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PREVALENCE OF REFRACTIVE ANOMALIES AMONG YOUTHS IN IMO STATE, NIGERIA

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ABSTRACT

This study was aimed at determining the prevalence of refractive anomalies among young boys and girls in Imo State. It is a retrospective study in which files of patients from 5 optometry clinics were reviewed; files of 200 patients aged between 18-30 years were randomly selected out of all the files that were reviewed. There were 100 boys and 100 girls. The data collected were classified into five basic refractive anomalies: myopia, hyperopia, astigmatism, myopic astigmatism and hyperopic astigmatism. The data were analyzed using a table based on frequency and percentages of the refractive anomalies, and further represented on a bar chart. It was found that the prevalence of myopia was greater in male (10%) than in female (5%). Hyperopia is more prevalent in female (17%) than in male (12%). For astigmatism, 4% were male while females were 7%. In hyperopic astigmatism, the prevalence was greater in male (47%) than in female (44%). Myopic astigmatism is equal in both boys and girls (27%).

INTRODUCTION

The eye is an imperfect optical system. This is so because it does not form a point focus after refracting light coming from an object. Rather it forms a circle of least confusion (Grosvenor, 2002). In a perfect eye, the circle of least confusion is always formed on the retina-with accommodation relaxed. In some cases, the circle of least confusion does not form on the retina. This happens when there is refractive anomaly inherent in the eye. Refractive anomalies are also called refractive errors (Millodot, 2009). In this case, the circle of least confusion does not form on the retina, in lieu they are formed either in front or behind the retina when accommodation is relaxed (Millodot, 2009). Refractive anomalies or errors of refraction that occur tend to be inherited but there is no pattern of inheritance, as it can be said to be seen in 20% of children mostly hyperopia and myopia. These errors have been seen to cluster in families. A variety of inheritance pattern has been observed, which include both dominant and recessive genes (Garner, 2006). Emmetropia is a term used to describe a normal eye free from refractive errors or anomalies (Grosvenor, 2002).

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Furthermore emmetropia can also be defined comprehensively as the refractive state of the eye in which, with accommodation relaxed, the conjugate focus of the retina is at infinity. Thus the retina lies in the plane of the posterior principle focus of the eye and distant objects are sharply focused on the retina (Garner, 2006). The opposite of emmetropia is ametropia. Ametropia is the anomaly of the refractive state of the eye in which with accommodation relaxed, the image of object at infinity is not formed on the retina (Grosvenor, 2002). Thus vision may be blur. The ametropias are: astigmatism, hyperopia (hypermetropia) and myopia. Ametropia is also divided into two categories: axial ametropia and refractive ametropia (Borish, 2005). Axial ametropia is ametropia due primarily to an abnormal length of the eye while the refractive power of the eye while the length is approximately normal. Refractive ametropias can be attributed to either an abnormal radius of curvature of the surface of the cornea, or the crystalline lens (curvature ametropia) or to an abnormal index of refraction of one or more of the ocular media – index ametropia (Grosvenor, 2002 and Millodot, 2009). Ametropia is also called refractive anomaly, refractive error, or error of refraction. The prevalence of refractive anomaly or ametropia varies with age. Refractive errors are genetic (Grosvenor, 2002). They are also associated with some genetic disorders such as Marfan's

syndrome, Down's syndrome etc. furthermore, size of eyeball, shape of cornea and lens and depth of anterior chamber have been said to increase the possible ocular combinations for refractive errors (Giles, 2000). As mentioned earlier, refractive errors include myopia, hyperopia and astigmatism, most babies are born hyperopic (80%) (Garner, 2006). About 5% are born myopia. About 15% are born with emmetropia. Astigmatism may be regular or irregular (Grosvenor, 2002). Ametropia is corrected with lenses which may be concave lenses, (negative lenses), convex lenses (positive lenses) and cylindrical lenses. In a normal eye, parallel rays of light focus exactly on the retina when the eye is in a state of rest (i.e. the lens does not have to accommodate). This condition is known as emmetropia in which, as said earlier, a circle of least confusion is formed on the retina. But when a circle of least confusion is formed away from the retina, it may be termed any of the ametropic conditions - myopia, hyperopia and astigmatism - (Grosvenor, 2002).

In far-sighted (hyperopic) eye, the eyeball too short and light comes to focus behind the fovea. In a near sighted eye, (myopic eye) the eyeball is too long, and the light rays come to a focus before they reach the fovea. The lens may also contribute to astigmatism (as in old age, when it may somewhat become irregular in shape because of cataractous changes). Astigmatism is an irregular curvature of the cornea in one or more of its meridians. Astigmatism may be simple, mixed, compound, lenticular, residual or even corneal in nature (Borish, 2005; Millodot, 2009 and Nemesure, 2009). In middle age (beginning anytime past 40) the lens become less flexible and less able to accommodate for near point viewing, this condition is called 'presbyopia' and is described as "when arms aren't long enough". Also because the human organism has two eyes, which must have coordinated visual reception for good vision to occur, a multitude of refraction variables are possible. Anisometropia refers to different refractive errors in each eye, anisekonia denotes a difference in the image size in the two eyes (Goh and Lan, 2004).

Generally, myopia and hyperopia are treated by the use of spherical concave and convex lenses respectively. Astigmatic corrections are cylindrical and are added to any prescription for myopia or hyperopia. Presbyopia is not a refractive anomaly or error. Presbyopia necessitates the use of bifocals or trifocals. Then, in the absence of disease or other ocular abnormalities, glasses or contact lens are the only treatment needed for refractive errors (Grosvenor, 2002). Most causes of visual impairment are as a result of refractive anomalies. Greater percentages of students are not aware of their refractive status. For instance, a student may not have problem with vision but is unaware he has hyperopia. In such case it can be found that the reading ability of such students depends on numerous factors because such students don't read for long. Poor reading ability has been traced to such factors such as; poor intelligence, poor health, neurological problems, mixed dominance or mixed laterality, developmental anomalies, intellectual deprivation, poor teaching, emotional and psychological disorder, hyperactivity and perceptual motor anomalies together with refractive and binocular vision anomalies (Carter, 2010). Myopia, hyperopia and astigmatism are associated with various signs and systems like tearing, squinting, headache (asthenopia) and blur-red vision. These factors, in undergraduates, affect their studies and also in later life. This study is aimed at determining the prevalence of visual anomalies among youths in Imo State with a view to providing appropriate remediation to each.

MATERIALS AND METHODS

The data used in this were gotten from clinics' records. Records of students within the age range chosen were collected. No record outside the age range was used. With permission from the clinics' authorities, the case files of patients with refractive errors from January 2010 to December 2013 were reviewed. The case history of each patient was properly checked to find out if they have been diagnosed of any systemic or ocular disorder that wasn't properly treated. Among the relevant data extracted from the clinical records included the age, sex, visual acuity, refractive status or error of the patient. Frequency and percentage charts were used to analyze the data collected to establish the prevalence of refractive anomalies among the male and female undergraduates in Imo State.

RESULTS

Table 1. Demographic data of Undergraduates used for study

Sex	N	Mean age ±SD
M	100	23.0±3.7
F	100	22.0±3.0

Legend
M= Males
F= Females
N= Number of subjects
SD= Standard deviation.

Table 2. Distribution of Refractive anomalies among male students in Owerri Municipal

Refractive Anomaly	Frequency
Myopia	10
Hyperopia	12
Astigmatism	4
Myopic Astigmatism	27
Hyperopic Astigmatism	47
Total	100

Table 3. Distribution of refractive anomalies among Female Students in Imo State

Refractive Anomaly	Frequency
Myopia	5
Hyperopia	17
Astigmatism	7
Myopic Astigmatism	27
Hyperopic Astigmatism	44
Total	100

Interpretation of Findings

From the information presented in table 5 and figure 2, the degree of myopia was -1.15D ±0.92 in males while in females, it was -1.2D+0.95, hyperopia was ±0.63+0.38 in males while in females, it was + 0.53±0.26.

Table 4. Comparative Analysis of Degree of refractive anomalies in the right eyes of young male and female in Imo State Refractive anomalies on the OD

Sex	Mean myopia ±SD	%	Mean hyperopia ±SD	%	Mean Astigmatism ±SD	%	Myopic Astigmatism ±SD	%	Hyperopic Astigmatism ±SD	%
Male	-1.15 ± 0.92	9.58	+0.63 ± 0.38	7.64	-0.75 ± 0.18	33.3	-1.36 ± 1.29	3.03	+0.57 ± 0.35	1.39
Female	-1.2 ± 0.95	16.06	+0.53 ± 0.26	7.1	-0.57 ± 0.11	14.3	-1.56 ± 1.44	2.99	+0.31 ± 0.95	1.05

Key
OD = RIGHT EYE
SD = STANDARD DEVIATION
% = PERCENTAGE

Table 5. Comparative analysis of degree of refractive anomalies in the left eyes of young males and females in Imo State: Refractive anomalies on OS

Sex	Mean myopia ±SD	%	Mean hyperopia ±SD	%	Mean Astigmatism ±SD	%	Myopic Astigmatism ±SD	%	Hyperopic Astigmatism ±SD	%
Male	-1.18 ± 0.92	10.03	+0.60 ± 0.42	8.01	-0.75 ± 0.18	33.3	-1.28 ± 1.3	3.09	+0.59 ± 0.39	1.28
Female	-1.15 ± 0.98	15.85	+0.56 ± 0.28	7.22	-0.61 ± 0.12	15.30	-1.41 ± 1.39	2.94	+0.59 ± 0.47	1.45

Key
OS = LEFT EYE
SD = STANDARD DEVIATION
% = PERCENTAGE

Astigmatism was -0.75D±0.18 in males but -0.57 ±0.11, in females, and then finally, hyperopic astigmatism was +0.57±0.35 in males but +0.31 ±0.95 in females. Therefore, it can be drawn from the data that the degree of myopia was slightly more in males than females, 1.15D and -1.2D respectively. Hyperopia was more in males (+o.63D) than in female (+0.53D) and that of astigmatism was also more in males (-0.75D) than in females (-0.57D). Also, the degree of myopic astigmatism was more in females (-1.56D) than in males (-1.36D) and that of hyperopic astigmatism was more also in males (+0.57D) than in females (+031D). In conclusion, the degree of myopia, hyperopia astigmatism and hyperopic astigmatism were more in males than in females while myopic astigmatism occurred more in females, we therefore concluded that there is a difference in the degree of refractive anomalies in the right eye between male and female undergraduates. From the information presented in the table 6 and figure 3, the degree of myopia was -1.18D±0.92 in male but -1.15D±0.98 in females.

Hyperopia was +0.60D ±0.42 in males but +0.56D ±0.28 in females. Astigmatism was -0.75D ±0.18 in males but -0.61D ±0.12 in females myopic astigmatism was -1.28D ±1.3 in males while in females it was -1.4D ±1.39. Hyperopic astigmatism was +0.59D ±0.39 in males while in females, it was +0.59D ±0.47. With these data, the degree of myopia was more in males (-1.18D) than in females (-1.15D), then that of hyperopia also occurred in males more (+0.60D) than in females (+0.56D). Also, astigmatism occurred more in males (-0.75D) than in females (-0.61). In myopic astigmatism, the degree of error occurred more in females (-1.4D) than in males (-1.28D) and finally in hyperopic astigmatism, the degree of errors were the same for both the males and females (-0.59D). Based on the above analysis, since the degrees of myopia, hyperopia, astigmatism occurred more in males while that of myopic astigmatism occurred more in females than males we therefore concluded that there is actually a difference in the degree of refractive anomalies in the left eye between male and female undergraduates.

DISCUSSION

The distribution of refractive anomalies in both sexes was equal (100 male and 100 females). This is in agreement with Kragha (2007) who also observed that the distributions of refractive error in both sexes are equal. This finding may have occurred because of the influence of some factors like genetics, age, environmental factors, near work and reading other than sex. The prevalence of myopic astigmatism was observed to be equal in both sexes (27% in males and 27% in females) while hyperopic astigmatism was slightly more prevalent in males (47%) than in females (44%). Myopic prevalence was more in males than in females and this is in agreement with (Rupert *et al*., 2004), which revealed that myopia is more common in males than in females. Hyperopia tends to occur due to flattening of the cornea that accompanies increase in axial length; however, some studies confirmed that hyperopia is hereditary (Kanefiyi, 2003 and Jankiewiez, 2006). Generally, our result shows that hyperopia varied significantly in both male and females with (29%) of the total data collected while myopia has 15% of the total data collected. This result goes in the affirmative direction towards the work of Ayed *et al*. (2002) who carried out a study on 708 children and found out that hyperopia was more prevalent with high significant rate of 77.22% and myopia was 22.75%.

This result is also similar that of to Giles (2000), which revealed that hyperopia is more common than myopia. However, in contrast to the result of this work are the works of Nnadozie (2006), Rupert *et al*. (2004) that revealed that myopia is more common. With regard to gender differences, hyperopia occurred more in females (17%) than in males (12%) and this is in agreement with kings and (Midelfart, 1994), which shows high prevalence of hyperopia in females than in males. Astigmatism was observed to be more prevalent in females (7%) than in females (4%) while myopic astigmatism was equal in both sexes (27% respectively) and hyperopic astigmatism was more prevalent in males (47%) than in females (44%). Hence astigmatism was the most

prevalent refractive anomaly as observed, in this study (7% astigmatism +27% myopic astigmatism +44% hyperopic astigmatism =78% in females and 3% astigmatism +27% myopic astigmatism +47% hyperopic astigmatism in males= 77% in males). Findings of Kragha (2007) and Morgan (1998) whose works reported 55% in females and 45% in male also confirmed it. The more prevalence of astigmatism in female may probably be due to earlier developmental changes in females resulting in a greaer variance in refractive state. Myopic astigmatism may be probably due to heredity and excessive near work associated with students and therefore had no sex predilection. Hyperopic astigmatism turned out to be the most prevalent anomaly in this study. This is supported by Jankiewiez (2006) who stated that hyperopic astigmatism might be regularly or irregularly dominant.

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