



Amblyopia in Black Children: as seen in University of Port Harcourt Teaching Hospital, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author CSE designed the study, performed the statistical analysis and wrote the protocol while author NIP wrote the first draft of the manuscript and analysed the study. Both authors approved the final manuscript.

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ABSTRACT

Background: Amblyopia is a common cause of visual impairment in children with uncorrected refractive errors, so screening and treatment should be carried out as early as possible to prevent permanent visual loss.

Objective: To determine the prevalence of amblyopia among individuals less than 18 years with refractive errors presenting to the Ophthalmology clinic of the University of Port Harcourt Teaching Hospital (UPTH).

Methods: Children with refractive errors presenting at UPTH over a period of 2 years were studied. Their bio-data and relevant medical and ocular history were obtained. Their visual acuity was measured and standard ophthalmic examination was done for the anterior segment with a pen torch and slit lamp bio-microscope. The posterior segment was examined with Welch Allen direct ophthalmoscope. All the children in the study were refracted using the appropriate techniques.

Result: A total of 306 children with refractive errors were studied, out of which 110 (36%) were

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males and 196 (64%) were females. Of these children, 204 (66.7%) had astigmatism, 68 (22.2%) had Myopia, 23(7.5%) had hypermetropia and 11(3.6%) had inconclusive refraction. Two hundred and seventy eight (90.8%) of these children with refractive errors had optimal correction by refraction while 17(5.6%) had developed amblyopia. All the children who had amblyopia were between 13 and 18years; five (29.5%) were males while twelve (70.5%) were females which is statistically significant ($p=0.00001$).

Conclusion: The prevalence of amblyopia among children with refractive error is high and therefore early screening and intervention is important to prevent permanent visual loss.

Keywords: Amblyopia; black children; teaching hospital; Nigeria.

1. INTRODUCTION

Amblyopia is visual impairment caused by inadequate stimulation of the brain in an eye with no structural or functional abnormality proportional to the available vision. The brain is usually not presented with clear images during amblyogenic period for amblyopia to develop. It is also called lazy eye and the blurred vision does not improve with correction the brain having learnt to see unclear images [1].

For the purpose of this study, a difference of two lines or more, on an eye-chart test of visual acuity, between the two eyes or a best corrected vision of 6/9 or worse in one or both eyes with no apparent structural abnormality seen would be defined as amblyopia.

There are three recognized types namely; strabismic amblyopia, refractive amblyopia and stimulus deprivation amblyopia. In strabismus the misaligned eye is suppressed in children but leads to diplopia in adults [2]. This may lead to poor impulse transmission to the brain and consequently amblyopia in children [3]. Studies have shown that problems of the visual cortex can as well lead to strabismus [4]. The better eye in anisometropia may be used preferentially by children leading to the suppression and subsequent development of amblyopia in the other eye [5]. Deprivation amblyopia is caused by opaque ocular media as in the case of congenital cataract, ptosis or corneal haziness which prevent adequate visual stimulation of the eye [6].

Mild amblyopia may go unnoticed till later in life during routine examination or examination for other conditions while the severe form is noticed much earlier due to its various associated problems like poor spatial acuity and limited stereopsis [7,8]. The sensitive period for most types of amblyopia is between 7 - 8 years of age therefore detecting and treating it before this time

determines the prognosis [9]. Amblyopia affects 1-5% of the population and is an important cause of visual impairment in children [10].

Amblyopia is an important cause of monocular visual loss with negative functional impact.

This retrospective study therefore aimed to look at prevalence of amblyopia in individuals less than 18years who presented with refractive error at the University of Port Harcourt Teaching (UPTH).

2. MATERIALS AND METHODS

This is a retrospective study involving the review of the clinical records of children aged 18 years and below who presented over a 2 year period (between the 1st of January 2009 and 31st of December 2010) to the ophthalmology clinic of the University of Port Harcourt Teaching Hospital, Port Harcourt. The patients' ages, gender, occupation, relevant past medical and ocular history as well as family ocular history were reviewed.

The record of their general clinical evaluation and visual acuity measured at 6 metres, with Snellen's charts were also reviewed. Pictorial chart was used to test the visual acuity of children between the ages of 4 and 6 years old while those less than 4 years had their central fixation tested. Visual acuity was repeated with pinhole if it was less than 6/18. Also reviewed was the record of the standard ophthalmic examination done for the anterior segment with a pen torch and slit lamp bio microscope and posterior segment with Welch Allen direct ophthalmoscope. Small pupils were dilated with tropicamide for a better view of the fundus and to do preliminary refraction which is repeated with atropine when schools are not in session.

In younger children, especially those less than four years old, a cycloplegic objective refraction

(using atropine and Welch Allen retinoscope) was done followed two weeks later by a post mydriatic subjective test with trial lenses. For the older ones, an objective refraction with ReKto ORK 11 Auto Ref-keratometer followed by a subjective refraction, with trial lenses was done and refined with a Jackson's cross cylinder and Duochrome. Myopia is diagnosed when the correction of the eye is more than minus 0.25DS and hypermetropia when the correction of the eye is more than plus 0.25DS while astigmatism is the type of refractive error where the powers of the focusing elements of the eye are different in the different meridians and may occur in addition to myopia or hypermetropia [10,11]. It was defined as with the rule (WTR) if axis lay between 15° on either side of the horizontal meridian, against the rule (ATR) if the axis lay between 15° on either side of the vertical meridian, and oblique (other than WTR or ATR) if the axis lay between 15° and 75° or between 105° and 165°. Spherical equivalent was calculated as summation of spherical component and half of cylindrical component and 0.50DC practical tolerance limit for uncorrected astigmatism was used in this study as cut-off [12].

A difference of two lines or more, on an eye-chart test of visual acuity, between the two eyes or an optimally corrected vision of 6/9 or worse in one or both eyes with no apparent structural abnormality seen was considered as amblyopia.

The data obtained were analyzed using SPSS version 16 and presented in frequency tables.

3. RESULTS

The children were less than 18years of age and about 70% of the children were aged 10 years and above. Thirty six percent and 64% of the study population were males and females respectively giving a male: female ratio of 1:1.8. Also, there were more females than males in all the age groups studied as shown in Table 1.

Of the 306 children with refractive errors, 204 (66.7%) had astigmatism while 68 (22.2%) had

myopia. The total number of children with refractive errors in each age group increased with increasing age except for a decline between 10-12 age group and the 13-15 age group though no particular pattern was reflected, Table 2.

Table 1. Age and sex distribution of paediatric patients with refractive error

Age	Male	Female	Total (%)
≤3	5 (38.5)	8 (61.5)	13 (4.2)
4-6	6 (26.1)	17 (73.9)	23 (7.5)
7-9	25 (43.1)	33 (56.9)	58 (19.0)
10 -12	27 (40.3)	40 (59.7)	67 (22.0)
13-15	19 (31.1)	42 (68.9)	61 (20.0)
16 -18	28 (33.3)	56 (66.7)	84 (27.3)
Total	110 (36%)	196 (64%)	306 (100%)

More females 12(70.5%) than males 5(29.5%) developed amblyopia and this difference between the sexes is statistically significant (p=0.00001) Table 3.

Fifty three percent of the children with amblyopia were aged between 13-15 years. All children who were less than 13 years of age did not develop amblyopia as shown in Table 4.

All the children with Myopia had their vision corrected following refraction while five (21.7%) with hypermetropia and twelve (5.9%) with astigmatism developed amblyopia as shown on Table 5.

4. DISCUSSION

Childhood blindness is one of the priority conditions targeted in VISION 2020: The Right to Sight Initiative of the World Health Organisation [11]. Uncorrected refractive errors is the commonest cause of amblyopia in our environment and can hinder education, personality development and career opportunities which can impose significant economic burden on the family and society [9]. There is therefore the need for refractive errors to be detected and corrected promptly to mitigate these problems.

Table 2. Distribution of refractive errors in children by age

Refractive error	≤3	4-6	7-9	10-12	13-15	16-18	Total (%)
Myopia	2 (2.9)	5 (7.4)	9 (13.2)	22 (32.4)	11 (16.2)	19 (27.9)	68 (22.2)
Hypermetropia	1 (4.3)	3 (13.0)	4 (17.4)	4 (17.4)	5 (21.7)	6 (26.1)	23 (7.5)
Astigmatism	10 (4.9)	13 (6.4)	43 (21.1)	38 (18.6)	44 (21.6)	56 (27.5)	204 (66.7)
Inconclusive refraction	-	2 (18.2)	2 (18.2)	3 (27.3)	1 (9.1)	3 (27.3)	11 (3.6)
Total	13 (4.2)	22 (7.2)	58 (19.0)	67 (21.9)	61 (19.9)	84 (27.5)	306 (100)

Table 3. Sex distribution of amblyopia

Sex	No.	%	p-value
Male	5	29.5	0.00001
Female	12	70.5	
Total	17	100	

Table 4. Age distribution of amblyopia

Age (Years)	N	Percent (%)
≤3	-	-
4-6	-	-
7-9	-	-
10 – 12	-	-
13 – 15	9	53
16 – 18	8	47
Total	17	100

Table 5. Outcome of refraction

Re	Total no. (%)	Those optimally corrected (%)	Those who developed amblyopia (%)
M	68 (22.2)	68 (100)	
H	23 (7.5)	18 (78.3)	5 (21.7)
AS	204 (66.7)	192 (94.1)	12 (5.9)
I	11 (3.6)	-	-
Total	306 (100)	278 (90.8)	17 (5.6)

In our study, about 70% of the children with refractive errors had astigmatism while 22.2% and 7.5% had myopia and hyperopia respectively. This finding is similar to the findings of a cross sectional study among school children in Ghana [12] where astigmatism was the most common form of refractive error (55.0%) followed by myopia (27.0%) and hyperopia (18.0%). It is also consistent with findings from a study in Kampala [13] where astigmatism was the most common refractive error, affecting 52% of those with refractive errors. The proportion of children with refractive errors tends to increase with increasing age, similar to the findings of a study done among Chinese children in Singapore [14]. In these studies amblyopia was a major concern when treatment was delayed.

This study shows that the prevalence of amblyopia among children presenting with refractive error at the UPTH is 5.6% which is high compared to a prevalence of 0.3% reported in a cross sectional study in Calabar (with a similar criteria for defining amblyopia) among secondary school children aged 9-20years with refractive errors [15]. The higher prevalence in this study may be due to the fact that this study was carried out in a tertiary referral centre and children with significant visual impairment will likely present here in contrast to a school based cross

sectional study. Also, the difference in the sample size used in the studies may contribute to the higher prevalence in our study. More females had amblyopia in this study which is statistically significant ($p=0.00001$) but this may be due to the distribution of the study population and not necessarily to an increased prevalence.

In this study, all children less than 13 years did not develop amblyopia following refraction. It may be inferred that children who present late for correction of refractive errors are more likely to develop amblyopia. A good number of children with astigmatism (94.1%) and hypermetropia (78.3%) also had their vision fully corrected following refraction and these were mainly the younger aged children. The result of refraction in this study shows the importance of early treatment in children with refractive errors. Also, there was 100% percent correction in all children with myopia following refraction. This finding is not surprising as it has been found that amblyopia is less likely to occur in myopic children; this is because their near vision is usually good enough to carry out important tasks like reading, eating and other near tasks that adequately challenge their vision and thus prevent amblyopia.

5. CONCLUSION

In conclusion, this study has highlighted the high prevalence of amblyopia among black children in UPTH, a referral centre in Nigeria and therefore the need for all health care workers especially those at the primary level and primary school teachers to be trained in skills necessary for visual assessment in children. This will enhance early detection and prevention of some common causes of visual impairment like amblyopia in children. Public enlightenment about the causes, consequences and prevention amblyopia should be advocated by eye care service providers and the government should be a part of it.

Calabar study [15] is a tip of an iceberg of what is happening at the community level and therefore calls for a concerted effort to strengthen the school health program where children will have periodic eye examination at school entry, half way through it and before leaving the primary school. This way, there will be early detection and subsequent referral to appropriate centres where children with visual impairment and other handicaps will be promptly managed.

CONSENT

All authors declare that 'written informed consent was obtained from approved parties for publication of this article.

ETHICAL APPROVAL

This study was conducted in accordance with the Declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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