African Chronicles Research Publication Journals p-ISSN 3121-8989, e-ISSN 3121-8970
Emurotu et al. (2026). Afr Chron Res Pub J, 3(2): 1-20
Article URL: https://researchpubjournals.org/wp-admin/post.php?post=1540
Optometry & Vision Science research

The Burden of Binocular Vision Anomalies among School-aged Children in Delta North Senatorial District, Delta State, Nigeria.

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Received	07/01/2026
Provisionally accepted	12/05/2026
Accepted	11/07/2026
Published	18/07/2026

African Chronicles Research Publication Journals p-ISSN 3121-8989, e-ISSN 3121-8970
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Abstract

Binocular Single Vision (BSV) is the complex neuro-sensory and motor integration of separate ocular images into a single, three-dimensional perception. The maintenance of symptom-free BSV is contingent upon the synergistic integrity of the visual apparatus, the motor system governing extraocular movements, and the sensory cortex. Any disruption within this triad results in Binocular Vision Anomalies (BVAs), which manifest as significant global health challenges, particularly within paediatric populations. Despite their prevalence, BVAs specifically Convergence Insufficiency (CI) and accommodative dysfunctions remain profoundly underdiagnosed in underserved regions. These conditions induce significant asthenopia (visual fatigue), which directly impairs reading fluency, writing, and sustained attention. Untreated BVAs are not merely clinical issues but significant barriers to educational human capital formation. They lead to suboptimal academic achievement, increased dropout rates, and a measurable decline in long-term educational attainment. This research aims to determine the prevalence and clinical characteristics of binocular vision impairments within the Delta North Senatorial District, Delta State. Furthermore, the study will evaluate the socio-economic consequences of these anomalies and seeks to identify robust, cost-effective protocols for early screening, diagnosis, and rehabilitative intervention (such as vision therapy) within the primary health care framework. By implementing early identification strategies, healthcare systems can mitigate the negative impact of BVAs on children's learning paths. Ultimately, addressing these anomalies would reduce the long-term psychological and economic burden on the individual and their dependents.

Keywords: Binocular vision anomalies, Convergence Insufficiency, accommodative dysfunctions, Vision impairments, Diagnosis.

INTRODUCTION

1.1 Background of study

Binocular single vision is the state of simultaneous vision that is attained by using both eyes in unison. This allows for the fusion of distinct and somewhat different images that arise in each eye to be perceived as a single image (Bhola., 2006). Several variables affect how well binocular vision functions symptom-free, including the structure of the visual apparatus, the motor system that controls eye movement, and the sensory system that allows the brain to process and combine the two monocular inputs (Evans., 2002). When binocular single vision is bifoveal and there is no obvious deviation, it can be categorized as normal. When images of the focused object are projected from one eye's fovea and an extrafoveal region of the other eye, i.e., when the visual direction of the retinal elements has altered, it is considered abnormal (Bhola., 2006).

Corresponding retinal points are the retinal components of the two eyes that have a similar subjective visual direction. When the fovea in both eyes have the same visual direction and the retinal components in one eye that are nasal to the fovea match the retinal elements in the other eye that are temporal to the fovea, this is referred to as normal retinal correspondence (Hillis and

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Banks, 2001). For a specific visual direction, every other retinal element is either non-corresponding or dissimilar to a particular retinal element in the other eye. The fovea of one eye sharing a visual direction with an extrafoveal area in the other eye is therefore considered anomalous retinal correspondence. It is possible to draw a line through the object of interest so that each point is imaged on the matching retinal elements and appears separately. The locus of all object points that are imaged on related retinal elements at a specific fixation distance is known as a horopter. Distinct retinal elements image object points that are not on the horopter, making them appear double (diplopia) (Kalloniatis and Luu, 2007). Physiological diplopia is the term for the diplopia caused by object points off the horopter. We don't typically feel this diplopia, though. The Fusion Area proposed by Panum explains this (See Fig 1). The term "Panum's fusion area" refers to the small circle that surrounds the horopter and is where things that stimulate different retinal components give the appearance of single vision. Thus, Panum's fusional area is the range of horizontal disparities surrounding the horopter that will continue to perceive the input as single (Bhola., 2006).

Despite the critical role of binocular vision in academic performance and daily functioning, awareness of binocular vision anomalies (BVAs) remains low, leading to underdiagnosis and untreated conditions among school-aged children. Many children, especially in underserved communities, lack access to comprehensive eye care, resulting in prolonged visual discomfort, learning difficulties, and long-term visual impairments (Clark and Clark, 2015). The increasing use of digital devices in education further exacerbates symptoms such as eye strain and convergence insufficiency, highlighting the urgent need for early screening and intervention (Scanzera et al, 2025). This research proposal is aimed to determine the prevalence, characteristics, and impact of binocular vision abnormalities binocular vision anomalies as well as identify effective strategies for early detection, diagnosis, and treatment for binocular vision abnormalities in Delta North Senatorial district, Delta State.

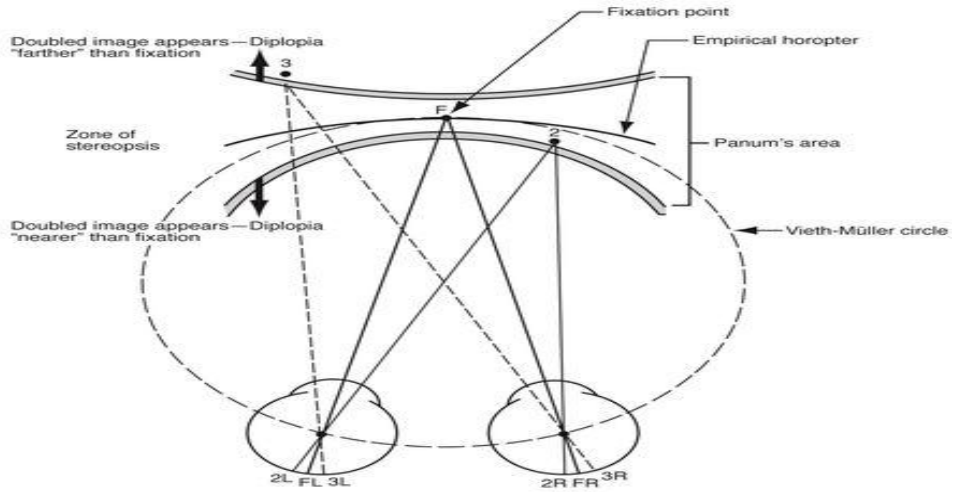

Fig 1: Principles of binocular single vision.

F, fixation point; FL left fovea, and FR right fovea. Point 2 is viewed single and stereoscopically, and it is located within Panum's region. Point 3 is double because it is outside of Panum's territory (Horwood., 2019).

1.2. Why Binocular Vision anomalies (BVAs) are a Public Health concern

Binocular vision anomalies are a major public health concern due to their prevalence and the potential for a variety of crippling symptoms and functional restrictions. To lessen the effects of these illnesses on people and society as a whole, greater awareness, early detection, and efficient treatment methods are crucial (García-Muñoz et al.,2014)

(i). Widespread Prevalence: A considerable percentage of the population suffers from binocular vision abnormalities, which are surprisingly prevalent. According to Russel., (2023), binocular vision anomalies may affect as many as 20% of the population. A lot of people have symptoms associated with these problems that affect their day-to-day lives without even being aware of the underlying cause.

(ii). Decreased Quality of Life: Anomalies related to binocular vision can have a major influence on day-to-day living, leading to pain, trouble reading and working close to others, and even affecting social interactions. Their independence and quality of life are significantly impacted by the inability of those who suffer from it to carry out daily duties (Akhgary et al.,2011).

(iii). Economic Impact: People and society may incur large expenses as a result of decreased productivity, the probable need for specialized care, and the chance for misdiagnosis (Van Den Bos et al, 2011).

(iv). Need for Increased Awareness: The public's understanding of binocular vision abnormalities and their possible consequences must be raised in order to facilitate early detection and effective treatment (Thakre, et al., 2021).

1.2.1. Impact on Daily Life:

Binocular vision disorders can significantly impair daily functioning, affecting essential activities and reducing the overall quality of life. Below are some of its impacts on day-to-day living;

i. Diminished Visual Function: People with binocular vision disorders may find it hard to concentrate on close-range activities like writing, reading, or using a computer, which can cause weariness and decreased output. According to studies, these visual issues and challenges have an impact on academic performance, which is a direct result of subpar educational outcomes. (Nunes et al., 2019).
ii. Balance and Co-ordination Issues: Problems with balance and coordination might arise from the brain's inability to integrate images from misaligned eyes, which can make tasks like driving, walking, and playing sports more difficult (Gaertner et al, 2013).
iii. Headaches and Eye Strain: Pain, headaches, and eye strain might result from a continuous attempt to correct mismatched eyes. (Ghadban et al., 2015).
iv. Learning and Academic Performance: Reading comprehension, concentration, and general academic achievement can all be negatively impacted by binocular vision issues in youngsters. García-Muñoz et al.,2014)

v. Increased Healthcare Costs: Untreated binocular vision issues can lead to more serious eye conditions and increased healthcare utilization (Rein et al, 2022). Children with uncorrected BVAs often require extended monitoring and specialty care, increasing the economic burden on families and health systems.

vi. Impact on Driving: Binocular vision, especially stereopsis (depth perception), is important for safe driving. Impairments in stereopsis or binocular function whether congenital or induced have been associated with reduced braking response, increased lane deviation, and higher collision risk in simulated and real-world driving studies (Molina et al, 2021).

vii. There's a potential for misdiagnosis of BVAs in Children to be mistaken for learning disabilities (Nunes et al., 2019).

1.2.2. Public Awareness:

Public Awareness is crucial for early detection and intervention as BVAs are often undetected despite high prevalence, particularly among children and young adults. Limited public understanding, especially among less-educated populations, leads to delayed diagnosis and treatment, negatively impacting academic performance, motor skills, and quality of life.

According to several research, it is crucial to educate the public, educators, and medical professionals on the significance of binocular vision, its effects, and the available treatment options (Bhowmick et al., 2024)

Relevant public health policies and programs should include binocular vision evaluations and treatment. Enhancing visual health, improving quality of life, and promoting improved learning outcomes are all possible by addressing binocular vision anomalies as a public health priority.

1.3. Synopsis of the literature

Researchers have found that a considerable proportion of people, particularly children, suffer from binocular vision anomalies globally. Convergence Insufficiency affects reading, writing, and attention spans, all of which are linked to poor academic performance, a decline in educational attainment, and difficulty completing tasks. A large number of binocular vision disorders are non-strabismic, which means that even when the eyes are aligned, binocular vision issues still arise. Blurred vision, headaches, eye strain, and trouble with close-range activities like writing and reading might result from these anomalies. (Nunes et al., 2019; Ghadban et al., 2015).

1.3.1: Global Perspective

In U.S, Donahue (2006), carried out a retrospective observational study of preschool-aged children with anisometropia, which sought to ascertain the association between anisometropia, patient age, and the onset of amblyopia. He reported a prevalence of 14% (six out of 44) of anisometropic children ages one year or younger to have amblyopia. Amblyopia was seen in 76% of 5-year-olds, 65% (119 of 182) of 3-year-olds, and 40% (32 of 80) of 2-year-olds. Age significantly enhanced the depth of amblyopia. The prevalence of moderate amblyopia increased gradually to 45% (children 6 to 7) from 2% (years 0 to 1) and 17% (age 2 years) degree of amblyopia in children

with strabismus were comparatively consistent (30% ages 0 to 2; 42% years 3 to 4; and 44% ages 5 to 7). For children ages 0 to 3, severe amblyopia was uncommon; at age 4, it was 9%, and at age 5, it was 14%. The prevalence and depth of amblyopia (30% in children aged 0–2; 42% in children aged 3–4; and 44% in children aged 5–7).

Wajuihian and Hansraj., (2016), carried out a study in South Africa to ascertain the distribution and frequency of accommodative abnormalities in a sample of Black high school students. The estimated prevalences were as follows: accommodative excess 2.8% (95% CI 1.9-3.8%), accommodative insufficiency 4.5% (95% CI 3.4-5.8%), and accommodative infacility 12.9% (95% CI 14.7%).

1.3.2: National Perspective

In Nigeria, Atowa et al., (2019), in their study to ascertain the prevalence of accommodative anomalies in school children in Abia State, used a total of 90 (16.8%) children who had accommodative anomalies to report prevalence estimates that include accommodative insufficiency (3.9%), accommodative excess (2.8%), and accommodative infacility (10.1%).

Olusanya et al. (2019), retrospective study reported that myopia accounts for 23% of refractive errors, making it the most common form. In addition to classifying the degree of myopia, this study discovered that 76% of patients had minor refractive errors, which were categorized as < -3.00Ds. he 88% of participants with hyperopia had mild hyperopia, which was further categorized as < +3.00D. As a result, this classification puts normal vision as Plano (0Ds) and refractive defects below + 3.00Ds or -3.00Ds as non-significant. Additionally, they stated that 20.8% of people had compound myopic astigmatism and 21.9% had simple myopic astigmatism. But when they looked at gender-based analysis, they observed that men were more likely than women to have refractive error.

The population health approach of any government Primary Health Department to lessen the burden of eye and visual health on society must include health promotion and education. The practice of empowering individuals to take charge of their health and make improvements to it is known as health promotion. According to WHO., (2016), it shifts its focus from human behaviour to a variety of social and environmental interventions. Therefore, in addition to disseminating information to motivate behavioural changes on an individual basis, health promotion efforts often involve broader policies and practices aimed at fostering more health-promoting social, economic, and structural settings (WHO., 2016).

1.3.3. Gap in Literature Review

1. Dearth in research and clinical data to support the treatment and management of binocular vision anomalies in Nigeria.
2. Lack in the knowledge and awareness of the prevalence of binocular vision anomalies.
3. Lack of screening programmes in schools to help in detecting of binocular vision anomalies
4. Lack of strategic public health policies for managing of binocular vision anomalies

5. Lack of evidence-based recommendations to mitigate problems associated with binocular vison anomalies.
6. Lack of guide to policy makers, and public health authorities on the need to incorporate school-based vision screening for all children to ensure the early detection and intervention for binocular vision anomalies.

1.4. Statement of the Problem

Binocular vision anomalies (BVAs) are a significant public health concern among school-aged children, affecting their academic performance, quality of life, and future career prospects. Despite the importance of binocular vision in learning and daily activities, there is a lack of awareness and understanding about the prevalence, causes, and consequences of BVAs among school-aged children (Clark and Clark, 2015; Pang, Gabriel and Tan, 2023). Many children with BVAs remain undiagnosed and untreated, leading to prolonged suffering and potential long-term vision problems. Also, many children, particularly in underserved communities, lack access to comprehensive eye care services, including diagnosis and treatment of BVAs. This worry is greatly heightened by the increasing use of digital devices in the classroom, working from home, and online learning, as these technologies worsen underlying binocular vision abnormalities (Bhandari and Maharjan, 2022; Scanzera et al, 2025).

Research gap: There is a need for research to determine the prevalence, characteristics, and impact of binocular vision abnormalities BVAs as well as identify effective strategies for early detection, diagnosis, and treatment for binocular vision abnormalities among secondary-aged children in Delta North Senatorial District.

1.5 Aim of the study

To investigate the prevalence and risk factors of binocular vision anomalies in secondary school-age children aged 10– 18 years, as well advocate for the development of effective strategies for early detection, diagnosis, and treatment in Delta North Senatorial District.

1.6 Objectives of the study

These are;

(i) Need to establish the prevalence of binocular vision anomalies secondary school students aged 10 – 18yrs in Delta North Senatorial District.

(ii) Need to establish the causes of binocular vision anomalies in secondary school students aged 10 – 18yrs in Delta North Senatorial District.

(iii) Need to establish the problems associated with binocular vision anomalies in secondary school students aged 10 – 18yrs in Delta North Senatorial District.

(iv) Need to establish the most common type of binocular vision anomaly in secondary school students aged 10 - 18yrs in Delta North Senatorial District.

(v) Need to establish the distribution of binocular vision anomalies between male and female students in the study population aged 10 – 18yrs in Delta North Senatorial District.

(vi) Need to establish the most dominant form of binocular vision anomaly with gender bias in the study population aged 10 – 18yrs in Delta North Senatorial District.

1.7. Research Questions

(i) What is the prevalence of binocular vision anomalies among secondary school students aged 10 – 18yrs in Delta North Senatorial District?

(ii) What are the factors responsible for the prevalence of binocular vision anomalies in secondary school students aged 10 – 18yrs in Delta North Senatorial District?

(iii) What are the problems associated with binocular vision anomalies among secondary school students aged 10 – 18yrs in Delta North Senatorial District.

(iv) Which is the most common type of binocular vision anomaly among secondary school students aged 10 - 18yrs in Delta North Senatorial District.

(v) What is the distribution of binocular vision anomalies among male and female students among the study population aged 10 – 18yrs in Delta North Senatorial District.

(vi) What type of binocular vision anomaly among the students is most dominant in the study population aged 10 – 18yrs in Delta North Senatorial District.

1.8. Research Hypotheses

a. HO: There is no significant relationship between the prevalence of binocular vision anomalies and age of onset among secondary school students aged 10 – 18yrs in Delta North Senatorial District.

b. HO: There is no significant relationship between the causal factors for binocular vision anomalies and age of onset among secondary school students aged 10 – 18yrs in Delta North Senatorial District.

c. HO: There is no significant relationship between the problems associated with binocular vision anomalies and age of onset in secondary school students aged 10 – 18yrs in Delta North Senatorial District.

d. HO: There is no significant relationship between types of binocular vision anomalies and age of onset in secondary school students aged 10 – 18yrs in Delta North Senatorial District.

e. HO: There is no significant difference in gender distribution of binocular vision anomalies among students aged 10 – 18yrs in Delta North Senatorial District.

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f. HO: There is no significant difference between gender and binocular vision anomalies dominance among secondary school students aged 10 – 18yrs in Delta North Senatorial District.

2. Methods

2.1. Research design

The research is cross-sectional in nature and will be carried out using the random sampling technique. Secondary Schools will be selected using a selective random sampling technique from nine distinct Local Government Areas.
The nine Local Governments that make up Delta North Senatorial District in Delta State, Nigeria includes; Aniocha North, Aniocha South, Ika North East, Ika South, Ndokwa East, Ndokwa West, Oshimili South, Oshimili North, and Ukwuani. (INEC., 2019)
Questionnaires and vision screening tests will be utilized as data collection instruments.

2.2. Sample and Sampling technique

The study population is made all school-aged children aged 10-18 years in Delta North Senatorial District, Delta State. The sample size was determined using the estimation formula for sample size (Hajian-Tilaki, 2011). 422 patients who met the inclusion criteria will be chosen at random from the study population.

Table 2.1: Selected Schools in Delta North Senatorial District and LGAs, Delta State.

Local Government Area	**Secondary Schools**	**No. of Students**
Oshimili South LGA	West-End Mixed Secondary School, Asaba.	142
Ndokwa West LGA	St. Philips Academy Secondary School, Kwale	140
Aniocha South LGA	Adonte Mixed Secondary School, Ogwashi-uku	140
	Total	422

Table 2.2: Showing inclusion and exclusion criteria for co-opting students into the study.

S/No	Inclusion	Exclusion
1	Subjects aged between 10-18 years	Subjects below 10 or above 18 years.
2	Subjects with healthy eyes.	Subjects with unhealthy eyes.
3	Subject who are resident in Delta North Senatorial District	Subjects who are non-residents in Delta North Senatorial District

The protocol for examination of subjects who would be evaluated includes visual acuity assessment, cover test, ocular alignment examination. Anterior and posterior segment examinations conducted using the slit lamp biomicroscope and monocular direct ophthalmoscopes respectively.

Visual acuity testing with the Snellen Eye Chart will be done at 6 m distance. Pinhole testing will be performed for subjects whose distant VA is 6/9 and below. These procedures will be carried out by the Optometrists. An improvement in VA will be taken to indicate a probable refractive error while non improvement suggested an organic cause or amblyopia. For those with strabismus or decreased VA not improved with refraction, detailed ocular examination with dilated funduscopy will be done. Refractive status assessment will be non–cycloplegic so that accommodation variables can be investigated. Refractive errors will be measured with the auto-refractometer or the Heine Beta200 retinoscope.

Ocular alignment will be assessed using the Hirschberg light reflex test at a distance of 33 cm, the cover-uncover test and the alternate cover test with fixation targets at both 33 cm and 6 m as indicated.

Data to be collected will include: age, gender, type refractive error, presence of deviation (strabismus), associated conditions with strabismus. Accommodation variables will include Amplitude of Accommodation (AA), Positive relative accommodation (PRA), Negative relative accommodation (NRA) and accommodative facility test. Vergence variables will include near point of convergence (NPC), fusion reserves (PFV and NFV), and AC/A ratio.

Prevalence will be calculated as the ratio of the number of individuals with any type of binocular vision anomaly to the total number evaluated. The projected timeline for this study will be a minimum of 18 months.

2.3. Scope of the Research

There is a dearth of research and clinical data to support the treatment and management of binocular vision anomalies in Nigeria. Onu et al., (2020), in their research on Survey of binocular vision anomalies in Abia State University, Uturu, also reported paucity of data on the prevalence of binocular vision anomalies across various age groups in south-eastern Nigeria. A huge gap exists, as little or no literature that supports the knowledge and prevalence of binocular vision anomalies in Asaba, Delta State. The research will thus cover the investigation of the prevalence of binocular vision anomalies, associated risks factors, distribution of the types of binocular vision anomalies, gender bias in the distribution of binocular vision anomalies and most dominant type of binocular vision anomalies among secondary school students Delta North Senatorial District.

2.4. Operational process/Achievability

A medical team consisting of 4 Optometrists and 8 trained support staff will be set up for this research. Questionnaires will be administered to subjects to obtain socio- demographic information by trained support staff under strict supervision and guidance by an Optometrist. Information obtained from subjects and parents will include the age, sex, school and class, child's birth weight, duration of gestation, family history of strabismus and refractive errors and asthenopia complaints. Other data that will be generated by the optometrists from direct testing include type refractive error, presence of deviation (strabismus), associated conditions with strabismus, accommodation variables such as Amplitude of Accommodation (AA), Positive relative accommodation (PRA),

Negative relative accommodation (NRA) and accommodative facility test. Vergence variables will include near point of convergence (NPC), fusion reserves (PFV and NFV), and AC/A ratio. All generated data will be anonymous and deidentified.

2.5. Statistics rationale/plan

1. Sampling Technique: Random sampling technique at selected secondary schools in Delta North Senatorial District to control sampling bias. This approach involved dividing the population into subgroups, randomly selecting clusters within those subgroups, and then randomly selecting participants from within the chosen clusters.
2. Selection of Subjects: Secondary school students aged 10-18years at selected schools in Delta North Senatorial District will be screened. A total number 422 subjects will be randomly selected to make up the study population giving subjects equal chance of being co-opted for the study.
3. Data collection: Questionnaires will be administered to students at the selected schools. 422 subjects who meets the inclusion criteria will be grouped into 142, 140 and 140 according the number allotted for their schools. These groups will be further broken down to classes for better control and accessibility. This will encourage better participation and will not shut down completely academic activities in selected schools.
4. Data analysis will be done using tables, pie charts, and histograms with statistics presented in simple percentages, cross-tabulations, and chi-squared tests to enable data management and clarity of results.
5. The level of significance for hypothesis testing will be at 0.05 (5%).
6. The literature review will summarize existing research on binocular vision anomalies, highlighting gaps in knowledge, prevalence and associated risks factors for binocular vision anomalies.
7. Data will be analysed with descriptive statistics and inferences drawn at 95% confidence level using the Statistical Package for Social Sciences (SPSS) version 22.0.
8. This research is significant as it will provide baseline data on binocular vision anomalies for public health practice in Delta State. The Knowledge and information on the prevalence of binocular vision anomalies would help with the planning of public health strategy. These will in turn encourage practitioners to do proper diagnostic and management protocol for patients with binocular vision anomalies.

3. Expected Outcomes

3.1. Expected outcome

The expected outcome of this study is to provide baseline data on binocular vision anomalies for public health practice, to provide Knowledge and information on the prevalence of binocular vision anomalies that would help with the planning of public health strategy and to encourage practitioners to do proper diagnostic and management protocol for students with binocular vision anomalies (Menjivar et al., 2018).

3.2. Significance of study

1. The outcome of this study will improve the quality and sensitize practitioners to do proper diagnostic and management protocol for better patient care.
2. It will raise awareness as well as encourage parents/guardians to pay attention to the eye care needs of their wards.
3. It will provide baseline data on binocular vision anomalies for public health practice.
4. Knowledge and information on the prevalence of binocular vision anomalies generated from this study would help with the planning of public health strategy.
5. The study would add to existing literature on the prevalence of binocular vision anomalies in developing countries.

4. Conclusion

The burden of binocular vision anomalies among school children aged 10–18 years is substantial, with studies indicating high prevalence rates of conditions such as convergence insufficiency and refractive errors like myopia (Ezinne et al, 2025). These anomalies often remain undiagnosed, leading to academic difficulties, visual discomfort, and reduced quality of life. Limited access to comprehensive eye care, especially in underserved communities, exacerbates the problem, while increased screen time from digital learning further strains binocular function (Bhandari and Maharjan, 2022)). Early detection through school-based vision screening and timely intervention are critical to mitigating long-term impacts on learning and development.

4.1. Ethical Consideration

Ethical clearance will be obtained from the Ethics Committee of Novena University, Ogume, and Delta State Ministry of Health. The subjects' parents or guardians will give their informed consent after ascertaining their children's desire to take part. The Helsinki Declaration of the World Medical Association (1968), as revised in 2013, will serve as the guide for conducting the study. The records will be de-identified and anonymous in accordance with best standard practices.

Acknowledgements

I gratefully acknowledge Novena University, Ogume, for its academic and institutional support, and the Delta State Ministry of Health for its collaboration in advancing healthcare and education. Special thanks to my supervisors for their expert guidance, unwavering support, and invaluable contributions in this research process.

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Emurotu et al. (2026). Afr Chron Res Pub J, 3(2): 1-20
Article URL: https://researchpubjournals.org/wp-admin/post.php?post=1540
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Appendices

NOVENA UNIVERSITY OGUME, P.M.B 2, KWALE, DELTA STATE

College of Medical and Health Sciences, Dept. of Public and Community Health.

Questionnaire for Binocular Vision Anomalies (BVAs)

This questionnaire is designed to probe binocular vision anomalies and can be used as a starting point for further evaluation and diagnosis.

Directions: For each of the following questions, check the answer that best describes your situation.

Always = every day, Frequently = at least once a week, occasionally = less than once a week, Never = never

Section 1: Demographic Information

(i). School: (ii). Gender: (iii). Age: (iv): Class: (v) Tribe:

Section 2: Visual Symptoms

1. Do you experience eye strain or fatigue after reading? [ ]
2. Do you notice that your eyes feel tired or uncomfortable after prolonged use? [ ]
3. Do you have pain in your eyes when your eyes move? [ ]
4. Do you experience double or vision, either at near or far distances? [ ]
5. Do you see blurred vision with far-distance activities (television, movies, chalkboard at school, etc.)? [ ]
6. Do you see blurred vision with close-distance activities (computer work, reading, writing, etc.)? [ ]

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7. Do you have to read the same thing multiple times to understand it? [ ]
8. Do you use a finger, ruler, or other guide to maintain your position on the page when reading? [ ]
9. Does it take you a long time to finish your homework? [ ]
10. Do you close or cover one eye with near or far tasks? [ ]
11. Do you tire easily with close-up tasks (computer work, reading, writing)? [ ]
12. Do you blink to 'clear up' distant objects after working at a desk or working with close-up activities (computer work, reading, writing, etc.)? [ ]
13. Do you have dizziness and/or light headedness? [ ]
14. Do you experience glare or have sensitivity to bright lights? [ ]
15. Do you have difficulty judging distances or depth perception? [ ]

Always =3 Frequently =2 Occasionally =1 Never =0 TOTAL: ----------

Add the scores for questions 1 - 15 to get a TOTAL score. A BVA score of 15 or greater is highly suggestive of a Binocular Vision Anomaly.

NOVENA UNIVERSITY

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College of Medical and Health Sciences, Dept. of Public and Community Health (CMHS).

Title of the research: The Burden of Binocular Vision Anomalies among School-Aged Children in Delta North Senatorial District, Delta State, Nigeria.

Name(s) and affiliation(s) of researcher(s) of applicant(s): This study is being conducted by
Dr Emurotu Edafe
Department of Public and Community Health, Novena University Ogume, Nigeria
Department of Optometry, Faculty of Allied Medical Sciences, Dennis Osadebay University, Asaba, Nigeria.
Correspondence: murodaf01@gmail.com, edafe.emurotu@dou.edu.ng, +2348035957196

Purpose(s) of research:
The aim of this study is to investigate the prevalence and risk factors of binocular vision anomalies in secondary school-age children aged 10 – 18 years, as well advocate for the development of effective strategies for early detection, diagnosis, and treatment in Delta North Senatorial District. The objectives of the study are;

(i) Need to establish the prevalence of binocular vision anomalies secondary school students aged 10 – 18yrs in Delta North Senatorial District.
(ii) Need to establish the causes of binocular vision anomalies in secondary school students aged 10 – 18yrs in Delta North Senatorial District.

(iii) Need to establish the problems associated with binocular vision anomalies in secondary school students aged 10 – 18yrs in Delta North Senatorial District.

Procedure of the research:
You are invited to participate in a study of the "The Burden of Binocular Vision Anomalies among School-Aged Children in Asaba Metropolis". The study will use questionnaire and direct testing to measure type refractive error, presence of deviation (strabismus), associated conditions with strabismus. Accommodation variables include Amplitude of Accommodation (AA), Positive relative accommodation (PRA), Negative relative accommodation (NRA) and accommodative facility test. Vergence variables include near point of convergence (NPC), fusion reserves (PFV and NFV), and AC/A ratio. The procedure will take about 30minutes, where you will answer questions about your vision and any challenges. Your participation is voluntary, and you can withdraw at any time. This study involves about 422 Secondary School children from select schools. Your input will help improve healthcare policies and planning in Nigeria.

Expected duration of research and of participant(s)' involvement:
In total, we expect you to be involved in this research for approximately 30minutes. Each participant will be required to attend only one session, and there are no follow-up visits. Your participation will be completed in a single consultation, which will last no more than 30 minutes.

Risk(s):
There are no expected risks associated with your participation in this study. However, if you feel uncomfortable during examination, you can stop at any time without penalty. As this is a non-invasive study, no physical risks are involved.

Costs to the participants, if any, of joining the research:
Your participation in this research will not cost you anything. No fees will be charged, and there are no costs for travel or any other activities related to the study.

Benefit(s):
The goal of this research is to determine the prevalence of binocular vision anomalies, associated risks factors, distribution of the types of binocular vision anomalies, gender bias in the distribution of binocular vision anomalies and most dominant type of binocular vision anomalies among secondary school students in Asaba metropolis. This information will help improve healthcare policies and services in Nigeria. While no immediate benefits are guaranteed to you, your participation will contribute to making health policies more relevant to the population.

Confidentiality:
All information collected during the study will be assigned code numbers, and your personal identity will not be recorded. Your responses will not be linked to your name, and no identifying information will be used in any publications or reports. Only authorized individuals from the research team and ethical review bodies may have access to your data.

Voluntariness:
Your participation in this research is entirely voluntary. You are free to decline or withdraw at any point during the study without any consequences.

Alternatives to participation:

If you choose not to participate, this will not affect your access to healthcare or any other services in your community.

Due inducement(s):
You will not be paid for your participation in the study.

Consequences of participants' decision to withdraw from research and procedure for orderly termination of participation:
You may withdraw from the research at any time without any negative consequences. Please note that any information collected prior to withdrawal may still be used in reports or publications. The research team will make efforts to comply with your wishes as much as possible.

Modality of providing treatments and action(s) to be taken in case of injury or adverse event(s):
There are no expected physical risks in this study. If any issues arise, you will be provided with appropriate support and treatment as needed.

What happens to research participants and communities when the research is over:
After the research is completed, the results will be shared with participants through a summary report or news bulletin. You will be informed of any key findings that may affect healthcare policies or practices in your community.

Statement about sharing of benefits among researchers and whether this includes or excludes research participants:
If this research leads to any commercial products or findings, there are no plans for financial compensation or benefits for the participants. Any commercial products or patents resulting from the research will be jointly owned by the institution(s) conducting the study. Participants will not be contacted in the future regarding any commercial benefits.

Any apparent or potential conflict of interest:
None of the researchers are involved in any commercial interests related to this study, nor do they own shares or hold any financial interest in companies that could influence their work. There are no conflicts of interest that would affect the integrity of the research.

Detailed contact information including contact address, telephone, fax, e-mail, and any other contact information of researcher(s), institutional HREC, and head of the institution:
This research has been approved by the Health Research Ethics Committee (HREC) of [Novena University, Ogume, Kwale]. For further inquiries about the study, you may contact the Head of Department PCH at [_Novena University, Ogume, Kwale], [Phone Number___07038389922].
For any questions regarding your participation in this research, don't hesitate to get in touch with the Principal Investigator, [Dr Emurotu Edafe], at [Lucid View Eye Clinic, Asaba, Delta State], [+234 803 5957196], [Email: murodaf01@gmail.com].
You may also contact the Head of the institution [Name: Professor Nwose Ezekiel], at [CMHS), Novena University, Ogume, Kwale], [+61437004315], [Email: nwose.uba@novenauniversity.edu.ng].

Statement of the person obtaining informed consent:

I have fully explained this research to _____ and have given sufficient information, including about risks and benefits, to make an informed decision.
DATE: _____ SIGNATURE: _____
NAME: _____

Statement of the person giving consent:
I have read the research description or had it translated into a language I understand. I have also discussed it with the researcher to my satisfaction. I know that my participation is voluntary and that I can withdraw at any time without consequence. I know enough about the purpose, methods, risks, and benefits of the research study to decide that I want to take part. I have received a copy of this consent form and an additional information sheet to keep for myself.

DATE: _____ SIGNATURE: _____
NAME: _____
WITNESS' SIGNATURE (if applicable): _____
WITNESS' NAME (if applicable): _____

PLEASE KEEP A COPY OF THE SIGNED INFORMED CONSENT.