

Investigating the Prevalence of Refractive Error and burden of complications associated with uncorrected Refractive Error among adult patients at the Ophthalmic Department of the Kenema Regional Referral Hospital Between January to December, 2022

ABSTRACT

BY:

Authors: *Rashid Bundu Kpaka* (Department of Nursing, Faculty of Health Sciences and Disaster Management Studies, Eastern Technical University of Sierra, Patricia Tarawally (ophthalmic department, Kenema government hospital, MoHS-SL). RE is considered a major public health threat to individual health and socioeconomic development. Refractive error, also known as refraction error, or R.E is a problem with focusing light accurately on the retina due to the shape of the eye and or cornea. Refractive error is one of the leading causes of avoidable visual impairment and second most common cause of visual loss. The assessment of Refractive Error is now done in DALY (Disability Adjusted Life Years) which showed an 8% increase from 1990 to 2019. In 2020, it was estimated that 157 million people had significant vision impairment (< 6/18 in the better eye) due to uncorrected refractive errors affecting distance vision, including at least three million people with blindness (< 3/60 in the better eye). In addition, 510 million people were without adequate correction for functional presbyopia in 2020. The large majority of vision impairment in school aged children is due to uncorrected refractive error.

The aim of this study is to investigate the prevalence of Refractive error and to identify corrective glass wear compliance rate and burden of complication associated with uncorrected refractive error among patients (age 8yrs- and above) visiting the ophthalmic department of the kenema regional referral hospital of the east between January to December, 2022.

This research is a retrospective cross sectional survey design using a secondary data source from unit records and a quantitative data analysis technique was used to organize and clarify information for accuracy. Data was analyzed using Microsoft excel based on the objectives of the study. Information was then generated and results presented in the form of simple statistics graphs, tables and charts indicating frequencies and percentages of variables.

The result of this study shows 6.55% prevalence rate as opposed to the world statistics of the disease (0.96%) indicate a 5.54% higher prevalence rate of the disease and more males are affected than females. The prevalence rate of the disease was seen to be high amongst the young adults may be due to life style changes. The research indicates 67.4 % compliance rate of glass wear and in table 6 it indicates that compliance rate increases with age and in table 7 females wear corrective glasses than males with a percentage ratio of 55.5% : 44.5% respectively. Also a 0.5% of the population under study developed low vision and other eye pathologies as a result of uncorrected RE and this was seen in more males than females (0.3%:0.2% respectively) and the reason for the high % increase in males might be due to their lack of compliance on corrective lens wear and high cost of glasses.

Key words: Refractive Error (RE), Myopia, Hyperopia, Astigmatism, Presbyopia, Contact/Corrective Lenses or Glass, prevalence rate, Disability Adjusted Life Years (DALY) etc.

INTRODUCTION

Refractive errors are the most common ocular problem affecting all age groups. Uncorrected refractive error leads to reduced vision. Good vision contributes greatly to the strength of health and wits. The ultimate molding of a person's personality and potentiality rests with his nature, surroundings and quality of eye sight.” Many ocular diseases including R.E have their origin in childhood and the morbidity may go unnoticed and adversely affect the child’s performance in school and may also cause severe ocular disability in the later part of life (adulthood) and therefore RE is considered a major public health threat to individual health and socioeconomic development. Refractive errors affect the economy of different societies. ^[11]

Refractive error, also known as **refraction error**, or R.E is a problem with focusing light accurately on the retina due to the shape of the eye and or cornea. The most common types of refractive error are near-sightedness, far-sightedness, astigmatism, and presbyopia. Near-sightedness results in faraway objects being blurry, far-sightedness and presbyopia result in close objects being blurry, and astigmatism causes objects to appear stretched out or blurry. Other symptoms may include double vision, headaches, and eye strain. Near-sightedness is due to the length of the eyeball being too long, far-sightedness the eyeball too short, astigmatism the cornea being the wrong shape, and presbyopia aging of the lens of the eye such that it cannot change shape sufficiently. Some refractive errors occur more often among those whose parents are affected. Diagnosis is by eye examination. Refractive errors are corrected with eyeglasses, contact lenses, or surgery. Eyeglasses are the easiest and safest method of correction. Contact lenses can provide a wider field of vision; however they are associated with a risk of infection. Refractive surgery permanently changes the shape of the cornea. Presbyopia affects most people over the age of 35^[11]

Refractive error is one of the leading causes of avoidable visual impairment and second most common cause of visual loss^[21]. The assessment of Refractive Error is now done in DALY (Disability Adjusted Life Years) which showed an 8% increase from 1990 to 2019^[22]. In 2020, it was estimated that 157 million people had significant vision impairment (< 6/18 in the better eye) due to uncorrected refractive errors affecting distance vision, including at least three million people with blindness (< 3/60 in the better eye). In addition, 510 million people were without adequate correction for functional presbyopia in 2020 and the large majority of vision impairment in school aged children is due to uncorrected refractive error ^[25]

The number of people globally with refractive errors has been estimated at one to two billion. Rates vary between regions of the world with about 25% of Europeans and 80% of Asians affected^[2]. Near-sightedness is the most common disorder ^[5]. Rates among adults are between 15-49% while rates among children are between 1.2-42%^[6]. Far-sightedness more commonly affects young children and the elderly^[8]. The number of people with refractive errors that have not been corrected was estimated at 660 million (10 per 100 people) in 2013. Of these 9.5 million were blind due to the refractive error^[7]. It is one of the most common causes of vision loss along with cataracts, macular degeneration, and vitamin A deficiency^[8].

The yearly cost of correcting refractive errors is estimated at 3.9 to 7.2 billion dollars in the United States^[23]. In 2013, the number of people globally with refractive errors that have not been corrected was estimated at 660 million (10 per 100 people) and uncorrected refractive error is responsible for visual impairment and disability for many people worldwide^[7]. It is one of the most common causes of vision loss along with cataracts, macular degeneration, and vitamin A deficiency^[8].

Recent studies and WHO reports indicate that refractive errors are the first cause of visual impairment and the second cause of visual loss worldwide as 43% of visual impairments are attributed to refractive errors ^[9]. In a review study, Naidoo and colleagues showed that uncorrected refractive errors were

responsible for visual impairment in 101.2 million people and blindness in 6.8 million people in 2010^[10]. Smith and colleagues also stated that uncorrected refractive errors result in an annual economy loss of \$269 billion worldwide. According to this report, this index was \$121.4 billion in individuals above 50 years^[12]. Anyone can have refractive errors, but people are at higher risk if they have family members who wear glasses or contact lenses. The Online Mendelian Inheritance in Man (OMIM) database has listed 261 genetic disorders in which myopia is one of the symptoms^[15]. Myopia may be present in heritable connective tissue disorders such as: Knobloch syndrome (OMIM 267750); Marfan syndrome (OMIM 154700); and Stickler syndrome (type 1, OMIM 108300; type 2, OMIM 604841)^[16]. Most types of refractive errors, like nearsightedness, usually start in childhood. Presbyopia is common in adults ages 40 and older. There is a correlation between environmental factors and the risk of developing myopia^[17]. Myopia has been observed in individuals with visually intensive occupations^[16]. Reading has also been found to be a predictor of myopia in children. It has been reported that children with myopia spent significantly more time reading than non-myopic children who spent more time playing outdoor^[16]. Socioeconomic status and higher levels of education have also been reported to be a risk factor for myopia.

In Sierra Leone the population prevalence of blindness is estimated at 0.7% affecting 56,000 people, while the prevalence of blindness in people over 50 years of age is estimated as 5.9%, according to the most recently available national data. More than 90% of all blindness in Sierra Leone is also avoidable, which is significantly higher than the global average of 80%. Eye care services provided in the country is limited not until 2012 when Sight savers was awarded two complementary five-year grants from the European Commission (EC) and Seeing is Believing (SiB), which together have enabled comprehensive support to the Sierra Leone Eye Care Programme across all four of the country's regions^[28]

This study aim **to investigate** the prevalence of Refractive error and to identify corrective glass wear compliance rate and burden of complication associated with uncorrected refractive error among patients (age 8yrs- and above) visiting the ophthalmic department of the Kenema regional referral hospital of the east between January to December, 2022.

RESEARCH METHODOLOGY

Study Location

The location (study site) for this research is the Kenema Government Hospital (KGH). The KGH is in Kenema City situated at the east end of the City along Combema Road and Sumaila Street junction and very closed to the Eastern technical university of Sierra Leone, Kenema. It was established in 1958. The hospital serves as the regional referral hospital for the eastern region and as the district referral Hospital for Kenema District. It carries out both medical and surgical treatment as well as maternal and child health services, dental, ophthalmic, TB, under-fives and laboratory services amongst others. It also double serves as a teaching hospital for nurses and other allied health professionals. The hospital is comprised of 9 wards of which the ophthalmic department is the 9th ward.

The ophthalmic department was constructed in 2010 comprising of the ophthalmic unit and the optical unit .The ophthalmic unit is responsible for treating pathologies and also conduct cataract surgeries and some other minor surgeries. Whiles the optical unit is responsible for conducting refraction, glazing of lenses and dispensing of spectacles, sun glasses and low vision aids after a successful refraction

Research Design

This research is a quantitative and retrospective cross sectional survey study design using a secondary data source from the Optical unit at the Ophthalmic department in the Kenema government hospital, Kenema to estimate the prevalence of Refractive error and corrective glass wear compliance rate and burden of complication associated with uncorrected refractive error among patients (age 8yrs- and above)

visiting the ophthalmic department of the Kenema regional referral hospital of the east between January to December, 2022. Secondary as the main source of data from unit records and register within the study period was obtained as it gives a comprehensive analysis of cases admitted, disease burden by sex and age ratio and records of corrective glasses usage compliance.

Target Population and Sample Size

The study population for this research is the total number of patients who visited the ophthalmic unit of the KGH for health care services and were registered in the unit register within the study period (January-December, 2022). The sample population is made up of clients who visits the optical unit at the ophthalmic department .K.G.H for refraction or review of past or present prescription and the total number of patients who were diagnosed of Refractive Error within the study period with sampling analyzing the required variables such as refractive error disease burden, sex and age prevalence, disability burden and contact glass usage compliance.

Research Instruments and Data Collection Procedures

Table matrix was used to collect data from the ophthalmic unit of the KGH records and register as this instrument is most convenient and authentic or reliable because it provide data from the official unit concern with the keeping of all information necessary for the study. This was backed up with short interview of few staff and patients that were available at the time of data collection.

Data Analysis Techniques

A qualitative data analysis technique is used to organize, clarify information for accuracy; give explanations and opinions that may have not been captured in the original records .Data was analyzed using Microsoft excel based on the objectives of the study. Information was then generated and results presented in the form of simple statistics graphs, tables and charts indicating frequencies and percentages of variables.

Data Safety and Monitoring

Privacy and Confidentiality are of utmost importance during the project and all completed records were anonymous and names or other identifying data were never requested. All electronics collated data will be stored in a password protected file and paper records will be stored in a locked cabinet, both of which only the researcher can access. The results of this study might be published; but no information that could identify any of the participants will be included.

Ethical Consideration

The researcher obtained permission from the hospital and unit authorities to access the necessary records. The Researcher also assured the authorities of confidentiality on the information obtained not to be used for any other purpose other than education research.

Result Analysis and Presentation of Data

Different sets of data were collected based on the objective of the research and the results were processed,analyzedand presented intable'sformats bar & pie charts as follows:

4.1 Data Presentation

TABLE 1. Number & % of patient who visited the ophthalmic department by age limit

Age Limit In Year	MONTHS												Total	Percentage
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8-19	45	40	46	64	25	53	05	16	62	04	45	49	454	7.1%
20-34	87	119	93	34	48	70	20	55	77	15	79	99	796	12.4%
35-49	131	79	139	160	72	80	90	110	128	08	65	148	1210	18.8%
50-64	174	159	232	128	120	133	202	240	168	11	154	198	1919	29.8%
>65	219	199	185	97	96	115	285	198	201	22	189	247	2053	31.9%
TOTAL	656	596	695	483	361	451	602	619	636	60	532	741	6432	100%

Table 2.Number& % of patient who visited the ophthalmic department by sex

SEX RATIO	MONTHS												Total	Percentage
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Male	393	397	347	183	185	201	402	302	390	42	260	439	3541	55.1%
Female	263	199	348	300	176	251	200	317	246	18	272	302	2891	44.9%
TOTAL	656	596	695	483	361	451	602	619	636	60	532	741	6432	100%

TABLE 3. Total number & % of patientsdiagnosed of refractive error by various types

	REFRACTIVE ERROR BY TYPES								
	HYPEROPIA		MYOPIA		ASTIGMATISM		PRESBYOPIA		
	Male	Female	Male	Female	Male	Female	Male	Female	
	1	0	3	2	0	1	0	0	
	1	9	3	5	9	3	1	3	
	5	6	8	12	10	9	6	7	
	51	41	24	13	30	31	47	48	
	6	2	4	2	5	2	4	3	
	64	58	42	34	54	46	58	61	
TOTAL	122/29.3%		76/18.2%		100/24%		119/28.5%		417/100%

Figure 1.A bar chart showing total % of patientsdiagnosed of refractive error by various types

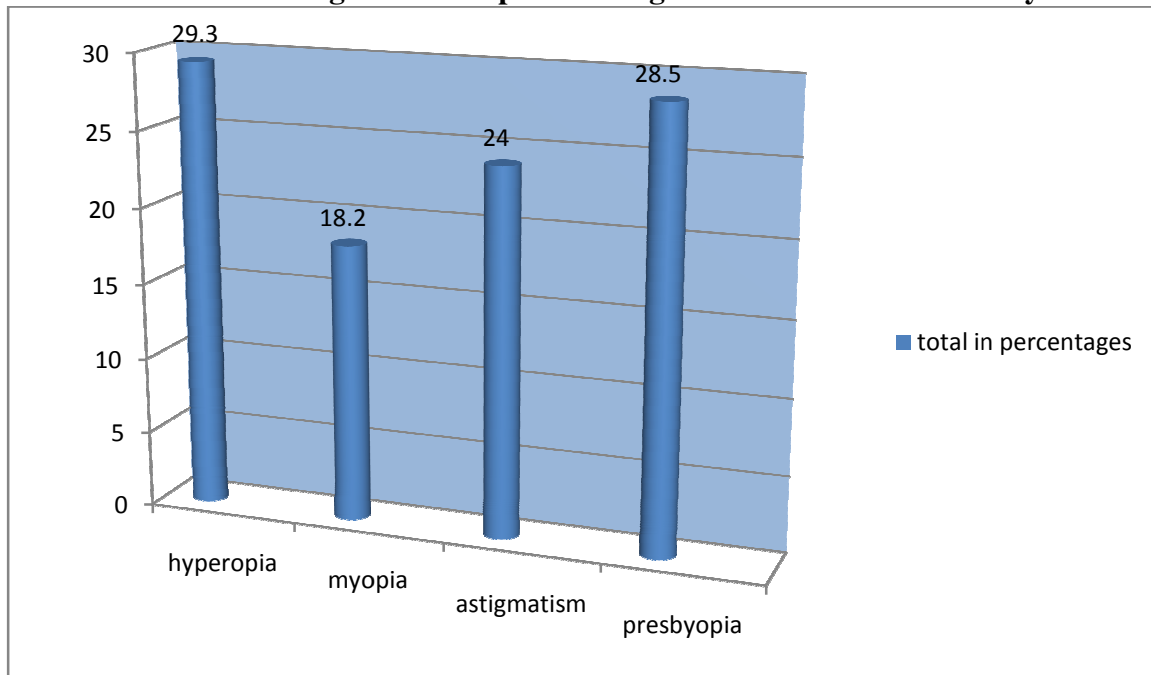


FIGURE 2: A Pie Chart Showing the Prevalence Rate in % of Refractive Error amongst the Population

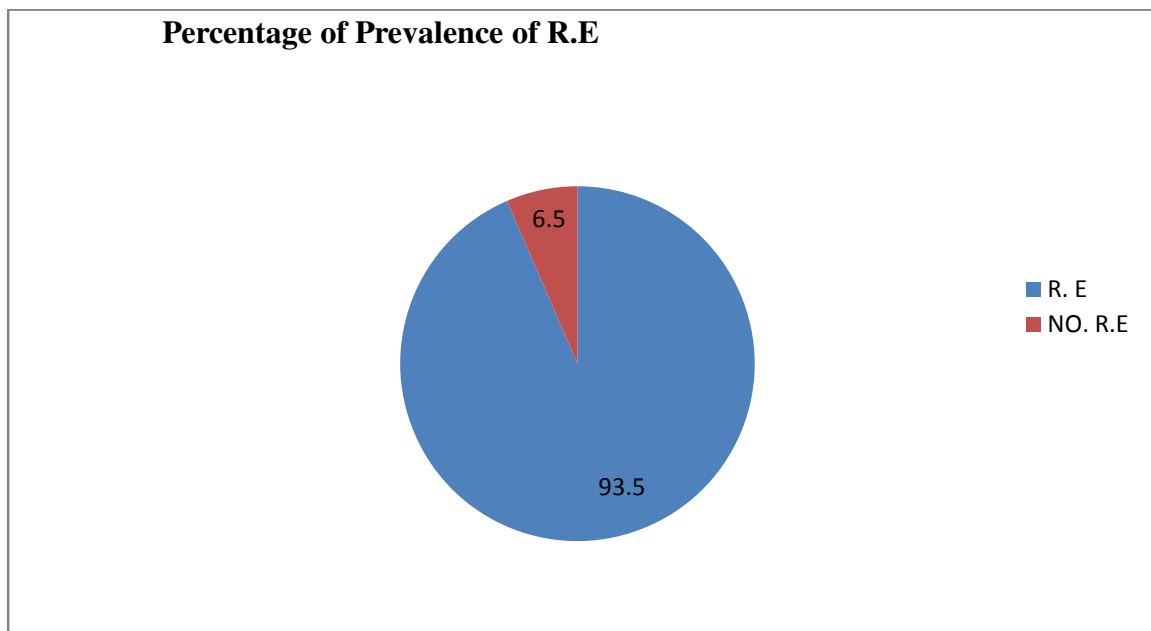


TABLE 4. Shows the number & % of patients diagnosed of refractive error by types and corresponding sex ratio

SEX RATIO	DISEASIS CONDITION BY TYPES				TOTAL	PERCENTAGE
	Hyperopia	Myopia	Astigmatism	Presbyopia		
MALE	64	42	54	58	218	52.3%
FEMALE	58	34	46	61	199	47.7%
					417	100%

FIGURE 3: A Pie Chart Showing the SEX Prevalence Rate in % of Refractive Error amongst the Population

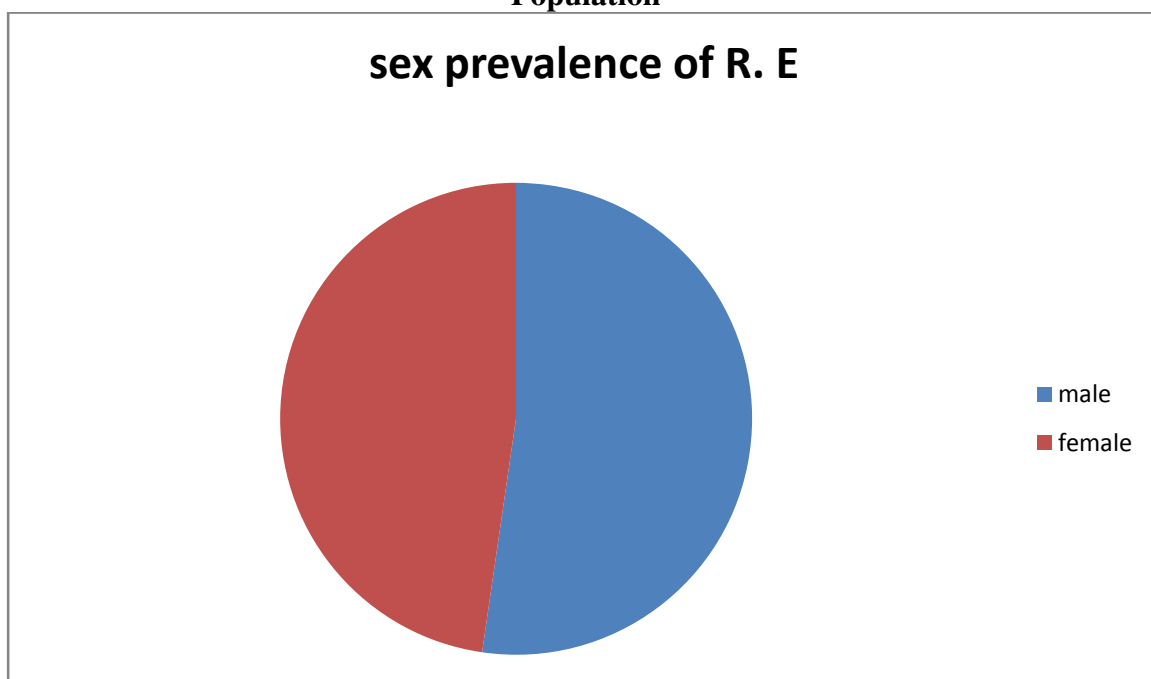


TABLE 5. Shows the number & % of patients diagnosed by refractive error types and corresponding age limits

Age Limit In Years	DISEASIS CONDITION BY TYPES				TOTAL	PERCENTAGE
	Hyperopia	Myopia	Astigmatism	Presbyopia		
8-19	1	5	1	0	7	1.7%
20-34	10	8	12	4	34	8.2%
35-49	11	20	19	13	63	15.1%
50-64	92	37	61	95	285	68.3%
>65	8	6	7	7	28	6.7%
					417	100%

TABLE6. Number & % of patients who owned spectacles to correct R.E by age

AGE LIMIT IN YEARS	TOTAL WITH REFRACTIVE ERROR	TOTAL THAT OWNED CORRECTIVE EYE GLASS	PERCENTAGE
8-19	7	2	28.6%
20-34	34	10	29.4%
35-49	63	35	55.6%
50-64	285	209	73.3%
>65	28	25	89.3%
TOTAL	417	281	67.4%

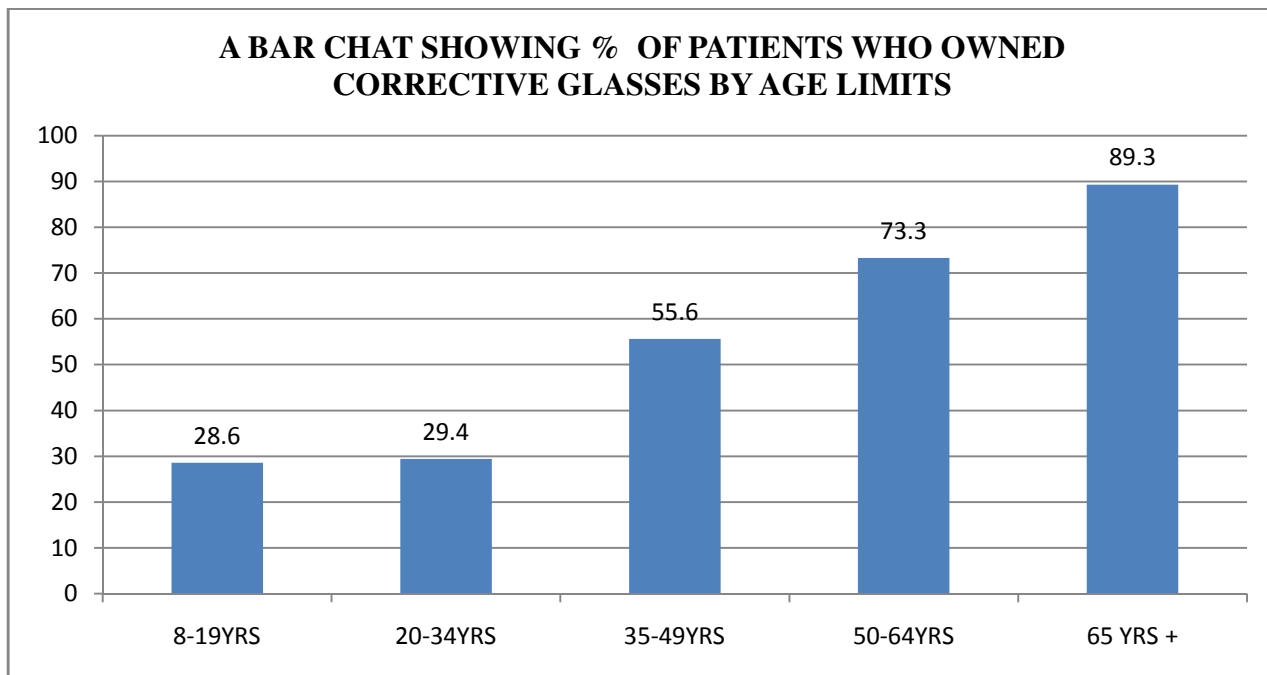


FIGURE 4.A bar charts above showing % of patients who owned corrective glasses by age limits

TABLE 7. Number & % of patients who owned spectacles to correct RE by sex

SEX RATIO	TOTAL WITH REFRACTIVE ERROR	TOTAL THAT OWNED CORRECTIVE EYE GLASS	PERCENTAGE
MALE	218	125/57.3%	44.5%
FEMALE	199	156/78.3%	55.5%
TOTAL/%	417	281	67.4%

FIGURE 5. A pie chart showing % of glass wears ownership by sex ratio

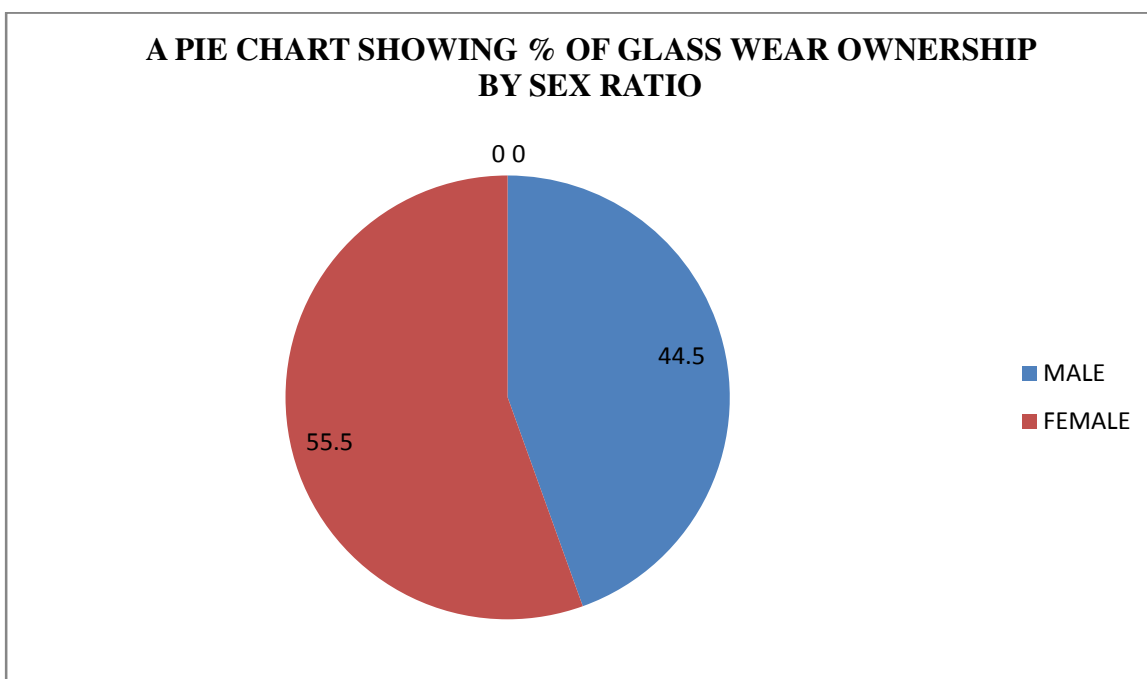


TABLE 8. Number & % patients with low vision and some other pathology as a result of uncorrected refractive error

SEX RATIO	TOTAL WITH REFRACTIVE ERROR	TOTAL THAT DEVELOPED LOW VISION	PERCENTAGE
MALE	218	12/0.3	0.3 %
FEMALE	199	8/ 0.04	0.2%
TOTAL/%	417	20	0.5%

Result Discussion

The total number of patients who visited the facility for health care consultations from January to December 2022 as shown in table 1 was 6432. The highest age group who registered was above 65 years with a total of 2053 representing 31.9% and the lowest record was seen in children between 8-19 years with a total of 454 representing 7.1%. In figure 2, it is shown that more males visited the facility than females with a record of 3541 (55.1%) and 2891 (44.9%) respectively.^[31]

Table 3, shows the number and percentage prevalence of refractive error amongst the study population was estimated as 6.5%, the highest prevalence recorded was hyperopia representing 29.3%, followed by presbyopia as 28.5%, astigmatism and myopia as 24% and 18.2% respectively. This is in contrast to data published at ^[1] which stated Presbyopia to affect most people over the age of 35. Figure 2 shows percentage prevalence of R.E among population estimated as 417 out of 6,432 representing approximately 6.5% which is higher than global prevalence of 0.96% ^[28]. In table 4 more males suffered from R.E than females; 52.3% and 47.7% respectively. Also in table 5 it shows that people between the age limit of 50-64 suffer more from RE than any other age group which indicates that the disease progresses with advancement in age and without corrections its results to further complications like blindness as seen in people above age 65. Tables 6 and 7 show the age and sex distribution of patients who wear corrective glasses. The research indicates 67.4 % compliance rate of glass wear and in table 6 it indicates that compliance rate increases with age and in table 7 females wear corrective glasses than males with a percentage ratio of 55.5% : 44.5% respectively.

In table 8, result shows that 0.5% of the population under study developed low vision and other eye pathologies as a result of uncorrected RE and this was seen in more males than females (0.3%:0.2% respectively) and the reason for the high % increase in males might be due to their lack of compliance on corrective lens wear and high cost of glasses.

Strength and Limitations of Study

The secondary data collected has the tendency to be inaccurate, obsolete and data quality to be controlled. A retrospective survey design has limitations in that it has the possibility of not being representative, as only secondary data is required and generally results are not always generalizable. Also access to readily available data was a challenge since data storage is a problem in most institutions especially when it's a paper base data and most of the variables are not well organized, so the researcher has to use more effort and expertise to get the required information. The small sample size might lead to result bias. Other limitations to this project include the time, resource, and technical know-how constraints. These limitations were taken into consideration when analyzing the data and writing up the final conclusion.

Conclusion and Recommendations

Conclusion

The result of this study shows 6.55% prevalence rate as compared to the world statistics of the disease (0.96%) indicate a 5.54% higher prevalence rate of the disease and more males are affected than females. The prevalence rate of the disease was seen to be high amongst the young adults may be due to life style changes. The research indicates 67.4 % compliance rate of glass wear and in table 6 it indicates that compliance rate increases with age and in table 7 females wear corrective glasses than males with a percentage ratio of 55.5% : 44.5% respectively. Also a 0.5% of the population under study developed low vision and other eye pathologies as a result of uncorrected RE and this was seen in more males than

females (0.3%:0.2% respectively) and the reason for the high % increase in males might be due to their lack of compliance on corrective lens wear and high cost of glasses.

Recommendations

After thorough investigations, the following recommendations were made based on the result of the findings:

- ✓ The MOHs in collaboration with health NGOs to embark on massive sensitization campaign, periodic screening and provision of free or subsidized corrective glasses to the citizens especially students in academic institutions and civil servants.
- ✓ The MoHS through the University Administrations/government institutions to do free screening of all successful candidates before admission into the university or schools.
- ✓ The Government through the MOHS in collaboration with the international and Local Health NGOs to provide comprehensive eye care services in every tertiary hospitals and basic eye care services in every health facilities in the nation
- ✓ Further research work to be done on the disease since it is of great public health concern.

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