

Original article

The Visual and Refractive Status in One Sample Population of ‘Orang Asli’(Indigenous) Children in Hulu Langat, Selangor

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Abstract:

Background: The aim of this study is to assess the visual and refractive status among ‘Orang Asli’ (indigenous) children in Kampung Sungai Lalang, Semenyih, Selangor. Uncorrected refractive error is a major burden among children around the world. It results in a significant number of problems among this high-risk group including educational loss, low productivity and impaired quality of life. Besides that, there are lacking information regarding vision problems among aborigine children or ‘Orang Asli’ in Malaysia. This study was undertaken to determine the prevalence of refractive error, and the association of the refractive error and visual acuity with age among ‘Orang Asli’ children. **Methods:** A cross sectional study was conducted on ‘Orang Asli’ children (n=43) where 51.2% were male and 48.8% were female. Visual acuity and refraction assessment were done on every child using Refractive Error Study in School Children (RESC) protocol. **Results:** The prevalence of refractive error was simple myopia (1.2%), simple hyperopia (18.6%), compound myopic astigmatism (7.0%), and mixed astigmatism (73.3%) respectively. The visual acuity measurement shows that the majority of subjects achieved 6/6 represented by 88.4% of the right eye and 86% of the left eye. There is no association between refractive error and age ($P>0.05$). **Conclusion:** This study concludes that there is a high prevalence of hyperopia among ‘Orang Asli’ children and There is no association of refractive error with age and gender. Therefore, there is a need to create better awareness programs among the parents about the importance of eye examination to their children.

Keywords: Refractive status; ‘Orang Asli’ (Indigenous); visual acuity

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Introduction

Studies on vision problems and refractive errors status are essential for developing national strategies for the prevention of visual impairment.¹ There was a lack of information regarding vision problems among aborigine children or ‘Orang Asli’ in Malaysia. ‘Orang Asli’ are the indigenous inhabitants or known as original peoples of Peninsular Malaysia. They constitute a minority group in the population making up approximately 0.6% of the total population (28.2 million in 2016). Studied by Dandona et al² found that prevalence of myopia in suburban and rural

regions to be 5% and 2.5% respectively.

School children are the high risk group of having myopia because uncorrected refractive errors can adversely affect their learning disabilities and mental development.³ Children usually not be aware of defective vision problems and hence may not complain.⁴ Commonly they might adopt ways like sitting close to the whiteboard, holding books closer to eyes and even by avoiding work requiring visual concentration to accommodate to poor vision. Hence awareness of refractive error and its risk factors, early diagnosis and treatment are required to prevent

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further disability.⁵The lack of appropriate preschool vision screening continuously to contribute to an unacceptable prevalence of permanent visual loss from vision disorders and amblyopia one of the most of which is reversible if detected and treated early.⁶ Since the colonial era, many surveys and studies have been conducted on the medical and health aspects of the 'Orang Asli'. Many studies show evidence of poor health and nutritional status of 'Orang Asli' population have been documented over the decades⁷but not for vision problems. It could be a high relationship between vision problems and refractive errors among 'Orang Asli' children population. In order to reduce the prevalence of avoidable visual impairment and blindness caused by refractive error, epidemiological information on refractive error and other vision problems are needed.⁸There is lacking data about the aborigine regarding ocular health and vision status.

By conducting the study, eye health screenings at 'Orang Asli' settlement provide an opportunity for them to get access to proper eye examination as they did not have easy and modern access to health checkup

The importance of this study is to rule out visual and refractive error status of the 'Orang Asli' children in one sample population for the earlier intervention.

Materials and methods

The objective of this cross sectional study are to determine the current visual acuity status and refractive status and to identify the association between sociodemographic (age and gender) with refractive error in one sample of population of 'Orang Asli' children in Hulu Langat, Selangor. This study was conducted at the 'Orang Asli' settlement in Kampung Sungai Lalang, Semenyih, Selangor. The total population of 'Orang Asli' in Kampung Sungai Lalang, Semenyih is 214. Participants were randomly selected from the children registered for the vision screening. Selection criteria involving male and female children, age 4 to 12 years old, reliable response and no abnormalities detected during ocular health assessment. Children who were detected with the ocular disease or binocular vision problem were excluded. The sample size was determined by using the following population proportion formula:

$$n = N * X / (X + N - 1),$$

where,

$$X = Z_{\alpha/2} * p * (1-p) / MOE^2$$

$$n = 214(88.5)/(88.5+214-1)$$

$$X = 1.96^2 * 0.64 * (1-0.64)/0.1^2$$

$$n = 63 \text{ subjects.}$$

The original Refractive Error Study in School Children (RESC) protocol was relied upon in designing the examination protocol for 'Orang Asli' children.⁹The examination protocol for 'Orang Asli' children was simplified to ensure the understanding of the subjects on the procedure of examination and the cooperation from the subjects will be easy. The examination involved a visual acuity test at 3-meter for distance and 40-cm for near using LEA distance and near charts, ocular health assessment using the ophthalmoscope, and objective refraction using the non-invasive cycloplegic method. Subjects with manifest ocular disease and Corrected visual acuity less than 6/9 and fail stereopsis were excluded from the study. The criteria were excluded because to ensure that subject only has refractive error problem and not influenced by other factors. Those subjects who have been diagnosed with having ocular disease were referred to nearest hospital.

The classification of refractive error is based on spherical equivalent. Myopia was classified by the spherical equivalent of mild myopia (-0.50D to -3.00D), moderate (-3.00D to -6.00D), high (>6.00D). Hyperopia had been defined by spherical equivalent of mild (+0.50D to +3.00D), moderate (+3.00D to +5.00D) and high (>+5.00D). Subjects with bilateral hyperope and myopic were classified according to the more hyperopic and myopic eye. Emmetrope was classified if refractive error other than the spherical equivalent mention above. The associated refractive error with astigmatism were defined as astigmatisme value more than -2.00D.

The refractive error was classified based on the focusing of perpendicular images which the types are simple myopia, simple hyperopia, simple myopic astigmatism, simple hyperopic astigmatism, compound myopic astigmatism, compound hyperopic astigmatism, and mixed astigmatism.

This research protocol adhered to the provision from Management and Science University, Research Ethics Committee Board for research involving human subject. This research obtains prior permission from the *Orang Asli* Community Health Department, Ministry of Health Malaysia and Department of Indigenous Development, Malaysia (*Jabatan Kemajuan Orang Asli Malaysia, JAKOA*). Data were analyzed using SPSS version 22.0. Descriptive statistics analysis was used to determine the distribution of refractive error and visual status.

Kruskal-Wallis was used to compare means between age groups due to data not normally distributed, and the number of subject for each group were small which less than 30 subjects. All the refractive errors data were converted to spherical equivalent which the means of refractive error could be identified. Fisher Exact test were used to study the association of refractive error with sociodemographic (age and gender).

Ethical Approval

Management and Science University, Research Ethics Committee Board for research involving human subject(Ref: SG-338-0915-HLS)

Results

A total of 50 children involved in this study. Seven of the children were in excluded criteria which 2 detected with ocular disease and five fail stereopsis screening. Only 43 subjects have completed the study based on inclusion and exclusion criteria.

The distribution of subjects in this study involved 51.2% male (22) and 48.8% female (21) children as shown in Table 1. The overall visual acuity of children was better than 6/9 and, 80% achieved 6/6 for both the right and the left eyes. However, only 9.3% of subjects had right eye achieved visual acuity 6/7.5 and 11.6% for left respectively. The remaining was achieved less than 6/9 which the visual acuity was 6/24. Distribution of type of refractive error was presented in Table 1. The highest percentage of hyperopia was observed for the right eyes was compound hyperopic astigmatism for the left eyes. As presented in Table 2, all the age groups show the mean of refractive error was hyperopia and classified as mild hyperopia type for right and left eyes. There was no significant difference between the three age groups ($p > 0.05$) as well as no significant association between refractive error with age and gender ($p > 0.05$).

Table 1. Demography of subject in one sample population of ‘Orang Asli’ children

Subject Demography	N	%
Gender	22	
Male	21	51.2
Female		48.8
Age	5	
4-6 yrs	11	11.6
7-9 yrs	27	25.6
10-12 yrs		62.8
Visual acuity		
Right Eye	38	
6/6	4	88.4
6/7.5	1	9.3
6/24		2.3
Left Eye	37	
6/6	5	86.0
6/7.5	1	11.6
6/24		2.3
Refractive Errors		
Right Eye	2	
Simple Myopia	9	4.7
Simple Hyperopia	2	20.9
Simple Myopic Astigmatism	5	4.7
Simple Hyperopic Astigmatism	0	11.6
Compound Myopic Astigmatism	21	0
Compound Hyperopic Astigmatism	4	48.8
Mixed Astigmatism		9.3
Left Eye	0	
Simple Myopia	10	0
Simple Hyperopia	4	23.3
Simple Myopic Astigmatism	2	9.3
Simple Hyperopic Astigmatism	1	4.7
Compound Myopic Astigmatism	21	2.3
Compound Hyperopic Astigmatism	5	48.8
Mixed Astigmatism		11.6

Table 2. Subject demography with refractive error

Subject demography	n	Refractive Error	P value
Age			
Right Eye		Median (IQR)	
4-6	5	+1.00D (0.69)	
7-9	11	+0.75D (1.32)	0.227*
10-12	27	+0.75D (0.56)	

Subject demography	n	Refractive Error		P value
Left Eye				
4-6	5	+0.75D (0.94)		
7-9	11	+1.00D (1.13)		0.540*
	27			
		Myopia		
10-12	115	+0.50D (0.69)		
	3			
Right Eye	24	Myopia	Hyperopia	
4-9	1	6.3%	93.8%	1.000**
10-12	1	11.1%	88.9%	
Left Eye	15			
4-9	3	6.3%	93.8%	1.000**
10-12	24	11.1%	88.9%	
Gender				
Right Eye				
Male	2	9.1%	90.9%	
Female	20	9.5%	90.5%	1.000**
Left Eye	2			
Male	19	13.6%	86.4%	0.607**
Female	3	4.8%	95.2%	
	19			
	1			
	20			

*Kruskal Wallis

**Fisher Exact Test

Discussion

This study shows that the higher prevalence of refractive error in one sample of children population was hyperopia and the age group 10-12 years old. In Ethiopia town, there was a higher incidence of refractive error in females compared to male in the age group of 10 years to 14 years old and as well as other age groups¹⁰It is approximately similar to our findings which our study found that the degree of hyperopia was falls to the mild hyperopia. In other study, it was discussed that most children with hyperopia of less than +3.00D experience a reduction in hyperopic refractive error over time and will outgrow any need for corrective lenses while children with hyperopia greater than +5.00D will not experience a significant reduction in the power of the refractive error¹¹. A study conducted by Signes-Soler et. al¹²on young subjects in a rural area in Paraguay found that the prevalence of refractive error was lower than our results, but myopia was higher than hyperopia.

Our results show the overall visual acuity status for 'Orang Asli' children in one sample population of aborigine children in Hulu Langat Selangor are

better than 6/6 for the right eye (88.4%) and left eye (86%) respectively. Only 11.6% and 13.9% of aborigine children have visual acuity worse than 6/6 for right and left eyes. Studied in Ethiopia, similar results were found where among all the samples, a majority of students had normal visual acuity level (91.9% for right eye and 92.3% for left eye). Only 1.94% students had visual acuity of 6/36 and lower in the right eye and 1.46% of the students in the left eye. The rest of students had visual acuity ranging between 6/9 to 6/24.¹⁰Studied by Norlaila et.al¹³found that 93% subjects have visual acuity better than 6/9 or 6/6 and only 7% have visual acuity worse than 6/9. It was discussed that 'Orang Asli' people have good eyesight due to lifestyle, including good food resources which are more to nature base but it might due to genetic factor too.

The distributions of the type of refractive error for aborigine children on right eye were 9.4% myopia, 81.3% hyperopia and 9.3% mixed astigmatism respectively. The most common type of refractive error found in the right eye was compound hyperopic astigmatism (48.8%). For left eye, hyperopia is the highest distribution (76.8%) followed by myopia (11.6%) and mixed astigmatism (11.6%). The most common type of refractive error was compound hyperopic astigmatism (48.8%).

Fan et al¹⁴2004 found children from as young as three years and as young as two years in Hong Kong who participated in additional education before formal education, began to have refractive errors. A study in Singapore also discovered that a low level of education might attenuate the effect of risk alleles on myopia. These findings further underline the role of gene-environment interaction in the pathophysiology of myopia¹⁴

There is no association found in this study between the occurrence of refractive error with age and gender. In Mexico, studied by Garcia-Lievanos et al¹⁵found that there was no significant difference in refractive error between male and female in school children they studied. Hashemi et al¹⁶also found there was no significant difference in refractive error between different gender and age. This study also found, hyperopia typically appears between 4 years to 12 years of age among 'Orang Asli' children. Studied by Carter et al,¹⁷ hyperopia was found to be higher for age less than eight years old and decrease with increasing of age, but it remains as hyperopia up to 12 years old.

Conclusion

Overall uncorrected visual acuity is better than 6/7.5, 88.4% for right eye and 86% for left eye. Hyperopia is the most prevalent type of refractive error for both eyes among 'Orang Asli' children. There is no association of age and gender with types of refractive error. This research was carried out in one area or sector only thus comparison cannot be made with another area. Besides that, lack of family history data, history of near work activity are other limitation and this can be improved in the future studies.

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Conflict of Interest: None declared

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Author contribution:

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