



Original

## Prevalence of Refractive errors and other eye disorders in School children in a rural Local Government Area in Ogun State, Nigeria

<sup>1,2</sup>Otulana TO, <sup>3</sup>Sobanjo AB, <sup>2</sup>Ayeni OA, <sup>1</sup>Bodunde OT, <sup>1</sup>Ajibade HA

<sup>1</sup>Department of Surgery, Faculty of Clinical Sciences, Olabisi Onabanjo University

<sup>2</sup>Department of Ophthalmology, Olabisi Onabanjo University Teaching Hospital, Sagamu Ogun State Nigeria

<sup>3</sup>State Hospital Ota, Ogun State, Nigeria

**Corresponding author: Otulana Taibat Olusola**, Department of Surgery, Faculty of Clinical Sciences, Olabisi Onabanjo University, Sagamu Ogun State Nigeria; [Otulana.olusola@oouagoiwoye.edu.ng](mailto:Otulana.olusola@oouagoiwoye.edu.ng); +2348033745315

Article history: Received 27 April 2024, Reviewed 13 June 2024, Accepted for publication 21 June 2024

### Abstract

**Background:** Poor vision limits a child's ability to learn and reach the highest potential in life. Ensuring comprehensive eye examination before enrolling children in schools will go a long way in reducing the prevalence of uncorrected refractive error in society and possibly improve school performance of these children. The objective of this study was to determine the prevalence of refractive error among primary six and junior secondary school students and identify uncorrected refractive error and other eye disorders.

**Method:** This is a cross-sectional analytical study conducted on school children in Imosan of Odogbolu Local Government Area in Nigeria. History about vision, visual impairment and its correction was established from the students. Eye examination and on-the spot refraction were performed, and the data was analyzed using SPSS version 21.

**Result:** Five hundred and seventy-three students (573) were examined, and 72.8% were from public schools. Ninety-two (16.1%) students had refractive error and of these 60.3% were from private schools, 89% were cases of myopia while 8.2% had anisometropia. Fifty-four (21.4%) of 252 girls pretended to have refractive error due to substandard initial visual acuity which became normal after putting a plano lens in the trial frame during subjective refraction. 1.7% had allergic conjunctivitis and other ocular diseases. Sixty-four (12.8%) students had undetected refractive errors before secondary school entry.

**Conclusion:** The prevalence of uncorrected refractive error was 16.1% and myopia was most common. Eye screening before enrollment into secondary school will help to identify and correct those with pre-existing refractive errors.

**Keywords:** Eye screening, refractive error, eye disorders, school children, Ogun state.



This is an open access journal and articles are distributed under the terms of the Creative Commons Attribution License (Attribution, Non-Commercial, ShareAlike" 4.0) - (CC BY-NC-SA 4.0) that allows others to share the work with an acknowledgement of the work's authorship and initial publication in this journal.

### How to cite this article:

Otulana TO, Sobanjo AB, Ayeni OA, Bodunde OT, Ajibade HA. Prevalence of Refractive errors and other eye disorders in School children in a rural Local Government Area in Ogun State, Nigeria. The Nigerian Health Journal 2024; 24(2):1311 – 1318.

<https://doi.org/10.60787/tnhj.v24i2.822>



## Introduction

Good vision is required for good academic performance, and it is vital in everyday life. Vision has been linked to cognitive growth and social development. Poor vision affects a child's ability to learn and reach the highest potential which includes getting to the pinnacle of academic attainment, job opportunities and career development.<sup>1</sup>

According to the World Health Organization (WHO), refractive error is a recognized cause of reversible visual impairment and blindness in both children and adults worldwide.<sup>2</sup> Refractive error is easy to diagnose, and the treatment is relatively simple and cheap. However, treatment can be challenging in the developing countries where health care treatment is by out-of-pocket payment. The situation is worse for children who depend on their parents or guardians for provision of health care.

It is reported that globally about 12million children between the ages of 5 and 15 years are visually impaired from uncorrected refractive error.<sup>3</sup> This is because refractive error itself may produce symptoms which only observant parents may be able to recognize. It is possible for poor vision to go undetected, if an opportunity of comparing the vision with others is not present. The sufferer of poor vision will think that every other person sees the same way as him/her since they do not know how clear and sharp distance vision ought to be. A study done in Norway by Falkenberg et al on children referred to the university eye clinic by school screening program showed that 83% of the children had previously undetected vision problem.<sup>4</sup>

Pre-school eye screening is used to identify prospective students with eye defects and offer solutions, especially those with uncorrected refractive error, before enrollment in school. It is therefore essential to ensure comprehensive eye examination before enrolling children in schools for optimal academic performance. Vision check before enrolling in primary school may not be feasible in rural communities of developing countries because of the primitive nature of the pupils and non-availability of eye care facility/workers in most of these rural areas. Vision checks should at least be performed before they enter secondary school particularly in countries where standard guidelines for screening are not in place. An Ophthalmologist should detect students with refractive error and other visual problems at the early stages to restore vision with the aid of corrective lenses in those with uncorrected refractive errors and prevent the development of amblyopia.

The aim of the study was to determine the prevalence of refractive error among primary six and junior secondary school students and identify those with uncorrected refractive error and those with and others eye defects. The study also focused on identifying visual impairments in children transiting from primary to secondary school, and possibly determine the proportion of children whose visual impairment were undetected and are now in junior secondary school.

## Method

This is a cross-sectional analytical study conducted on school children at Imosan in Odogbolu Local Government Area (LGA) which is a rural community in Ogun State, Nigeria. Odogbolu is one of the twenty LGAs in Ogun State and is in the Ijebu geopolitical zone of the State. This research is a part of a larger community survey at Imosan in Ifesowapo local council (semi-rural area) in Odogbolu LGA. The study was conducted among the exiting primary six pupils and Junior Secondary School (JSS) 1-3 students in the local council. There are 3 primary schools and 4 secondary schools in the locality. Six schools comprising of 4 public and 2 privates were assessed, the headteacher of the seventh school refused access to the students. All the students in JSS 1-3 and all primary 6 pupils in the available schools were included in the study. The research was conducted within one week, during a community outreach program.

**Study participants:** All primary 6 pupils and students in JSS 1-3 available in the schools at the time of the study were included.

Consent was obtained from the heads and teachers at the schools who were *loco parentis* for these students. Ethics approval was obtained from the Olabisi Onabanjo University Teaching Hospital Health Research Ethics Committee.

The research team that participated in the survey comprised of ophthalmologists, optometrist, ophthalmic nurses, and student nurses. Ocular examination was done under natural light in open space in some of the schools and in a brightly illuminated classroom in others. Less illuminated spaces were used for other ocular examinations like funduscopy. Tools used were mobile Snellen chart, Illiterate tumbling E chart, Near reading test type, trial lens boxes and trial frames, pen touches, ophthalmoscopes and retinoscopes.

The study was conducted in each of the schools. Registration of the participants was done by the student

nurses who documented their demographic characteristics (name to avoid duplication of record, age, sex, class) in the data collection form. History of use of recommended/medicated spectacle in the students and members of their families and any previous visual examination check was recorded. The ophthalmic nurses checked and recorded the students' visual acuities unaided, with pin hole and near vision in the data collection form. Each student received the filled data form and sent it to the Ophthalmologists for further examination. Basic ocular examination was conducted, and findings were recorded in each student's form. Visual acuity of 6/9 was regarded as emmetropia in this study and those with visual acuity less than 6/9 (that is 6/12 and worse) and those who found it difficult to read N5 in the presence of normal ocular findings were sent for refraction. Refraction was performed by the Optometrist and Ophthalmologist. Retinoscopy was done in a relatively dark class with fogging of the eyes where necessary (cycloplegic refraction was not done because the schools agreed to release each student for just one day). Those who required glasses were given their prescription for glasses and encouraged to give it to their parents to purchase for them. Those with refractive errors were those whose visual acuity improved with refraction by at least a line on the Snellen chart. Those with difficult refraction that could not be concluded on the spot and those with other ocular diseases that needed additional evaluation were referred to either the teaching hospital or eye care facility close to their abode and were not included in the final analysis. For analysis and comparison, the students were grouped into A and B. Group A comprised of primary 6 pupils and JSS1 students while Group B was those in JSS 2 and 3.

All the forms were collected at the last stage of examination and kept for analysis. The information was used to generate the data which was recorded in personal computer and analyzed with SPSS version 21. Visual acuity of 6/9 was used as cut off to be able to identify those with hypermetropia who could have been missed because of accommodation, the same reason for checking their near vision. Frequencies and percentages were calculated. *p value* of significance was set as  $P \leq 0.05$ .

\***Visual acuity:** is the ability to discern the shapes and details of the things you see.

## Results

The total number of students examined was 573 with a male female ratio of 1.3:1. Three hundred and twenty-

one (56.0%) were males, with 50 (15.6%) males and 23 (9.1%) females having refractive error ( $p$  values = 0.02). The number of students in public schools was 417 (72.8%), and in private schools 156 (27.2%), with refractive errors distribution being 29 (7.0%) in public school and 44 (28.2%) in private schools; this difference was statistically significant with  $p$  value  $<0.01$ . Socio-demographic characteristics of the students is represented in Table 1

**Table 1:** Socio-demographic characteristics of students

Variables	Freq (n)	Percent (%)
<b>Age Group in years</b>		
9 - 12	327	57.1
13 - 16	238	41.5
17 - 20	8	1.4
<b>Sex</b>		
Male	321	56.0
Female	252	44.0
<b>Class</b>		
Pry 6	73	12.7
JSS1	309	53.9
JSS2	92	16.1
JSS3	99	17.1
<b>Type of Schools</b>		
Public	417	72.8
Private	156	27.2

One hundred and sixty-three (28.4%) failed the visual acuity test with VA of 6/12 and worse and were refracted on the spot. The VA of 54 (76.1%) girls and 17 (23.9%) boys improved with plano lenses. Ninety-two students (16.1%) were confirmed cases of refractive error out of which 19 (20.7%) were referred to hospitals close to their places of abode because their refraction could not be concluded on the field: such were excluded from the final analysis. Sixty eight out of 500 (68/500) secondary school students (13.6%) had refractive error but 4 (0.8%) of them had been previously diagnosed with refractive error leaving those that were undiagnosed before secondary school entry to be 64 (12.8%). Overall, normal vision of 6/6 (unaided) was recorded in 364 (63.5%) students and 541 (94.4%) students after correction. After correction of refractive error 549 students had visual acuity of 6/9 and better. Near vision was N5 in all the students. The visual assessment and refractive error types are shown in Table 2.

**Table 2:** Visual assessment of the students and types of refractive error

Variables	Freq	Percent (%)
<b>Total number of students with Visual acuity 6/9 and better</b>		
Unaided	409	71.4
After malingering was ruled out	71	12.4
After correction of refractive error	69	12.0
<b>Causes of reduced Vision (VA &lt; 6/9) n= 163</b>		
Malingering	71	43.6
Refractive error	73	44.8
Unconfirmed (Referred)	19	11.7
<b>Types of refractive error n=73</b>		
Myopia	65	89.0
Hypermetropia	3	4.1
Astigmatism	5	6.9
<b>Sub-classification of refractive errors</b>		
Simple refractive errors	70	95.9
Compound refractive errors	3	4.1
<b>Differences between the power of lenses in both eyes</b>		
Isometropia	23	31.5
Anisometropia	6	8.2
*Others	44	60.3
<b>Prevalence of refractive error in the classes</b>		
Pry 6	5/73	6.9
JSS1	40/309	12.9
JSS2	15/92	16.3
JSS3	13/99	13.1

*\*Others were those with differences in refractive error in both eyes (in diopters) less than  $\pm 1D$*

Forty-two males and 23 females had myopia (total 65), all the students with hypermetropia and astigmatism were males. Myopic astigmatism was the only type of astigmatism noted.

Emmetropia (VA 6/9 and better) was recorded in 480 (83.8%) students. Eighty-nine percent (89%) of all cases of refractive error were those with myopia. Seventy (95.9%) students had simple refractive error as represented in Table 2. The least correction was 0.50D in each eye which was recorded in eight students. The highest error was -3.50D. In total forty-seven (64.4%) of the refractive error cases had correction of at least 1.00 diopter/25 cases with at least 1.50D. Forty-four (students had unequal refractive error of less than 1.00 diopter in both eyes. Forty-four (60.3%) cases of refractive error were from private schools while 29 were from public schools.

Of the 309 students in JSS1, 40 (12.9%) of them had refractive error which formed more than half 40/73 (54.8%) of the total number of students diagnosed with refractive error in the study. More than three quarters of them 33/40 (82.5%) required correction of at least 0.75D to see better.

Forty-four (28.2%) out of the 156 students in private schools had refractive error as against 29 (7.0%) out of 417 in public school with a p value of <0.01.

Fifty-four (21.4%) of the females examined were found to be malingering as compared to 17 (5.3%) of the 321 boys, this is statistically significant with p value <0.01. Seventy out of the 73 students had refractive error in both eyes p value <0.01 as represented in Table 3 (comparative analysis of the variable).

**Table 3:** Comparative analysis of Prevalence of Refractive error variables and their *p values*

Variables	Freq	Percent (%)	<i>p value</i>
<b>Category of schools</b>			
Private	44/156	28.2	<0.01
Public	29/417	7.0	
<b>Sex</b>			
Male	50/321	15.6	0.02
Female	23/252	9.1	
<b>Malingering based on Sex</b>			
Male	17/321	5.3	<0.01
Female	54/252	21.4	
<b>Other Ocular diseases</b>			
RE with other ocular diseases	00/573	0.0	<0.01
RE alone	73/573	12.7	
Other Ocular diseases alone	10/573	1.7	
<b>Laterality</b>			
Unilateral	03/73	4.1	<0.01
Bilateral	70/73	95.9	
<b>Grouping</b>			
Grp A	45/382	11.8	0.33
Grp B	28/191	14.7	

\*RE Refractive Error

Other ocular diseases encountered were allergic conjunctivitis in eight students, one student each were blind in one eye from corneal scar and optic atrophy from a history of previous trauma.

### Discussion

The prevalence of refractive error among the primary six and junior secondary school students by vision screening was 12.7 %, this is much higher than the 7.5% and 8.9% reported by Alam et al<sup>5</sup> and Nakua et al<sup>6</sup> in Karachi and Ghana respectively. Visual parameters of the studies were comparable to that of our study but much lower than the 28.4% reported by Aribaba et al<sup>7</sup> in Lagos, Nigeria whose study was on senior secondary school students.

There were more males in the study which may be due to the disproportion in the enrollment of students in schools in favor of males which had been reported in studies in Nigeria,<sup>8,9</sup> this difference (*p* value 0.02) was statistically significantly. This study found that significantly more males had refractive error of all types than females contrary to the report of Czepita et al, which reported more females.<sup>10</sup> Females generally want to look

good and attractive, and this may explain why malingering was statistically significantly in them.

Malingering is an intentional deceptive mimicry of a nonexistent disorder<sup>11</sup> and it is a diagnosis of exclusion after eye disease/ disorder has been ruled out in the presence of good vision and normal ocular findings which prevailed in these students. These students presented visual acuity less than 6/9 which improved with pin hole. Retinoscopy did not reveal refractive error and subjective with Plano trial lens produced emmetropic visual acuity. The students were then counseled and no prescription for glasses was given to any of them. The prevalence of 43% is quite high and this finding has not been prominent in the literature. The students who were identified as having refractive error had the privilege of being examined twice. The malingering students probably also wanted to have another chance of being re-examined for glasses. This finding was more prominent among the female sex in a significant proportion and can be a cause of spectacle intolerance if the refraction was done by inexperienced personnel. This can further stretch the already fatigued purses of the parent/guardian in a country where health care facilities are accessed by out-of-pocket payment.

The psychiatric evaluation of these students was not done because the authors did not see the need for it.

More than 80% of the students were emmetropic (visual acuity of 6/9) after correcting for those with malingering. A study done in Norway by Midelfart et al reported emmetropia of about 50% in older age group<sup>12</sup> while Mahjoob et al reported that 35% of their population were emmetropic.<sup>13</sup> Near vision was N5/N6 at 33cm and arm's length distance in all the students that were examined, this ruled out clinically significant hypermetropia.

Ninety percent of refractive error was due to myopia, similar to that reported by other authors.<sup>14,15,16</sup> This must be why near vision was normal. The reason for this finding might be due to early exposure of the children to near work which has been known to be a risk factor for development of myopia. Meanwhile, in the survey by Mahjoob, more than one third of their population were hypermetropic.<sup>13</sup> The sex prevalence of refractive error may be related to the race, ethnicity, social and environmental factors. About two thirds of those with myopia were males, this might be due to the predominance of males in the study population although a study in Poland by Czepita et al reported a higher prevalence of myopia in the females.<sup>10</sup>

Very few students (4.1%) were diagnosed with hypermetropia, some of them could have been missed because of great ability to accommodate at this age. This was the rationale for allowing visual acuity of 6/9 and difficulty to read N6 in the near test type as the cut off for the diagnosis of refractive error, although those with high hypermetropia were likely to have been identified if they were present and this is like the report of Ezegwui et al.<sup>16</sup> In the meta-analysis by Castagno et al, the prevalence of hypermetropia was low among the age group that this study considered.<sup>17</sup>

While the student population in group A was much more than those in group B, the refractive error pattern followed the same trend, there was no statistically significant difference in refractive error across the groups. Unfortunately, this has not been reported in the literature. Most studies considered the age, sex and sometimes ethnicity. The importance of this finding is that the prevalence of refractive error across the class groups is the same and that such grouping may not be scientifically important.

One third of cases of refractive error had myopia of at least -1.50DS/greater than fifty percent of the population with refractive error had correction of at least -1.00DS

which were more common in students in JSS1. This showed vision disabling refractive error and they could have been identified and corrected if pre-school vision test was enforced. The result from this study may just be a tip of the iceberg, a higher prevalence of RE in schools may be likely if a larger population of students in the state is surveyed.

Use of appropriate spectacle to correct refractive error was said to be the best intervention in eye health.<sup>18</sup> Unfortunately, only 4% of the students with refractive error gave history of spectacle use but did not come to school with them on the days of the survey. A number of factors which were due to prescriber, students, parents' factors and others have been identified by some authors to contribute to noncompliance of use of spectacles.<sup>19,20</sup> Use of spectacle in people with very low refractive error (those who did not appreciate the improvement in vision with their spectacles) may be one of the students' factors for poor spectacle compliance. Eye care workers therefore must be experienced enough to be able to decipher those who desire spectacles from those who deserve it.

It was also discovered that more cases of refractive error, especially myopia, were from private schools, and this was statistically significant. It had been reported in some studies that refractive error was more predominant in children of high social economic status.<sup>15</sup> Although socioeconomic status of parents was not considered in this study, it can be asserted that those who could afford to send their children to private schools arguably had a little bit of financial comfort.

Studies conducted in Ghana, and India,<sup>21,22</sup> both reported that refractive error was a significant cause of visual impairment in the school studies and bilaterality was the predominant presentation as found in this study. Good vision is important for good academic performance of any student and early identification of those with correctable visual impairment will go a long way in improving academic and life standards in schools and other spheres of life. Some of the limitations of the study included the inability to perform cycloplegic retinoscopy in some of the students. The short duration of the study prevented repeated visits to the schools, thus some eligible students were inadvertently excluded, because they were absent in school at the time of the study.

There is need to strengthen the pre-school vision screening test, while enforcement at the stage of enrollment in Junior secondary school by making it an eligibility/requirement criterion for enrollment will help

to reduce the prevalence of uncorrected refractive error. This will allow the ophthalmologist to detect students with other ocular diseases thus preventing permanent visual disability.

**Implication of the Study:** Refractive error is a significant cause of visual impairment and blindness among school children, eye screening before enrollment into secondary school will help to identify and correct those with pre-existing refractive errors thus improve the school performance of these children. It is therefore important to make eye screening mandatory before enrollment into secondary school in Nigeria.

Policies should be made to enforce pre-school eye examination for children. School proprietors should include eye screening as a part of their admission criteria. This study is opened for future research on a larger sample size.

**Limitations of the Study:** One of the limitations is the small sample size. Some students with refractive errors might have been missed because cycloplegic refraction was not done.

## Conclusion

Uncorrected refractive error remains the most important cause of visual impairment among school children. Some students had other eye defects. Therefore, eye screening before enrollment into secondary school will help to identify and correct those with pre-existing refractive errors.

## Declarations

**Ethical Consideration:** Ethical approval was obtained from the Olabisi Onabanjo University Teaching Hospital Health Research Ethics Committee.

**Authors' Contribution:** Concept and Design of the study was done by TO Otulana

Intellectual content was done by TO Otulana, AB Sobanjo, OT Bodunde, OA Ayeni, HA Ajibode

Literature search was done by TO Otulana, OT Bodunde, Dr. OA Ayeni

Acquisition of data was done by Dr AB Sobanjo, Dr. OA Ayeni, Dr TO Otulana

Statistical Analysis and interpretation of the of data was done by TO Otulana, AB Sobanjo

Drafting the article/manuscript preparation was by TO Otulana, HA Ajibode

Manuscript editing/manuscript revising was done by Dr. TO Otulana, Dr. AO Sogebi, Prof LOA Thanni, OT Bodunde

**Conflict of interest:** There was no conflict of interest by any of the authors.

**Funding:** The research was funded by the authors.

**Acknowledgment:** The authors wish to acknowledge the contribution of Mrs. Olajitan (Ophthalmic Nurse) and two other general nursing students, Miss Okereke (an Optometrist) for their involvement in field work and collection of data. Professor LOA Thanni and Dr OA Sogebi are acknowledged for their invaluable contribution in constructively criticizing and correcting the manuscript.

## References

1. Zheng DD, Swenor BK, Christ SL, West SK, Lam BL, Lee DJ. Longitudinal Associations Between Visual Impairment and Cognitive Functioning: The Salisbury Eye Evaluation Study. *JAMA Ophthalmol.* 2018; 136(9):989-995.
2. Briant PS, Flaxman SR, Taylor H R B, Jonas JB, Abdoli AA, Abrha WA, et al. Causes of blindness and vision impairment in 2020 and trends over 30 years, and prevalence of avoidable blindness in relation to VISION 2020: the Right to Sight: an analysis for the Global Burden of Disease Study. *The Lancet Global Health.* 2021; 9(2): E144-E160.
3. Gore FM, Bloem PJ, Patton GC, Ferguson J, Joseph V, Goffey C, et al. Global burden of disease in young people aged 10-24 years: a systematic analysis. *Lancet.* 2011; 377(9783): 2093-2102.
4. Falkenberg HK, Langas T, Svarverud E. Vision status of children aged 7-15 years from school vision screening in Norway during 2003-2013: a retrospective study. *BMC Ophthalmology.* 2019; 19, 180 (2019). <https://doi.org/10.1186/s12886-019-1178-y>.
5. Alam H, Siddiqui MI, Jafri SIA, Khan AS, Ahmed SI, Jafar M. Prevalence of refractive error in school children of Karachi. *J Pak Med Assoc.* 2008;58(6):322-325.
6. Nakua EK, Otupiri E, Owusu-Dabo E, Dzomeku VM, Out-Danquah K, Anderson M. Prevalence of refractive errors among junior high school students in the Ejisu Juaben municipality of Ghana. *Journal of Science and Technology (Ghana).* 2015; 35(1):52-62.
7. Aribaba OT, Obembe OM, Ilo OT, Adenekan OA, Alabi AS, Akinbami OA et al. Prevalence and Pattern of Refractive Error in Senior Secondary School Students In Lagos State, Nigeria: The Need

- For A National School Eye Health Screening Programme. Nigerian Quarterly Journal of Hospital Medicine. 2018; 28(2):83-92.
8. Akinbi JO, Akinbi YO. Gender Disparity into Basic Formal Education in Nigeria: Implication for National Development. African Research Review. 2015;9(3):11-23.
  9. Omoregie N, Abraham IO. Persistent Gender Inequality in Nigerian Education. 2018.
  10. Czepita D, Mojsa A, Ustianowska M, Czepita M, Lachowicz E. Role of gender in the occurrence of refractive error. Ann Acad Med Stetin. 2007;53(2):5-7.
  11. Trauzettel-Klosinski KS. Functional Visual Loss and Malingering. Chapter 15: pgs 203-214.
  12. Midelfart A, Kinge B, Midelfart S, Lydersen S. Prevalence of refractive error in young and middle-aged adults in Norway. Acta Ophthalmologica Scandinavica. 2002; DOI: 10.1034/j.1600-0420.2002.800508.x.
  13. Mahjood M, Heydarian S, Nejati J, Ansari-Moghaddam A, Ravandeh N. Prevalence of refractive error among primary school children in a tropical area, Southeastern Iran. Asian Pacific Journal of Tropical Biomedicine. 2016; 6(2):181-184.
  14. Baloyi VHA, Akinsola HA, Mabunda JT. Pattern of distribution of refractive error among school children in Malamulele community of Limpopo province, South Africa. African Journal of Physical Activity and Health Sciences. 2018;24(3): 142-152.
  15. Abdul-Kabir M, Bortey DNK, Onokhua EE, Asare-Bediako B, Kumah DB. Ametropia among school children – A cross-sectional study in a sub-urban municipality in Ghana. open access text. DOI: 10.1576/PD.1000114.
  16. Ezegwui IR, Oguego NC, Okoye OI, Maduka-Okafor FC, Udeh N, Aghaji AE et al. Erratum: Prevalence of refractive errors and visual impairment in school children in Enugu South-East Nigeria. Niger J Clin Pract. 2021; 24(3):380-386.
  17. Castagro VD, Fassa AG, Vidal Carret ML, Vileda MAP, Meucci RD. Hyperopia: a meta-analysis of prevalence and a review of associated factors among school-aged children. BMC Ophthalmol. 2014 23; 14:163. Doi: 10.1186/1471-2415-14-63.
  18. Ezelum C, Razavi H, Siva Subramaniam S, Gilbert CE, Murthy GV, Entekume G, et al. Refractive error in Nigerian adults: Prevalence, type and spectacle coverage. Invest Ophthalmol Vis Sci. 2011; 52:5449-5456.
  19. Narayanan A, Kumar S, Ramani KK. Spectacle compliance among adolescents in Southern India: Perspective of service providers. Indian J Ophthalmol. 2018; 66(7):945-949.
  20. Aldebasi YH. A descriptive study of compliance of spectacle-wear in children of primary schools at Qassim Province, Saudi Arabia. Int J Health Sci (Qassim). 2013; 7(3):291-299.
  21. Ntim-Amponsah CT, Ofori-Amaah S. Prevalence of refractive error and other eye diseases in schoolchildren in the Greater Accra region of Ghana. J of Paediatr Ophthalmol and Strabismus. 2007; 44 (5):294-297.
  22. [Singh V](#), [Malik K P S](#), [Malik V K](#), [Jain K](#). Prevalence of ocular morbidity in school going children in West Uttar Pradesh. Indian J Ophthalmol. 2017; 65:500-508.