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PREVALENCE AND PATTERN OF STRABISMUS AMONG SECONDARY SCHOOL CHILDREN IN OGUN STATE, NIGERIA

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ABSTRACT
Strabismus is the most common amblyopic factor. However, few studies have been done to determine the prevalence of strabismus in Ogun State. This study was aimed to determine the prevalence of Strabismus among Secondary School students in Ogun State. This was a cross-sectional study. With all ethical considerations sustained, three hundred and sixty (360) students who were within the age range of 9 to 22 years were randomly selected from three (3) public secondary schools selected from each of the three senatorial districts of Ogun State. Participants involved in the study were 168 males (46.3%) and 192 females (53.7%). Tests were conducted during the normal academic session for a period of Nine (9) months using instruments such as Snellen Visual Acuity Chart, Occluder, Pen Torch, Prism Bars, and a sheet to record the data. Simple case history and questionnaire were used to determine demographics, and information about the history of trauma, birth history of squint, family history of squint, and to rule out other pathological anomalies from the participants. Snellen's Visual Acuity Chart, Cover and Uncover tests, Hirshberg Test, and Krimsky test, was also conducted to diagnose and determine the prevalence and pattern of strabismus in the population. Data obtained was analyzed was using Statistical Package for Social Sciences (SPSS) version 16, and tested with descriptive statistics frequency and chi-square, while a p-value was set at 0.05 ($p<0.05$). The prevalence of strabismus was 1.90%, and this was significantly high compared to most regions in Africa. Esotropia was more common than Exotropia in equal distribution. Early detection and treatment, as well as training for non-ophthalmic staff like teachers to detect and refer cases of strabismus are advocated.

Keywords: Prevalence; Pattern; Strabismus; Children;

INTRODUCTION
There is a varying prevalence of strabismus among various populations across the world. Strabismus is the most common amblyopic factor Strabismus is a condition where the lines of sight of both eyes are not parallel to each other and the eyes appear to look in different directions (Millodot, 2012). Untreated strabismus is one of the causes of childhood blindness and approximately 40% of children with manifest strabismus have amblyopia, as it is the most common amblyopic factor (Akpe *et al.,* 2014). The symptoms of strabismus

include double vision and/or eye strain. In addition to headaches and eye strain, symptoms may include an inability to read comfortably, fatigue when reading, and unstable or "jittery" vision. Strabismus can be seen in Down syndrome, Loeys-Dietz syndrome, cerebral palsy, and Edwards' syndrome muscle dysfunction, uncorrected refractive error, problems in the brain, trauma, or infections (Gunton *et al.,* 2015). The risk is increased among those with a family history of the condition, and treatment depends on the type and the underlying cause (Gunton *et al.,* 2015).

Globally, the prevalence of strabismus is about 3-5% in the general population (Greenberg *et al.,* 2007), and reports from World Health Organization show that the highest prevalence rates of strabismus are found in developing countries, such that approximately 90% of strabismus patients live in low-income countries, while European and American countries have the lowest rates (Oystreck, 2012). But studies in Africa show that the prevalence of strabismus among Africans is quite low compared to Caucasian or Asian studies (Azonobi *et al.,* 2008). This is not different from other results obtained in the Nigerian population. However, there is no existing data on the prevalence and pattern of Strabismus in Ogun State, South-Western Nigeria. This study, therefore, aimed to determine the prevalence and pattern of Strabismus among Secondary School Students in Ogun State, to make necessary recommendations to eliminate the challenge.

MATERIALS AND METHODS

Study Design

This was a descriptive Cross-Sectional study, employed to determine the prevalence and pattern of Strabismus among secondary school children in Ogun State Nigeria, who were between the ages of 9 to 22 years within the duration of nine months.

Inclusion and Exclusion criteria

The study included registered Secondary School Students in the State, within the age group of 9-22 years were included in the study. And excluded those who were not within the stated age range, or who were not registered with the schools as at the duration of the study. All legible participants who came for reviews and follow-ups within the study period were also excluded from the study to avoid repetition.

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Sample size and Sampling Technique

The calculated sample size of 360 participants was used in the general population. The Study Population is comprised of 360 Students drawn from three (3) Secondary Schools in Ogun State and selected from each of the three (3) senatorial zones of the state. Stratified Random Sampling Technique was used where Twenty (20) participants were selected from each of the classes that make up a secondary education in Nigeria (from 1 to 6) so that a total of 120 students were selected from the 6 classes in each selected school. A total of 360 student participants were selected from the three (3) selected Schools.

Instrumentation

Snellen Visual Acuity Chart, Trial lens box, Occluder, Pen Torch, Prism Bars

Procedure for Data collection

Case history: Simple demographic data was obtained through a case history on-site and entered using a data collection sheet. The age of the participant, gender, and socio-economic status, were obtained with the use of the data collection sheet. A questionnaire was administered to get information on the history of ocular trauma, ocular surgeries, and eye patching.

Visual acuity: A printed Snellen visual acuity chart calibrated for 6meters was used to assess the participants' visual acuity.

Cover test: Cover/uncover test was done using an occluder.

Hirshberg test: Hirschberg's test was done using a pen torch to check for tropia in the eye, and krimsky test was done using the prism bars, and recorded for each participant and classified according to the categories of strabismus previously stated. The Hirschberg test compares the position of the corneal reflexes (the first Purkinje images) of the two eyes that are formed by a pentorch. Using prisms from the trial case, the Hirschberg test can be extended to provide more accurate measures of the angle of heterotropic deviation. When carried out in this fashion, the test is known as the Krimsky test (David *et al.,* 2007).

Ethical Considerations

Approval was sought and obtained from the Research and Ethics Committee (REC) of Madonna University and the Permanent Secretary, Ministry of Education, Ogun State. Oral consent was also obtained from the Principals of each of the three (3) schools and the subjects involved.

Data analysis

All questionnaire forms were cross-checked on-site for completeness. Data was entered and analyzed using Statistical Package for Social Sciences version 16.0 (IBM Corp., Armonk, NY, USA). The prevalence of Strabismus was calculated in percentages and presented in tables using the descriptive statistics. The correlation test (Chi-square test) was used to determine relationships between variables. Statistical significance was set at $P < 0.05$.

RESULTS

Demographics

A total of three hundred and sixty (360) participants were used in this study. The ages ranged from 9-22 years with a mean of 14.21 and a standard deviation of 2.081years. There were nearly an equal number of males and females in this study in a ratio of 1.14:1, though with a difference of 4.4%.

Prevalence of Strabismus

The prevalence of Strabismus in this study was determined to be 1.94%. Strabismus was found to be present in Seven (7) participants out of the 360 subjects that were examined.

Table 1: Prevalence of Strabismus among secondary school students in Ogun State.

Strabismus	Frequency	Percent (%)
Orthotropia (Participants Without Strabismus)	353	98.1
Heterotropia (Participants With Strabismus	7	1.9
Total	360	100.0

Pattern of Strabismus

Esotropia was more common than Exotropia in a ratio of 3:1. Also, the frequency of horizontal Tropia was more than the vertical Tropia. Also, the types of Strabismus diagnosed were as follows; Accommodative Esotropia, Intermittent Esotropia, Exotropia, and Hypertropia from different participants (0.27% each).

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Table 2: Pattern of strabismus among secondary school students in Ogun State

Heterotropia	Frequency	Percent (%)
Orthotropia	353	98.1
Intermitent Esotropia	1	0.27
Constant Esotropia	1	0.27
Constant Exotropia	1	0.27
Constant Hypertropia	1	0.27
Constant Hypotropia	1	0.27
Accommodative Esotropia	1	0.27
Intermittent Exotropia	1	0.27
Total	**360**	**100.0**

Pattern of Esotropia: There was an equal distribution of the different types of esotropia in the study. Intermittent esotropia, accommodative esotropia, and constant esotropia were seen in one participant at 0.27%. The table below shows the degree of the different degrees of esotropia.

Table 3: Pattern of Esotropia

Esotropias	Degree	Cases
Intermitent Esotropia	≈5Δ	1
Accommodative Esotropia	≈3Δ	1
Constant Esotropia	≈5Δ	1

Patterns of Exotropia: There was an equal distribution of the two types of exotropia (alternating exotropia and sensory exotropia) seen in the study (each at 0.27%). The table below shows the degree of exotropia seen in this study.

Table 4: Patterns of Exotropia

Exotropias	Degree	Cases
Alternating Exotropia	≈2Δ	1
Sensory Exotropia	≈2Δ	1

Patterns of Hypertropia: Only a case of constant hypertropia was seen with a degree of ≈2Δ.

Patterns of Hypotropia: Only a case of constant hypotropia was seen with a degree of ≈2Δ.

DISCUSSION

There is a varying prevalence of strabismus from studies conducted by other researchers in different locations. The prevalence of strabismus found in this study was 1.90%. This is lower than the global prevalence range of 3-5% (Greenberg *et al.,* 2007), but similar to previous results found in other parts of Nigeria (1.89%) and Africa (1.50) (Mojon, 2009). This further confirms the low prevalence of strabismus among Negroes (Oystreck, 2012). The prevalence of strabismus in this study was similar to that obtained in Benin city, Edo State, Nigeria (Ebele *et al.,* 2014; Akpe *et al.,* 2014) with a prevalence of 0.89% and 0.8% in West Iran (Hashemi., 2010). However, it was at variance with the

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studies done in native America 2-5% (Abbassali *et al.,* 2009). Studies from other African countries had prevalence rates ranging from 0.2% to 0.5% (Ntim-Amponsah & Ofosa., 2007), which was also lower than that obtained in this study. The variations may be due to differences in methodology, the study population, or perhaps regional differences. Although the prevalence of Strabismus obtained in this study was lower than the rates obtained from studies in the United Kingdom, United States of America, Brazil, Canada, and Seoul (Williams *et al.,* 2008; Drover *et al.,* 2008), it was similar to that obtained in Japan with a prevalence of 0.99% found in elementary school pupils (Matsuo., 2007). It is believed that the prevalence of strabismus among people of Asian origin and mixed ethnicity is low as compared to white populations. This observed increase in prevalence among the secondary school students may be a result of the ocular decompensating of children who had Phorias to Tropias and also an increase in the incidence of acquired strabismus as the children grew older. Most of the participants had ocular trauma, and did nothing about it as revealed through case history, which in itself can be a cause of Phoria and consequently acquired Tropia.

Regarding the Pattern of Strabismus (Tropia), the most common type of manifest strabismus was Esotropia. This is similar to studies in the United States of America (Williams *et al.,* 2008), Canada (Drover *et al.,* 2008) and in Ilorin, Nigeria (Azonobi, 2008). However, studies from Japan, Hong Kong, and Brazil (Matsuo, 2007) show a preponderance of Exotropia. The pattern of Strabismus in this study was consistent with the study done in Asia with the prevalence of Esotropia doubled than other patterns of Strabismus (Ungsoo *et al.,* 2008; Khorrami *et al* 2014). The reasons for this variability in the pattern of Tropias in different regions of the world and from studies in the same country are not fully understood, but several studies have suggested a complex interaction between genetic, racial, anatomic, refractive, and environmental factors (Gravlee *et al.,* 2009). Regarding the Pattern of Esotropia, there was an equal distribution of the types of Esotropia noted in this study, which is; Accommodative Esotropia, Intermittent Esotropia, and Constant Esotropia. These were seen in one case. Considering the Pattern of exotropia, it showed Exotropia with alternating fixation as the most common form of exotropia determined in this study. A disturbance in the tonic horizontal vergence is usually considered the cause of most primary divergent deviations (Gunton *et al.,* 2015).

CONCLUSIONS

This study showed that there is a significant prevalence of manifest Strabismus among school Children in Ogun State. Although this is high when compared to that obtained in other African societies, it is still low compared to the Caucasian population and global prevalence rates. Esotropia was more common than Exotropia.

RECOMMENDATIONS

It is recommended that vision screening policy be established and strengthened in secondary schools, and those diagnosed with strabismus should be treated early enough. Since younger children have better prognosis in the management of strabismus than older patients, early detection and referral is crucial. More so, training for non-ophthalmic staff such as teachers to detect and refer cases of strabismus is advocated.

REFERENCES

Abbasali, Y., Hassan, H. & Reza, N. (2013) the prevalence of amblyopia, strabismus, and ptosis in school children of Dezful. *Nigerian Journal of Ophthalmology.* 27(1), 33-40.

Akpe, B.A., Dawodu, O.A. & Abadom, E.G. (2014) Prevalence and pattern of strabismus in primary school pupils in Benin city, Nigeria. *Nigerian Journal Ophthalmology.* 22 (5), 38-43.

Azonobi, I.R., Olatunji, F.O., Adido, J. & Osayande, O.O. (2008) Vision of strabismic children in Ilorin, Nigeria. *Nigerian Journal Ophthalmology;* 6, (12)12-5.

David B. Elliott., Brendan Barrett., John G. Flanagan., Patricia Hrynchak., C. Lisa Prokopich., Edward Mallen., Konrad Pesudovs (2007) Clinical procedures in primary eye care, Third edition. Elsevier Limited, ISBN 13: 9780750688963

Drover, J.R., Kean, P.G., Courage, M.L. & Adams, R.J. (2008) Prevalence of amblyopia and other vision disorders in young Newfoundland and Labrador children. Can J Ophthalmol ;43:89-94.

Ebele, G.A., Oseluese, A.D., Akpe, B.A. & Omon, E.A. (2014), the prevalence of tropia in primary school pupils in Benin city, Edo state, Nigeria. Nigerian Journal Ophthalmology; 13: (10)12-5.

Gravlee, C.C., Non, A.L. & Muligan, C.J. (2009) Genetic ancestry, social classification, and racial inequalities in blood pressure in southeastern Peurto Rico. 4(9) PMID 19742303

International Journal of Medical Science and Applied Biosciences
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http://www.casirmediapublishing.com

Greenberg, A.E., Mohney, B.G., Diehl, N.N., Burke, J.P. (2007) The Incidence and types of childhood esotropia in a defined population. Opthalmology 114 (1): 170-4.

Gunton, K.B., Wasserman, B.N. & DeBenedictis, C. (2015) Strabismus. Primary care. 42 (3): 393–407. doi :10.1016/ nj.pop.2015.05.006. PMID 26319345.

Hashemi, G. (2010) The prevalence of amblyopia, strabismus, and ptosis among schoolchildren in Dezful in the west of Iran. ISSN 1091-8531. PMID 22681945.

Khorrami-Nejad, M., Akbari, M.R. & Khosravi, B. (2017) To determine the frequency of different types of strabismus and amblyopia in the patients of strabismus clinics from 2008 to 2014 Volume 2018:10 Pages 19—24

Matsuo, T. & Matsuo, C. (2007). The prevalence of strabismus and amblyopia in Japanese elementary school children. Ophthalmic Epidemiololgy Feb; 12 (1): 31-6.

Millodot Michael (2012). Dictionary of oprtometry and vision science 7th edition; 9780702051883.

Mojon-Azzi (2011). The Massachusetts Eye and Ear Infirmary illustrated manual of ophthalmology (3rd ed). Saunders/Elsevier. ISBN 978-1-4377-0908-7.

Ntim-Amposah, C.T. & Ofosu, A.S. (2007) The prevalence of refractive error and other eye diseases in school children in the greater Accra region of Ghana. Journal Pediatric Ophthalmolmology Strabismus. 2007 Sep-Oct; 44(5): 294-7.

Oystreck, T. (2012) The WHO prevalence of strabismus in developing countries. Saunders/ Elsevier. ISBN 978-1-4377-0908-7.

Ungsoo, G. (2008) carried out a similar study to investigate the prevalence and patterns of refractive errors and strabismus in Asian patients with Down syndrome.

Williams, C., Northstone, K., Howard, I., Harvey, M., Harrad, R.A. & Sparrow, J.M (2008). Prevalence and risk factors for common vision problems in children: Data from the ALSPAC study. British Journal Ophthalmology, 92 (43):959-64.