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Prevalence and Impact of Uncorrected Refractive Errors on Academic Performance of Public Secondary School Students in Uyo Local Government Area, Akwa Ibom State Nigeria

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Abstract *- Uncorrected refractive errors (UREs) remain a leading cause of visual impairment globally particularly among school aged children, where they can severely hinder learning capacity and academic achievement. This study assessed the prevalence of URE s and their impact on academic performance among secondary school students in Uyo Local Government Area of Akwa Ibom State, Nigeria. A descriptive cross-sectional design was adopted, enrolling a total of 193 students from selected public secondary school through a multistage sampling method. The sample comprised 43.00% males and 56.99% females, aged between 10 and 24years, with a mean age of 16.19±3.68years. Visual acuity was measured using a standard Snellen chart, and refractive errors were further confirmed using a handheld autorefractor. Academic performance was evaluated based on the students terminal examination scores obtained from school records. Descriptive statistics were used to summarize demographic and clinical data, while the chi-square test was applied to determine the association between visual acuity status and academic performance, with significance set at $p<0.05$. The findings revealed a URE prevalence of 28.49% indicating that nearly one in three students had some form of correctable vision impairment. Among students with subnormal visual acuity (VA<6/9), 54.55% scored below50% in their academic performance, in contrast to 30.43% of students with normal vision, a difference that was statistically significant ($\chi^2=10.43, p<0.05$). Although not statistically significant, female students with UREs performed marginally better than their male counterparts, and older students (20–24years) tended to have higher academic scores compared to younger ones (10–14years), suggesting potential influence of maturity and adaptive learning strategies ($p=0.27$ and $p=0.30$, respectively). The study highlights a meaningful relationship between visual health and educational outcomes. The high prevalence of UREs and their demonstrable impact on learning emphasize the urgent need for routine vision screening programs within schools, along with the provision of affordable corrective interventions. Addressing vision problems early could contribute significantly to improving academic performance, reducing school drop-out rates, and promoting educational equity in Uyo Local Government and similar settings.*

Keywords: *Academic, Impact, Learning Refractive-Errors, Students, Uncorrected*

I. INTRODUCTION

Uncorrected refractive errors (UREs) are among the most common causes of visual impairment globally. These vision problems occur when the eye cannot properly focus light on the retina, resulting in blurred vision. Common types of refractive errors include myopia (nearsightedness), hyperopia (farsightedness), and astigmatism. Despite being easily diagnosable and treatable with corrective lenses, UREs remain a significant public health issue, particularly in regions with limited access to eye care services (Resnikoff et al*.,* 2008).Visual impairment is any visual condition that impacts an individual's ability to successfully complete the activities of everyday life which include academic activities and other leisure activities such as playing ball, watching television and involvement in other recreational activities.

Students with visual impairments such as infants, toddlers, children and youths who experience impairments of visual system that impact negatively their ability to learn (College of Optometry, 2011). In the educational context, vision is a critical component of learning as students rely heavily on their visual abilities to read, write, and engage in classroom activities. Consequently, uncorrected refractive errors can have profound implications on academic performance. Studies by Anera et al*.,* (2009) and Castagno et al., (2014) have shown that children with UREs often struggle with reading; exhibit decreased concentration, and show lower academic achievement compared to their peers with corrected

visual defect. Visual impairment is a significant challenge faced by students worldwide; impacting their educational experiences and outcomes and poses a significant challenge to learners worldwide, affecting their educational experiences and outcomes.

In the context of Africa, and particularly Nigeria where educational disparities already exists, inclusive education is gaining prominence, therefore understanding the effects of visual impairment on academic performance is crucial.

Murthy et al., (2021) in their study posits that in sub-saharan Africa, visual impairment varies across countries. Factor such as limited access to eye care services, poverty, and inadequate infrastructure contribute to the high prevalence especially among children. Nigeria being one of the most populous African countries faces unique challenges in providing quality education to visually impaired students. According to the World Health Organization (WHO), Africa bears a substantial burden of visual impairment, with higher rates compared to other regions (WHO, 2020). Reduced vision often results in a low motivation to explore the environment, initiate social interaction, and manipulate objects. These students cannot share common visual experiences with their sighted peers, and therefore vision loss may negatively impact the development of appropriate social, skills (American Foundation for Blind, 2011; Turnbull *et al.,* 2007).

The relationship between vision and learning has been extensively documented. Visual acuity, the clarity or sharpness of vision, plays a pivotal role in a student's ability to absorb and process information. Uncorrected refractive errors disrupt visual acuity, leading to blurred vision that can hinder a student's academic achievement. For instance, Holden et al., (2016) reported that myopia, which affects the ability to see distant objects clearly, can make it challenging for students to read the class board from their desks. Hyperopia, on the other hand, can affect the ability to see objects up close, complicating tasks such as reading and writing.

Research by the World Health Organization (2019) indicated that over 12 million children between the ages of 5 and 15 are visually impaired due to uncorrected refractive errors (UREs). Yan et al., (2021) further reported that in developing countries, the prevalence of UREs among children can be as high as 20%, a rate that significantly affects their academic potential and overall quality of life.

According to Bruce et al. (2016), the academic implications of uncorrected refractive errors are far-reaching. Students with UREs often encounter difficulties in reading comprehension, experience slower reading speeds, and suffer from eye strain that leads to headaches and fatigue. These symptoms can diminish classroom participation and engagement, ultimately impacting academic performance. Bruce and colleagues also noted that the psychological and social consequences of academic struggles due to poor vision may result in lowered self-esteem and motivation, compounding the issue.

Kulp et al. (2016) and Ma et al. (2014) demonstrated that efforts to address UREs among school-aged children have yielded positive outcomes. Their studies revealed that vision screening programs combined with the provision of corrective eyewear significantly improve visual acuity and academic performance. Children who receive timely correction for refractive errors showed measurable gains in reading skills and overall educational achievement, underscoring the importance of integrating vision care into school health programs.

Keller (2012) highlighted the broader impact of visual impairments on children's daily lives. He observed that children with refractive errors often struggle to see the board clearly, squint during classroom activities, and lag behind in completing homework. Recreational activities such as engaging in sports or watching movies can become challenging. According to Keller, these difficulties may lead to the child being mistakenly labeled as having learning or behavioral problems, and in severe cases, chronic poor academic performance may lead to drop out from school. He emphasized that while uncorrected refractive errors are not life-threatening, they can be "quality of life threatening," affecting academic success, social integration, and future economic prospects.

Several studies have underscored that visual function is fundamental to children's physical, intellectual, social, and emotional development. They stress the importance of routine vision screening ideally conducted through school health programs and emphasize coordinated follow-up involving pediatric

providers, educators, and families to ensure that children with visual difficulties are promptly identified and referred for treatment.

Reports by UNESCO, (2021) suggests that Nigeria as a populous African Countries, faces a rather significant challenge in its educational system. Understanding how visual impairment intersects with academic performance of students is essential for developing targeted interventions.

II. STATEMENT OF THE PROBLEM

Optimal vision is a critical component of a child's overall development, influencing academic performance, social interaction, and general well-being. Visual impairments in school-aged children, particularly when undetected or uncorrected, can hinder effective classroom participation, reduce learning outcomes, and contribute to behavioral or attention-related concerns. Children are sometimes unable to detect or communicate their visual challenges and as a result bear the consequences such as poor academic performance and lack of interest to learn. To make matters worse for school age children, some parents rebuke their kids or wards who suggest to them the need for an eye exam or refractive correction on the ground of been too young to wear lenses.

Refractive errors such as myopia, hyperopia, and astigmatism remain among the most prevalent causes of visual impairment in children and knowledge of these errors in the area of study is limited. Despite the significant impact of uncorrected refractive errors (UREs) on visual acuity and overall quality of life, these conditions remains under diagnosed and under corrected, especially in resource-limited settings. The oversight is particularly concerning given the central role vision plays in the learning process. In many developing regions including the study area, there exist limited access to vision screening, low public knowledge and relatively high cost of corrective eyewear which leaves a large numbers of children struggling with preventable visual challenges.

Educational institutions and parents have implemented a variety of strategies aimed at addressing the issue of poor academic performance among students. These efforts include school-based tutorials, after-school programs, virtual learning platforms, and the integration of technology such as projectors to enhance lesson delivery. While well-intentioned, these interventions have yielded only marginal improvements, suggesting that a fundamental barrier to learning may still be overlooked. A considerable number of students may continue to underperform academically, not due to lack of effort or inadequate teaching methods, but because of undiagnosed visual impairments that impede their ability to fully engage in the learning process.

In the study area, anecdotal and observational evidence points to a substantial burden of UREs among school-aged children, with many exhibiting symptoms such as squinting, difficulty reading from the board, headaches, and inattentiveness—symptoms that often go unaddressed due to a lack of routine vision screening. As a result, these students are placed at a distinct disadvantage, experiencing reduced reading ability, decreased concentration, lower classroom participation, and diminished academic motivation.

Thus, this study addressed the urgent need to examine the prevalence of refractive errors among students and to quantify their impact on educational performance. While existing literature suggests a link between UREs and poor academic achievement, there remains a paucity of context-specific data detailing the extent and nature of this relationship. Understanding this association is crucial for informing school health policies, implementing cost-effective screening strategies, and ultimately ensuring that no child's academic potential is compromised by an undetected visual impairment.

III. SCOPE AND OBJECTIVES OF THE STUDY

This study ascertainined the impact of refractive status on academic performance of secondary school students in Uyo Local Goverment Area, Akwa Ibom State Nigeria took place from October 2024 to february 2025. It ascertained the prevalence of refractive errors among students in the study area considering factors such as age and gender. It also assessed the impact of visual acuity on academic performance of secondary school students in the LGA through quantitative records such as examination score. This study however did not involve evaluating the existing educational facilities and resources available for visually impaired students at the various study sites. In specific terms, the

present study sought to;

- ascertain the prevalence of refractive errors among public secondary school students in uyo LGA, Akwa Ibom State Nigeria
- find out the relationship beween refractive status and academic performance among secondary school students in Uyo Local Government of Akwa Ibom State Nigeria.
- Determinethe influencebof gender on the impact of refractive status on academic performance of public secondary school students in Uyo LGA of Akwa Ibom State Nigeria.
- find out the influence of age on the impact of refractive status on academic performance of public secondary school students in Uyo LGA of Akwa Ibom State Nigeria.

IV. MATERIALS AND METHOD

Study Design

The study employed a descriptive cross-sectional study design aimed to capture a snapshot of URE prevalence and its concurrent impact on academic outcomes. This design facilitated the simultaneous collection of data on uncorrected refractive error and academic performance of the subjects. It involved visual acuity assessment using the Snellen's distance and near acuity chart followed by autorefraction using a hand held autorefractometer to ascertain the refractive status of the subjects. An ophthalmoscope was also used to view the internal structures of the eye to identify subjects with obvious ocular pathology. Academic performance was determined using records from the immediate past terminal examination. The data collection procedure involved random sampling to ensure representation across various demographic factors. A structured questionnaire was used to gather data on demographic information and academic achievement. This comprehensive approach ensured robust data collection to address the research questions effectively.

Area of Study

The study was conducted in Uyo local government of AkwaIbom state. Uyo, the capital of AkwaIbom State in southeastern Nigeria, it is situated between latitudes 4°53' and 5°04' north and longitudes 7°48' and 8°02' east. It is a rapidly urbanizing city with significant economic and administrative importance in the region. The National Population Commission (NPC) (2006) affirmed that Uyo had a population of approximately 427,873. However, more recent estimates indicate a significant increase, with a projected population of 1,393,000 in 2024, reflecting an annual growth rate of 4.82%.

The city is predominantly inhabited by the Ibibio people, who are indigenous to Akwa Ibom State. The Ibibio language is widely spoken, alongside English, which serves as the official language for education and administration. The economy of Uyo is driven by agriculture, commerce, and industrial activities. The city serves as a trade center for agricultural products such as yams, cassava, and palm produce. Additionally, there are manufacturing industries, including a brewery and a textile mill, contributing to employment and economic growth. Uyo as a state capital hosts several government and private healthcare institutions, including hospitals, clinics, and health centers. The health-seeking behavior of residents is influenced by factors such as accessibility, socio-economic status, and cultural beliefs. Uyo has a significant number of government-owned secondary schools, catering to the educational needs of students. However, exact figures on the number of schools and student enrollment vary across sources with the list of public secondary school being the most consistent

Sample size and Sampling Technique

The sample size for this study was 193 students. However the working population / sample size was calculated as below using the Fischer formula which states that $n=z^2\ p\ q/\ r^2$.

Where z=the standard normal deviation (p less than 0.05) and is given as 1.96

p=estimated proportion or prevalence of refractive errors in Nigeria in Nigeria (Adeoye & omolase 2021) where p= 80% (p=0.80).

q= 1- p = 1- 0.90 q= 0.1

r = absolute error which is 0.05

Therefore sample size used was $n= (1.96)^2$ X 0.80 X $0.1/(0.05)^2$

n= 3.8416 X 0.08 / 0.0025

n= 0.707328/ 0.0025

n= 282.9 approximately 283.

However, a total of 193 students were involved in the study. The reduction in sample size was due to the time consuming nature of the data collection procedures, easy collection and management of data and short duration of the research.

A two-stage sampling procedure was used to select the sample size. The first stage involved the use of Simple random sampling technique to select four public secondary schools from the list of schools obtained from the LGA education authority. Stage two involves the selection of subjects recruited for the study where a simple balloting was used. Ballot papers were numbered 1-100 and squeezed into a box after which the students were asked to pick a ballot paper and students who picked even number from the sampling pool were selected for the study and issued study number. Each ballot picked was replaced back to the pool and the process continues with the rest.

Instrument for Data Collection
Visual Acuity (VA) Chart: A Snellen.s chart was used to measure distance visual acuity. The symbols on the chart, known as optotypes, resembled block letters designed to be read as standard letters. Each line of the chart was arranged from top to bottom in decreasing letter size. For this study, a Three-meter reverse Snellen chart was utilized to assess visual acuity in a standardized manner.

Pinhole/Occluder: The Pinhole Occluder is an opaque disc with one small hole used to test visual acuity by allowing only parallel rays to enter the eye. This temporarily eliminated the effects of refractive errors. Improvement in vision with the pinhole is suggestive that the reduced acuity was due to refractive error while no improvement is indicative of ocular pathologies or a non refractive visual anomaly..

Pen Torch: This was used to view the external structures of the eyes to identify anomalies of the ocular surface

Autorefractor: In addition to the above, refractive errors were objectively detected using a retinoscope. This instrument provided accurate and reliable measurements of refractive status, ensuring an objective value that was used to categorize the error.

Ophthalmoscope: This was used to view the internal parts of the eyes to identify pathology of the media or structures.
Data Form: A data form was used to record each participant's biodata and the results of the visual screening in each eye. This form served as a central tool for organizing visual assessment outcomes. A sample of the form, along with a photograph of the instrument, is included in the appendix.

Questionnaire: The questionnaire used in this study consisted of two sections which captured the student's demographic information (age, sex, and class/ grade and academic performance including student's academic challenges and overall average score

Reliability/ Validity of the Instrument:
The ophthalmic equipment and procedures employed in the study are of international standard approved and spelt out by the World Council of Optometry (WCO) and also in line with the approved criteria for optometric practice in Nigeria by the Optometrist and Dispensing Opticians Registration Board of Nigeria (ODOBRN).

The questionnaire designed for the thesis "Effects of Uncorrected Refractive Error on Academic Performance" was rigorously evaluated for its validity. Content validity was established through a comprehensive approach. The questionnaire items were derived from an extensive review of relevant literature, incorporating insights from key studies. This process was further refined through consultations with ophthalmologist and optometrists.

Construct validity was ensured by grounding the questionnaire in a solid theoretical framework. This framework, based on established relationships in the literature, guided the development of items to accurately capture uncorrected refractive errors and their effects. Exploratory factor analysis was conducted using pilot test data, identifying the underlying factor structure of the questionnaire. Items that did not align with the intended constructs were revised or removed. Internal consistency reliability was confirmed with Cronbach's alpha values exceeding 0.70 for all constructs, indicating that the items consistently measured the same underlying concepts.

Procedure for Data Collection
The data collection phase began with comprehensive vision screenings conducted by trained optometrists. These screenings were carried out in collaboration with local schools that had agreed to participate in the study. Each subject underwent a series of standardized vision tests, including visual acuity tests using Snellen charts, external examination using a

Pen Light, funduscopic (internal structure) examination using an Ophthalmoscope and refractive status assessments with a hand-held auto refractors. The results of these screenings were meticulously recorded, identifying children with uncorrected refractive errors (UREs). This initial step was crucial in establishing the prevalence of uncorrected refractive errors among the sampled population. Following the vision screenings, structured questionnaires were distributed to the subjects. The questionnaires were designed to collect self-reported data on academic performance and challenges. Teachers and school staff assisted younger children in completing the questionnaires to ensure accuracy and completeness. The questionnaires included sections on demographic information, vision-related questions, and validated scales for measuring psychological factors such as anxiety and self-esteem.

To supplement the self-reported academic data, permission was obtained from parents and guardians to access the children's official academic records. This process involved liaising with school administrators to collect formally documented test scores, teacher assessments, and examination record. These records provided an objective measure of academic performance, allowing for a more comprehensive analysis of the impact of uncorrected refractive errors.

Once data collection was completed, all collected data were entered into a secure data base. This process involved careful transcription of questionnaire responses and vision screening results, as well as the digitization of academic records. Data entry was conducted by trained personnel to minimize errors and ensure accuracy.

After data entry, a thorough data cleaning process was undertaken to identify and correct any inconsistencies or errors in the dataset. This included checking for missing values, outliers, and logical inconsistencies. Any discrepancies were addressed through cross-referencing with original records or follow-up clarifications with the schools.

Mean academic score

Academic performance was based on the students mean (average) scores for the immediate past term examinations and was graded as follows

70% and above = Excellent
60-69% = Above average
50-59% = Average
40-49% = Below Average
<40% = Poor

Good academic score included students who had an average score of 50% and above while poor academic score included students who had scored below 50%. Participants with Snellen;s visual acuity of 6/6 to 6/9 were classified to be normal while participants with a visual acuity worse than 6/9 were classified as subnormal.

Data Analysis

Data was entered into the Microsoft Excel 2016 application then imported to the Statistical Package for Social Science (SPSS) version 22 software. Data was edited, cleaned and formatted to ensure it was complete. Final data was analyzed using Stata version 15. Frequencies and percentages were used to describe categorical variables while relationships were established using Chi-Square with a significance level of $p<0.05$. Results were presented in narrative formats, figures and tables.

V. RESULTS

The results section presents the findings of the study on the relationship between visual acuity and academic performance of secondary school students. The total number of participants was 193. The data were analyzed using descriptive and inferential statistics. The descriptive statistics include frequency, percentage, mean and standard deviation. The inferential statistics include chi-square test. The level of significance was set at 0.05.

Demographic profile of public secondary school students in Uyo LGA, Akwa Ibom State Nigeria

The study involved a total of 193 subjects comprising of 83(43.00%) males and 110(56.99%) females with a male to female ratio of 1:1.3. The age of the subjects ranged from 10-24 years with a mean age of 16.19±3.68 years. The age distribution of the males ranged from 11-23 with a mean age of 17.00±8.49 years while that of the females ranged from 10-24 with a mean age of 17.01±9.90 years as shown in Table 1 below.

Table 1: Gender distribution of public secondary school students in Uyo LGA, Akwa Ibom State Nigeria

GENDER	N	%	Age (years)

			Range	Mean	Std. Deviation
Male	83	43.01%	11-23	17.00	±8.49
Female	110	56.99%	10-24	17.01	±9.90
Total	193	100.0%	10-24	17.00	±9.19

Table 2: Age distribution of public secondary school students in Uyo LGA, Akwa Ibom State Nigeria

Age group (Years)	N	%	Age (years)		
			Range	Mean	Std. Deviation
10 – 14	70	36.27%	10 – 14	53.47	±0.743
15-19	84	43.52%	15 – 19	67.32	±1.252
20-24	39	20.21%	20 – 24	72.51	±1.09
Total	193	100.0%	50 – 88	64.52	±6.58

Table 2 below showed the general age distribution of the study subjects with the 15-19 years age group constituting the largest proportion of the study subject with 84(43.52%) subjects while those within the ages of 20-24 years constituted the least proportion with 39(20.21%) subjects.

Relationship between Refractive Status and Academic Performance

This section presents results pertaining to the relationship beween refractive status and academic performance of public secondary school students in Uyo LGA Akwa Ibom state Nigeria.

Table 3: Refractive Status and Academic Performance of public secondary school students in Uyo LGA Akwa Ibom state Nigeria.

Refractive status (RS)	Academic Performance			Total
	Good (≥70%)	Average (50–69%)	Poor (<50%)	
Normal	40 (28.99%)	56 (40.58%)	42 (30.43%)	138
Subnormal	8 (14.55%)	17 (30.91%)	30 (54.55%)	55
Total	48 (24.87%)	73 (37.82%)	72 (37.31%)	193

From Table 3 above, of the 193 subjects involved in the study, 48 (24.87%) had good academic scores, 73 (37.82%) had average scores while 72 (37.31%) had poor academic scores. Among 138 students with normal RS, 40 (28.99%) performed well, 56 (40.58%) had average performance, and 42 (30.43%) had poor academic performance. In contrast, among students with subnormal visual acuity (n=55), only 8 (14.55%) had good scores, 17 (30.91%) had average scores, while 30 (54.55%) had poor academic performance. These results indicate a trend where students with subnormal refractive status are more likely to perform poorly in academic assessment.

Hypothesis Testing

This section presents results arising from inferential statistical analysis employing Chi Square statistics at the 0.05 level of significance.

Table 4: Chi Square test of the association between refractive status and academic performance of public secondary school students in Uyo LGA Akwa Ibom state Nigeria

Refractive status	Good	Average	Poor	χ^2	Df	p-Value
Normal	40	56	42			
Subnormal	8	17	30	10.43	2	0.001769
Total	48	73	72			

A Chi-square test of independence was performed to determine the association between visual acuity and academic performance (classified as good, average, or poor). The result revealed a statistically significant association between refractive status and academic performance ($\chi^2 = 10.43$, df = 2, $p < 0.05$). This suggests that visual acuity status significantly affects academic performance among public secondary

school students in Uyo Akwa Ibom State Nigeria.

Influence of Gender on the association between Refractive Status and Academic Performance of public secondary school students in Uyo LGA Akwa Ibom state Nigeria

This section presents results pertaining to the the influence of gender on the impact of refractive status on academic performance of public secondary school students in Uyo LGA Akwa Ibom State

Table 5: Influence of Gender on the Impact of Refractive Status and its Influence on Academic Performance of Public Secondary School Students in Uyo LGA Akwa Ibom State Nigeria.

Gender	Academic Performance			
	Good n (%)	Average n (%)	Poor n (%)	Total (%)
Male	3 (12.50%)	5 (20.83%)	16 (66.67%)	24 (100%)
Female	5 (16.13%)	12 (38.71%)	14 (45.16%)	31 (100%)
Total	8 (14.55%)	17 (30.91%)	30 (54.55%)	55 (100%)

Table 5 presents the academic performance of students with refractive errors, categorized by gender. Among the 24 male students with subnormal visual acuity, 3 (12.50%) achieved good academic performance (scores ≥70%), while 5 (20.83%) had average performance (scores between 50% and 69%). The majority, 16 males (66.67%), recorded poor academic outcomes with scores below 50%.

In comparison, among the 31 female students with refractive errors, 5 (16.13%) had good academic performance, 12 (38.71%) performed at an average level, and 14 (45.16%) had poor academic scores.

Overall, female students with visual impairment showed slightly better academic outcomes than their male counterparts. A greater proportion of females fell within the good and average performance categories, whereas a larger percentage of males clustered in the poor performance range. These findings suggest a possible gender-related difference in how visual problems may impact academic achievement, though statistical analysis indicated that this difference was not significant as shown in Table 6 below.

Table 6: Inferential Test on the Association between Pattern of Refractive Error and Academic Performance of Public Secondary School Students in Uyo LGA Akwa Ibom State Nigeria.

Gender	Good	Average	Poor	χ^2	P-value
Male	3	5	16		
Female	5	12	14	2.62	0.27
Total	8	17	30		

Table 6 presents the results of a Chi-square test used to examine the association between gender and academic performance among students with subnormal visual acuity. The academic performance was categorized into three levels: good (≥70%), average (50–69%), and poor (<50%). The data showed that among male students with refractive errors, 3 achieved good performance, 5 had average performance, and 16 performed poorly. Among female students, 5 had good scores, 12 performed averagely, and 14 scored below 50%.

The Chi-square value was calculated to be 2.62 (with 2 degrees of freedom) and the corresponding p-value was 0.27. Since the p-value is greater than the significance threshold of 0.05, the association between gender and academic performance in this group is not statistically significant.

Influence of Age on the Impact of Refractive Status and its Influence on Academic Performance of Secondary School Students

This section presents results pertaining to the the influence of age on the impact of refractive status on academic performance of secondary school students in Uyo LGA Akwa Ibom State Nigeria.

Table 7: Influence of Age on the Impact of Refractive Status and its Influence on Academic Performance of Public Secondary School Students in Uyo LGA Akwa Ibom State Nigeria

Age Group (Years)	Good (%)	Average (%)	Poor (%)	Total (%)
10–14	1 (4.76%)	6 (28.57%)	14 (66.67%)	21 (100%)
15–19	2 (10.53%)	7 (36.84%)	10 (52.63%)	19 (100%)
20–24	5 (33.33%)	4 (26.67%)	6 (40.00%)	15 (100%)
Total	8 (14.55%)	17 (30.91%)	30 (54.55%)	55 (100%)

Table 7 shows the distribution of academic performance across three age groups (10–14, 15–19, and 20–24 years) among students with subnormal visual acuity. Of the 21 students aged 10–14 years, only 1 (4.76%) achieved good academic performance, 6 (28.57%) performed at an average level, while the majority 14 students (66.67%) had poor academic scores. Among the 19 students in the 15–19 years group, 2 (10.53%) achieved good performance, 7 (36.84%) had average scores, and 10 (52.63%) performed poorly. In contrast, students aged 20–24 years demonstrated relatively better academic outcomes: 5 out of 15 (33.33%) had good performance, 4 (26.67%) were in the average category and 6 (40.00%) performed poorly.

This distribution suggests a trend where older students with refractive errors tend to perform better academically than younger ones. The proportion of good performance increases with age, while the proportion of poor performance is highest among the youngest group (10–14 years). This may be due to cognitive maturity, better coping mechanisms, or more established study habits in older students. However inferential statistics revealed that there is no statistically significant association between age and academic performance of students with refractive errors as shown in Table 8.

Table 8: A two-by-two chi-square table to compare the Association between age and Academic Performance of students with refractive errors

Age Group (Years)	Good	Average	Poor	χ^2	P-value
10–14	1	6	14	4.84	0.30
15–19	2	7	10		
20–24	5	4	6		
Total	8	17	30		

Table 8 above presents the results of Chi-square statistical analysis of the association between age and academic performance of students with refractive errors. The age groups considered were 10–14 years, 15–19 years, and 20–24 years, while academic performance was categorized as good (≥70%), average (50–69%), and poor (<50%). The result showed that in the 10–14 years group, 1 student had good academic performance, 6 had average performance, and 14 performed poorly. For the 15–19 years group, 2 students recorded good performance, 7 were in the average category, and 10 had poor performance. Among the 20–24 years group, 5 students had good performance, 4 had average performance, and 6 had poor academic performance. A Chi-square value of 4.84 was obtained with 4 degrees of freedom, and the associated p-value was 0.30. This indicates that there was no statistically significant relationship between age group and academic performance among the students with refractive errors at the 0.05 level of significance.

VI. DISCUSSION

The study included 193 secondary school students, with 56.99% females and 43.01% males, yielding a male-to-female ratio of approximately 1:1.3. This female predominance is not unusual in school-based research conducted in urban or peri-urban Nigerian contexts. For instance, similar gender ratios have been reported in studies such as Adeoti et al. (2014) and Uchenna et al. (2017), where female students were either more accessible or more cooperative in health surveys. Cultural factors may also contribute, as female students may be more likely to remain in structured school environments, while male students may be drawn into informal labor or apprenticeship, reducing their participation in school and, by extension, in health-based research.The mean age of the participants was 16.19 ± 3.68 years, covering a

wide age range of 10–24 years. The largest proportion of students (43.52%) was in the 15–19 years age group, reflecting average senior secondary school enrolment. Students aged 20–24 years formed the smallest group (20.21%), possibly due to delayed schooling, repeating academic years, or schooling interruptions, which are not uncommon in regions facing socioeconomic challenges. From a theoretical stand point, the Ecological Systems Theory (Bronfenbrenner, 1979) helps explain how multiple layers, family income, school quality, and cultural expectations—can influence age and gender distributions in education. Age and gender are not isolated variables; they interact with environmental conditions, such as access to healthcare, parental supervision, and educational support, to shape academic performance and health behaviors, including eye care utilization. Demographic variations highlight the importance of tailoring vision screening programs and academic interventions to account for age-specific and gender-sensitive differences. Younger students may require more intensive support due to less academic maturity, and female students may be more receptive to school-based health initiatives.

The relationship between visual acuity and academic performance was both quantitatively evident and statistically significant ($\chi^2 = 10.43$, $p < 0.05$). Students with normal vision were more likely to achieve good (28.99%) and average (40.58%) academic results while those with subnormal vision had disproportionately higher representation in the poor performance category (54.55%).This finding is strongly supported by previous studies. For example, Ma et al. (2014) in China found that children with uncorrected myopia had significantly lower academic scores in mathematics and reading. Padhye et al. (2009) in India also observed lower academic performance among students with uncorrected refractive errors. In Nigeria, Olatunji et al. (2015) emphasized that visual difficulty significantly impairs concentration, reading speed, and classroom participation.The Health Belief Model (HBM) can explain this association. Students with uncorrected vision might not perceive their poor vision as a medical issue requiring intervention (low perceived severity), especially if their parents or teachers fail to identify the problem. Additionally, without cues to action (e.g., school eye screening or peer advice), they remain untreated, allowing their academic struggles to persist. Another explanation is based on Cognitive Load Theory, where students already facing high academic demands must now exert extra cognitive resources to compensate for poor vision thus reducing learning efficiency and retention. These findings reinforce the need to prioritize vision correction as part of academic support programs. Teachers should be trained to recognize behavioral signs of visual difficulties, such as squinting, excessive eye rubbing, or difficulty copying from the board. School authorities could also partner with NGOs and optometrists to provide subsidized eyeglasses.

The analysis showed that female students with refractive errors performed better than their male counterparts, with higher percentages achieving good and average scores. However, this trend was not statistically significant ($\chi^2 = 2.62$, $p = 0.27$).

Several theories may explain this pattern. Social Cognitive Theory suggests that females may engage more in self-regulated learning and seek help (e.g., sitting closer to the board or compensating with note sharing), which could complement the effects of poor vision. Studies such as Onunkwor et al. (2016) found that Nigerian female students are more compliant with health interventions and more academically resilient under adverse conditions.
However, other studies show conflicting results, Souru et al. (2019) reported that male students outperformed females in some performance domains despite vision issues, possibly due to better access to personal resources (e.g., private tutoring, spectacles). Thus, gendered coping strategies, cultural expectations, and household priorities could all play a role in modulating the relationship between vision and learning outcomes. Even if the gender difference isn't statistically significant, the trend suggests a need for gender-sensitive interventions. For instance, school vision programs should include peer-led counseling and parental education that consider gender-specific attitudes toward health-seeking behavior and academic goals.

Students in the 20–24 years age group with refractive errors had better academic outcomes than their younger counterparts: 33.33% had good academic performance compared to only 4.76% in the 10–14 years age group. However, the Chi-square test did not find this association statistically significant ($\chi^2 = 4.84$, $p = 0.30$). This age-related pattern may be explained by academic maturity and adaptive coping

strategies that develop with age. Older students might have built stronger reading habits or developed mechanisms to manage their limitations, such as seeking seats closer to the blackboard or studying with corrected peers.

Similar findings were reported by Abah et al. (2018) and Ezinne et al. (2013), who observed that age could act as a moderating factor in how students adapt to visual impairments. Younger students may lack the awareness or initiative to report visual difficulties, while older students may also have more autonomy to seek correction.

However, conflicting studies exist. Ikonne et al. (2012) suggested that younger students may perform better because they receive more structured academic support from teachers and parents, but this may only hold when vision is not impaired. While not statistically significant, the trend indicates that vision correction may be even more crucial for younger students, who are still developing academic foundations. Early detection and intervention could prevent compounded learning deficits over time.

VII. CONCLUSION

This study examined the relationship between refractive errors and academic performance of public secondary school students in Uyo Local Government Area, Akwa Ibom state Nigeria and provided compelling evidence that visual health significantly influences academic outcomes. With a prevalence of uncorrected refractive errors found in over one-quarter of the participants, the findings highlight a critical gap in eye care among schoolchildren, many of whom may struggle silently in the classroom due to undetected vision problems. A statistically significant relationship was established between visual acuity status and academic performance, as students with normal vision consistently achieved higher academic scores than their peers with subnormal vision. This supports the notion that good visual function is vital for learning, reading, comprehension, and active classroom participation. While female students and older students with refractive errors appeared to perform better than their male and younger counterparts, these differences were not statistically significant. Nonetheless, the trends suggest that factors like age and gender may influence how students cope with visual challenges, potentially affecting their academic engagement and performance. The study did not explore the impact of specific types of refractive errors on academic outcomes, focusing instead on overall visual acuity status. Ultimately, these findings underscore the urgent need for school-based vision screening programs and timely correction of refractive errors. Integrating vision care into school health services could help improve educational outcomes, reduce academic disparities, and support students in reaching their full learning potential.

VIII. RECOMMENDATIONS

Based on the findings of this study, several recommendations were made to improve the academic performance of students by addressing the issue of refractive errors effectively

1. Regular Vision Screening Programs: Schools should establish mandatory regular vision screening programs for all students. These screenings should be conducted at the beginning of each academic year to ensure early detection of refractive errors. Early identification of refractive errors can prevent the academic decline associated with uncorrected vision problems. Regular screenings will help in timely identification and intervention, ensuring that students can perform at their best academically.
2. Access to Affordable Corrective Measures: Schools, in collaboration with local health authorities and non-governmental organizations, should provide affordable or free corrective lenses and other visual aids to students diagnosed with refractive errors. Financial constraints often prevent students from accessing necessary corrective measures. By providing affordable or subsidized corrective lenses, schools can help ensure that all students, regardless of their economic background, have the tools they need to succeed academically.
3. Awareness and Educational Campaigns: Schools should organize regular awareness campaigns and educational sessions for students, parents, and teachers about the importance of eye health, the impact of refractive errors on academic performance, and the availability of corrective measures. Increased awareness can lead to better health-seeking behaviors. Educating parents and teachers on recognizing signs of visual impairment can ensure timely interventions, thereby mitigating the negative impact of refractive errors on academic performance.
4. Training for School Health Personnel: Ministry of health in collaboration with eye care professional are to train school nurses and health personnel to conduct

basic eye screenings and provide initial assessments of visual acuity. Empowering school health personnel with the skills to conduct eye screenings can facilitate early detection and referral for professional eye care, ensuring that students receive timely and appropriate interventions.

5. Inclusion of Vision Care in School Health Policies: Ministry of health in collaboration with the ministry of education and school owners are to integrate vision care into existing school health policies and programs, making it a standard component of student health services. Institutionalizing vision care within school health policies ensures a systematic and sustained approach to managing refractive errors and other vision-related issues, thereby promoting long-term academic success and overall well-being.

6. Collaboration with Optometry and Ophthalmology Services: School owners and government agencies are to establish partnerships with local optometrists and ophthalmologists to provide professional eye care services to students, including comprehensive eye exams and follow-up care. Collaboration with eye care professionals ensures that students receive high-quality, comprehensive eye care, which is crucial for accurately diagnosing and treating refractive errors and other eye conditions.

IX. CONTRIBUTION TO KNOWLEDGE

This study makes several important contributions to the field of optometry and eye care, particularly concerning the relationship between refractive errors and academic performance among secondary school students. The key contributions are as follows:

1. Evidence of the Prevalence of Refractive Errors: The study provides current and specific data on the prevalence of uncorrected refractive errors among secondary school students in Uyo Local Government. This data is valuable for eye care professionals and policymakers, indicating the need for targeted vision screening and intervention programs in similar demographic settings. It also adds to the existing body of literature by providing localized prevalence rates, which can be used for comparative studies and in shaping regional public health policies.

2. Correlation between Visual Acuity and Academic Performance: The significant association found between normal visual acuity and better academic performance highlights the critical role of good vision in educational outcomes. This finding reinforces the importance of regular eye examinations and timely correction of refractive errors in the student population. It provides empirical evidence that can be used to advocate for the integration of vision care into school health programs, thereby influencing educational policies and practices.

3. Gender and Age Dynamics in Refractive Error Impact: The exploration of gender and age differences in the impact of refractive errors on academic performance provides valuable insights. While no significant gender-based differences were found, the study did observe trends that suggest female students with refractive errors perform slightly better academically than their male counterparts. Additionally, older students with refractive errors demonstrated better academic performance compared to younger students. These findings can inform targeted interventions and support programs that consider gender and age-specific needs.

4. Highlighting the Need for Comprehensive Eye Care Programs in Schools: The study's findings underscore the necessity for comprehensive eye care programs within the school health system. The evidence provided can be used to advocate for policies that ensure regular vision screenings, access to affordable corrective measures, and education on eye health. Such initiatives can significantly reduce the incidence of uncorrected refractive errors and improve academic outcomes.

5. Basis for Further Research: By identifying gaps in the current understanding of the relationship between refractive errors and academic performance, this study sets the stage for further research. Future studies could explore the long-term impact of corrective measures on academic performance, the effectiveness of different types of interventions, and the role of other factors such as socioeconomic status and access to healthcare. This research contributes to the ongoing dialogue in optometry and eye care, encouraging a deeper investigation into these critical issues

X. LIMITATIONS OF THE STUDY

While this study provides valuable insights into the relationship between refractive errors and academic performance among secondary school students, it is not without limitations. Understanding these limitations is crucial for interpreting the results accurately and for guiding future research. Here are

the primary limitations identified, along with the ways the study attempted to mitigate them:

1. Sample Size and Generalizability: The study involved 193 participants from a specific local government area. This relatively small and localized sample size may limit the generalizability of the findings to other regions or populations. The study attempted to ensure a representative sample by including participants from various age groups (10-24 years) and a balanced gender distribution (43.00% males and 56.99% females). This diversity helps in capturing a broad spectrum of the student population, enhancing the relevance of the findings within the local context.
2. Cross-Sectional Design: The cross-sectional design of the study captured data at a single point in time, making it difficult to establish causality between refractive errors and academic performance. Despite this limitation, the study used robust statistical methods (chi-square test) to analyze the data and identify significant associations. These methods provide a strong basis for suggesting potential relationships, though longitudinal studies would be necessary to confirm causality.
3. Uncontrolled Confounding Variables: Factors such as socioeconomic status, access to educational resources, and other health issues were not controlled for, which might influence both refractive errors and academic performance. The study focused on clear and measurable variables, such as
visual acuity and academic scores, to maintain clarity and objectivity in the analysis. Future studies could include these additional variables to provide a more comprehensive understanding.
4. Potential for Selection Bias: There is a possibility of selection bias, as students with known vision problems might be more likely to participate in the study. The study sought to minimize this bias by actively recruiting participants across different schools and classes, aiming for a diverse and representative sample. Efforts were made to include students regardless of their known vision status.

ETHICAL APPROVAL

Ethical approval to conduct this study was obtained from the Ethical Committee of Ministry of Health and Human Services and the Research ethics committee of Madonna University Nigeria and copies of these approvals and a letter of introduction of the researchers to the Oyo LGA education authority, Akwa Ibom State Nigeria.

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CONFLICT OF INTEREST

The researchers hereby declare that there was no conflict of interest in the study and its reported findings.

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