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UNDERSTANDING VISION IMPAIRMENT: A COMPREHENSIVE STUDY OF UNCORRECTED REFRACTIVE ERRORS AMONG PRIMARY SCHOOL TEACHERS AND PUPILS IN NONGOWA CHIEFDOM, KENEMA DISTRICT, SIERRA LEONE

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ABSTRACT: *Introduction: Uncorrected Refractive Error (URE) is a major concern globally, particularly in developing nations like Sierra Leone, where limited access to eye care services poses challenges. Aim: This study, conducted in Nongowa Chiefdom, Kenema District, Sierra Leone, aimed to investigate the prevalence of URE and associated knowledge, attitudes, and practices among primary school pupils and teachers. Methods: Descriptive cross-sectional designs, incorporating both qualitative and quantitative methods were used. A structured survey questionnaire and visual acuity screening tools were used to assess uncorrected refractive errors among 692 randomly selected participants, data analysis involved descriptive statistics and qualitative content analysis. Results: The study involved 374 pupils and 318 teachers from 145 public and 14 private schools, uncorrected refractive error prevalence was 66%, with hypermetropia most prevalent and blindness at 0.13%. Girls contributed 29% of cases compared to boys' 25%. Ages 5-17 were most affected. Public schools accounted for 91% of cases, with peri-urban areas contributing 24% and urban areas 76%. Economic status and education influenced prevalence. Teachers played a crucial role in promoting eye health education. Economic factors may have influenced observed differences in refractive errors. Conclusion: The study highlighted the multifaceted nature of URE, involving demographic, economic, and educational factors. Addressing these complexities through targeted interventions is crucial for mitigating the burden of visual impairment in the region.*

KEYWORDS: Uncorrected Refractive Error (URE), Visual Impairment (VI), Mild to Severe Vision Impairement (MSVI), Sight Savers, Rapid Assessment of Avoidable Blindness (RAAB**)**

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INTRODUCTION

Refractive errors leading to reduced vision are the most common ocular problem affecting all age groups and considered a major public health threat to individual health and socioeconomic development with an annual correction costs range from 3.9 to 7.2 billion dollars in the United States alone (Kpaka & Tarawally, 2023). Uncorrected refractive error is the world's leading cause of avoidable visual impairment with an estimated global prevalence of 670 million sufferers. Rapid Assessment of Avoidable Blindness (RAAB) (2010) notes that of all blindness in Sierra Leone, 91.5% is avoidable and 58.2% is treatable.

The World Health Organization (WHO) estimates that approximately 285 million people suffer from vision impairment globally. 90% live in developing countries, with 39 million being blind and 246 million having low vision (Fricke et al., 2012a; Parikshift & Clare, 2007b). Vision impairment is defined by the WHO as visual acuity (VA) of worse than 6/18 (Fricke et al., 2012) but other widely acceptable definitions of vision impairment include VA 6/12 or worse (Muma et al., 2007) and VA worse than 6/12. In developed countries, the major cause of vision impairment is age-related macular degeneration; while in developing countries it is uncorrected refractive errors (URE) (43%) (Parikshift & Clare, 2007).

Refractive errors are the most important cause of Moderate Visual Impairment and continue to be a major public health concern. Visual loss in childhood alone has implications in all aspects of the child's development such as educational, occupational, and social challenges, with affected children being at risk of behavioral, psychological, and emotional difficulties, impaired self-esteem, and poorer social integration. There are an estimated 1.5 million blind children worldwide, with an additional 5 million who are visually impaired. Among the blind and visually impaired children, 90% live in developing countries. Worldwide uncorrected refractive error has been estimated to account for more than half of the cause of visual impairment and 18.2% of blindness (Bourne et al., 2010). Global causes of vision impairment are uncorrected refractive errors (myopia, hyperopia or astigmatism representing 43% of all vision impairment); un-operated cataract representing 33% and glaucoma representing 2% (Bourne et al., 2010). A global estimate shows that annually, the world economy loses $269 billion in productivity due to uncorrected refractive Error (URE) (Fricke et al., 2012) and 640 million people are visually impaired due to refractive error (Muma et al., 2007). However, there are regional and ethnic variations in the contribution of each type of refractive error to vision impairment. In 2010, it was reported that the age-standardized prevalence of moderate to severe vision impairment in sub-Saharan Africa population was 4.0% (95% CI: 3.4% – 5.0). Moreover, it revealed that 17.1% of the total numbers of people with mild to severe vision impairement (MSVI) worldwide are in Africa (Mbeboh et al., 2020; Diress et al., 2021). Among causes of vision impairment, refractive error is known to be most amenable to treatment and providing treatment could make the best public health impact (Racette et al., 2003). Four-fifths of all persons with a refractive error do not have spectacles and 94.4% of presbyopia (long-sight linked to aging) is uncorrected.

The prevalence of blindness in Sierra Leone is estimated at 0.7% affecting 43,842 people, while the prevalence of blindness in people over 50 years of age is estimated as 5.4% (Sight Savers Report, 2018). As with other developing countries, vision impairment affects the lives of many people in Sierra Leone, which became a signatory to VISION 2020-THE RIGHT TO SIGHT on 31st October 2000, thereby committing its government to work towards eliminating avoidable vision impairment and blindness by the year 2020. Despite the

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advances made in combating the infectious diseases that cause vision impairment, many people are still affected by poor vision and blindness (Nano et al., 2014). This is particularly true in the Eastern Region of Sierra Leone, where the adult populations living in rural areas have limited access to eye care services, which are mainly provided in urban areas. Lack of knowledge, stigma and erroneous beliefs towards refractive errors play major roles in uptake of refractive services in different cities. No study in Sierra Leone has clearly tried to determine the prevalence of uncorrected refractive error to vision impairment (Sight Savers Report, 2018).

The National Eye Health Policy of Sierra Leone (2018-2022) has a vision to attain the highest possible standard of eye health accessible to all people in Sierra Leone. Its goal is to reduce the burden of eye diseases through a comprehensive and quality eye health service that is accessible and affordable to all people in Sierra Leone; and to achieve this, a geographically specific epidemiological research is required to address the problem of vision impairment to enable proper planning of eye care programmes and strategies to reduce vision impairment (Kalikivayi et al., 1997). Concentrating on addressing Uncorrected Refractive Error (URE) in service delivery, along with screening for other sight-threatening conditions, can significantly lower the prevalence of vision impairments. Additionally, it facilitates the identification of individuals with eye ailments, enabling proper referral for advanced treatment at the eye care service at Kenema Government Hospital.

In the absence of recent research on the prevalence of uncorrected refractive errors to vision impairment among adults in the Nongowa Chiefdom of Kenema District, it is impossible to plan appropriate services, and to know if the right services are being provided in the right places. This study therefore seeks to investigate the prevalence and associated knowledge, attitudes, and practices of uncorrected refractive errors leading to vision impairment among primary school pupils and teachers in Nongowa Chiefdom, Kenema District, Sierra Leone.

THEORETICAL/CONCEPTUAL FRAMEWORK UNDERPINNING THE RESEARCH WORK

For the investigation of the prevalence and associated knowledge, attitudes, and practices of uncorrected refractive errors leading to vision impairment among primary school pupils and teachers in Nongowa Chiefdom, Kenema District, Sierra Leone, a suitable theoretical and conceptual framework that guided the research was built by integrating multiple models, including concepts from the Health Belief model, Social Cognitive Theory and Ecological Model.

Health Belief Model (HBM)

The Health Belief Model (HBM) is valuable for understanding individuals' perceptions and behaviors related to health issues, including refractive errors. This model suggests that people are likely to take health-related actions if they believe they are susceptible to a condition, the condition is severe, taking a specific action would be beneficial, and there are no significant barriers to taking that action (Rosenstock, 1974).

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Key Questions from HBM

- Perceived Susceptibility and Severity: How do individuals perceive their susceptibility to uncorrected refractive errors, and how severe do they consider the potential consequences?
- Perceived Benefits: What are the perceived benefits of seeking eye care, wearing corrective lenses, and addressing refractive errors?
- Perceived Barriers: What are the barriers hindering individuals from seeking preventive or corrective actions for uncorrected refractive errors?

Social Cognitive Theory (SCT)

Social Cognitive Theory (SCT) by Bandura emphasizes the dynamic interaction between personal, environmental, and behavioral factors. This theory is particularly relevant for understanding how individuals acquire knowledge, attitudes, and practices through observation, imitation, and direct experiences (Bandura, 1986).

Key Questions from SCT

- Personal Factors: How do personal factors, including individual knowledge, attitudes, and practices, contribute to the prevalence of uncorrected refractive errors?
- Environmental Factors: How do environmental factors, such as access to eye care services, socio-economic conditions, and educational settings, influence behaviors related to refractive errors?
- Behavioral Factors: What behaviors do individuals exhibit regarding eye care, spectacle use, and adherence to treatment for refractive errors?

Ecological Model

The ecological model, encompassing individual, interpersonal, community, and societal levels, provides a comprehensive perspective on the various influences on health behaviors (McLeroy et al., 1988).

Key Questions from Ecological Model

- Individual Level: How do individual knowledge and behaviors contribute to the prevalence of uncorrected refractive errors?
- Interpersonal Level: What role do peer interactions, family dynamics, and social influences play in shaping attitudes and practices related to refractive errors?
- Community Level: How does the community context, including access to eye care services and community norms, impact the prevalence of uncorrected refractive errors?
- Societal Level: What broader socio-economic factors, policy implications, and cultural influences contribute to the prevalence of uncorrected refractive errors?

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Integration of Frameworks

By integrating the Health Belief Model, Social Cognitive Theory, and the Ecological Model, the research can offer a comprehensive understanding of the prevalence and associated factors of uncorrected refractive errors leading to vision impairment among primary school pupils and teachers in Nongowa Chiefdom.

RESEARCH METHODOLOGY

Study Area

Nongowa Chiefdom, located in Kenema District, Sierra Leone, houses a population of 45,562 (Census, 2015), with predominant agricultural and livestock-based economy. The area faces poverty challenges, and its economy centers around agriculture. The chiefdom's strategic location, diverse agricultural production, and commercial activities make it a significant hub. Fertile soil supports the cultivation of food crops and vegetables. Despite environmental concerns, it remains an economically viable and cosmopolitan chiefdom (Kenema District, Sierra Leone) (Population Statistics, Charts, Map and Location, n.d.). The choice for research stems from its importance in educational, trading, and employment activities. The study, motivated by practical experience with Vision Aid Overseas, aims to assess the prevalence of uncorrected refractive errors leading to vision impairment, recognizing the significance for future eye care and educational intervention.

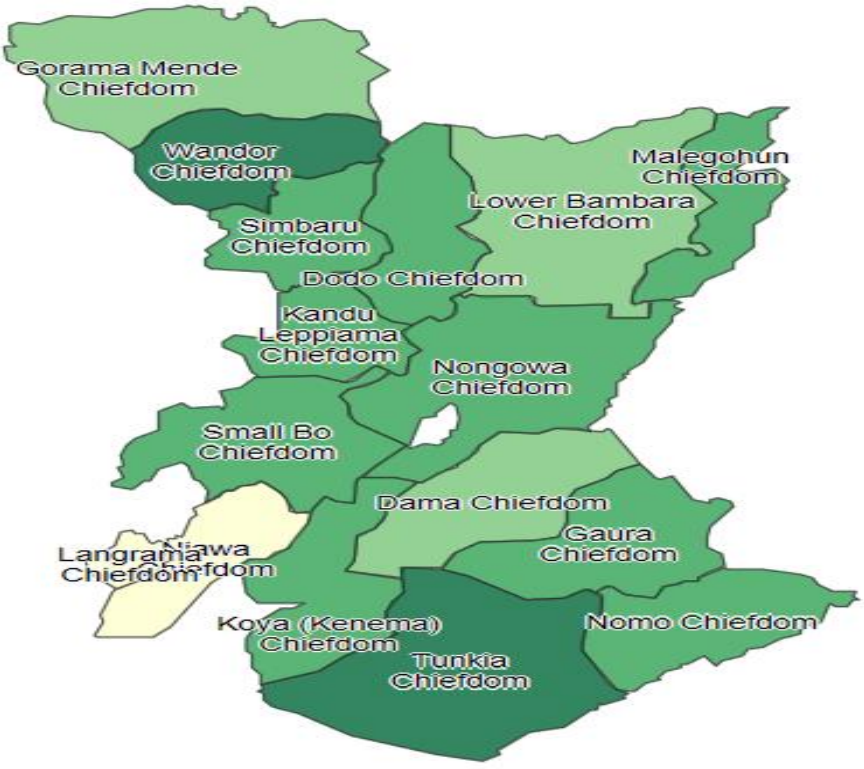

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Figure 1: Map of Kenema District Showing Chiefdoms and Boundaries in Sierra Leone

Research Design

This study adopted a descriptive cross-sectional research design combining both qualitative and quantitative approaches. This mixed-method design allows for an in-depth understanding of the research problem. A Structured Survey Questionnaire was used to qualitatively assess knowledge, attitudes, and practices of participants and the risk factors associated with uncorrected refractive errors. Similarly, a Visual Acuity and other Testing Equipment were used to conduct eye screenings to determine the prevalence and types of uncorrected refractive errors that lead to visual impairment.

Sampling Technique and Sample Size Estimations

The study targeted primary school children and teachers in selected primary schools in Nongowa Chiefdom, Kenema District and the inclusion criteria involved participants from various age groups and genders to ensure representation. All teachers and pupils aged 5 years and above attached to any of the 159 primary schools are randomly selected. Recently transferred pupils and teachers to Nongowa Chiefdom from other districts to attend school were excluded from the study.

The target population for this study was 53,953 comprising of 53,635 pupils and 318 teachers from a purposive sample of 159 selected primary schools within the Nongowa Chiefdom (M=191, F=127, B= 24,710 and G=28,925). A stratified random sampling technique was used to select research subjects from the total population based on factors such as age, gender, and occupation (teachers and pupils). A proportionate number of participants were then randomly selected from each stratum summing up to 692 participants.

The sample size was determined by the fisher formula used (Fisher et.al, 1998) for a population >10,000.

$$n=\frac{Z^2pqD}{d^2}$$

Where n= Minimum sample size

Z= Standard normal deviation usually set at 1.96

P= Assumed population prevalence in %

q--= 1-p

D= the likely design effect

d—Maximum acceptable random sampling error in %

in this case,

p= 10%= 0.1

q= 1-0.1=0.9

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D= 5

d--= 5%=0.05

Therefore,

n--= $\frac{(1.96)^2(0.1)(0.9)5}{(0.05)^2}$

$= \frac{3.84 \times 0.1 \times 0.9 \times 5}{0.0025}$

$= \frac{1.728}{0.0025}$ **= 691.2, approximately 692**

Data Collection Instrument

The study employed a structured survey questionnaire and eye screening tools, including the Snellen Visual Acuity Chart, Pinhole, Near Acuity Chart, Ophthalmoscope, Retinoscope, Energizer Pen Touch, and Head Loupe Magnifier. The questionnaire covered demographic details, educational aspects, ocular examinations, and final diagnoses. Research assistants, a qualified optometry technician, and an optometrist contributed to data collection and analysis, following a protocol similar to established studies by Marmamula et al. (2011a) and Oye et al. (2006b).

Data Collection Process/Method

Study participants, after receiving detailed information and addressing concerns, underwent examination in well-lit school areas. A modified Rapid Assessment of Vision Impairment (RAVI) protocol, including informed consent, demographic data collection, and various visual acuity tests, was employed. Ophthalmoscopes were performed for all participants to address RAVI's limitations. Pinhole examinations, non-cycloplegic refractions, and near vision assessments were conducted as needed. The primary cause of vision impairment was determined for participants with uncorrected visual acuity of 6/12 or worse, aligning with WHO recommendations. Data completeness was ensured before participants left as shown in Figure 2 below:

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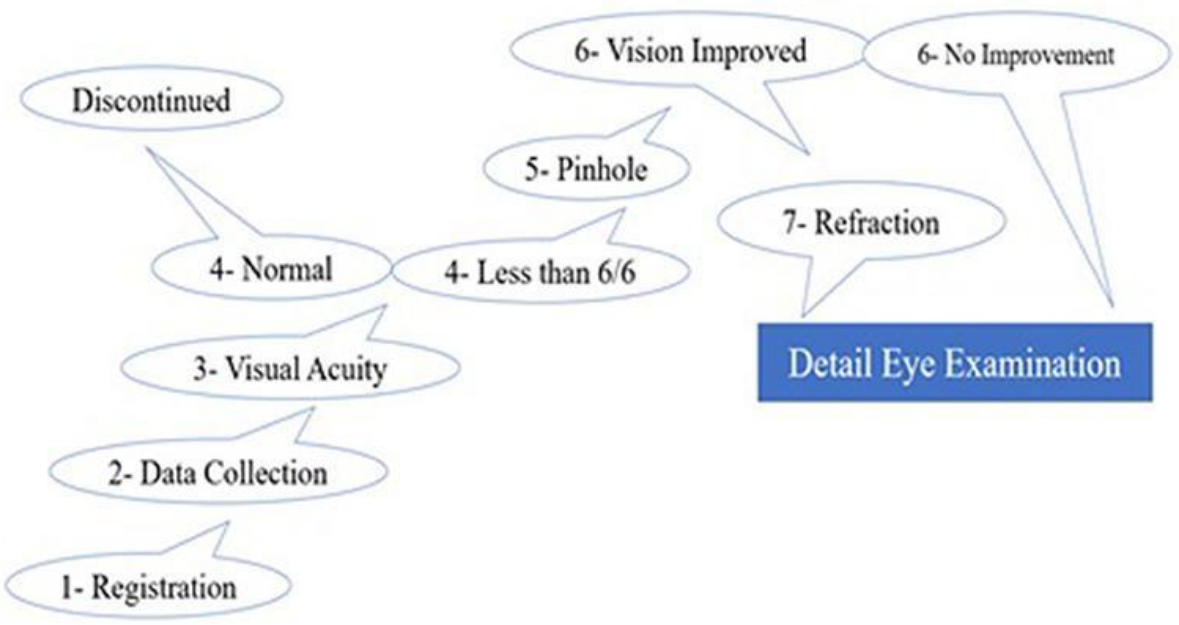

Figure 2: Schematic diagram of the screening protocols for determination of refractive errors

Data Analysis and Safety

The data collected from the questionnaires and screening tests were entered into Microsoft Excel tool pack 2019 for data cleaning. Subsequently, the cleaned data was exported into Statistical Package for Social Sciences (SPSS) version 26.0 for in-depth analysis. A descriptive statistics was computed to calculate the prevalence of uncorrected refractive errors among primary school pupils and teachers in Nongowa Chiefdom. Frequency distribution and percentages were used for a clear presentation of prevalence rates in tables and plotted graphs.

For the qualitative data, the researcher employed a qualitative coding for open-ended responses from the structured survey questionnaire, utilizing qualitative content analysis to derive themes and patterns related to knowledge, attitudes, and practices and associated risk factors. Subgroup analyses were also made to compare prevalence rates, types of refractive errors, and knowledge/practices among different demographic groups (e.g., students vs. teachers, different age groups).

Robust data security measures, including encryption and limited access, were implemented for a confidential and secure research process.

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RESULTS

Demographic Characteristics of the Respondents

A total of 374 pupils participated in this study, out of which 170 (25%) were boys and 204 (29%) were girls. Similarly, a total of 318 teachers were recorded, out of which 224 (32%) were males and 94 (14%) were females drawn from 145 public and 14 private schools.

Age Distribution of Respondents

From table 1 below, the age groups mostly represented were 11-15 years at 36% and 20+ years at 46% respectively and the age groups least represented were <6 years at 1% and 16-20 years at 3% respectively.

Table 1: Percentage Distribution of Respondents by Age Category

AGE GROUP (YEARS)	FREQUENCY (n=692)	PERCENTAGE (%)
<6	4	1
6-10	100	14
11-15	250	36
16-20	20	3
20+	318	46
Total	**692**	**100**

Gender Distribution of Respondents

From table 2, male teachers comprised 32%, females teachers 14%, male pupils 25%, and Female pupils 29%.

Table 2: Percentage Distribution of Respondents by Gender

GENDER	FREQUENCY (n=692)	PERCENTAGE (%)
MALE TEACHERS	224	32
FEMALE TEACHERS	94	14
MALE PUPILS	170	25
FEMALE PUPILS	204	29
Total	**692**	**100**

Class Distribution of the Respondents

The class category 5-6 had the highest proportion of respondents among public schools at 67% and 64% respectively. Overall, the class category 5-6 had the highest proportion of respondents followed by class category 3-4 at 31% and 36% respectively (Table 3). The higher proportion of respondents in higher classes in public schools could be linked to the high enrolment due to the free quality primary education while the higher participation in upper classes in private schools could be due to the shift of pupils with the hopes of better performance at National Primary School Examination (NPSE).

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Table 3: Percentage Distribution of Respondents by Class Category

CLASS CATEGORY	PUBLIC N=332	PRIVATE N=42
1-2	**7 (2)**	**0 (0)**
3-4	**102 (31)**	**15 (36)**
5-6	**223 (67)**	**27 (64)**
TOTAL	**100**	**100**

Distribution of Respondents by Zone and Type of School

Majority of the respondents were from urban 121(76%) zones which are purely urban as compared to rural 38(24%) which have peri-urban characteristics. Public schools contributed to 145(91%) of the respondents while private schools contributed 14(9%) (Table 4).

Table 4: Distribution of Respondents by Zone and Type of School

ZONE	PUBLIC (n=145)	PRIVATE (n=14)	TOTAL
URBAN	107	14	121 (76)
RURAL	38	0	38 (24)
TOTAL	145 (91)	14 (9)	100

Distribution of Respondents by *Educational Level*

From the table 5 below, 374 (54%) of the study respondents were school pupils, while 275 (40%), 25 (4%), and 10 (1%) acquired TC, HTC Primary and Secondary respectively.

Table 5: Educational Level of the Respondents

EDUCATIONAL LEVEL	FREQUENCY (n=692)	PERCENTAGE (%)
PUPILS	**374**	**54**
TC	**275**	**40**
HTC Primary	**25**	**4**
HTC Secondary	**10**	**1**
BED	**8**	**1**
Masters	**0**	**0**
PhD	**0**	**0**
Total	**692**	**100**

4.1.6 Distribution of Respondents by *Marital status*

It was observed that 54% (374) were unmarried, while 28% (191) were married and 12% (87) single, respectively (table 6) .

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Table 6: Marital Status of the Respondents

MARITAL STATUS	FREQUENCY (n=692)	PERCENTAGE (%)
Unmarried	374	54
Single	87	12
Married	191	28
Widowed	23	3
Divorced	12	2
Others	5	1
Total	**692**	**100**

Distribution of the Respondents by Ethnicity

From the table below, the Mende ethnic group comprised 78% (540), followed by the Temne 7% (50), Fullah 7% (45), and others 4% (31) respectively.

Table 7: Ethnic Distribution of the Respondents (Pupils and Teachers)

ETHNIC GROUP	FREQUENCY (n=692)	PERCENTAGE (%)
Mende	540	78
Temne	50	7
Krio	7	1
Fullah	45	7
Madingo	19	3
Others	31	4
Total	**692**	**100**

Distribution of Respondents by *Religious Belief*

From table 8, it was observed that 62% (431) of the study respondents were Muslims, 34% (232) Christian, and 4% other religious groups, respectively.

Table 8: Religious Distribution of the Respondents (Pupils and Teachers)

RELIGIOUS GROUP	FREQUENCY (n=692)	PERCENTAGE (%)
Muslim	431	62
Christian	232	34
Others	29	4
Total	**692**	**100**

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Prevalence of uncorrected refractive error to vision impairment among participants (Teachers and Pupils)

From table 9 below, a total of 236 (34%) of the respondents had normal VA while 455 (66%) had refractive error to VI. There was no case of severe visual impairment (SVI), however 0.14% of the respondents were observed to be blind (Table 9 below). The single case of a blind pupil was diagnosed with retinal disease (Retinoblastoma) as the cause of blindness and was in a public integrated school where assistance is provided by special teachers, with necessary tools and equipment both for mobility and learning purposes. The diagnosis was made at the age of 5 years and the pupil underwent enucleation of both eyes within 3 months according to the medical records at the school.

Table 9: Prevalence of Uncorrected Refractive Error to Vision Impairment among the Respondents

VA CATEGORY	FREQUENCY (n=692)	PERCENTAGE (%)
6/6-6/9 (Normal)	236	34.0
6/12-6/24 (RE-VI)	455	66.0
6/36-6/60 (SVI)	0	0.0
<6/60 (Blind)	1	0.14
Total	**692**	**100**

Patterns of uncorrected refractive error to vision impairment among different demographic categories

The pattern of refractive error to visual impairment was sought among age category, gender, class category, type of school and zone.

Uncorrected refractive error to vision impairment amongst the Gender category

From table 11, males including boys contributed 57% of uncorrected refractive error to vision impairment while for females including girls, this was 43%**.**

Table 11 Uncorrected refractive error to vision impairment amongst Gender category

GENDER	FREQUENCY (n=692)	PERCENTAGE (%)
MALE	224	32
FEMALE	94	14
BOY	170	25
GIRL	204	29
Total	**692**	**100**

Uncorrected refractive error to vision impairment by class category

According to table 12, the class category 5-6 had the highest proportion of respondents with RE among public schools compared to class category 5-6 among private schools at 67% and 64% respectively.

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Table 12 Uncorrected refractive error to vision impairment and class category

CLASS CATEGORY	PUBLIC (n=332)	PRIVATE (n=42)
1-2	7 (2)	0 (0)
3-4	102 (31)	15 (36)
5-6	223 (67)	27 (64)
TOTAL	100	100

Uncorrected refractive error to vision impairment by zone and type of school

From table 13, most of the respondents with RE to VI were from urban zones 121 (76%), which are purely urban compared to rural 38 (24%) which have peri-urban characteristics. Public schools contributed to the majority of the cases representing 145 (91%) of the respondents while private schools contributed 14 (9%).

Table 13: Distribution of Respondents by Zone and Type of School

ZONE	PUBLIC (n=145)	PRIVATE (n=14)	TOTAL
URBAN	107	14	121 (76)
RURAL	38	0	38 (24)
TOTAL	145 (91)	14 (9)	100

Risk Factors/Causes and Types of Uncorrected Refractive Error to Visual Impairment among the Respondents

Risk Factors/Causes of Uncorrected Refractive Error to Visual Impairment

In the current study as shown in table 14, refractive error was responsible for 455(66%) of uncorrected refractive error to visual impairment. Other causes were albinism 7(1%), corneal diseases 30(4%), disease of the globe 10(1%), strabismus 5(1%), nystagmus 5(1%), cataract 150(22%), and glaucoma 30(4%).

Table 14: Percentage Distribution of Risk Factors/Causes of Uncorrected Refractive Error to Visual Impairment among Respondents

CAUSES	FREQUENCY(n=692)	PERCENTAGE (%)
Refractive Error	455	66
Albinism	7	1
Corneal Disease	30	4
Disease of the whole globe	10	1
Strabismus	5	1
Nystagmus	5	1
Cataract	150	22
Glaucoma	30	4
Total	**692**	**100**

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Types of Uncorrected Refractive Error to Visual Impairment among Respondents

From table 15 below, it was observed that the most common refractive error among the respondents was hypermetropia 455(66%) followed by myopia 210(30%) and astigmatism 27(4%) respectively.

Table 15: Types of Uncorrected Refractive Error to Visual Impairment among Respondents

TYPES OF URE TO VI	FREQUENCY(n=692)	PERCENTAGE (%)
Hypermetropia	455	66
Myopia	210	30
Astigmatism	27	4
Total	**692**	**100**

Factors Associated with Uncorrected Refractive Error to Visual Impairment

From table 16 below, the majority of pupils and teachers in public schools had more economic status than those in private schools. Socio-economic status therefore had influence on the prevalence of uncorrected refractive error to visual impairment between types of schools.

From table 17, there was no statistical difference in the economic status of the two groups of respondents as there was no monthly income distribution for the school going pupils as one of the respondents to this research.

Table 16: Economic Characteristics of Respondents (Pupils and Teachers)

ECONOMIC STATUS	FREQUENCY(n=692)	PERCENTAGE (%)
Pupil	374	54
Public Servant	318	46
Total	**692**	**100**

Table 17: Monthly Income Distribution of the Respondents (Teachers and Pupils)

INCOME LEVEL (SLL)	FREQUENCY(n=692)	PERCENTAGE (%)
0	374	0= school pupils
0-600	0	0
600-1000	150	47.2
1000-1,500	100	31.4
>1,500	68	21.4
Total	**692**	**100**

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Participants' Knowledge Attitudes and Practices on Uncorrected Refractive Error to Vision Impairment

Pupils Knowledge on Causes of Uncorrected Refractive Error to Vision Impairment

From table 18, about half of the pupils affected by uncorrected refractive error to vision impairment cited allergy as the main cause of uncorrected refractive error to vision impairment. However, still a good proportion of the pupils do not have an idea of what causes uncorrected refractive error to vision impairment or blindness. In the current study, allergy and genetic factors were cited as the main causes of URE to VI or blindness but many respondents too did not have an idea on how these problems come about.

Table 18: Pupils' Knowledge on Causes of Uncorrected Refractive Error to Vision Impairment

CAUSES	FREQUENCY(n=374)	PERCENTAGE (%)
Genetic factors	70	19
Allergy	200	53
No idea	104	28
Total	**374**	**100**

Pupils Respondents' Knowledge on Preventing Uncorrected Refractive Error to Vision Impairment

In the table below (table 19), early treatment was considered as a means of preventing uncorrected refractive error to vision impairment by 70% of the respondents. The pupils also cited use of spectacles (17%) and staying in dust free environments (12.50%) as other means of prevention.

Table 19: Pupils Respondents' Knowledge on Prevention Uncorrected Refractive Error to Vision Impairment

MEANS OF PREVENTION	FREQUENCY(n=374)	PERCENTAGE (%)
Early Treatment	**262**	**70**
Use of Spectacles	**64**	**17**
Dust free Environment	**48**	**13**
Total	**374**	**100**

Attitudes and Practices of Pupils Respondents towards Eye Ailments Especially URE

From table 20 below, the majority of the pupils (92%) reported that they informed their parents or teachers whenever they had any eye ailments (Table 4.11). A few of the pupils (8%) did not inform either parents or teachers whenever they had eye ailments.

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Table 20: Pupils Respondents' Attitudes and Practices Towards Eye Ailments

PRACTICE	FREQUENCY(n=374)	PERCENTAGE (%)
Do Inform	344	92
Do not inform	30	8
Total	374	100

Teachers Respondents' Knowledge on the Causes of Uncorrected Refractive Error to Vision Impairment

The table below shows that the majority of the teachers cited poor hygiene as the leading cause of uncorrected refractive error to VI (44%). Other causes cited were poor nutrition (31%), other diseases (13%) and genetic factors (12%), (Table 21).

Table 21: Teachers Respondents' Knowledge on Causes of Uncorrected Refractive Error to Vision Impairment

CAUSES	FREQUENCY(n=318)	PERCENTAGE (%)
Genetic Causes	38	12
Poor Nutrition	99	31
Poor Hygiene	140	44
Other Diseases	**41**	**13**
Total	**318**	**100**

Teachers Knowledge on Preventing Uncorrected Refractive Error to Vision Impairment

It was observed from table 22, that the majority of the teachers (29.47%) cited good nutrition as a means of prevention of uncorrected refractive error to VI. The teachers also cited good personal hygiene (26.32%), good lighting (13.68%), and early treatment (10.53%) as ways of prevention. Another 20.00% cited regular screening and environmental hygiene as other ways of prevention.

Table 22: Teacher's Knowledge on Prevention of Uncorrected Refractive Error to Vision Impairment

WAYS OF PREVENTION	FREQUENCY(n=318)	PERCENTAGE (%)
Good Nutrition	**94**	**30**
Good Personal Hygiene	**83**	**26**
Good Lighting	**45**	**14**
Early treatment	**32**	**10**
Others- (regular screening & environmental hygiene)	**64**	**20**
Total	**318**	**100**

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Attitudes and Practices among Teacher Participants on Uncorrected Refractive Error to Vision Impairment

From table 23 below, teachers reported that they teach lessons on eye health promotion in primary schools. Among these lessons are personal hygiene by 36.21% of teachers, good nutrition by 29.31%, care of the visually impaired and blind by 20.69% and emphasis for early treatment by 13.79%.

Table 23: Teachers Attitudes and Practices on Eye Health Promotion

LESSON TAUGHT	FREQUENCY (n=318)	PERCENTAGE (%)
Personal Hygiene	114	36
Good Nutrition	92	29
Care of the VI and Blind	67	21
Emphasis on Early Treatment	45	14
Total	**318**	**100**

Qualitative Content Analysis

Qualitative content analysis of the data on knowledge, attitudes, and practices regarding uncorrected refractive errors (URE) and associated risk factors in Nongowa Chiefdom, Kenema District, Sierra Leone revealed noteworthy themes as thus:

Economic Status Influence

Public school pupils and teachers had a higher prevalence of URE compared to private schools and economic factors were deemed influential in the prevalence of URE, highlighting a potential socio-economic disparity.

Monthly Income Distribution

Monthly income distribution, particularly among pupils, showed no significance difference. This lack of disparity may indicate a uniform economic status among school pupils.

Pupils' Knowledge on Causes of URE

Genetic factors and allergy were identified as main causes, however, half of the pupils attributed URE to allergy, while a significant portion lacked awareness of the causes but a notable percentage lacked clarity on the origins of URE.

Pupils' Knowledge on Prevention

Pupils predominantly recognized early treatment as a preventive measure against URE. However, limited awareness existed regarding other preventive measures such as the use of spectacles and maintaining a dust-free environment.

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Attitudes and Practices of Pupils

The majority of pupils informed parents or teachers when experiencing eye ailments, reflecting a positive practice. Only a small percentage of pupils did not communicate their eye ailments to parents or teachers.

Teachers' Knowledge on Causes of URE

Teachers identified poor hygiene as the primary cause of URE, followed by poor nutrition, other diseases, and genetic factors.

Teachers' Knowledge on Prevention

Teachers emphasized good nutrition as a prominent means of preventing URE. Other preventive measures as stated included personal hygiene, good lighting, early treatment, regular screening, and environmental hygiene.

Attitudes and Practices of Teachers

Teachers actively engaged in teaching eye health promotion in primary schools through lessons covering topics, such as personal hygiene, good nutrition, care for the visually impaired and blind, and the importance of early treatment indicative of positive attitudes.

DISCUSSION & LIMITATIONS

The discussion of findings in this study focused on the demographic characteristics of the respondents, the prevalence of uncorrected refractive error to vision impairment and patterns of occurrence based on age, gender, class, and school type, as well as associated factors. The study aimed to investigate the prevalence and associated factors of uncorrected refractive error to visual impairment in Nongowa Chiefdom, Sierra Leone, and utilized questionnaires, and eye screening tests for data collection. The demographic characteristics revealed insights into the age, gender, class distribution, and type of school of the study population.

Based on study findings, the age group most represented in the study was 5-17 years at 54%, with a higher percentage among females (32%) compared to males (14%). Similar study conducted in Kenya revealed that the age groups most represented were 11-15 and 6-10 years but contrary to a study conducted by (Kpaka & Tarawally, 2023). The normal school age children (5–19-year-olds) are reflected in the National Health Sector Strategic Plan (NHSSP II) as well as Kenya Education Sector Support Programme (KESSP) (Ntim-Amponsah, 2017).

Class distribution indicated that higher classes in public schools had more respondents due to the free quality primary education policy, while private schools showed higher participation in upper classes, possibly due to aspirations for better performance in national examinations. In a similar study conducted in Ghana, there was equal representation of respondents among all the four class categories of between 24.22% and 25.77%. Among public schools, the class categories had between 16.37% and 17.92% respondents which again were relatively equal. Among private schools, the representation was between 7.86% and 8.24%. This equal representation between class categories was because the school samples were divided equally

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among all the eight classes. There were however lower enrolments among private compared to public schools. This is because under the Free Primary Education, enrolment in public schools rose considerably from 86.8% in 2002 to 101.5% in 2004. This enabled some 1.3 million poor children to benefit for the first time through the abolishment of fees and levies for tuition (UNESCO, 2006).

The prevalence of uncorrected refractive error to visual impairment in the study population was substantial, with 66% affected, significantly surpassing the global estimate of 0.40% (Lynne, 2016). This high prevalence was attributed to socio-economic differences between the studied population and others, emphasizing the impact of economic status on access to eye care services. A similar study conducted among standard one pupil in Kibera slums of Nairobi, Kenya found a prevalence of VI to be 10.00% (Musa, 1998); and in Nigeria, the prevalence of VI in children less than 16 years in a hospital-based study was 2.0% (Adegbehingbe, 2007). In the USA, the prevalence of VI in children is estimated to be 5-10% (Murthy, 2018). This is a national estimate and given regional variations that may be found in the Kenyan setting, the Kenyan national figure could be much higher because of the socio-economic differences between the two countries.

The prevalence of blindness was lower at 0.14%, but still of public health importance. The 18% global estimate for VI by WHO (Fricke, 2012) is much higher above the findings of this study because this estimate is based on whole populations. The current study only focused on primary school children and teachers. Analyzing patterns, the leading cause of VI in this study was refractive error and the age category 5-17 years was most affected, aligning with the typical manifestation period for refractive errors. This age category is characterized by rapid growth that includes rapid anterior- posterior diameter of the eye (from the posterior corneal surface to the retina, normally 22 to 26mm). This growth in the size of the eye has a bearing on the development of refractive errors. Majority of significant refractive errors manifest themselves during teenage life (Holden et al., 2000). In a study carried out among children 12-15 years within a hospital setting in Nigeria, males were also more affected by VI at 31.60% than females at 22.20% (Adegbehingbe, 2007). Generally, females are more affected by VI and blindness than males; of the people who are blind in the world, 64% are female (Courtright & Lewallen, 2007). Another similar study conducted in the USA revealed that the prevalence and distribution of corrective lenses among school age children with refractive errors was 25.40% with more girls having corrective spectacles than boys (Kemper & Bruckmen, 2004). This therefore implies that accessibility to refractive services is still a challenge even in developed countries and the fact that more girls than boys had corrective spectacles needs to be explored further through research. Perhaps the majority of the females in the current study already had corrections and that is why more males were still visually impaired than females. In this current study, the only blind pupil was female. Blindness being a low prevalence condition requires very large samples for study especially among children. The public health implications of even one case of blindness, however, are very immense.

Class category 5-6 had the highest proportion of affected individuals, reflecting the impact of free primary education on enrollment and the potential delay in seeking medical intervention. The distribution by zone and type of school indicated higher prevalence in urban zones and public schools, suggesting economic disparities among teachers and pupils. Economic characteristics played a significant role, with those in public schools, often of lower economic status, forming the majority of cases.

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Refractive error emerged as the primary cause of visual impairment, accounting for 66% of cases. This aligns with similar studies in India (Kalikivayi et al., 1997a; Brien, 2002b; Leon, 2017c) and China (Zhao et al., 2000) but contrasts with a Kenyan study (Musa, 1998), highlighting regional variations. Hypermetropia was the most common refractive error, followed by myopia and astigmatism and this was supported by a study conducted in Ghana (Ghana Statistical Service, 2018).

Economic characteristics among parents, as well as pupils' and teachers' knowledge, influenced the prevalence of uncorrected refractive error to visual impairment. Socio-economic status, hygiene, and nutrition were identified as key factors. Pupils demonstrated varying knowledge of causes and prevention, with allergy often cited. On the other hand, teachers identified poor hygiene, poor nutrition, and genetic factors as leading causes, indicating a gap between perceived and actual causes and prevention of uncorrected refractive error to visual impairment, emphasizing the need for educational interventions. Similar result has been revealed by a study done in Kibera and Dagoretti divisions in Nairobi which found that 49% of the participants did not seek treatment for ocular disorders because they did not perceive the need as the problems did not bother them. Another 33% did not have money, 7.50% did not know where to go, 6.80% had no time to seek treatment, and 1.00% said eye facilities were far away while 2.70% had other unspecified reasons (Karimurio et al., 2008).

Despite the high prevalence, the study highlighted positive practices, such as pupils informing parents or teachers about eye ailments and teachers playing a crucial role in promoting eye health through lessons on personal hygiene, good nutrition, and early treatment. However, there was a lack of training on primary eye care in the syllabus, suggesting a need for curriculum adjustments to enhance teachers' capacity in eye health education, especially in public schools. Similar findings were seen in a study on perceptions amongst primary school teachers of visual problems affecting their pupils in Quetta, as there is lack of any training about primary health care or primary eye care teaching in the syllabus of primary teachers (Mohammad, 2015). The implementation of the school health policy will therefore go a long way in addressing this gap.

Limitations include potential lack of generalizability due to the specific location, absence of a control group, and constraints in implementing cycloplegic examinations, as well as being limited to selected urban and rural schools due to time and resource constraints.

IMPLICATION TO RESEARCH AND PRACTICE

The implications for research and practice based on the study findings involved a multilateral approach involving policy enforcement, collaborative efforts, provision of resources, and educational initiatives to address visual impairment effectively in the following ways:

A. Enforcement of school health policy that mandates visual assessment before school admission and conducting annual school eye screenings as this will facilitate early detection and management of eye problems among pupils and teachers. Given that many individuals with vision impairment had refractive errors, there is an urgent need for provision of subsidized spectacles thereby improving accessibility to corrective measures for pupils and teachers experiencing visual impairment. Collaboration between the

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Ministry of Health and sanitation and eye care development partners is essential for the provision of subsidized spectacles. This collaborative effort would alleviate the financial burden on individuals with refractive errors leading to visual impairment.

B. Concerted efforts are required from the Ministry of Health and Sanitation and Public Health Institutions to provide comprehensive eye health education. Targeting pupils, teachers, and parents, this initiative aims to enhance awareness and early detection of major blinding and visually disabling conditions. The Ministry of Health and Sanitation and its development partners should undertake a national visual impairment and blindness survey. This empirical data would be instrumental in understanding the scope of the issue and devising effective interventions. Awareness raising about the existence of primary eye care facilities in hospitals and promoting the benefits of regular eye tests is essential. Encouraging individuals to seek eye care proactively, even before noticeable problems arise, is vital for preventive measures, rather than a reactive response to developed eye problems, which can be modeled after successful practices in countries like the UK, minimizing avoidable visual impairment.

CONCLUSION

The study provided valuable insights into the prevalence, patterns, and associated factors of uncorrected refractive error to visual impairment in Nongowa Chiefdom. The findings revealed a multifaceted nature of this public health issue, involving demographic, economic, and educational aspects. Further research and interventions are warranted to address the identified gaps and contribute to mitigating the burden of visual impairment in the studied population.

FUTURE RESEARCH

Future research endeavors in the field of eye health should consider the following areas:

Beyond the diseases identified in the current study, there is a need for extensive research into other potential disease conditions that could lead to visual impairment and blindness. Conducting a study on eye diseases affecting primary school pupils and teachers across diverse geographic locations would provide a more inclusive understanding of the various contributing factors. An urgent call for national research on the prevalence of significant refractive errors among primary school teachers and pupils is required to establish the overall burden and to facilitate the development of targeted interventions.

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