



## RESEARCH ARTICLE

### REFRACTIVE ERROR PATTERNS AT A COMMUNITY EYE HOSPITAL IN SOUTHWEST OF NIGERIA

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#### ABSTRACT

**Background:** visual impairment is one of the commonest causes of disability globally. Uncorrected refractive error is the commonest and largely preventable cause of avoidable visual impairment worldwide. The objective of this study is to ascertain the distribution of refractive errors in the adult populations in Ogun state, southwestern Nigeria.

**Methods:** This is a retrospective review of adults from 18 years and above. Data was collected from the patients' case notes from January 2008 to December 2012 from the record department of Deseret Community vision institute (DCVI) in Ogun state, Southwestern Nigeria. The diagnoses used are: myopia, hyperopia and astigmatism. A systematic sampling of 1000 patients from 6000 case notes was done. Specific information that was retrieved include: age, sex, town of residence, entry or unaided visual acuity, degree of refractive error and corrected visual acuity. Myopia is regarded as  $\geq -0.50$ DS, hyperopia  $\geq +0.75$ DS, astigmatism  $\geq -0.25$ DC and emmetropia:  $> -0.50 - < +0.75$ . All statistical analysis was done by statistical software STATA 11.0.

**Results:** Of the 446 with refractive error, 191(42.82%) were males, 255(57.18%) were females. Age range is from 18-88. Mean age was 48.2. Astigmatism is the commonest cause of refractive error 289(64.80%), followed by hyperopia 96(21.50%) and myopia 61 (13.70%). Females have more refractive errors than males. Age, sex and occupation are not statistically associated with refractive errors.

**Conclusion:** Refractive errors are common eye conditions and astigmatism is the commonest type of refractive error in adults. Females have more refractive errors than male.

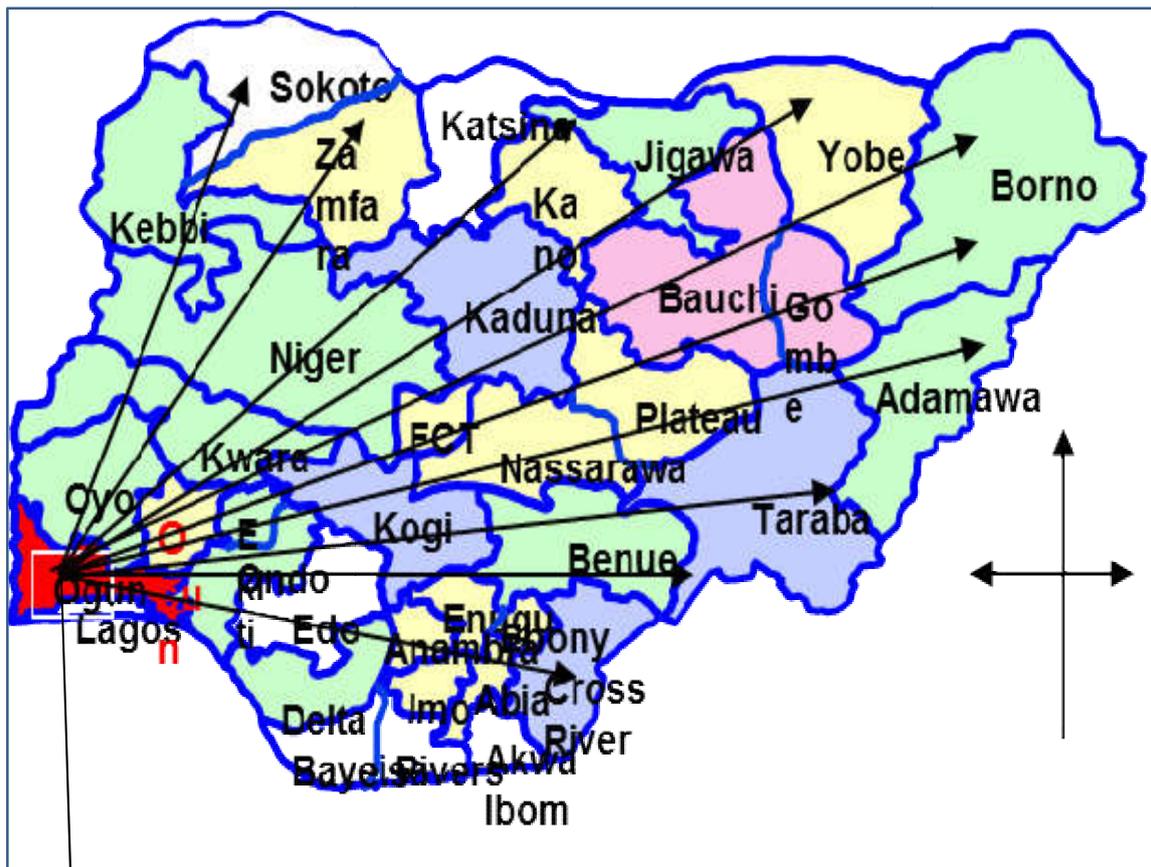
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#### INTRODUCTION

Visual impairment is one of the commonest causes of disability globally. Uncorrected refractive error is the commonest cause of avoidable visual impairment worldwide (43%), it is largely preventable (Stevens *et al.*, 2013; Naidoo *et al.*, 2016; Pascolini and Mariotti, 2010). Between 117-153million people are visually impaired due to refractive error (Foster and Johnson, 2008; Smith *et al.*, 2009). This occurs when the ray of light from an object fails to focus accurately on the retina plane. Consequently, the patient cannot see clearly and refractive correction is needed. There are 3 main types of refractive error (RE): myopia (short-sightedness), hyperopia (long-sightedness) and astigmatism. These represent 38-49% of all global visual impairment (Foster and Johnson, 2008).

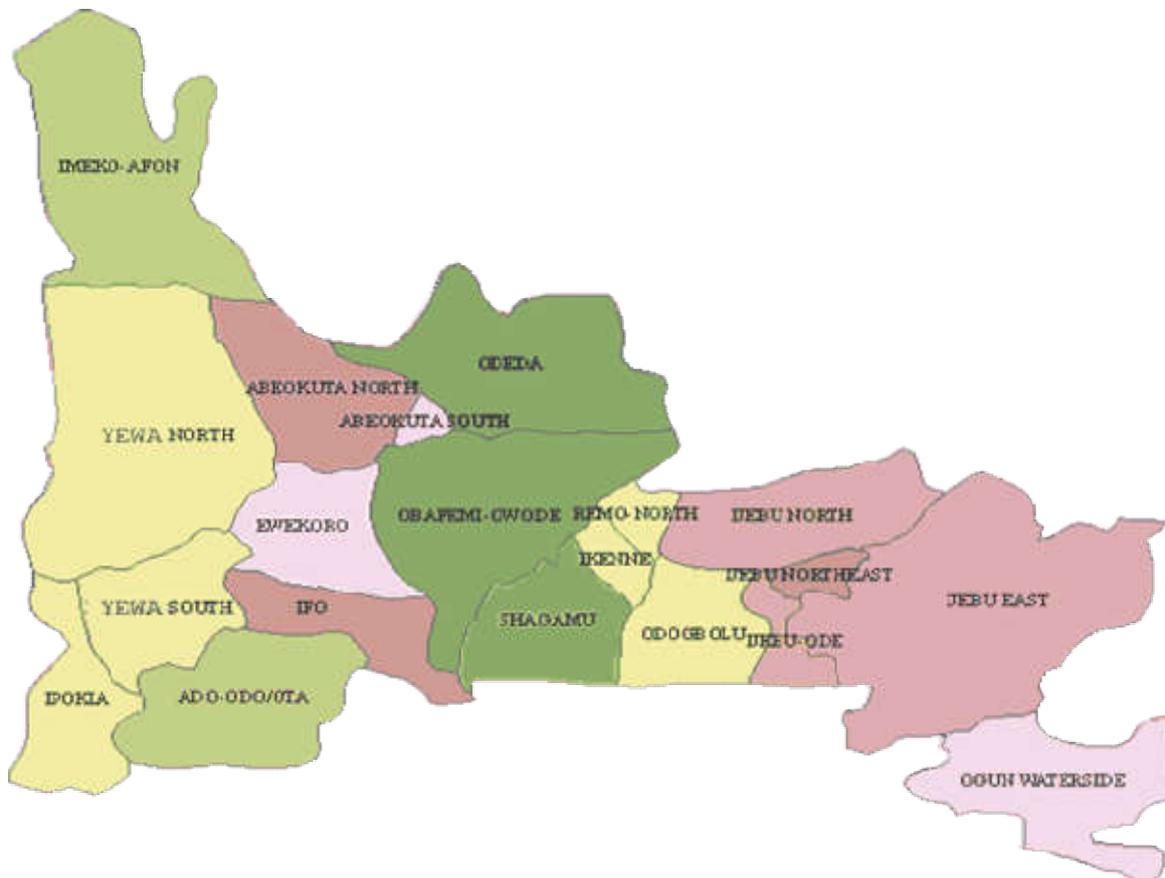
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Refractive errors are important cause of visual impairment (VI) in children and adults and second largest cause of treatable blindness after cataract in many parts of the world (Smith *et al.*, 2009). From the Nigerian national blindness and visual impairment survey, uncorrected refractive errors were the commonest cause of mild to moderate visual impairment (77.9% and 57.1% respectively) being responsible for visual impairment in 2.46million adults in Nigeria (i.e. acuity of  $<6/12-6/60$ ) (The Nigerian national blindness and visual impairment survey 2005-2007). It is one of the cardinal areas targeted by vision 2020. Uncorrected refractive errors in both developing and developed countries causes lost productivity which has significant economic implications. Refractive errors can simply be diagnosed, measured, and corrected with the aid of optical corrective approaches and devices such as spectacles and contact lenses or by refractive surgical procedures (Katie *et al.*, 2015). Owing to lack of data on the distribution of RE in Ogun state (southwestern Nigeria), its resultant effect on planning of refractive error services, there is need to properly



Source: Nigerian official website

Figure 1. Map of Nigeria showing states of the federation



Source: Ogun state official website

Figure 2. Map of Ogun state showing 20 local governments that make up the state

study the distribution and magnitude of refractive error in Ogun state. There is a secondary community eye centre: Deseret community vision institute (DCVI) in Ijebu-Imushin, in Ijebu east local government area of Ogun state. The hospital currently serves all the local government areas in Ogun state and neighbouring Oyo, Ondo and Lagos states (Southwestern Nigeria).

### Ogun state of Nigeria: profile

Nigeria is one of the countries in West Africa made up of 140 million people (2006 national census) currently estimated at 186 million (www.tradingeconomics.com/National bureau of statistics; National Population Commission website). It is made up of 36 states plus the federal capital territory Abuja. Ogun state is one of the 36 states that make up Nigeria. It is located in the southwest zone of Nigeria with a population of 3.7million (2006 national census) currently estimated at 5.2 million. It is made up of 20 local government areas with headquarter in Abeokuta. 45% of the population is urban while 55% is rural. The aim of this study is to ascertain the distribution of refractive errors in the adult populations in Ogun state of Nigeria for the purpose of sustainable eye care planning. Data and knowledge will help to plan services.

## MATERIALS AND METHODS

This is a retrospective review of adults from 18 years and above. Data was collected from the patients' case notes from January 2008 to December 2012 from the record department of Deseret Community vision institute (DCVI) in Ogun state, Southwestern Nigeria. It included all cases that were refracted and there is improved vision. The diagnoses used are: myopia, hyperopia and astigmatism. The 2 eyes are taken in to consideration with same refractive error. A systematic sampling of 1000 patients from 6000 case notes was done. One patient case note was used out of every 6 consecutive patients, starting from 1 to 6000. Specific information that was retrieved include: age, sex, town of residence, entry or unaided visual acuity, degree of refractive error and corrected visual acuity. Myopia is regarded as  $\geq -0.50DS$ , hyperopia  $\geq +0.75DS$ , astigmatism  $\geq -0.25DC$  and emmetropia:  $> -0.50 - < +0.75$ . The following are excluded: patients with Diabetic mellitus, anisometropia and where details of refractive findings are not recorded. The following cases were included: cataract, glaucoma, retinal detachment, and age-related macular degeneration: those that have improvement in VA at least to one line. This study did not set out to know the magnitude of presbyopia. Mean (SD) and Frequency (percentage) was used for continuous and categorical variables respectively. Chi-square test and analysis of variance (ANOVA) were used to assess associations and trends between variables. P-value of less than 0.05 considered as statistically significant. All statistical analysis was done by statistical software STATA 11.0. Ethical approval was given from the ethics committee of the Olabisi Onabanjo University Teaching Hospital (OOUTH) Sagamu.

## RESULTS AND DISCUSSION

Total numbers with refractive errors were 446 (44.6%) met the inclusion criteria. Of the 446 with refractive error, 191(42.82%) were males, 255(57.18%) females, see table 1.

Age range is of 18-88. Mean age was 48.2. See table 2. Astigmatism is the commonest cause of refractive error 289(64.80%), followed by hyperopia 96(21.50%) and myopia 61 (13.70%) see Table 2. Age, sex and occupation are not statistically associated with refractive errors. (See Tables 1, 2 & 3).

### Distribution of refractive errors

Table 1. Sex

Refractive status	Sex		Total	P-value
	Male	Female		
Astigmatism	123(42.6)	166(57.4)	289	0.717
Myopia	24(39.3)	37(60.7)	61	
Hyperopia	44(45.8)	52(54.2)	96	
Total	191(42.8)	255(57.2)	446	

Sex is not statistically significant associated with refractive error status (P-value=0.717, using Chi-square test)

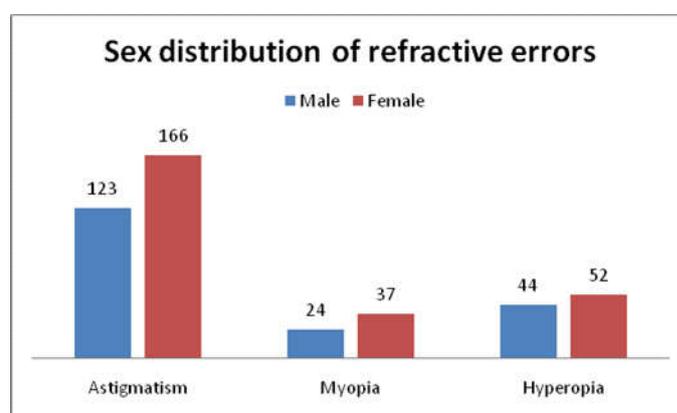


Figure 3. Sex distribution of refractive errors

Table 2. Age

Refractive status	No. of patients	Mean(SD)	Min - Max	p-value
Astigmatism	289	47.8(15.2)	18 - 88	0.425
Myopia	61	47.2(19.1)	18 - 76	
Hyperopia	96	50.0(12.1)	18 - 81	
Total	446	48.2(15.2)	18 - 88	

Age is not statistically significant difference between refractive error status (P-value=0.425, using ANOVA test)

Table 3. Distribution of refractive errors (Occupation)

Occupation	Refractive status			Total	P-value
	Astigmatism	Hyperopia	Myopia		
Senior officer/Office job	184(63.7)	61(63.5)	33(54.1)	278(62.3)	0.325
skilled/unskilled worker	20(6.9)	11(11.5)	5(8.2)	36(8.1)	
Others*	85(29.4)	24(25.0)	23(37.7)	132(29.6)	
Total	289	96	61	446	

\*Others (Unemployed/Student/Retired/Housewife)

Occupation category is not statistically associated with refractive error status (P-value=0.325, using Chi-square test).

This is the first study of patterns and magnitude of refractive errors in Ogun state in Southwestern Nigeria to the authors' knowledge. This study looked at the refractive error patterns among adults (18-88 years) in a community eye hospital in south western Nigeria. Most of the studies done all over the world are either of the paediatric age group (Hazarika *et al.* 2017; Naido *et al.*, 2013; Opubiri *et al.*, 2013) or adults and children mixed (Ntim-Amponsah, 2007; Malu and Ojabo, 2014; Adegbehingbe *et al.*, 2003). In this study, Refractive

errors are common eye conditions presenting in a community eye hospital. 44.6 percent of patient who visited the eye hospital have refractive error. This is comparable to the study done in Kano, Nigeria where 40% of patients that attended eye clinic had refractive errors by Lawan *et al.*, 2014 and Accra, Ghana by Ntim-Amponsah C. T reported that 44.3% (Ntim-Amponsah, 2007) of the patients had RE. The two are hospital-based. A study that is equally hospital-based gave lower percentages in Nigeria like that of Malu *et al* in Jos 36.8% (Malu and Ojabo, 2014). Conversely, other hospital-based studies in other regions of Nigeria gave a higher percentage: Adegbehingbe *et al* (54.9%) (Adegbehingbe *et al.*, 2003), Koroye-Egbe *et al* (54.28%) (Koroye-Egbe *et al.*, 2010). In Durban, South Africa, in a population-based study 57.3% of population 35 years and older are affected by RE (Mashige *et al.*, 2016). These various differences may be due to the non-uniformity of inclusion and exclusion criteria in the studies and the definition of the various types of refractive errors in different studies. Also as mentioned above: the different age cut off points. Astigmatism is the commonest cause of RE in this study (64.8%), followed by hyperopia (21.5%) and myopia (13.7%). this is the same pattern with the study by Lawan A 2016 where astigmatism is 41%, hyperopia 29% and myopia 9%. Koroye-Egbe: astigmatism 45.6%, myopia 31.8% and hyperopia 22.5%. Astigmatism in our study is very high. It is comparable to the population-based study of the Nigeria National Blindness and Visual Impairment Survey (NNBVIS) where Ezelum *et al.*, 2011 reported that crude prevalence of astigmatism was 63%, hyperopia 50.7% and myopia 16%. Apart from different methodology in the study of pattern of RE all over the world, the roles of race and genetics have been well documented (Stambolian, 2013; Young *et al.*, 2007; Xu *et al.*, 2006; Morgan *et al.*, 2012; Wong *et al.*, 2000). In the East and South East Asia, myopia is commonest (Pan *et al.*, 2013) followed by hyperopia then astigmatism. In Europe: It is about the same (Katie *et al.*, 2015) except that the myopia is more severe in Asians.

### Limitations of this study

This is a hospital-based retrospective study with its attendant selection bias. It is not inclusive. Cases are selected according to age, sex, occupation etc. Patients come to the hospital mostly when conditions or associated conditions are severe. Hospital records are mostly incomplete and information unstandardized. Duplicate consultations and admissions create problems in determining incidence and prevalence rate. This study only included people that came to the hospital for one problem or the other. It did not look at the situation of people with refractive errors who are not attending any health facility or people with undiagnosed refractive errors. Presbyopia was not included in this study. In spite of these circumstances, this study gave a good account of refractive error patterns at a community eye hospital in southwestern Nigeria.

### Conclusion

Uncorrected refractive error is the commonest cause of avoidable visual impairment worldwide (43%), it is largely preventable. Owing to lack of data on the distribution of RE in Ogun state (southwestern Nigeria), its resultant effect on planning of refractive error services, there is need to properly study the distribution and magnitude of refractive error. This

study revealed that refractive errors are common eye conditions and astigmatism is the commonest type of refractive error in adults (64.80%), followed by hyperopia (21.50%) and myopia (13.70%). Females have more refractive errors than males at 57.18% and 42.82% respectively. Data and knowledge will help to plan services for sustainable eye care in the state.

### REFERENCES

- Stevens GA, White RA, Flaxman SR, Price H, Jonas JB, Keeffe J, Leasher J, Naidoo K, Pesudovs K, Resnikoff S, Taylor H, Bourne RR; Vision Loss Expert Group. Global prevalence of vision impairment and blindness: magnitude and temporal trends, 1990-2010. *Ophthalmology*, 2013 Dec; 120(12):2377-84. doi: 10.1016/j.ophtha.2013.05.025. Epub 2013 Jul 10
- Naidoo KS, Leasher J, Bourne RR, Flaxman SR, Jonas JB, Keeffe J, Limburg H, Pesudovs K, Price H, White RA, Wong TY, Taylor HR, Resnikoff S; Vision Loss Expert Group of the Global Burden of Disease Study.
- Pascolini D, Mariotti SP. Global Estimates of Visual Impairment – 2010. [http://www.who.int/blindness/VI\\_BJO\\_text.pdf](http://www.who.int/blindness/VI_BJO_text.pdf)
- Naidoo KS and Jaggernath J. Uncorrected refractive errors. *Indian J Ophthalmol.*, 2012 Sep-Oct; 60(5): 432–437
- Foster A, Johnson G. Changing patterns in global blindness: 1988-2008. *Community Eye Health*, 2008, 21:37-9.
- Smith TS, Frick KD, Holden BA, Fricke TR, Naidoo KS. Potential lost productivity resulting from the global burden of uncorrected refractive error. *Bull World Health Organ*. 2009; 87(6):431–437. doi: 10.2471/BLT.08.055673. [PMC free article] [PubMed] [Cross Ref]
- The Nigerian national blindness and visual impairment survey 2005-2007 (2009) International centre for eye health, London.
- Katie M. Williams, Virginie J. M. Verhoeven, Phillippa Cumberland, Geir Bertelsen, Christian Wolfram. Prevalence of refractive error in Europe: the European Eye Epidemiology (E3) Consortium. *Eur J Epidemiol.*, 2015; 30(4): 305–315
- Nigeria 2006 census figure (population) [www.nigeriamasterweb.com/Nigeria06censusng](http://www.nigeriamasterweb.com/Nigeria06censusng)
- [www.tradingeconomics.com/National bureau of statistics](http://www.tradingeconomics.com/National_bureau_of_statistics).
- National Population Commission website
- The official website of Ogun state, Nigeria: [www.ogunstate.gov.ng](http://www.ogunstate.gov.ng)
- Hazarika HN, Bhuyan D, Hazarika SC, Addya S. Refractive Errors in age group seven to fifteen years: North-east India scenario. *Int J Community Med Public Health*, 2017; 4:1928-31.
- Naidoo K.S. et al. 2003. Refractive error and visual impairment in African children in South Africa. *Invest Ophthalmol Vis Sci.*; 44(9):3764-70.
- Opubiri I, Adio A et al. 2013. Refractive error pattern of children in South-South Nigeria: A tertiary hospital study. *Sky Journal of Medicine and Medical Sciences*, Vol. 1 (3), pp. 10-14.
- Lawan, A., Okpo, E., Philips, E. Refractive errors in presbyopic patients in Kano, Nigeria. *Ann Afr Med.*, 2014; 13:21-4
- Ntim-Amponsah, C. T. 2007. Contribution of refractive errors to visual impairment in patients at Korle-Bu Teaching Hospital. *Ghana Med. J.*, 41(2):68-71.

- Malu K., Ojabo C. Refractive errors in patients attending a private hospital in Jos, Nigeria. *Niger J ClinPract.*, 2014; 17:106-11
- Adegbhingbe, B.O., Majekodunmi A.A., Akinsola, F.B., Soetan, E.O. Pattern of refractive errors at Obafemi Awolowo University Teaching Hospital, Ile-Ife, Nigeria. *Nigerian Journal of Ophthalmology*, 2003, 11:76-79.
- Koroye-Egbe, A., Oveneri-Ogboma, G.O., Adio, A.O 2010. Refractive error status in Bayelsa state, Nigeria. *JNOA-VOL 16*
- Mashige, K. P, Jaggernath, J, Ramson, P, Martin, C, Chinanayi, F. S., Naidoo, K. S. Prevalence of Refractive Errors in the INK Area, Durban, South Africa. *Optometry & Vision Science*: March 2016 - Volume 93 - Issue 3 - p 243–250.
- Ezelum C1, Razavi H, Sivasubramaniam S, Gilbert CE, Murthy GV, Entekume G, Abubakar T; Nigeria National Blindness and Visual Impairment Study Group. Refractive error in Nigerian adults: prevalence, type, and spectacle coverage. *Invest Ophthalmol Vis Sci.* 2011 Jul 23; 52(8):5449-56. doi: 10.1167/iovs.10-6770.
- Stambolian D. Genetic Susceptibility and Mechanisms for Refractive Error. *Clin Genet.* 2013 Aug; 84(2): 102–108.
- Young T. L., Metlapally R, Shay A. E. Complex Trait Genetics of Refractive Error. *Arch Ophthalmol.*, 2007; 125(1):38-48. doi:10.1001/archoph.125.1.38.
- Xu L, Wang Y, Li Y, Wang Y, Cui T, et al. (2006) Causes of blindness and visual impairment in an urban and rural area in Beijing: the Beijing Eye Study. *Ophthalmology* 113: 1134.e1–11.
- Morgan I.G, Ohno-Matsui K, Saw S.M. (2012) Myopia. *Lancet* 379: 1739–1748.
- Wong T. Y. Foster P.J. Hee J. Ng T.P. Tielsch J.M. Chew S.J. Johnson G.J. Seah S.J.L. Prevalence and Risk Factors for Refractive Errors in Adult Chinese in Singapore. *Investigative Ophthalmology & Visual Science* August 2000, Vol.41, 2486-2494.
- Pan CW, Zheng YF, Anuar AR, Chew M, Gazzard G, Aung T, Cheng CY, Wong TY, Saw SM. Prevalence of refractive errors in a multiethnic Asian population: the Singapore epidemiology of eye disease study. *Invest Ophthalmol Vis Sci.* 2013 Apr 9; 54(4):2590-8. doi: 10.1167/iovs.13-11725

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