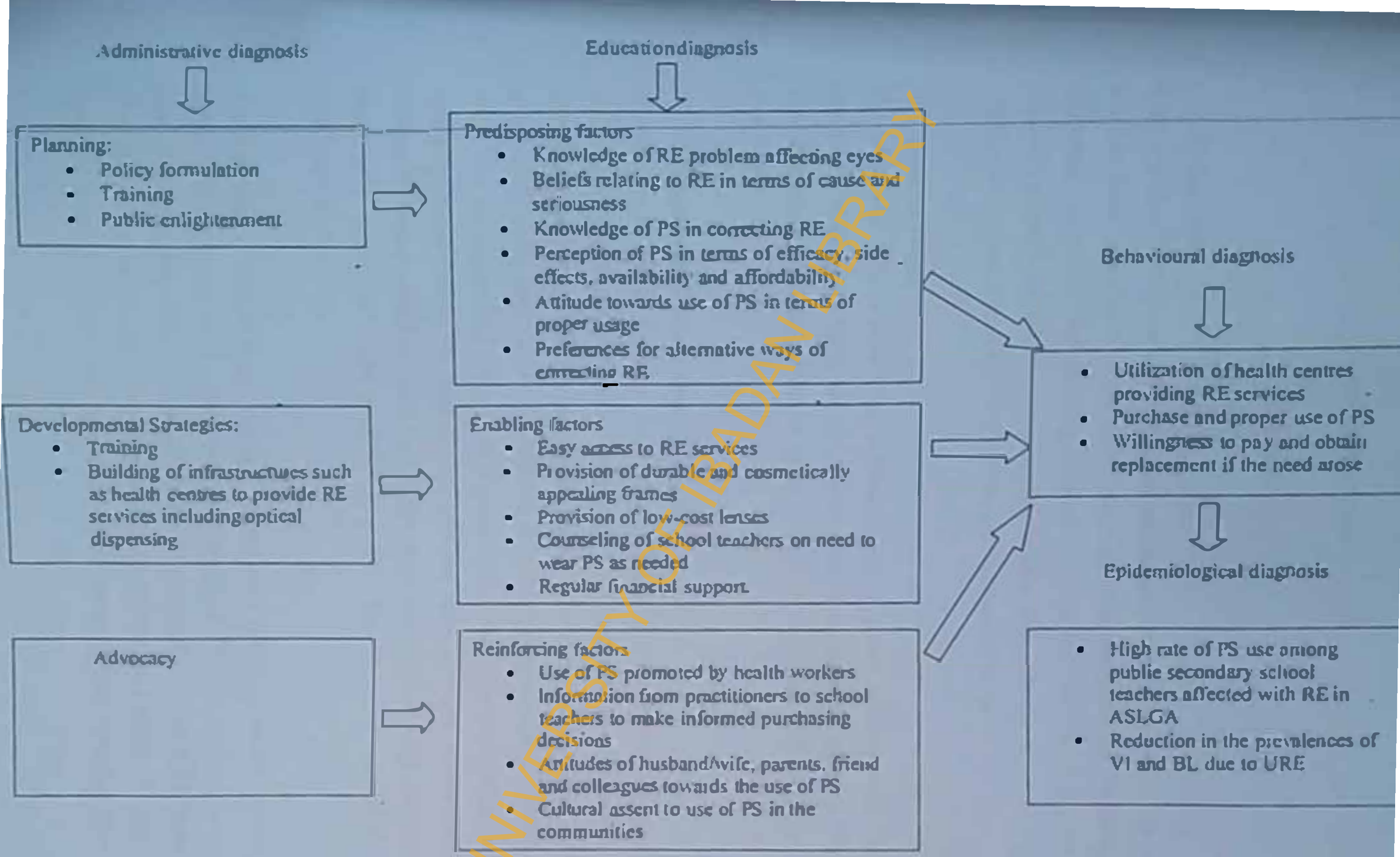

Figure 2.1: The PRECEDE framework applied to the use of prescription spectacles for correcting refractive errors in secondary school teachers in Abeokuta South Local Government Area

CHAPTER THREE

3.0 METHODOLOGY

3.1 Background

In this chapter, a description of the study area and research design is presented. Also it describes other components of the methodology including the following: the study population; sample size and sampling technique; methods and instruments for data collection; validity and reliability of study instruments; data collection process; data management and analysis; ethical consideration; and limitations of the study.

3.2 Research Design

The study was a descriptive cross-sectional survey. It aimed at determining the prevalence of refractive errors and the use of prescription spectacles among public secondary school teachers in Abeokuta South Local Government area (ASLGA), Ogun state, Nigeria.

3.3 Description of the Study Area

Abeokuta lies on latitude 7^0 15N and longitude 3^0 25E. The city is about 81km south-west of Ibadan, the capital of Oyo State, and 106km North of Lagos State. It is located at an altitude of about 157m above sea level amidst isolated outcrops of natural formation of granitic rock which gives the town's landscape its undulating characteristics (Oyesiku, 1986). It is the largest city in Ogun State. The city is divided into five major traditional quarters or wards and has two main dialects, Owu and Egba. Abeokuta has two Local Government Areas- Abeokuta South Local Government Area (ASLGA) and Abeokuta North Local Government Area (ANLGA) (Oyesiku, 1986). It is the ASLGA that constituted the study area.

Abeokuta South is bounded in the north by Obafemi Owode Local Government Area and in the south by Odeda Local Government Area. (Oyesiku, 1986). It is a semi-urban community with a population of about 250,295 (National Population Commission, 2010). The LGA consists of 16 politicalhealth wards. The community has a network of access roads and transportation is mainly by means of taxes and motocycles. Abeokuta South

I-GA has social amenities such as electricity supply and pipe-borne water. The residents of this area belong majorly to the Yoruba ethnic group.

The dying of textiles is a lucrative business in ASLGA. The other occupations of the people include trading, and involvment in artisan trades. Many of the educated people in the LGA work as civil servants. Christianity, Islam and Traditional Religions are the three major religions practised by the people of ASLGA. The use of traditional medicines (*agbo*) cuts across the literate and illiterate alike (Idowu, Soniran, Ajana and Aworinde, 2010; Lawal, Uzokwe, Asinwa, Igbeanugo and Ladipo, 2010; Omobuwajo, Alade and Sowemimo, 2008; Lawal and Banjo, 2007).

In some communities in the LGA, such as Ake, Itoko, Ijaye, Adatan and Kugba, use of *agogo* by town criers to disseminate information still exists and is acceptable by the people. Other sources of information include radio, television as well as Yoruba and English newspapers.

There are several educational establishments in the LGA. These include 46 public primary schools, 19 secondary schools and two schools of nursing. The health facilities in the LGA include the following: seven Primary Health Centres (PHCs), eight primary health posts, one secondary health care facility (State Hospital (SH)), one tertiary health care facility (Federal Medical Centre (FMC)), one mission hospital (Sacred Heart Hospital (SHH), several private clinics, and six private eye clinics. One of the PHCs (in Oke-Itewo) has a primary eye care unit. The eye care professionals in the LGA are Optometrists, Ophthalmologists, Ophthalmic Nurses and Dispencing Opticians (see table 3.1 for the distribution of eye care professionals in the various categories of health facilities in the LGA).

Table 3.1: The Eye Care Professionals in the Various Categories of Health Facilities in ASLGA

PHC Oke-Ilewo	State hospital	FMC	Mission hospital	Private eye clinic
1Ophthalmic nurse	1 Optometrist 1 Ophthalmologist 5 Ophthalmic nurses	1 Optometrist 3 Ophthalmologists 5 Ophthalmic nurses	1 Ophthalmologist	5 Optometrists (1 in SH). 3 Ophthalmologists (2 in FMC). 4 Dispencing Opticians.

3.4 The Study Populatinn

The study population consisted of male and female public secondary school teachers in ASLGA. Each of the secondary school was segmented into junior and senior secondary schools. The teachers were selected as the study population because teachers have been found to be effective key informants in finding school children with URE and agents of change in the delivery and uptake of eye care services in their local community (Muhammad, Maishanu, Jabo and Rabiu, 2010; Jose and Sachdeva, 2009; Muhit, Shah, Gilbert, Hartley and Foster, 2007). The distribution of the teachers in the LGA as at January, 2009 is shown in appendix I

3.5 The Study Variables

3.5.1 Independent variables

- the socio-demographic characteristics of the teachers including sex, age and marital status and
- the teachers' family history of use of spectacles.

3.5.2 Dependent variables

- perceptions of the teachers relating to refractive error services;
- perceptions and attitudes of the teachers relating to the use of spectacles;
- use of prescription spectacles among the teachers and
- the refractive error(s) prevalent among the teachers and
- teachers' awareness and knowledge on REs and prescription spectacles.

3.6 Sample size determination

The sample size was calculated based on the assumption that the proportion of teachers with refractive error was 50%. Since no prior value or figure was available on the study of the prevalence of RE(s) and the use of prescription spectacles among secondary school teachers in ASLGA. the sample size was calculated using the formula for estimating single proportions.

$$n = \frac{P(100-P)Z^2}{E^2}$$ (Gill and Johnson, 2010)

where n = sample size

E = percentage maximum error required (level of precision), 5%

Z= confidence level, 1.96

P= reasonable estimate of key proportion= 50% or 0.50

100-P= (100%-50%)=50% or 0.50

$$n = \frac{1.96^2 \times 0.50 \times 0.50}{0.05^2} = 384$$

The sample size was rounded up to 500 to address possible attrition and non-response and to enhance the generalizability of the result. Attrition rate of over the minimum of 10% have been reported in some previous related studies conducted in Nigeria, Ghana and Korea (Kyari, Gudlavalleti, Sivasubramaniam, Gilbert, Abdull, Entickume, Foster, 2009; Ocansey, Ovenseri-Ogbomo, Abu, Kyei and Boadikusi, 2012; Yoo, Kim, Park, Kim and Kim, 2013).

3.7 The Sampling Procedure

The procedure leading to the selection of schools and teachers involved the following:

Step 1: *Community diagnosis*

A community diagnosis was carried out. A list of all public secondary schools in ASLGA was obtained from the Ogun State Teaching Service Commission. The schools were then stratified into the various political/health wards as shown in table 3.2

Table 3.2: The Number of Public Secondary Schools in each Political/Health Ward

Wards	Area	Secondary school	Number of School(s)
1.	Ake 2	Lantoro High School	1
2.	Ake 3	Egba Comprehensive High School	
		Ascro High School	2
3.	Emere /Kugba	Saje High School	
		Baptist Boys High School	2
4.	Ijaiye	Abeokuta Grammar School	
		Baptist Girls' College	
		Lisabi Grammar School	3
5.	Oke-Ijeun	Nuwaru-deen High School	
		Rev. Kuti Memorial Grammar School	2
6.	Kuto	St John's Anglican School	1
7.	Igbore	Methodist High School	
		Igbore High School	2
8.	Ibara 1	St Leo's College	
		Anglican High School	2
9.	Ibara 2	Abeokuta Girls Grammar School	
		Macjob Grammar School	2
10.	Oke-Ilewo/	Catholic Comprehensive High School	
	Ibara housing	Ijeun Tuun High School	2
		Total	**19**

Step 2:

This step involves stratifying the schools into health wards. Only 10 out of the 16 wards had secondary school. Therefore one secondary school each was selected from each of the 10 wards by balloting. This yielded the selection of schools in table 3.3.

Table 3.3: The Selected Secondary Schools

Ward	Area	Secondary school	Number of School
2.	Ake 2	Lantoro High School	1
3.	Ake 3	Egba Comprehensive High School	1
4	Emere/Kugba	Baptist Boys High School	1
7	Ijaiye	Lisabi Grammar School	1
8	Oke Ijeun	Rev. Kuti Memorial Grammar School	1
12	Kuto	St John's Anglican School	1
13	Igbore	Igbore High School	1
14	Ibara I	St Leo's College	1
15	Ibara 2	MacJob Grammar School	1
16	Oke-Ilewo/Ibara housing	Ijeun Titun High School	1
		Total	10

Step 3:

The calculated sample size was equally distributed among the 10 selected schools. This led to a total of 50 (25 each among the junior and senior secondary) teachers in each school.

Step 4: *Selection of the teachers in each school*

A register containing the list of teachers in each school was used as sampling frame to aid the selection of the study participants. The sampling fraction was calculated using the formula below:

$$k = n/N$$

where k= sampling fraction

n=sample size

N=total population of teachers in each school

For example: Egba Comprehensive High School (senior)

$$k = \frac{25}{56} = 1/2$$

Therefore every 2nd name on the register of teachers was recruited (e.g 2nd, 4th, 6th, 8th etc.);

Fourteen teachers from the junior secondary school in five schools were either not available or were not willing to participate in the study. This necessitated more teachers to be selected from the senior secondary to make up for the shortfall.

In the end the study participants from the senior and junior seccondary schools were 257 (51.4%) and 243 (48.6%) respectively. The senior and junior school teachers have the same socio-demographic characteristics.

3.8 Methods and Instruments for Data Collection

Quantitative methods of data collection were used in this study. Data were collected using a pre-tested questionnaire and by observation involving use of standardized ophthalmic instruments.

The questionnaire consisted of eight sections labeled A, B, C, D, E, F, G and H.

Section A dealt with the socio-demographic characteristics of the respondents. Section B focused on the respondents' family history of use of spectacles and section C contained questions on the awareness and level of knowledge on refractive errors and prescription spectacles among the teachers. A 100-point knowledge scale (as shown in appendix II)

was used to assess respondents' level of knowledge, with knowledge scores of 0-40, 41-55 and 56-100 categorized as poor, fair and good respectively.

Section D focused on the respondents' attitude towards wearing of spectacles while section E contained questions on the respondents' belief on REs and the use of spectacles. Section F dealt with the teacher's perceptions relating to prescription spectacles and use of spectacles by children. It also had questions on the ability of school teachers to identify their students with eye problems and their ability to educate the students about eye care. Section G was on practices relating to having an eye examination and the use of spectacles. It also focused on the teachers' previous involvements in eye health related activities in their communities. Section H is a recording sheet to document findings from the eye examination.

The ophthalmic instruments used included Snellens' charts, ophthalmoscopes (Beta 200S. Heine, Germany), penlights, trial frames and lenses and hand-held retinoscopes (18240 WelchAllyn, USA). Other materials included record sheets, meter rule, occluders and pinhole.

3.9 Validity and Reliability of Instruments

Validity is the extent to which an instrument measures what it purports to measure while reliability is the degree to which an instrument yields constant responses irrespective of the environment (Amoyc, 2004). Measures were taken to ensure the validity and reliability of the questionnaire and the ophthalmic instruments used.

3.9.1 *Validity of the questionnaire and training of recruited Research Assistance*

In order to ensure validity of the questionnaire, a wide range of literature on related studies was reviewed and variables of interest were gleaned from the reviewed literature. Variables teased out of the reviewed literature were used to construct the questionnaire for the study. Optometrists and experts in health promotion and education were given a draft of the questionnaire to examine its relevance, appropriateness and adequacy. Their comments were noted and necessary corrections were effected.

Training was conducted for two recruited Research Assistants (RA) to ensure that they had adequate understanding of the questionnaire prior to the commencement of data collection. The training focused on the objectives and importance of the study, how to

secure respondents' informed consent, basic interviewing skills and how to review questionnaire copies to ensure completeness.

3.9.2 *Validity of the ophthalmic instruments*

The retinoscopes, ophthalmoscopes, Snellens' charts, meter rule, trial lenses and frames, occluders and pinholes are standardized ophthalmic instruments.

The training of an Optometrist and an ophthalmic health attendant, who assisted in the conduct of the eye examination focused mainly on the objectives and importance of the study, proper time management and to ensure that the findings from the examination were kept confidential. The same team of Research Assistants that assisted in the conduct of the pre-test were also used to facilitate the conduct of the main study.

3.9.3 *Reliability of test instruments*

In order to ensure reliability of the test instruments, the questionnaire was pre-tested among public secondary school teachers in ANLGA because they shared the same characteristics with the teachers in the study LGA. A total of 49 respondents representing 9.8% of the target population participated in the pre-test. The reliability was further calculated using the Cronbach's alpha coefficient. A reliability value of 0.5 was obtained The ophthalmic instruments used for the study had been in use by the researcher and other eye care professionals for over a period of 4 years.

3.10 Data Collection Process

3.10.1 *Data collection phase*

There were two phases of the data collection exercise, the semi-structured interview phase and the eye examination phase. A visit was paid to the 10 selected schools and permission was sought from the principals of the schools used. Photocopies of the letter of introduction from the Head, Department of Health Promotion and Education, Faculty of Public Health, University of Ibadan was given to each principal. Serial numbers were written on copies of the questionnaire for easy identification and recall of any instrument with problems.

The recruitment of the participants was carried out in each school using the sampling frame and process earlier described. The interview began with an introduction and presentation of the overview of the research including the objective of the study. The

respondents were assured that participation in the study was voluntary and that information disclosed by them would be kept confidential. The respondents showed their willingness to participate voluntarily by signing the consent form for survey participants (appendix VIII).

The respondents were asked not to write their names on the questionnaire copies so as to ensure anonymity. The questionnaire copies were interviewer-administered. The teachers were informed that there would be a free eye examination for those who participated in the interview and that participation in the eye screening exercise was however, voluntary. Respondents were encouraged to ask questions on what they did not understand during the interview and explanations were given as required. Each questionnaire copy was reviewed for completeness immediately after the interview. An enrolment note (see appendix III) that would admit willing respondents to the eye examination was given to each respondent at the end of the interview.

3.10.2 *Eye examination phase*

This took place after the completion of the questionnaire administration phase. The eye examination which took seven weeks was conducted in each of the schools. A venue was provided for the examination which was free from distraction and with a good adjustable illumination.

Testing for refractive errors may use several procedures in order to measure how the eyes focus light and to determine the power of any optical lenses needed to correct the reduced vision. The procedures adopted included the following processes:

(i) *Registration of respondents:* This was done by a trained Research Assistant. Registration was carried out at the venue of the examination. This was done to ensure that it was the respondents that participated in the questionnaire interview that were coming for the screening.

(ii) *Eye health education:* A brief health talk was given to the participants on how to care for their eyes including foods to be eaten that make the eyes healthy such as foods rich in vitamin A and Beta-carotene. They were also encouraged to have routine eye examination with or without a symptom.

(iii) *Assessment of Visual Acuity (VA):* Visual Acuity is defined as the spatial resolving capacity of the visual system, the ability to perceive small details. The VA testing is

conventionally performed at viewing distances of 6m (20 feet) and 40cm (16 inches) for the assessment of distance and near acuity respectively (Lay, Wickware and Rosenfield, 2009; Keirl, 2007; Bailey, 2006). However, other test distances may also be used depending on the patient's visual status and or occupation. In this study, the VA for distance was recorded as a fraction using the Snellen's fraction, which is defined as test distance divided by the distance at which the letter subtends 5 minutes of arc. It is to be noted that $^{20}/_{20}$ and $^{6}/_{6}$ vision are terms used to express normal VA measured at distances of 20 feet or 6 meters respectively (Lay, Wickware and Rosenfield, 2009; Keirl, 2007; Grosvenor, 2007; Bailey, 2006).

When an individual has $^{20}/_{20}$ or $^{6}/_{6}$ vision, it indicates that, at a viewing (test) distance of 6m, the smallest letter he/she could read subtended 5 minutes of arc at a distance of 6m. Likewise, a vision of 6/12 indicates that, at a viewing distance of 6m, the smallest letter the individual could read subtended 5 minutes of arc at a distance of 12m. The near VA was recorded using the N notation.

The VA of each respondents was measured using the Snellens' charts for far disunce and near distance (near point card). Each respondent was asked to identify letters on a distant Snellens' chart placed at 6 meters from the sitting position. Thereafter they were asked to read the prints on a near point card at distances between 33cm and 40cm or at their comfortable working distance. Distances were measured with the meter rule. Each eye was tested separately; care was taken to ensure that the other eye was completely covered with an occluder. After this, the VA of both eyes was assessed. Testing was done with their naked (unaided) eyes and then with their spectacles (aided) if any to check whether their spectacles were effective. This was done by a trained Ophthalmic Attendant. The VA of each participant was noted on a recording sheet (see section H of the questionnaire) bearing the same serial number on the questionnaire that was filled by the participants.

(iv) *Clerking of the respondents:*

This was done by the Optometrists. Bio-data and medical history of each participant were taken. The data collected included age, sex, date of last eye examination, subject taught by the respondents and the chief ocular (eye) complain by the respondents. Others were

history of any eye disease or defect, history of hypertension, diabetes or any other systemic disease. Also included was the respondents' family history of eye problem(s).

(v) *Examination of the anterior and posterior segments of the respondents' eyes:* This was done by the Optometrists. Penlights were used to evaluate the anterior segment, followed by evaluation of the posterior segment with the aid of the ophthalmoscopes. Evaluation was done to rule out any abnormality in both segments.

(vi) *Determination of the refractive status of the respondents' eyes:* This was carried out by the Optometrists. This was done using the trial frame while series of trial lenses were placed in front of the respondents' eyes to measure how they focused light using the hand-held retinoscope. The power of the lenses was then refined by the patient's responses to determine the lenses that allowed the clearest vision. Using the information obtained from these tests, the teachers found with REs (those that met the criteria used in this study) were worn with the spectacle prescription (lenses) on a trial frame that gave the best corrected distance vision and asked to walk some distances with it to check for kinaesthesia effect. This was done to ensure they could walk comfortably with their new prescription after which they were given a written spectacle prescription.

The power of the teachers' spectacles brought to the examination venue was checked by hand neutralization. Participants found with ocular pathology that needed further examination were referred to the Federal Medical Centre, Abeokuta for further management. The participants were educated and/or counseled as required.

The cut-offs (subjective findings) for the various REs used in this study and taken into consideration asthenopic compliants were as follows: myopia = ≤0.25Dioptre sphere (Ds); hyperopia = ≥+0.25Ds and astigmatism = ≤-0.25Dioptre cylinder (Dcyl). The cut-off for presbyopia = an addition of ≥+1.00Ds to their best corrected distance prescription where required with an improvement of at least a line on the near visual acuity chart.

In this study myopia was classified as low (>-3.00), medium (-6.00 to -3.00) and high (<-6.00). Hyperopia was classified as low (<+2.00), medium (+2.00 to +5.00) and high (>+5.00). Astigmatism was classified as low (>-1.00), medium (-3.00 to -1.00) and high (<-3.00). Astigmatism was further classified based on the axis orientation: With-The-Rule astigmatism (20°-160°), Against-The-Rule astigmatism (70°-110°) and Oblique astigmatism (between 20° and 70° or between 110° and 160°).

3.11 Data Analysis and Presentation

The steps involved in data analysis included the following:

1. Serial numbers were written on copies of the questionnaire for easy identification and recall of any instrument with problems. This was done before administering the questionnaire copies to the participants
2. Data collected from the eye examination were documented on the recording sheet of the questionnaire (section H).
3. Data from the questionnaire survey and clinical examination were coded and entered into the computer using SPSS version 15.0. Data were later cleaned.
4. Using Pearson's correlation coefficient, the refractive error status of the respondents right eyes was found to be positively related with that of the left eyes ($r^2 = 0.948$; $p=0.01$). Therefore only the refractive error data of the right eyes were analyzed to avoid data duplication that could affect the significance of the result.
5. Data analysis was done using descriptive, student t-test, Chi-square, and Pearson's correlation statistics.
6. The questionnaire copies were stored in a place that was safe from destruction by water or fire and where unauthorized persons would not have access to them.
7. The findings are presented in Chapter 4.

3.12 Ethical Consideration

Ethical approval was received from the Hospital Research Ethics Committee, Federal Medical Centre, Idi-Aba, Abeokuta (see appendix IX). Permission was sought from the authorities of the schools used for the study. Consent of the participants was sought after imparting them with the purpose of the study, its importance and benefits to their health and profession. The teachers were told about measures put in place to ensure confidentiality throughout the study. Participation in the study was voluntary and participants were told that they could withdraw from the study at any time if they so wished.

3.13 Study Limitation

Participation in the vision screening was voluntary hence it is likely that only those with vision problems presented for the eye test. The findings from this study are based solely on data from ten public secondary schools. The scope of the study therefore limits the generalization of the findings to state and national levels. However, appropriate scientific

steps have been taken in analysing the data inorder to ensure the results could be used for intervention study.

CHAPTER FOUR

4.0 RESULTS

4.1 Respondents' Socio-Demographic Characteristics

Table 4.1 shows the basic socio-demographic characteristics of the respondents. The majority (63.2%) of them were females, 72.6% were married and most (95.4%) of them were Yorubas. Christians constituted 84.6% of the respondents. First degree topped (42.6%) the list of the highest level of education attained by the respondents, followed by holders of the HND (31%). Few (4.6%) of the respondents had post-graduate qualifications (MA/MSC/M.Phil). The other details are contained in the table. Figure 4.1 highlights the broad typologies of subjects assigned to respondents to be teaching. Arts teachers (32.6%) topped the list, closely followed by the Science teachers (30%). The mean age of the respondents was 38.9± 9.5 years with an age range of 20-58 years. The majority (31.8%) were within the age group of 30-39 years. The details are shown in table 4.2.

Table 4.1: Respondents' Socio-Demographic Characteristics

N = 500

Variables		N	%
Sex of respondent:			
	Male	184	36.8
	Female	316	63.2
Marital Status:			
	Single	132	26.4
	Married	363	72.6
	Divorced	3	0.6
	Widowed	2	0.4
Ethnic Group:			
	Yoruba	477	95.4
	Igbo	15	3
	Others	8	1.6
Religion:			
	Christianity	423	84.6
	Islam	77	15.4
Highest level of education:			
	NCE	28	5.6
	OND	81	16.2
	HND	155	31
	BSC/BA/BED	213	42.6
	MA/MSC/MPHIL.	23	4.6

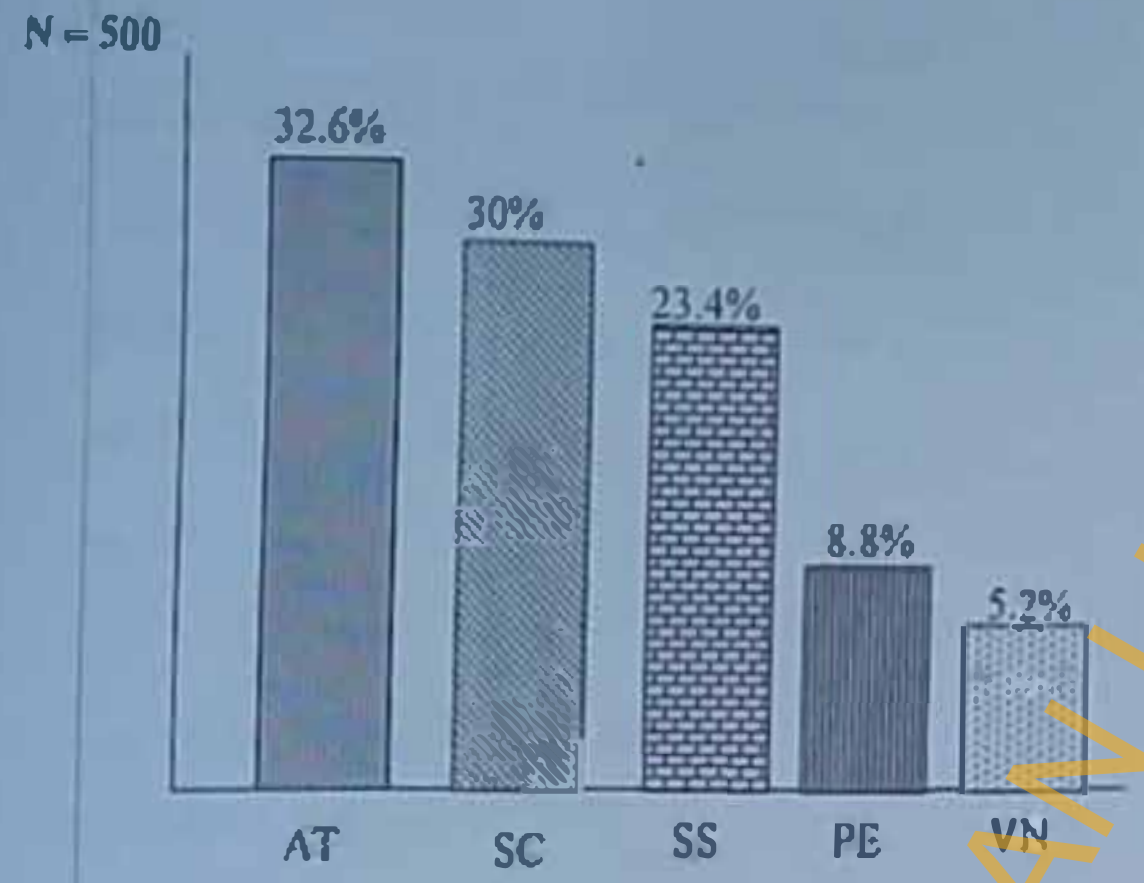

Figure 4.1: Subjects taught by the respondents

Key:

AT = Arts

SC = Science

SS = Social science

PE = Physical Education

VN = Vocational

Table 4.2: Age of respondents in years

N=500

Age Group (years) *	No	%
20-29	98	19.6
30-39	159	31.8
40-49	157	31.4
50-59	86	17.2

* Mean age of the respondents = 38.9 ±9.5

* Respondents' age range = 20–58

4.2 The Respondents' Family History of Use of Prescription Spectacles (UPS)

Presented in table 4.3 is the respondents' family history of use of prescription spectacles. The majority (72%) had a positive family history of UPS. Most (92%) of the respondents had 1-3 (mean = 2±1.2) family members who wore prescription spectacles.

Table 4.3: Respondents Family History of Use of Prescription Spectacles (UPS)

N = 500

Family history of UPS	N	%
Family history:		
Positive	360	72
Negative	140	28

4.2.1 Prevalence of Refractive Errors among the Respondents

Free eye screening was conducted among the respondents to determine the prevalence of RE(s). Over half (56.4%) of the respondents presented for the screening. Two respondents were excluded from the refraction test, one of whom had anterior uveitis post cataract surgery and the other, a glaucoma suspect. Objective and subjective refraction was performed on the respondents. The subjective findings that gave the Best Corrected Visual Acuity (BCVA) were recorded.

Most (95.4%) respondents had REs in form of hyperopia (6.4%), presbyopia (5.3%), myopia (1.4%), astigmatism (1.1%) and a combination of REs (81.2%). Very few (6.3%) of the respondents with RE(s) had antimetropia. Highlighted in table 4.4 is the detail of the various REs present in the screened respondents. The mean amounts of myopia, hyperopia, astigmatism and presbyopia were -1.4±-1.4, +0.70±045, -0.44±-0.33 and +2.00±0.45 respectively (see appendix V).

Table 4.4: Prevalence of Refractive Errors among the Screened Respondents

Variable	N = 282 N	%
Refractive error status:		
Positive	269	95.4
Negative	13	4.6
Type of refractive errors:		
Hyperopic astigmatism with presbyopia	87	30.9
Hyperopia with presbyopia	49	17.4
Hyperopic astigmatism	47	16.7
Hyperopia	18	6.4
Myopic astigmatism	19	6.7
Presbyopia	15	5.3
Myopic astigmatism with presbyopia	14	4.9
Myopia with presbyopia	6	2.1
Myopia	4	1.4
Astigmatism with presbyopia	7	2.5
Astigmatism	3	1.1
Emmetropia*	13	4.6

*= Two out of the 13 respondents were exempted from the refraction test

4.3 Awareness and Knowledge about Refractive Errors and Prescription Spectacles

The majority (75.2%) had never heard about refractive error (RE). Optometrists topped (10.8%) the list of respondents' sources of information on RE, followed by Ophthalmologists (10.2%) and the television (7.2%). (see table 4.5 for details). Most (52%) of the respondents had always heard about prescription spectacles (table 4.6 shows other responses). A majority (41.4%) had their information on prescription spectacles from Optometrists, followed by the respondents' relations (40.6%), friends (40.4%), Ophthalmologists (38.4%) and the television (30%). Listed in table 4.7 are the respondents' sources of information on prescription spectacles.

Table 4.5: Respondents Source of Information on Refractive Errors

Variable	No	%
Awareness of the term Refractive Error (RE) (N=500):		
Yes	124	24.8
No	376	75.2
Sources of information on RE (n=124):*		
Optometrist	54	10.8
Ophthalmologist	51	10.2
Television	36	7.2
Newspaper	30	6
Friends	27	5.4
Relative	25	5
Radio	22	4.4
Nurses	13	2.6
Physics textbook	4	0.8
Internet	1	0.2

* There were multiple responses

Table 4.6: Frequency of Hearing about Prescription Spectacles

N = 500

Frequency	No	%
Always	260	52
Occasionally	196	39.2
Rarely	43	8.6
Never	1	0.2

Table 4.7: Respondents' Sources of Information about Prescription Spectacles

N=499

Sources	N •	%
Optometrist	207	41.4
Relative	203	40.6
Friends	202	40.4
Ophthalmologist	192	38.4
Television	150	30
Radio	110	22
Newspaper	91	18.2
Nurses	63	12.6
Physics	4	0.8
Internet	1	0.2

• There were multiple responses.

The respondents were asked open-ended questions requesting them to state what they understood to be the main causes of presbyopia, myopia, hyperopia and astigmatism. Tables 4.8, 4.9, 4.10 and 4.11 show their responses respectively. The majority (45%) listed "*no idea*", followed by "*farsightedness*", (19.6%) as the cause of presbyopia. Only a few correctly listed "*aging*" (2.2%) and "*the inability of the lens to focus light rays on the retina*" (0.2%) as the main cause of presbyopia. Majority (36.8%) listed "*I don't know*" and (29.4%) "*shortsightedness*" as a cause of myopia. Few of the respondents correctly stated "*eyeball too long*" (2.8%) and "*hereditary*" (1.2%) as a cause of myopia. Many (46.2%) of the respondents did not have any idea of the cause of hyperopia and (23%) listed "*farsightedness*". The correct responses stated by the teachers as a cause of hyperopia were "*the eyeball too short*" (2.2%) and "*hereditary*" (1.4%). Most (68.6%) of the respondents did not have any idea of the cause of astigmatism. Only a few (1.2%) correctly mentioned "*uneven curative of the cornea/multiple rays not formed on one spot on the surface of the retina*".

Misconceptions of the cause of the various REs were also mentioned. These included "*reading under poor illumination*" (2%); "*exposure to sun/closeness to bright objects*" (1%); "*family/spiritual problems*" (0.6%) and "*too much thinking*" (0.6%).

Majority (60.8%) of the respondents correctly chose "*eyestrain*" as a symptom of presbyopia. Many (63%) correctly ticked "*difficulty copying from the blackboard*" as a symptom of myopia. Over half (55%) correctly ticked "*pain in the eyes*" as a symptom of hyperopia and 56.6% correctly chose "*skipping of lines when reading as a symptom of astigmatism*". Several other signs/symptoms which are not due to presbyopia, myopia, hyperopia and astigmatism were also chosen. The other details are shown in tables 4.12, 4.13, 4.14 and 4.15 respectively.

Prescription spectacles topped the lists of the ways of correcting myopia (78.2%), presbyopia (76.8%), astigmatism (72.8%) and hyperopia (77.4%) chosen by the respondents. This is distantly followed by eye operation- 27.8%, 23.2% and 21.8% for myopia, hyperopia and astigmatism respectively. There were misconceptions of the ways of correcting refractive errors. These included: non-use of lantern/candle to read (54.2%) for correcting presbyopia; intake of yeast for correcting myopia (43%) and hyperopia (43.8%). Tables 4.16, 4.17, 4.18 and 4.19 highlight the respondents' knowledge on ways of correcting myopia, presbyopia, astigmatism and hyperopia respectively.

Table 4.8: Respondents' Perceived Cause(s) of Presbyopia

N = 500

Causes	N	%
No idea	225	45
Forsightedness	98	19.6
Too long eyeballs	75	15
Eye problem	58	11.6
Aging*	11	2.2
Refractive error	10	2
Reading under poor illumination	7	1.4
Because the prints are tiny	5	1
Hereditary	4	0.8
Astigmatism	3	0.6
Oily food/groundnut oil	3	0.6
Inability of the lens to focus light rays on the retina*	1	0.2

* Correct responses

Table 4.9: Respondents' Perceived Cause(s) of Myopia

Causes	N =500	
	N	%
I don't know	184	36.8
Short sightedness	147	29.4
Farsightedness	65	13
Eye problem	38	7.6
Eyeball too long *	14	2.8
Malnutrition	13	2.6
When the image of a distant object is formed before the retina	12	2.4
Age	8	1.6
Hereditary *	6	1.2
Sun/closeness to bright objects	5	1
Cataract	4	0.8
Family/spiritual problems	3	0.6
Too much closeness to television at a tender age	1	0.2

* Correct responses

Table 4.10: Respondents' Perceived Causes of Hyperopia

N = 500

Causes of Presbyopia	No	%
No idea	231	46.2
Farsightedness	115	23
Image formed before the retina	49	9.8
Bad sight	47	9.4
Malnutrition / oily food	14	2.8
The eyeball too short *	11	2.2
Aging	8	1.6
Hereditary *	7	1.4
Uneven curvature of the cornea / astigmatism	6	1.2
The light rays diverge and the image is formed behind the retina	5	1
Cataract	3	0.6
Too much thinking	3	0.6
Refractive error	1	0.2

* Correct responses

Table 4.11: Respondents' Perceived Causes of Astigmatism

Causes	N = 500	
	No	%
No idea	343	68.6
Eye problem	50	10
Astigmatism	40	8
Eye disease	16	3.2
Myopia	11	2.2
Sign of old age	7	1.4
Uneven curvature of the cornea / multiple rays not formed on one sport on the surface of the retina *	6	1.2
Malnutrition	5	1
When the eyeball is too short	5	1
Imbalance of the lenses/ lenses are weak/malfunctioning of the glasses	5	1
Environmental problems like dust and flame	2	0.4
Roughness of the cornea *	1	0.2

* Correct responses

Table 4.12: Respondents' Knowledge of Signs/Symptoms of Presbyopia

N = 500

Signs/Symptoms	Responses (%)		
	Yes	No	Don't know
Eyestrain	*304	58	138
	(60.8)	(11.6)	(27.6)
Difficulty threading needle	*285	78	137
	(57)	(15.6)	(27.4)
Difficulty signing cheque	*110	227	163
book	(22)	(45.4)	(32.6)
Tearing/lacrimation	81	*200	219
	(16.2)	(40)	(43.8)
Fever	73	*220	207
	(14.6)	(44)	(41.4)

* Correct responses

Table 4.13: Respondents' Knowledge of Signs/Symptoms of Myopia

N = 500

Signs/Symptoms	Respouses (%)		
	Yes	No	Don't know
Difficulty copying from the	*315	88	97
black board	(63)	(17.6)	(19.4)
Bringing reading material	*283	115	102
close to the eye to see clearly	(56.6)	(23)	(20.4)
Squinting of the eyes	*282	100	118
	(56.4)	(20)	(23.6)
Itching	194	*122	184
	(38.8)	(24.4)	(36.8)
Redness of the eyes	164	*142	194
	(32.8)	(28.4)	(38.8)

* Correct responses

Table 4.14: Respondents' Knowledge of the Signs/Symptoms of Hyperopia

N = 500

Signs/Symptoms	Responses (%)		
	Yes	No	Don't know
Pain in the eyes	*275	88	137
	(55)	(17.6)	(27.4)
Rubbing of the eyes	252	*101	147
	(50.4)	(20.2)	(29.4)
Headache	*242	109	149
	(48.4)	(21.8)	(29.8)
Watering of the eyes	*227	117	156
	(45.4)	(23.4)	(31.2)
Tired eyes	*185	145	170
	(37)	(29)	(34)

* Correct responses

Table 4.15: Respondents' Knowledge of the Signs/Symptoms of Astigmatism

N = 500

Signs/Symptoms	Responses (%)		
	Yes	No	Don't know
Skipping of lines when	*283	70	147
readzing	(56.6)	(14)	(29.4)
Tilting of the head	*235	83	182
	(47)	(16)	(36.4)
Headache	*183	109	208
	(36.6)	(21.8)	(41.6)
Redness of the eyes	*144	124	232
	(28.8)	(24.8)	(46.4)
Fever	78	*176	246
	(15.6)	(35.2)	(49.2)

* Correct responses

Table 4.16: Respondents' Knowledge of Mode of Myopia Correction

N = 500

Mode of correction	Responses (%)		
	Yes	No	Don't know
Use of prescription spectacles	*391	33	76
	(78.2)	(6.6)	(15.2)
By taking yeast	215	*137	148
	(43)	(27.4)	(29.6)
By eye operation	*139	209	152
	(27.8)	(41.8)	(30.4)
By taking local herbs	40	*292	168
	(8)	(58.4)	(33.6)
None of the above	8	*418	58
	(1.6)	(83.6)	(14.8)

* Correct responses

Table 4.17: Respondents' Knowledge of Mode of Presbyopia Correction

N = 500

Mode of correction	Responses (%)		
	Yes	No	Don't know
Use of prescription spectacles	*384	50	66
	(76.8)	(10)	(13.2)
By not reading with	271	*135	94
lantern/candle	(54.2)	(27)	(18.8)
Eye operation	*104	236	160
	(20.8)	(47.2)	(32)
By taking local herbs	39	*302	159
	(7.8)	(60.4)	(31.8)
None of the above	8	*434	58
	(1.6)	(86.8)	(11.6)

* Correct responses

Table 4.18: Respondents' Knowledge of Mode of Astigmatism Correction

N = 500

Mode of correction	Responses (%) Yes	No	Don't know
Use of prescription spectacles	*364	43	93
	(72.8)	(8.6)	(18.6)
Through the use of medicine	272	*113	115
	(54.4)	(22.6)	(23)
Eye operation	*116	212	172
	(23.2)	(42.4)	(34.4)
None of the above	7	*419	74
	(1.4)	(83.8)	(14.8)

* Correct responses

Table 4.19: Respondents' Knowledge of Mode of Hyperopia Correction

N = 500

Mode of correction	Responses (%) Yes	No	Don't know
Use of prescription spectacles	*387	30	8.3
	(77.4)	(6)	(16.6)
By taking yeast	219	*131	150
	(43.8)	(26.2)	(30)
Eye operation	*109	221	170
	(21.8)	(44.2)	(34)
By taking local herbs	30	* 295	175
	(6)	(59)	(35)
None of the above	4	*416	80
	(0.8)	(83.2)	(16)

* Correct responses

A 100-point knowledge scale or marking scheme was used for assessing the respondents' knowledge on the cause, signs/symptoms and treatment of refractive errors (see appendix II for the scale). The respondents' overall mean knowledge score was 31.7±13.1. However, 78.8% scored between 0–10, and only one percent (1%) scored between 96-100 (see table 4.20 for details).The male teachers had a mean score of 32.4±13.0, while the female teachers had a mean knowledge score of 31.3±31.3. The difference between the mean scores of the two groups was not statistically significant (table 4.21). The screened respondents (diagnosed of having RE) without spectacles had a mean score of 30.5±13.5, while those with spectacles had a mean score of 32.2 ± 12.6. The difference between the groups was not statistically significant (table 4.21). The respondents with a positive family history of wearing prescription spectacles had a mean knowledge score of 31.7 ± 12.7, while those without a family history had a mean score of 31.7 ± 14.2. The difference between the two groups was not statistically significant (table 4.21).

Table 4.20: Distribution of Respondent's Level of Knowledge by Poor, Fair and Good

Level of knowledge	No	N = 500 (%)
Poor +	374	74.8
Fair ++	121	24.2
Good +++	5	1

+ Poor = 0 – 40
++ Fair = 41 – 55
+++ Good = 56 – 100
* Mean knowledge score = 31.7 ± 13.1
** Respondent's knowledge score range = 0 – 65

Table 4.21: Comparison of Respondents' Mean Knowledge Score by Sex, Use of Spectacles and Family History of Wearing Spectacles

Variables	Number	Mean score	SD	t – value	p – value
Sex *					
Male	184	32.4	13	0.906	>0.05
Female	316	31.3	13.3		
Use of spectacles **					
Without spectacles	151	30.5	13.6	-0.926	>0.05
With spectacles	118	32	12.6		
*Family history of wearing spectacles**					
Positive	360	31.5	12.7	-0.524	>0.05
Negative	140	32.2	14.1		

*N = 500

**N = 269- screened respondents with RE(s)

4.4 Attitudes towards the Use of Prescription Spectacles

Majority (58%) of the respondents disagreed with the attitudinal statement, *'teachers that wear prescription spectacles encounter problems with their sight when teaching'*. A negative attitude expressed by 53.4% of the respondents was that the *'wearing of prescription spectacles should be done once in a while so that one will not depend on them'*. However, 69.2% agreed to the statement that *'it is a bad habit not to wear spectacles as prescribed by the doctor'*. (See details in table 4.22).

Table 4.22: Respondents' Attitude towards the Use of Prescription Spectacle

Attitude towards use prescription spectacles	Responses			
	Agree (%)	Not sure (%)	Disagree (%)	Total (%)
Teachers that wear prescription spectacles encounter problems with their sight when teaching	79 (15.8)	131 (26.2)	290 (58)	500 (100)
Wearing of prescription spectacles should be done once in a while so that one will not depend on them	267 (53.4)	42 (8.4)	191 (38.2)	500 (100)
It is a bad habit not to wear glasses as prescribed by the doctor	34 6 (69.2)	48 (9.6)	106 (21.2)	500 (100)
Spectacles worsens the vision with prolong use because the eyes would then not be able to see well without the spectacles	280 (56)	39 (7.8)	181 (36.2)	500 (100)

4.5 Belief Concerning Refractive Errors and Prescription Spectacles

About half (50.6%) of the respondents had the wrong belief that, *'difficulty reading small letter prints at near (presbyopia) is not a serious eye defect'*. Presbyopia is known to affect the adult population (40 years and above) particularly teachers whose work depends mostly on reading and writing. Infact presbyopia was observed to affect 63.1% of the screened respondents. Majority (63%) of the teachers had the wrong belief that, *'difficulty seeing for objects (Myopia) cannot affect one's career as a teacher so it can be ignored'*. Myopia cannot be ignored particularly when the amount is enough to make the teacher unable to see clearly writings/figures on the screen/ board at academic workshops and seminars. It cannot be ignored also when the amount can hinder a teacher from recognizing the faces of the students. The other details are presented in table 4.23

Table 4.23: Respondents' Belief Concerning Refractive Errors and Prescription Spectacle

Belief	Responses			
	Agree (%)	Not sure (%)	Disagree (%)	Total (%)
Difficulty seeing far objects clearly (myopia) is a serious eye defect that can lead to blindness when not treated	204 (40.8)	180 (36)	116 (23.2)	500 (100)
Difficulty reading small letter prints at near (presbyopia) is not a serious eye defect	81 (16.2)	166 (33.2)	253 (50.6)	500 (100)
Difficulty seeing for objects (myopia) cannot affect one's career as a teacher so it can be ignored	77 (15.4)	108 (21.6)	315 (63)	500 (100)
All cases of eye problems are hereditary	48 (9.6)	137 (27.4)	315 (63)	500 (100)
Wearing of prescription spectacles spoils the eyes	146 (29.2)	118 (23.6)	236 (47.2)	500 (100)

4.6 Perception of Use of Prescription Spectacles

The perception of 84.2% of the respondents was that people do not wear prescription spectacles for fashion; only 3.6% shared the perception. Majority (60.2%) of the respondents had the perception that wearing prescription spectacles causes sunken eyes, a perception which is scientifically untrue. Only 20.6% had a contrary opinion. Many (43.6%) respondents were of the perception that prescription spectacles do not make people look more beautiful or handsome; few (27.4%) had a contrary perception (table 4.24).

Majority (72.4%) did not support the view that it is improper for children in secondary school to wear spectacles because they are young. Only a few (9.8%) agreed. Over half (58.2%) were of the opinion that most teachers do not have the skill for educating their pupils/students about eye care, while 20.6% were of the contrary opinion (table 4.24).

Table 4.24: Respondents Perception of the Use of Prescription Spectacles

N = 500

	Responses		
	Agree (%)	Not sure (%)	Disagree (%)
People that wear prescription spectacles, wear it for fashion	18 (3.6)	61 (12.2)	421 (84.2)
Wearing of prescription spectacles makes one look older than his/her age	192 (38.4)	105 (21)	203 (40.6)
Prescription spectacles makes people look more beautiful or handsome	137 (27.4)	145 (29)	218 (43.6)
Wearing of prescription spectacles causes sunken eyes	301 (60.2)	96 (19.2)	103 (20.6)
It is improper for children in primary school to wear spectacles because they are too young	90 (18)	101 (20.2)	309 (61.8)
It is improper for children in secondary school to wear prescription spectacles because they are young	49 (9.8)	89 (17.8)	362 (72.4)
Most teachers do not have the skill for educating their pupils or students about eye care	291 (58.2)	106 (21.2)	103 (20.6)
Most teachers have no skill for identifying students with eye problems	276 (55.2)	92 (18.4)	132 (26.4)

4.7 Respondents Practices Relating to Eye Examination and Use of Spectacles

The respondents were asked whether they had ever visited an eye care practitioner. Their responses are highlighted in table 4.25. Less than half (43.0%) had visited an Optometrist, while 37.2% had ever visited an Ophthalmologist. Over half (55.6%) of those that had visited an eye care practitioner had been told they needed to be wearing prescription spectacles. Of the 78 that had done so, 75.2% claimed they had commenced wearing of the prescribed spectacles (table 4.25).

The reasons adduced by the remaining 24.8% for not wearing the spectacles included the following: *"I felt my sight was good/didn't need spectacles"* (34.8%), *"I couldn't afford the glasses/I needed to take care of my children's school fees"* (31.9%) and *"I don't like to wear glasses"* (26.1%) (see table 4.26 for other details).

Table 4.25: Respondents' Practices Relating to Eye Examination and Use of Spectacles

Practice	No	(%)	Total No (%)
Visited an Optometrist:			
Yes	215	43	500(100)
No	285	57	
Visited an Ophthalmologist:			
Yes	186	37.2	500(100)
No	314	62.8	
Ever been told the need to wear prescription spectacles:			
Yes	278	55.6	500(100)
No	222	44.4	
Commenced wearing of the prescription spectacles:			
Yes	209	75.2	278(100)
No	69	24.8	

Table 4.26: Reason Adduced for not Wearing the Spectacles Prescribed

N = 69

Reasons	No	%
I felt my sight was good/didn't need spectacles	24	34.8
I couldn't afford the glasses/ I needed to take care of my children's school fees	22	31.9
I don't like to wear glasses	18	26.1
Not been able to go to the doctor to collect my glasses due to time constraint	2	3.0
I will get it soon	1	1.4
I felt it will improve since it has negligible effect	1	1.4
The problem disappeared	1	1.4

The respondents, who had been told they needed to be wearing spectacles, were asked whether they would prefer other options to spectacles for correcting refractive errors. Majority (61.2%) would prefer other options. Out of the 170 who preferred other options, 55.3% preferred prescribed medicine, very few (10.6%) preferred taking special diet while 10.6% did not specify any options (table 4.27 shows other details). The respondents were asked whether they were current wearers of prescription spectacles. Less than half (37.4%) of the entire study population were found to be using prescription spectacles at the period of the interview (see table 4.28). Among those who responded to the question: "where would you prefer to procure prescription spectacles?", 51.8% preferred private eye clinics, followed by government eye clinics (38.4%). The other details are shown in table 4.28. The respondents were further asked to state reasons for their choice. Reasons adduced by the respondents for patronizing private eye clinics included: *time saving/prompt attention/condition of service is faster than government clinic*" (37%);"*Easily accessible/because it is close to my residence*" (15.9%); "*They have variety (wide range) of frames/frames*" and "*lenses not available in government clinic*" (15.9%). (See table 4.29 for other details).

The reasons given by the respondents for patronizing government clinics included: "*They have qualified eye personnel/expert Optometrists*" (42.9%) and"*The services are cheap and affordable compared with private clinics*" (34.7%). The other details are highlighted in table 4.30. Reason for patronizing street vendors to procure spectacles included: "*Glasses are affordable*" (56.5%); "*Time saving*" (30.4%) (See table 4.31). Two respondents preferred their school premises. One stated "*The examiner is a known certified eye doctor*" and the other stated that "*It is convenient*" as adduced reason. The pattern of spectacle use among the respondents wearing spectacles is highlighted in figure 4.2. Many (44.9%) used their spectacles when reading only; 35.8% used spectacles when viewing distant objects and reading and 0.5% when driving only.

The respondents were requested to state where preferred to have their eyes examined. The respondents preferred places are presented in figure 4.3. Top on the list was government hospitals (61.8%). The respondents' were further asked to adduce reasons for their choice. Reasons for preferring the government hospitals included the following: "*Government hospitals have qualified eye care professionals*" (26.5%), "*Government hospitals are reliable*" (24.5%), "*To have access to the necessary gadgets/equipment*"

(20.4%). Table 4.32 shows the other details. The respondents' reasons for choosing private eye clinics included: "*less waiting time/they pay urgent attention to their clients*" (45.8%), "*for proper treatment*" (22.5%) and "*they have competent eye care professionals*" (11.3%). Table 4.33 highlights the other details.

The respondents' reasons for choice of their school to have a routine eye examination included the following: "*It will be convenient/keeps the teacher within his or her work premises*" (36.7%) and "*Because of time constraint/it helps to reduce the time the teacher is away from his/her duty post*" (30.0%). (See table 4.34).

Table 4.27: Responses Relating to Whether Respondents Would Prefer other Options to Spectacles for Correcting Refractive Error and the Options Preferred

Variables	No	(%)	Total No (%)
Would you prefer other option(s) to spectacles			278(100)
Yes	170	61.2	
No	108	38.8	
Other options preferred by the respondents for correcting refractive error:			170(100)
Prescribed medicine	94	55.3	
Taking special diet in correlation with the eye defect	18	10.6	
Did not specify other options	18	10.6	
Taking yeast	12	7.1	
Wearing contact lenses	9	5.3	
Eye surgery	7	4.1	
Use of traditional medicine/onions	7	4.1	
Medical counseling and advice	3	1.8	
Spiritual means/prayers	2	1.2	

Table 4.28: Respondents' Use of Prescription Spectacles and Preferred Place to Procure PS

Variables		No	(%)	Total No (%)
Current use of prescription spectacles:				500(100)
	Yes	187	37.4	
	No	313	62.6	
Respondents' preferred places for procuring prescription spectacles:				255(100)
	Private eye clinic	132	51.8	
	Government eye clinic	98	38.4	
	Street vendor (shop)	23	9	
	School premises	2	0.8	

Table 4.29: Respondents' Adduced Reason(s) for Patronizing Private Clinics to Procure Prescription Spectacles

Reason(s)	N = 132	
	No	%
Time saving/prompt attention/condition of service is faster than government clinic	49	37
Easily accessible/because it is close to my residence	21	15.9
They have variety (wide range) of frames/frames and lenses not available in government clinic	21	15.9
Good quality medical equipments/they are reliable	11	8.3
Patients are adequately taken care of/ proper treatment	17	12.9
One will be able to express one's feeling/they are friendly	5	3.9
Recommended based on good services provided by the clinic/I was advised to go there	3	2.3
Too much stress in government clinic	3	2.3
My father owns the eye clinic/the Optometrist is a family friend	2	1.5

Table 4.30: Respondents' Adduced Reason(s) for Patronizing Government Clinics to Procure Prescription Spectacles

Reason(s)	N = 98	
	No	%
They have qualified eye personnel/expert Optometrists	42	42.9
The services are cheap and affordable compared with private clinics	34	34.7
Government health facilities are safer	15	15.3
Government health facilities have good equipments	7	7.1

Table 4.31: Respondents' Adduced Reasons for Patronizing Street Vendors for the Procurement of Prescription Spectacles

Reason(s)	N = 23	
	No	%
Glasses are affordable	13	56.5
Time saving	7	30.4
Got the answer to the problem	2	8.7
I saw others doing so I joined them	1	4.4

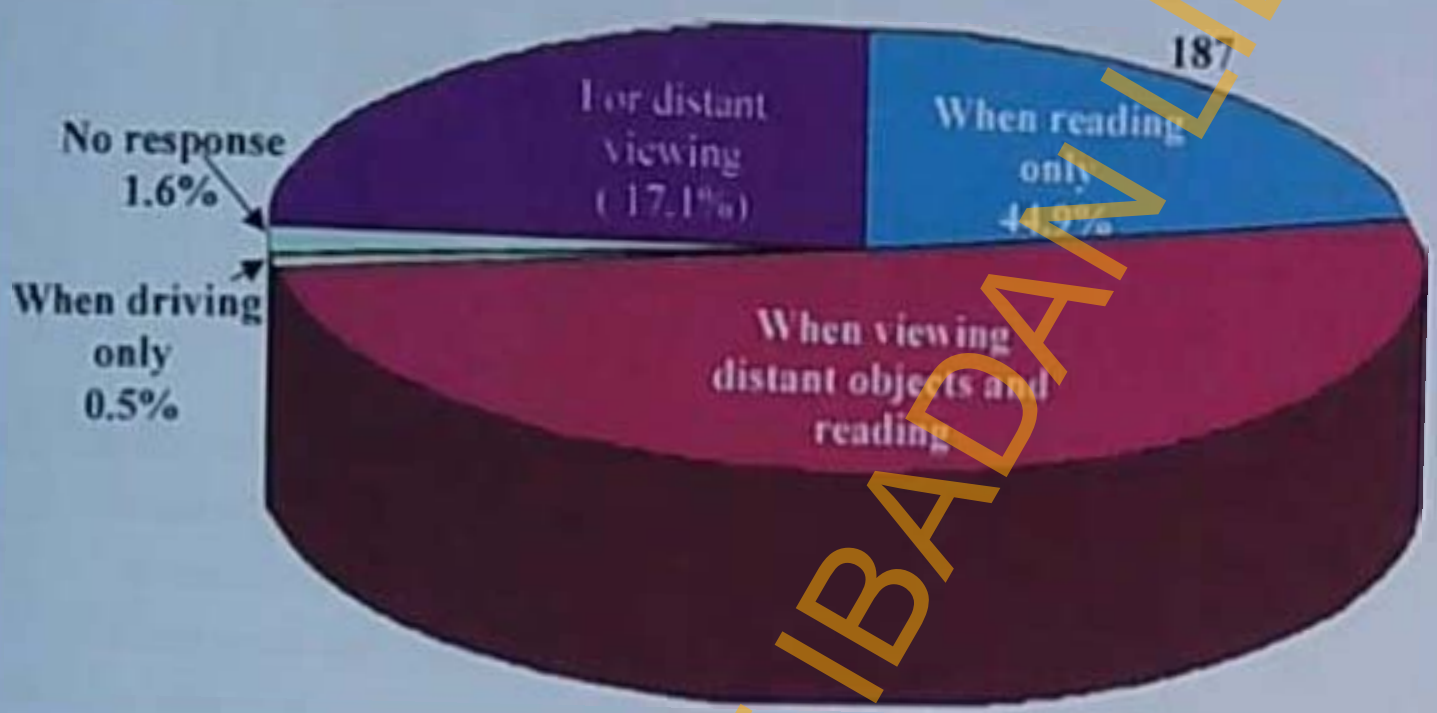

Fig 4.2: Frequency of use of prescription spectacles among the respondents

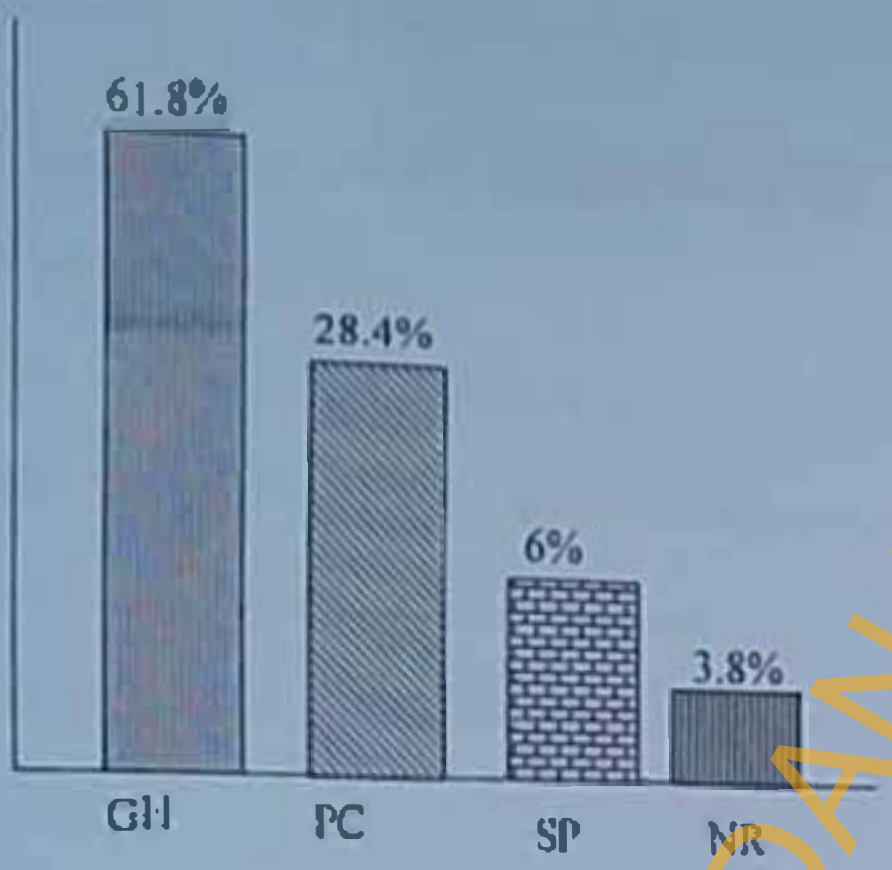

Fig 4.3: Places preferred for routine eye examination by respondents

GH = Government hospitals

PC = Private clinics

SP = School premises (respondents' work place)

NR = No response

Table 4.32: Reason(s) for Choice of Government Hospitals for Eye Examination among the Respondents

Reason(s)	N = 309	
	No	%
Government hospitals have qualified eye care professionals	82	26.5
Government hospitals are reliable	75	24.5
To have access to the necessary gadgets/equipment	63	20.4
There is a reduction or discount in the expenses/charges are affordable	63	20.4
Are safer due to presence of qualified professionals	26	8.4
Because most private clinics do not always release the results of the eye tests	6	1.9
For proper monitoring/for follow-up examination	3	1
Recommended by an uncle	1	0.3

Table 4.33: Reasons for Choice of Private Clinics for Routine Eye Examination

Reason(s)	N = 142	
	No	%
Less waiting time/they pay urgent attention to their clients	65	45.8
For proper treatment	32	22.5
They have competent eye care professionals	16	11.3
Their utilization is stress free/one can go at his or her own time	11	7.8
They are patient friendly	9	6.3
For good follow-up	8	5.6
Neither (an Ophthalmologist) owns the clinic	1	0.7

Table 4.34: Reason(s) for Choice of School Premises for Routine Eye Examination

Reason(s)	N = 30	
	No	%
It will be convenient/keeps the teacher within his or her work premises	11	36.7
Because of time constrain/it helps to reduce the time the teacher is away from his or her duty post	9	30
If the examiner is a qualified eye care professional	1	3.3
No specific reason	9	30

The respondents were requested to respond to a list of behavioural statements. Their responses are highlighted in table 4.35. The majority (64.6%) of the respondents did not visit the eye doctor regularly because they could still perform their daily activities. However, only (30.8%) said they did not visit the eye doctor because they were not likely to have an eye problem that requires the wearing of prescription spectacles. Majority (62.2%) stated they did not visit the hospital for eye screening regularly because the waiting time to see the eye doctor is too long.

Table 4.35: Recommended Spectacle Use Practices/Behavior among Respondents

Practice/ Behaviour	Responses		N=500
	Yes (%)	No (%)	
Do not visit the eye doctor regularly because I can still perform my daily activities	323(64.6)	177(35.4)	
Do not visit the eye doctor regularly because the waiting time is too long	311(62.2)	189(37.8)	
Do not visit the eye doctor regularly because it is too expensive to change glasses	154(30.8)	346(69.2)	
Not visited the hospital to test for glasses because am not likely to have an eye problem that requires the wearing of prescription spectacles	154(30.8)	346(69.2)	
Do not visit the eye doctor regularly because my sight is stable and do not need to change my spectacles	148(29.6)	352(70.4)	
Do not visit the eye doctor regularly because I do not have time	100(20)	400(80)	
Do not visit eye doctor regularly because I had a bad experience with an eye doctor.	41(8.2)	459(91.8)	
Do not visit the eye doctor regularly because I do not need perfect vision	41(8.2)	459(91.8)	

CHAPTER FIVE

5.0 DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 DISCUSSIONS

5.1.1 Socio-Demographic Information of Participants

A total of 500 public secondary school teachers from ten schools participated in this present study. The study sample consisted of more females (63.2%). The gender difference is not due to a sampling bias; rather the phenomenon is a pattern that has been noted in the teaching profession in Nigeria. Studies conducted in Uyo, Akwa Ibom (Christopher, Eye and Anthony, 2012), Ondo and Ekiti (Popoola 2009) and Delta State (Oghuvbu, 2008) attest to this pattern of variation; more females than males were teachers.

The mean age of the participants was 38.9 ± 9.5 years, implying that they were mostly adults.

5.1.2 Family History of Using Prescription Spectacles

A majority of the participants claimed they had family members who wore glasses and the mean numbers of family members who wore prescription spectacles was 2.0 ±1.2. Forty-three percent of those who had positive family spectacle history were current wearers of spectacles while only 22.9% of those without family spectacle history had prescription spectacles. The screening test conducted showed that 74.3% of the participants with REs had family members wearing prescription spectacles.

The findings of this present study suggest a relationship between REs and heredity. Previous studies conducted in India, Malaysia, Pakistan and Germany have revealed that REs could be inherited. For instance Prema (2011), Pavithra, Maheshwaran and Rani (2013) and Hashim, Tan, WH and Ibrahim (2008) in their studies reported a statistically significant association between positive family (Parental or Siblings) spectacle use history and the occurrence of RE(s). A strong positive correlation between family history of wearing spectacles and RE was also observed by Ali, Ahmad and Ayub (2007) in a study conducted in Pakistan. Jobke, Kasten and Vorwerk (2008) in their study in Germany reported a high correlation between the SE of the children and their parents ($p=0.000$).

5.1.3 Awareness of Refractive Errors and Prescription Spectacles

In this present study, awareness of "RE" and "prescription spectacles" refers to "having heard". The majority (75.2%) of the participants were not aware of the term "refractive error" but all except one (0.2%) were familiar with prescription spectacles. Optometrists and Ophthalmologists were the reported commonest sources of information on RE among those who had heard of RE.

In comparison with other findings from studies conducted among school teachers, the proportion of participants in this present study that were aware of RE was quite lower. Chew, Reddy and Karina (2004) conducted a study among University academic staff in Malaya and noted that 75.3% of their participants had heard of the three REs (Myopia, Hyperopia, and Astigmatism). The reason for this disparity could be that University academic staff is expected to be more knowledgeable than secondary school teachers. A high level of awareness of prescription spectacles was also noted among patients who attended free eye screening camp and Uma eye clinic in Chennai where 66.7% of the population had heard of prescription spectacles (Chawla and Rovers, 2010).

The study by Rosman, Wong, Wong and Saw (2009) revealed a much higher level of awareness of myopia (79.5%) and hyperopia (79.2%) among Singaporean adults with myopia and hyperopia respectively. While awareness on astigmatism was reported to be quite low (7.7%) among the astigmatism sufferers.

The low level of awareness of RE observed in this present study maybe due to the fact that a more technical term, "refractive error" was used rather than nearsightedness and farsightedness as seen in the study conducted in Saudi Arabia by Aldebasi (2011). The reason may also be that the question on awareness was not directed only to those with REs as observed in the study from Singapore by Rosman, Wong, Wong and Saw (2009).

This study shows that males (28.3%) were more aware of RE than the females (22.8%). A higher proportion of the teachers with a family history of RE (27.9%) had higher awareness of RE than those without RE (16.3%). The highest proportion of the teachers that were aware of the term RE was among the Science teachers (40.7%) and this may be due to their knowledge of physics.

5.1.4 Knowledge about Refractive Error

The overall mean knowledge score of the entire study population was 31.7±13.1, with a maximum score of 65 (table 4.20). Gender was not a significant factor affecting knowledge in this study. This agrees with the findings of the study from Singapore by Rosman, Wong, Wong and Saw (2009) but differs from the findings of the study done in Malaya where the females were reported to be significantly more aware and knowledgeable than the males (Chew, Reddy an Karina; 2004).

It was also noted in this study that, having a family history of RE was not a factor associated with knowledge of RE. The findings from Malaya (Chew, Reddy and Karina, 2004) differed from the result of this study in that, awareness and knowledge of RE(s) was found to be significantly associated with a family history of RE(s). It was also observed, among the screened participants with RE(s) that the mean knowledge score did not differ significantly between those who had a pair of prescription spectacles (32.0 ± 12.6) and those without a pair of spectacles (30.5 ± 13.6) (table 4.21). This implies that both groups have the same health education need relating to knowledge of RE.

The mean knowledge score of teachers in the various disciplines (Science, Arts, Education, Social Sciences and Vocational) did not differ significantly ($p>0.05$). This differs from the population from India (Dhull, Dhull, Hooda and Nidhi; 2003). Though not comparable to the teachers in this study due to the very small sample size (N=9), all (3) science teachers were reported to have high level of awareness about RE(s) and satisfactory knowledge regarding common symptoms of uncorrected RE(s) and treatment methods.

The proprotion of respondents who were able to give the correct response to the cause of myopia, hyperopia, presbyopia and astigmatism were 4%, 3.6%, 2.4% and 1.8% respectively. The teachers were able to distinguish more correctly the signs/symptoms of myopia followed by hyperopia, presbyopia and astigmatism. It agrees with the findings of the study in Sao Paulo where the school teachers distinguished more accurately the symptoms of myopia (70.8%) than those of hyperopia (42.9%) and Astigmatism (40.9%) (Armond, Temporini and Alves; 2001). It also agrees with the findings of the study in Michigan (Hinkley, Schoone and Ondersma; 2011) where a higher percentage of the

school teachers gave the most common signs associated with uncorrected myopia than those of hyperopia and astigmatism.

Though not significant, among the screened participants, a higher percentage of the myopes were found to be more knowledgeable than the hyperopes on the signs/symptoms of hyperopia and myopia. This preponderance of the myopes being more knowledgeable than the hyperopes could be due to the fact that myopes have been known to be more intelligent than hyperopes. Reports from previous studies on relationship between REs and higher intelligence quotient (IQ) have shown that higher IQ may be associated with myopia (independent of books read per week) in school children (Czepita, Lodygowska, Czepita, 2008; Saw, Tan, Fong, Chia, Koh, Tan and Stone, 2004). The extent to which this is true among adults such as teachers has not been well studied.

5.1.5 Attitude Towards Using Prescription Spectacles

Refractive error has been identified as one of the remediable causes of visual impairment (VI) that can be corrected with the use of prescription spectacles which is the simplest and cheapest of all treatment options. For the RE to be corrected, the patients must wear their glasses as prescribed by the Optometrist. The responses of the participants in this study that prolong use of glasses worsens the vision and that it should be worn once in a while to avoid dependence (table 4.22) indicates the likelihood of not using recommended glasses as appropriate. This compares with the findings from the study by Yasmin (2007) where 69% of the participants tried to avoid the use of glasses because of the misconception that using spectacles would cause their vision to deteriorate.

A lower proportion (30.1%) of the population from Dakshina (Savur, 2011) said continuous use of glasses would increase the power of the lens (that is progressively increase the RE). In cases of progressive RE, the signs and symptoms get worse and the patient would require a higher amount of power to see better. Such a patient if previously using spectacles and not well educated by the Optometrist about the refractive status of the eye may assume the vision had deteriorated as compared to when he/she started using the spectacles. The implication is that patient education is crucial in promoting adherence to the use of prescription spectacles and in helping to tackle the misconceptions associated with the wearing of spectacles.

5.1.6 Beliefs Relating to Refractive Errors and Use of Prescription Spectacles

Many of the participants had the belief that myopia and presbyopia are serious eye defects that can affect vision when not corrected (table 4.23). This kind of perceived seriousness of the conditions has the potential in prompting sufferers to seek eye care. The results of this study are similar, but lower in percentage, to the findings from a study by Armond, Temporini and Alves (2001) where a 100% of the school teachers had the belief that REs are very serious disorders. It can be concluded that the participants, if well informed and have easy access to quality refractive error services would be willing to use prescription spectacles when diagnosed of RE. Only a few (9.6%) believed all eye problems are inherited. Though it is true that not all eye problems are inherited, it has been observed from studies conducted that RE (which can be inherited) constitutes one of the commonest eye problems amongst conjunctivitis and glaucoma presenting in eye clinics in Nigeria (Hassan, Olowookere, Adeleke and Adepoju, 2013; Oladigbolu, Abah, Chinda and Anyebe, 2010; Waziri-Erumeh and Omoti, 2009; Amadi, Nwoko, Ibe, Chukwuocha, Nwoga, Oguejinfor and Iloh, 2009). Consequent upon this result, RE is likely to be seen by the participants as an eye problem that cannot be inherited.

5.1.7 Perceptions of Prescription Spectacle Use

The teachers' perceptions of prescription spectacles may affect their adherence with wearing spectacles. Though 84.2% had the view that people do not wear prescription spectacles for fashion, 60.2% had the misconception that wearing of spectacles causes sunken eyes (table 4.24). This misconception may result in their not using spectacles if needed. In a study by Adeoti (2009) in Osogbo it was revealed that 23.8% of the participants said they would not use spectacles when prescribed because it causes sunken eyes. The perception that spectacles do not enhance one's look (though relative) (table 4.24) could be a hindrance to the use of spectacles among the participants in this present study. This compares with the findings of the study by Savur (2011) in Dakshina where 52% of the participants considered spectacles to be a cosmetic blemish. A study in Pakistan (Yasmin, 2007) also revealed that spectacle use among women was discontinued because use of spectacles was considered a cosmetic blemish by the community.

5.1.8 Practices Relating to the Use of Prescription Spectacles

To correct REs, patients need to have their eyes examined by an Optometrist who will prescribe lenses for them. Patients understanding of refractive errors and their health seeking behaviour towards eye health and use of spectacles are expected to influence their spectacles adherence. Only 54.8% of the overall sample population had a previous visit to an eye care specialist (either an Optometrist or an Ophthalmologist) and of this, 86.9% were told they needed a pair of prescription spectacles. This shows the likelihood of a high prevalence of RE among this present study participants which was attested from the results of the RE screening where 95.4% were diagnosed of having RE. From the responses given, the teachers would rather not take a prompt action to solving their eye problems as long as they can still perform their daily activities (see table 4.35). At the time of the screening, 56.1% with REs did not have a pair of spectacles. This could be that they were not aware of their refractive status as 53.6% claimed they had never visited an eye care specialist and 57% claimed they had never been told they needed to wear prescription spectacles. Therefore, eye care education is needed to encourage the teachers to improve their eye health seeking behaviour.

The percentage of the screened participants without spectacles was lower than that from Germany (67.2%) (Jobke, Kasten and Worweck, 2008). It was also lower in percentage than that of the population from Dakshina (63%) (Savur, 2011) and Ghana (84.8%) (Overteri-Oghomio and Adofo, 2011). A report from Britain showed a very low percentage (1.8%) of spectacle nonuse (Sherwin, Khawaja, Broadway, Luben, Hayat, Dalzell, Wareham, Khaw and Foster, 2012). Comparing with previous studies from Nigeria, the percentage use of spectacles in this study was found to be higher than that of the population from Zaria (Abah, Chinda, Samaila and Anyebe, 2010) and the presbyopic population from Ibadan (Bekibele, Fowole, Bamgboye, Adekunle, Ajaye and Baiyeroju, 2007). It was observed to be lower than that of the population of secondary schools studied in Osogbo (Adeoti, 2009) and a population of a Research Institute in Lagos (Ashaye and Asuzu, 2005).

More of the screened female population with REs had prescription spectacles than the males. A similar observation was made in a population studied in Britain where significantly more females had spectacles than the males (Sherwin, Khawaja, Broadway, Luben, Hayat, Dalzell, Wareham, Khaw and Foster (2012). Adeoti (2009) also reported a

similar finding in their study carried out in Osogbo. Lu, He, Murthy, He, Congdon, Zhang, Lu and Yang (2011) however reported in their study that no association was found between gender and use of prescription spectacles among the Chinese population.

The use of spectacles was found to increase with increasing age (r^2=0.105, p=0.000). It was 21.7% among the 20-29 age group and decreased to 16.9% among those 30-39 years old, it later increased to 48.1% in those 40-49 years and 73.1% among those 50-59 years old. This increase in the use of prescription spectacles with increasing age could imply that more of the older screened participants had visited an eye care practitioner thus were more aware of the refractive status of their eyes.

This trend of increase use of spectacles with increasing age was reported by Sherwin, Khawaja, Broadway, Luben, Haynt, Dalzell, Warham, Khaw and Foster (2012) among the British population. A similar trend was observed among the population from India (p<0.05) (Prema, George, Ve, Hemamalini, Baskaran, Kumaramnic-Kavel, Catherine and Vijaya (2008). No association between age and use of spectacles (p=0.18) was reported by Lu, He, Murthy, He, Congdon, Zhang, Li and Yang (2011) among the Chinese population.

5.1.9 Prevalence of Refractive Errors

Only 56.4% of the participants presented for the free RE screening. Using Pearson's correlation coefficient, the refractive error status of the participants' right eyes was found to be positively related with that of the left eyes (r^2 = 0.948; p = 0.01). Therefore only the refractive error data of the phakic right eyes were analyzed to avoid data duplication that could affect the significance of the result.

Refractive errors were present in 95.4% of the respondents screened. Many of the respondents had hyperopic astigmatism with presbyopia, followed by hyperopia with presbyopia, then hyperopic astigmatism, (table 4.4). A similar occurrence of high prevalence (88.7%) of refractive errors was observed among the screened population from Abuja (Njepuome, Onyebuchi, Onwusoro and Igbe, 2012).

Using Pearson's correlation coefficient, the degree of hyperopia increased with increasing age (r^2=0.188; p=0.01). A similar trend of increasing rate of hyperopia with increasing

age was observed in some previous studies. These included the studies conducted in the United States (Vitale, Ellwein, Cotch, Ferri and Sperduto, 2008) and Spain (Anton, Andraha, Mayo, Portela and Merayo, 2009). It also agrees with the findings from the study conducted in Singapore (Tan, Chan, Wong, Gazzard, Nitl, Ng and Saw, 2011), India (Krishnainh Srinivas, Khanna and Rao, 2009), China (Hunt, Wong, Sun, Tao, Wang, Yang, Xiong, Wnng and Friedman, 2009) and Cape Town (Olum, Nachega, Harvey and Meyer, 2012). The increase in the rate and degree of hyperopia with increasing age could be explained by an apparent increase in the incidence of hyperopia, likely due to the manifestation of latent hyperopia.

The young normal eye requires little or no focusing ability to see distant objects clearly and uses its focusing ability as the object moves closer. On the contrary, the hyperopic eye can see distant objects clearly only with the assistance of the muscular focusing system (ciliary muscle) inside the eye and requires extra focusing ability for near work- a process called accommodation. Many young hyperopes compensate for all or a part of their hyperopia by accommodating and the hyperopia that is compensated for is known as latent hyperopia. All eyes usually slowly lose their focusing ability due to the gradual loss of ciliary muscle tonus with increasing age. As a result, latent hyperopia tend to become manifest, hence an increase in the rate of hyperopia with increasing age (Moore, Angi-Iburger, Ciner, Cockrell, Fern and Harb, 2008; Grosvenor, 2007).

Against-the-rule (ATR) astigmatism was the commonest (62.2%; 110/177) type of astigmatism among this study participants. It was observed to occur more (64.5%) among the older population (>40 years) than in those less than 40 years of age (35.5%). While WTR astigmatism occurred more (63%) among those <40 years of age (appendix VI). The preponderance of ATR astigmatism and its occurrence more among the older population agrees with the findings of the study by Raju, Ramesh, Arvind, George, Baskaran, Paul, Krishnamaniac-Kavel, McCarthy and Vijaya (2004), where ATR astigmatism was reported to be the commonest, 77.4% (1,064/1,374) and WTR astigmatism, the least 9.8% (135/1,374). They further stated that with increasing age, the prevalences of ATR and WTR astigmatism increased and decreased respectively ($p=0.006$; $p<0.001$). A similar occurrence was reported by Dorsine, Dineri, Ali, Hug and Ahsan (2004) in their study in Bangladesh. ATR astigmatism was said to be the

commonest (58.7%) with ATR and OA increasing with age while WTR astigmatism decreased with age.

Against-the-rule astigmatism occurring more than WTR astigmatism in the older age group could be due to increased lid laxity associated with aging (Pensyl and Benjamin, 2006). This causes flattening of the vertical corneal meridian, thereby decreasing the WTR astigmatism and increasing ATR astigmatism (Grosvenor, 2007; Gros, 2006; Pensyl and Benjamin 2006; Read, Collins and Carney, 2006; Gudmundsdottir, Jonasson, Jonasson, Stefansson and Sasaki, 2000).

The percentage of the screened population that presented with only presbyopia was 5.3% and 58% had presbyopia with other types of REs. The mean age of the presbyopes was 47.6±5.1 years and the minimum age at which a participant was prescribed a reading addition was 37 years. This was higher than the minimum presbyopic age observed in the populations from Bayelsa (30 years) (Kotoye-Egbe, Ovenseri-Ogbomo and Adio, 2010), Ekiti (30 years) (Ayanniyi, Fadamiro, Adeyemi, Folorunso and Uzukwa, 2010) and Warri (25 years) (Kio and Otite-Emina, 2002).

The prevalence of presbyopia among this screened study population was lower than that of the population from China (aged ≥40 years), 67.3%, by Lu, He, Murthy, He, Congdon, Zhang, Li and Yang (2011) and India (aged ≥30 years), 69.9%, by Nirmalan, Krishnaiah, Shamanna, Rao and Thomas (2006). It was also lower than that of the population in Zanzibar (aged ≥40 years), 82.9%, by Laviers, Omar, Jecha, Kassim and Gilbert (2010) and in Swaziland (aged ≥40 years), 70%, 95% CI: 66.1-73.8 by Ahmet (2011).

Also it was observed to be lower than the findings of the population from Ghana (aged ≥35 years), 68.1% (Kumah, Lartey, and Amoah-Duah, 2011); Bayelsa (mean age: 42.2±13.1years), 58.9% (Kotoye-Egbe, Ovenseri-Ogbomo and Adio (2010) and Isiala Ngwa (age ≥40 years), [illegible] (Ackorie 2009). It was however higher than the findings of the population from Ghana (mean age 39.2 ±11.8), 50% (Ovenseri-Ogbomo and Adio, 2011) and Tanzania (aged ≥40 years), [illegible] (Burke, Tade, Mboera, Kayongoya, McElnea, Schwarzwalder and West, 2006).

The Pearson's correlation coefficient showed that there was a positive correlation between age and reading addition (r^2=0.90; p=0.01). A similar occurrence of presbyopia showing an upward trend with increasing age was observed in the population from Chiun. The odds of presbyopia increased by 1.09 (95% CI: 1.06-1.11) for each year's increase in age (Lu, He, Murthy, He, Congdon, Zhang, Li, Yang, 2011). From India, the rate of presbyopia increased from 22.9% (427/1,863) in those aged 30-39 years to 92.7% (1,320/1,424) in those aged 40-49 years to 95.5% (1,001/1,047) among those aged 50-59 years, then decreased slightly to 94.1% (847/900) in those aged 60-69 years and increased again to 88.4% (312/353) in those 70 years and above (p>0.001) (Nirmalan, Krishnaiah, Sharmanna, Rao and Thomas, 2006).

A similar trend was also reported by Abner (2011) in Swaziland where presbyopia increased from 63.1% (82/130) in those 40-49 years to 71.1% (91/128) in those aged 50-59 years to 74.3% (84/113) among those aged 60-69 years and 76.7% (33/43) in those 70 years and above. Burke, Ilesh, Munoz, Kayongoya, McHiwa, Schwarzwalder and West (2006) included increased age among factors associated with presbyopia. The rate of presbyopia increased with age among the population from Warri (Klo and Ostia-Emina, 2003). A positive association (p<0.001) between age and presbyopia among the population from Ekiti was reported by Ayanniyi, Fadnmiro, Adeyemi, Folorunsho and Uzukwu (2010).

Koroye-Egbe, Ovenseri-Ogbomo and Adio (2010) also reported a positive correlation between age and the amount of presbyopia (r=0.654; p=0.000) among the population from Bayelsa. The increase in the rate and degree of presbyopia with increasing age can be explained by the known fact that every individual's near point of accommodation recedes gradually with increasing age. This is due to the changes in the configuration of the crystalline lens fibres as it grows. The fibres become compressed and hardened with increasing age which leads to a gradual decrease in the accommodative response of the crystalline lens to the contraction of the ciliary muscle (Grosvenor, 2007).

4.10 Perceived Barriers to the Use of Prescription Spectacles

From the responses given by the screened participants with refractive errors, some factors were identified as likely barriers to having an eye examination and obtaining a pair of spectacles. These included inadequate access to an eye doctor (68.2%) and unawareness

of the eye problem (53.6%). The belief that yeast consumption and non-use of lantern to read would correct RE were identified as likely barriers to using prescription spectacles among the entire study population. The respondents with RE are likely to resort to taking yeast or avoid the use of lantern as a means of correcting their REs before seeking (or not) an ophthalmic attention. When the participants with REs do not visit the eye care specialist to have a proper diagnosis of the condition of their eyes, their refractive errors would be left uncorrected.

Other perceived barriers included the misconception that wearing of spectacles would cause sunken eyes and prolonged use of spectacles could worsen ones vision. Also the relative view that wearing of prescription spectacles does not enhance one's look could pose as a barrier. Health education interventions are needed to address these misconceptions.

5.1.11 Implications of Findings for Health Education

The findings of this study have reiterated the fact that RE is one of the commonest eye diseases presenting to eye clinics in Nigeria. Findings of this present study show that presbyopia occurs in the prime working years of life. There was an early age (37 years) of onset of presbyopia among the screened participants. It places a burden on the school teachers primarily in the form of loss of productivity when uncorrected. Quality RE services are majorly available in government secondary and tertiary institutions and private eye clinics which are located mostly within the cities and big towns.

Despite the majority of the entire respondents having the right knowledge that spectacle correction is a treatment option for refractive errors, some of the respondents still said that intake of yeast and non-use of lantern to read could correct refractive errors. The teachers with uncorrected RE would likely resort to these "other options" before seeking (or not) an eye examination.

The findings of this study have shown that the teachers had the perception that wearing of prescription spectacles causes sunken eyes. They also had the perception that prescription spectacles worn for the purpose it was recommended will not pose any problem or spoil the eyes but that the spectacles should be worn once in a while and its continuous use should be avoided. The prolonged use of glasses does not worsen the vision; rather it is

the RE that is progressive. The patient will observe a further decline in his/her unaided vision compared to when he/she started using the glasses and will assume the glasses had worsened the vision. These misconceptions are a challenge in the fight to reduce the prevalence of uncorrected RE and prevent its consequences.

The findings of this study revealed the practices which should be addressed through eye health education strategies. Most of the respondents stated they did not visit the hospital regularly to have an eye screening because the waiting time to see the eye doctor was too long. Many of the participants did not visit the hospital to test for REs, not because they were not likely to have REs but because they could still perform their daily activities. The implication of this is performing below optimal level especially with visual-demanding task such as reading. Over half of the screened participants diagnosed of RE were without corrective spectacles.

In planning the training programme for the teachers, it is imperative to identify their gap in knowledge, their attitude, perceptions and practices relating to REs and use of spectacles. Health education is a combination of learning experiences designed to facilitate voluntary adaptation of behaviour conducive to health (Green, Kreuter, Deeds and Patridge, 1980). It is concerned with reinforcing and changing knowledge, attitudes and behaviour of people through effective communication of factual information, with the aim of helping to ensure an optimum wellbeing. Health education can therefore be employed to bridge the gaps in knowledge on RE and spectacle use among the respondents.

5.2 Conclusion

This study was conducted to provide baseline data on the prevalence of refractive errors and use of prescription spectacles among secondary school teachers in Abeokuta South Local Government Area of Ogun State. Hyperopic astigmatism was found to be the most prevalent distance RE among the school teachers, with hyperopia, astigmatism and presbyopia occurring in high percentages. The same was observed in some other African black populations. These three REs (hyperopia, astigmatism and presbyopia) present with symptoms such as blurred near vision, eye ache, and headache and eye fatigue especially after reading for a while. Therefore, the need for the school teachers with uncorrected REs to have a pair of prescription spectacles cannot be overemphasized.

A lower proportion of the respondents had the right belief about the seriousness of REs. Over half of the screened participants with REs did not have a pair of spectacles possibly due to lack of knowledge of the health condition. Misconceptions exist that could serve as barriers to the adoption of prescription spectacles. These include the perception that wearing of spectacles causes sunken eyes and the negative attitude relating to the use of spectacles. Knowledge on eye health regarding the causes, signs/symptoms and treatment options for refractive errors was generally low. For the participants with REs to own and use a pair of prescription spectacles as appropriate, school-based health education programmes are needed to address these challenges.

5.3 Recommendations

Based on the findings from this study, the following recommendations are offered:

1. There is need for the school teachers to be provided with in-service education to address the gaps in knowledge relating to RE. This will go a long way in making them a more valuable resource of information on vision health in school settings.
2. Secondary school teachers should be encouraged by appropriate educational authorities to have their eyes screened regularly especially among those aged 37 years and above.
3. Eye health education should be used to tackle the misconceptions associated with the use of prescription spectacles.
4. A well organized public enlightenment programme is needed to upgrade the study populations' level of awareness relating to the benefits of adopting RE screening test and use of prescription spectacles.

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APPENDICES

Appendix I

Distribution of teachers in public secondary schools in ASLGA as at JANUARY 2009

S/N	School	Senior secondary school			Junior secondary school		
		Male	Female	Total	Male	Female	Total
1	Abeokuta Girls Grammar School	24	53	77	15	58	73
2.	Anglican High School, Ibara	11	22	33	8	30	38
3.	Igbore High School	17	18	35	7	18	25
4.	Nuwaru-deen High School	22	20	42	10	41	51
5.	Ijemo Titun High School	19	25	44	8	41	49
6	Abeokuta Grammar School	43	22	65	27	45	72
7	St Leo's College	11	16	27	6	21	27
8	Baptist Girls College	22	26	48	18	62	80
9	St John's Anglican High School, Kuto	20	27	47	5	28	33
10	Methodist High School	9	16	25	6	25	31
11	Lisabi Grammar School	19	43	62	15	44	59
12	Saje High School	13	22	35	20	21	41
13	Catholic Comprehensive High School	16	34	50	8	40	48
14	Lantoro High School	22	10	32	11	33	44
15	Baptist Boys High School	41	24	65	19	43	62
16	Asero High School	19	25	44	5	39	44
17	Egba Comprehensive High school	23	33	56	12	45	57
18	Rev. Kuti Memorial Grammar School	34	33	67	17	54	71
19	Macjob Grammar School	12	21	33	7	26	33
	Total			887			938
	Grand Total						1825

Source: (Ogun State Teaching Service Commission, Abeokuta, 2009)

Appendix II

Knowledge scale

Question No	Variable measured	Maximum score
10	What is the cause of presbyopia?	5
11	What is the cause of myopia?	5
12	What is the cause of hyperopia?	5
13	What is the cause of astigmatism?	5
14	What are the signs/symptoms of presbyopia?	10*
15	What are the signs/symptoms of myopia?	10*
16	What are the signs/symptoms of hyperopia?	10*
17	What are the signs/symptoms of astigmatism?	10*
18	How can myopia be corrected?	10*
19	How can presbyopia be corrected?	10*
20	How can astigmatism be corrected?	10*
21	How can hyperopia be corrected?	10*
	Total score	100 points

*Scores are assigned depending on the number of right answers present in each question with two marks alloted to each question.

Appendix III

Enrolment note for admittance to free eye screening

Prevalence of refractive error and use of prescription spectacles among Secondary School teachers in Abeokuta South Local Government Area.

Survey Identification number: .....

Personal Identification number: .....

Signature of Optometrist

Phone number:.....

*Please come along with this note to have the free eye test.

Appendix IV

Visit to an eye care practitioner and use of spectacles among the screened respondents with refractive error

N=269

With prescription spectacles	Visited an eye care specialist	
	Yes	No
No	70(46.4%)	81(53.6%)
Yes	99(83.9%)	19(16.1%)

$X^2 = 39.970$; p=0.000

Appendix V

Amount of refractive error in the screened respondents

N=282*

Amount of myopia (Ds)**	(n=43)	%	Amount of hyperopia** (Ds)	(n=201)	%	Amount of astigmatism (Dcyl)**	(n=177)	%	Amount of presbyopic Addition(Ds)**	(n=178)	%
-0.25	6	14.0	+0.25	33	16.4	-0.25	80	45.2	+1.00	2	1.1
-0.50	9	21.0	+0.50	83	41.3	-0.50	76	43.0	+1.25	30	16.9
-0.75	7	16.3	+0.75	38	19.0	-0.75	15	8.5	+1.50	25	14.0
-1.00	3	7.0	+1.00	22	11.0	-1.00	3	1.7	+1.75	41	23.0
-1.25	4	9.3	+1.25	6	3.0	-1.25	2	1.1	+2.00	31	17.4
-1.50	2	4.7	+1.50	9	4.5	-4.00	1	0.6	+2.25	23	12.9
-1.75	2	4.7	+1.75	5	2.5				+2.50	12	6.7
-2.00	3	7.0	+2.00	2	1.0				+2.75	13	7.3
-2.75	1	2.3	+2.25	1	0.5				+3.00	1	0.6
-3.25	1	2.3	+2.50	1	0.5						
-3.50	1	2.3	+3.25	1	0.5						
-3.75	1	2.3									
-4.75	1	2.3									
-5.00	1	2.3									
-6.25	1	2.3									

Ds= Dioptre Sphere
Dcyl= Dioptre cylinder
N* = Multiple count
**Mean amount of myopia = -1.41±1.4
Range of myopia = -0.25Ds to -6.25Ds
**Mean amount of hyperopia = +0.70±0.45
Range of hyperopia= +0.25Ds to +3.25Ds
**Mean amount of astigmatism= -0.44±-0.33
Range of astigmatism= -0.25Dcyl to -4.00Dcyl
**Mean amount of addition= +2.00±0.15
Range of presbyopic addition= +1.00Ds to +3.00Ds

APPENDIX VI

Distribution of astigmatism by axis and age group in the screened respondents with refractive error

N =269

Axis orientation	Age group (%)			
	20-29	30-39	40-49	50-59
045°	1 (5.6)	6 (10.9)	7 (10.9)	8 (20.0)
090°	7 (38.9)	32 (58.2)	44 (68.8)	27 (67.5)
135°	4 (22.2)	6 (10.9)	6 (9.4)	2 (5.0)
180°	6 (33.3)	11 (20.0)	7 (10.9)	3 (7.5)

Appendix VII

Distribution of myopia and hyperopia by age group in the screened respondents

Age group	20-29	30-39	40-49	50-59
N = 282	26	79	109	68
Myopia	4(15.4)	17(21.5)	15(13.8)	7(10.3)
Hyperopia	18(69.2)	52(65.8)	78(71.6)	53(77.9)

APPENDIX VIII

PREVALENCE OF REFRACTIVE ERRORS AND USE OF PRESCRIPTION SPECTACLES AMONG SECONDARY SCHOOL TEACHERS IN ABEOKUTA SOUTH

Good day my dear teachers, I hope you are fine? My name is ....., an Optometrist and a postgraduate student from the department of Health Promotion and Education, Faculty of Public Health, College of Medicine, University of Ibadan.

I am carrying out a study on Prevalence of Refractive Errors and use of Prescription Spectacles among Secondary School Teachers in Abeokuta South Local Government Area. The information obtained from teachers will be useful in future for organizing useful eye health educational programmes for teachers.

There will be an opportunity for each participant in the study to have a free eye test. This will be facilitated by the investigator.

Note that you can participate in this interview without coming for the free eye test. Participation in the eye test is voluntary and it is only open to teachers that have taken part in the study. Those who would want to have a free eye test will be given an admittance note.

Taking part in this study is voluntary. If one wishes, one can also withdraw at anytime. If you decide to participate, we will like to inform you that whatever you tell us will be kept secret. It will not be revealed to your employer, friends and colleagues.

Thank you.

Note: Do no write your name or the name of your school on this questionnaire.

I understand all that has been explained above and I am willing to participate in this study.

1) _____ or 2) _____
Sign Thumb print

3) Not want to sign or thumb print but want to participate in the study. Please tick (√) the space provided (√).

Survey identification number: _____

Personal identification number: _____

Category of secondary school. Please tick (√) one.

1) Junior secondary ☐

2) Senior secondary ☐

SECTION A: Socio Demographic Characteristics

Instruction: please tick (√) or write in the spaces provided

1. Sex (1) Male ☐ (2) Female ☐

2. Age at last birthday in years .....

3. What is your marital status? (1) Single/never married ☐ (2)Married ☐
(3) Divorced ☐ (4) others please specify .....

4. What is your ethnic group? (1)Yoruba ☐ (2) Igbo ☐ (3)Hausa ☐
(4) Others please specify .....

5. What is your religion? (1) Christianity ☐ (2) Islam ☐ (3) Traditional ☐
(4) Other please specify

6 What is your highest level of education? (1) NCE ☐ (2)OND ☐
(3) HND ☐ (4) BSC/BA/BED ☐ (5) MA/MSC/MPHIL ☐
(6) PHD ☐

6b. what subject(s) do you teach?.....

SECTION B: Family History of Wearing Prescription Spectacles

('Medicated Glasses') Please tick (√) or write in the space provided.

7a. Do you have close family member(s) who wear prescription spectacles?
(1) Yes ☐ (2) No ☐

7b. If yes to question 7a, please tick (√) and state the number of close family member(s) who wear prescription spectacles in the table below. (Do not write down their names)

TABLE I: Categories of relations wearing spectacles.

	Categories of relation	Please tick (√)	Number of relations
1.	Father		N/A
2	Mother		N/A
3	Sister		
4	Brother		

N/A: Not applicable

SECTION C: Knowledge on Prescription Spectacles

Please tick (√) or write in the spaces provided

8a. Have you ever heard about the term refractive error?

(1) Yes ☐ (2) No ☐ If no go to question 9a

8b. If yes to question 8a, what are your source(s) of information on refractive errors? (Please tick (√) Yes or No as it applies to you in table 2).

TABLE 2: Source(s) of Information on Refractive Error

	Sources	Please tick (√)	
		Yes	No
1.	Optometrist		
2	Ophthalmologist		
3	Friend		
4	Relative		
5	Nurse		
6	Medical Doctor		
7	Newspaper		
8	Radio		
9	Television		
10	Internet		
11.	Physics		

9a. How often do you hear people talk about spectacles for correcting poor eye sight?

(1) Always ☐ (2) Occasionally ☐ (3) Rarely ☐ (4) Never ☐

If never please go to question 10.

9b. What are your source(s) of information on prescription spectacles? (Please tick (√) Yes or No as it applies to you in table 3).

TABLE 3: Source(s) of Information on Refractive Error

	Sources	Please tick (√)	
		Yes	No
1.	Optometrist		
2	Ophthalmologist		
3	Friend		
4	Relative		
5	Nurse		
6	Medical Doctor		
7	Newspaper		
8	Radio		
9	Television		
10	Internet		

10 What causes the condition in which one has to move reading materials with small letters further away from the eyes before one can see the letters clearly (presbyopia)?

.....

.....

.....

11. What causes the condition in which one finds it difficult to see far objects clearly (myopia)? .....

.....

12. What causes the condition in which one finds it difficult to see near objects clearly (h)peropia)? .....

.....

13. What causes the condition in which one sees objects (which are either far or near) appearing distorted or wavy (astigmatism)? .....

.....

14. Which of the following problems do persons who move reading materials with small prints further away from the eyes in order to see clearly (presbyopia) also have? (Please tick (√) Yes or No or don't know in table 4).

TABLE 4: Perceived Problem(s) Associated With Difficulty Reading Small Letters At Near

	Problem	Please tick (√)		
		Yes	No	Don't know
1.	Difficulty threading needle			
2	Difficulty signing a cheque book			
3	Eyestrain			
4	Tearing			
5	Fever			

15. Which of the following problem(s) do people with difficulty in seeing far objects (myopia) also have? (Please tick (√) Yes or No or don't know in table 5).

TABLE 5: Perceived Problem(s) Associated With Inability To See Far Objects

	Problem	Please tick (√)		
		Yes	No	Don't know
1.	Moving reading material very close to the eyes to see clearly			
2	Copying wrong words or numbers from the blackboard which can lead to poor academic performance			
3	Squinting of the eyes often to see far objects/writings clearly			
4	Redness of eyes			
5	Itching of the eyes			

16. Which of the following problem(s) do people with difficulty in seeing near objects (hyperopia) also have? (Please tick (√) Yes or No or don't know in table 6).

TABLE 6: Perceived Problem(s) Associated With Difficulty Seeing Near Objects

	Problem	Please tick (√)		
		Yes	No	Don't know
1.	Headache			
2	Tired eyes			
3	Pain in the eyes			
4	Rubbing of the eyes often			
5	Tearing			

17. Which of the following problem(s) do people who see letters or objects appearing wavy or distorted (astigmatism) also have? (Please tick (√) Yes or No or don't know in table7).

TABLE 7: Perceived Problem(s) Associated With Seeing Objects or Letters That Appear Distorted.

	Problem	Please tick (√)		
		Yes	No	Don't know
1.	Tilting of the head to see objects or letters clearly			
2	Skipping lines when reading			
3	Headache			
4	Fever			
5	Redness of the eyes			

18. How can the difficulty of seeing far objects (myopia) be corrected? (please tick (√) Yes or No or don't know in table 8).

TABLE 8: Perceived Mode of Correction of Difficulty Seeing Far Objects.

	Mode of Correction	Please tick (√)		
		Yes	No	Don't know
1.	By taking yeast			
2	Eye operation			
3	Wearing of prescription spectacles			
4	By taking local herbs			
5	None of the above			

19 How can the eye problem of moving reading materials further away from the eyes to see clearly (presbyopia) be corrected? (Please tick (√) Yes or No or don't know in table 9).

TABLE 9: Perceived Mode of Correction of Difficulty Reading Small Letters Prints At Near.

	Mode of Correction	Please tick (√)		
		Yes	No	Don't know
1.	By not reading with Lantern/candle			
2	Wearing of prescription spectacles			
3	Eye operation			
4	By taking local herbs			
5	None of the above.			

20 How can the problem of seeing letters or objects appearing distorted (astigmatism) be corrected? (Please tick (√) Yes or No or don't know in table 10).

TABLE 10: Perceived Mode of Correction of Letters or Objects Appearing Distorted

	Mode of Correction	Please tick (√)		
		Yes	No	Don't know
1.	Wearing of prescription spectacles			
2	By taking medicines			
3	By taking yeast			
4	Eye operation			
5	None of the above.			

21. How can the difficulty of seeing near objects (hyperopia) be corrected? (Please tick (√) Yes or No or don't know in table 11).

TABLE 11: Perceived Mode of Correction of Difficulty In Seeing Near Objects (hyperopia).

	Mode of Correction	Please tick (√)		
		Yes	No	Don't know
1.	By taking yeast			
2	Eye operation			
3	Wearing of prescription spectacles			
4	By taking local herbs			
5	None of the above.			

SECTION D: Attitude Towards Wearing of Prescription Spectacles

People have different attitudes about wearing of prescription spectacles. For each of the statements in the table below, please tick (√) whether you agree, not sure or disagree.

S/N	Attitude	Please tick (√)		
		Agree	Not sure	Disagree
22.	Teachers that wear prescription spectacles encounter problems with their sight when teaching			
23	Wearing of prescription spectacles should be done once in a while so that one will not depend on it.			
24	It is a bad habit not to wear spectacles as prescribed by the doctor.			
25	Spectacles worsen the vision with prolong use because the eyes would then not be able to see well without the glasses			

SECTION E: Beliefs Relating To Refractive Errors And Wearing of Prescription Spectacles

People have different beliefs relating to causes, seriousness and treatment of eye problems. Please carefully go through the statements in the table below and tick (√) whether you agree, not sure or disagree.

S/N	Beliefs	Please tick (√)		
		Agree	Not sure	Disagree
26.	Difficulty seeing far objects clearly (myopia) is a serious eye defect that can lead to blindness when not treated			
27	Difficulty reading small letter prints at near (presbyopia) is not a serious eye defect			
28	Difficult seeing far objects (myopia) cannot affect one's career as a teacher so it can be ignored			
29	All cases of eye problems are hereditary			
30.	Wearing of prescription spectacles spoils the eyes			

SECTION F: Perceptions Relating to Wearing of Prescription Spectacles

People have different understanding or opinions on wearing of prescription spectacles. Please carefully go through the statements in the table below and tick (√) whether you agree, not sure or disagree.

S/N	Perception	Please tick (√)		
		Agree	Not sure	Disagree
31	People that wear prescription spectacles, wear it for fashion.			
32	Wearing of prescription spectacles make one looks older than his/her age.			
33	Prescription spectacles make people look more beautiful or handsome.			
34	Wearing of prescription spectacles causes sunken eyes			
35	It is improper for children in primary school to wear prescription spectacles because they are too young			
36	It is improper for children in secondary school to wear prescription spectacles because they are young.			
37	Most teachers are not having the skill for educating their pupils or students about eye care			
38	Most teachers have no skill for identifying students with eye problems.			

SECTION G: Practices Relating to Spectacle Wear

Please tick (√) or write in the space provided in question 39a - 41a.

39a. Have you ever seen or visited an Optometrist?

(1) Yes ☐ (2) No ☐

39b. Have you ever seen or visited an Ophthalmologist?

(1) Yes ☐ (2) No ☐

40a. Have you been told you need to wear prescription spectacles?

(1) Yes ☐ (2) No ☐

If no to Q40a, please go to number 43

40b. If yes to Q40a, did you start wearing the spectacles?

(1) Yes ☐ (2) No ☐

40c. If no to Q40b, why did you not start wearing the spectacles?

(1) I felt my sight was good and I didn't need the spectacles ☐

(2) I couldn't afford the spectacles ☐

(3) I needed to take care of my children's school fees ☐

(4) I don't like to wear spectacles ☐

(5) Others please specify.....

40d. Would you have preferred other 'options' for correcting the eye defect other than spectacles?

(1) Yes ☐ (2) No ☐

40e. If yes please list the optio n(s).....

.....

41a Do you currently wear prescription spectacles?

(1) Yes ☐ (2) No ☐

41b If yes to question 41a, where did you obtain the glasses you are currently using? (Please give reasons for your answer in the table below).

TABLE 15: Preferred Place to Obtain Prescription Spectacles.

S/N	Place where pair of spectacles was obtained	Reason(s) for choice of place
1	Private eye clinic	
2	Government eye clinic	
3	Street vendor (shop)	
4	Others please specify	

42. How often or when do you wear the spectacles? (For current users of spectacles only)

(1) For distant vision (or moving about) only ☐ (2) When reading only ☐

(3) For sight and reading ☐ (4) When driving only ☐

43. Where would you prefer to have a routine eye examination? (Please give reason(s) for your choice in the table below).

TABLE 16 Where Would You Prefer To Have A Routine Eye Examination?

S/N	Preferred Place for eye examination	Reason(s) for choice of place
1	Government eye clinic	
2	Private eye clinic	
3	Road side shop	
4	School premises	

The table below contains a list of statements about people's behavior relating to the use of prescription spectacles. Please go through the statements carefully and tick (√) whether you agree, or disagree.

S/N	Behaviour	Agree	Disagree
44	I do not visit the eye doctor because it is too expensive to change spectacles		
45	I do not visit the eye doctor regularly because I can still perform my daily activities		
46	I do not visit the eye doctor regularly because I do not have time.		
47	I do not visit the eye doctor regularly because the waiting time is too long.		
48	I do not visit the eye doctor because I have had a bad experience with an eye doctor.		
49	I do not visit the eye doctor regularly because my eye sight is stable and I do not need to change my spectacles		
50	I do not visit the eye doctor regularly because I do not need perfect vision.		
51	I have not visited the hospital/eye clinic to test for spectacles because am not likely to have an eye problem that requires the wearing of prescription spectacles		

52. Have you been involved in any eye health promotion activity in your school?

(1) Yes ☐ (2) No ☐

53. Have you been involved in any eye health promotion activity in your Community?

(1) Yes ☐ (2) No ☐

Section II: Vision Screening Sheet

Survey number:

House number:

Sex:

Age:

Entry Visual Acuity (VA):

Unaided distant VA:	OD	OS	OU
Aided distant VA:	OD	OS	OU
Unaided Near VA:	OD	OS	OU
Aided Near VA:	OD	OS	OU

Medical history:

OD .....

.....

.....

.....

Present Spectacle prescription:

OD .....

OS .....

External examination:

OD .....

.....

OS .....

.....

Ophthalmoscopy:

OD .....

.....

OS.....

.....

Retinoscopy:

Objective findings: OD.....

OS.....

Subjective findings: OD.....

OS.....

Assessment: OD.....

OS.....

Plan: .....

APPENDIX IX

FEDERAL MEDICAL CENTRE

Idi-Aba, P.M.B. 3031 (Sapon Post Office), Abeokuta, Nigeria
08095948006-7
e-mail: fmcabk@yahoo.com

Medical Director	Head of Clinical Services	Director of Academic Sec. Board of Mgt.
Dr. O. S. Sotiloye MBBS, FWACS, FICS, Dip. Reproductive Med & Biology (Geneva) D MAS	Dr. C. O. Akisanya MB; BS, FWACS, FMCR	Dr. O. T. Ozoba

FMCA/238/05

28th October, 2010

NAME OF PRINCIPAL INVESTIGATOR: ERUE NGOZI ROSEMARY.

TITLE STUDY: PREVALENCE OF REFRACTIVE ERRORS AND USE OF PRESCRIPTION SPECTACLES AMONG PUBLIC SECONDARY SCHOOL TEACHERS IN ABEOKUTA SOUTH LOCAL GOVERNMENT AREA OF OGUN STATE NIGERIA.

RESEARCH LOCATION: FEDERAL MEDICAL CENTRE, ABEOKUTA

PROTOCOL NUMBER: FMCA/238/HREC/22/2010

HREC REG. NUMBER: NHREC/08/04/2010

NOTIFICATION OF FULL MEMBER APPROVAL OF RESEARCH PROTOCOL

This is to inform you that the Federal Medical Centre, Abeokuta Health Research Ethics Committee (HREC) at its sitting on 1st August, 2010 decided to give full membership approval to your research proposal, after necessary reviews and corrections, under the regulations guiding experiments in human subjects.

This approval is for a period of one year from 28th October, 2010 to 27th October, 2011. If there is delay in starting this research, please inform the HREC so that dates of approval can be adjusted accordingly. Note that no activity related to this research may be conducted outside these dates. No changes are permitted in the research without prior approval by HREC.

All forms and questionnaires used in this study must carry the HREC assigned number and the duration of HREC approval.

You are to note further that, the National Code of Health Research Ethics requires you to comply with all institutional guidelines, rules and regulation, to follow trends of the code. Please ensure that any adverse effect from your study is promptly reported to the HREC Federal Medical Centre, Abeokuta.

You are expected to submit a progress report to this Committee every three (3) months from the date of approval. The HREC reserves the right to conduct compliance visits on your research sites without previous notification.

Thank you.

Dr. A. I. Rasaki
For: Chairman, Hospital Research Ethics Committee