

## The Prevalence of Refractive Errors Among First Grade of Primary School in Amara, South of Iraq

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### ABSTRACT

**Background and Objectives:** One of the main health problems of concern is refractive error in children, which has a real burden on community and individuals especially among schoolchildren. The study aim is to evaluate the refractive errors' prevalence in primary school children.

**Methods:** The study was a cross sectional with the element of analysis which was carried out in a primary school of the Amara city. A total of 768 children were selected randomly from 76 primary schools (urban rural, male and female schools) by cluster sampling according to the geographic area of health districts and their primary health care centers. Each child was examined for visual acuity (both uncorrected and best corrected) dry and cyclo-refraction.

**Results:** In this study, the response rate was (95.7%) from which 66.1% were male and 33.9% were female. The prevalence of refractive error was 47% (360) distributed as myopia, hyperopia, and astigmatism which was (19.6%, 20.1% and 7% respectively) while amblyopia was 4.8%. 39.9% of students showed abnormal visual acuity. After cyclo-refraction, the prevalence of refractive error was changed for all types, most of myopic children were female (52.1%) while most children with hyperopia (53.4%) and astigmatism (54.7%) were male children with statistical significant association ( $P=0.001$ ).

**Conclusion:** we concluded that refractive error and visual acuity loss prevalence was high among children of primary school in the Amara city in south of Iraq. It seems that an extensive ocular and visual screening protocol must be considered in this province.

**Keywords:** Refractive error, Amblyopia, Visual acuity, Primary school

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### Introduction

Blindness and vision impairment in childhood are more important and disabling than adult onset blindness, due to the long span of life and their permanent effects on developing eyes, which may result in developing amblyopia (He, 2004). The primary and main cause of visual impairment remains to be refrac-

tive error in children worldwide (Michaeline, 2016); it is one of the important causes of correctable visual impairment which represents about eighty percent of visual impairment in children in the United States (Evans, 2004; Munoz, 2000; Chia, 2004; Munoz, 2002; Vitale, 2006). It is expected to be higher in less developed countries. The early detection and man-

agement of eye disease is very important to prevent vision disorders and eye diseases (LAN, 2013; Adegbehingbe, 2005). There is evidence which indicates that uncorrected refractive error is the main cause of preventable blindness in world (Maul, 2000).

There are many factors such as environment and age that may have contributed to refractive errors prevalence and distribution pattern. It varies in children from less than one percent, which is registered in children in Tanzania, to reach more than 36.7% in Malaysia. Also there are about 3% cases in South Africa to cases as high as 15.8 percent in Chile (Giordano, 2009; Zainal, 2002; Goh, 2005; Hashim 2005, and Reddy 2006). A report in Japan shows that prevalence of refractive error was about 50%, while in Taiwan a report showed a prevalence of 84% among 16-year old children. (Chang, 2013; Zhao, 2000, & Dirani , 2010). In developed countries, about 25% of refractive error was uncorrected, so school-based refractive error programs are becoming more common as a result of an improved understanding of the importance of refractive error as a cause of visual disability in children (Dirani, 2010).

There is no data provided on the schools or age of children in Iraq. . Despite the correction of refractive errors included in the 2020 Vision strategy the fact that the Iraqi population is relatively young; enough information must be available for programing and development (Garamendi, 2006). Following long term wars and other economic and health problems in Iraq, we need to know about the visual health and performance of children in their most critical age; kinds in primary school 7-year-old kids

## **Material and Methods**

A cross sectional study conducted in a primary school of Amara city depended on school-based data with elements of analysis. A total of 768 children were selected randomly from 76 primary schools by the method of cluster sampling, according to the geographic area of health districts (4 cluster of health district) and their primary health care centers (total 31 PHCs). We examined 10 students from the first classroom for each selected school as a pilot

study. But after the pilot study, all the first grade primary school children in Amara were included in the study. The study included all children of primary school in the specified region, who were fit for sampling regarding their age, gender, address and eye examination. The study was conducted by a researcher whose examinations included visual acuity, dry and cyclo- refraction by specific tools including log Mar chart, occluder, cyclopentolate 1% (Milmet Pharma, FDC Limited, Abdilbrahim, Spain), and retianscope (Heine beta 200, HEINE Optotechnik, GmbH & Co. KG, Germany).

Data was collected by data sheet forms, constructed by a supervisor and researcher and based on standard forms and criteria.

The data analysis was carry out by using SPSS-20.0. Data was presented as numbers and percentages in form of a table. Analytical tests were used for testing the significance of associating between variables under study. The P-value equal or less than 0.05 was considered as a significant difference.

### **Eye Examination**

Log mar chart: provides the assessment of visual acuity for distance with log mar chart (Tumbling E) at room illumination and ocular motility evaluation. The distant vision of a child was tested with the chart at 6. The right eye was tested first, then the left one, occluding the fellow eye each time. Finally vision report was recorded.

Subtract it from the final spherical correction before writing the prescription.

### **The Cyclo Refraction**

Cyclopentale 1%, 1 drop in each eye, repeated once after 5 minutes. A Waiting period of at least 30 minutes before performing the cylcoretinocopy.

Students's visual acuity who participated in the study is not corrected by optical means, they are referred to an eye clinic for more comprehensive evaluation.

Refractive errors less than 0.50 in all group is considered as emmetropia. Each refractive error is considered separately.

**Results**

A total study sample included 768 children of primary school. 735 children from outside primary school also participated in this study with a response rate of (95.7%) after obtaining approved consent forms from them and their parents and teachers. 486 ( 66.1% ) of these students were males and 249 (33.9%) were females. The age of children ranged from 6 to 8 years with a mean  $\pm$  SD of (6.1  $\pm$  0.34) years, and there was no significant differences ( $P=0.723$ ) between the

mean  $\pm$  SD age of males (6.1  $\pm$  0.35) and females (6.1  $\pm$  0.33). The following tables show the descriptive and analytical analysis of the findings. In table 1, the description of the subjects' age in two groups of girls and boys are presented. Table 2 shows the frequency of each refractive error. In tables 3, 4 and 5, the frequency of normal and abnormal visual acuity and refractive errors are shown. In the rest of tables, analysis of visual acuity and refractive error are presented.

Table 1. Age mean  $\pm$  SD of study sample with gender distribution.

		N	Mean	Std. Deviation	P value
gender	Male	486	6.10	.352	0.723
	Female	249	6.10	.334	

Table 2. Refractive error types frequency.

		Frequency	Percent
Refractive error	Emmetropia	390	53
	Myopia	144	19.6
	Hyperopia	148	20.1
	astigmatism	53	7.3

		Frequency	Percent
Visual acuity	Normal	442	60.1
	Abnormal	293	39.9
	Total	735	100.0

Table 4. Acuity distribution in each level.

		Frequency	Percent
Visual acuity log MAR	0.2 (6/9)	72	24.6
	0.3 (6/12)	91	31.1
	0.5 (6/18)	42	14.3
	0.6 (6/24)	25	8.5
	0.8 (6/36)	12	4.1
	1.0 (6/60)	51	17.4
	Total	293	100

Table 5. Cyclo refraction results

		Frequency	Percent
Cyclo-refraction	Normal	206	28
	Myopia	147	20
	Hyperopia	323	43.9
	Astigmatism	59	8
	Total	735	100

Table 6. Analytic tables for gender, refractive error in different addresses

		Normal		myopia		hyperopia		astigmatism		Total		P value
		N	%	N	%	N	%	N	%	N	%	
gender	male	309	79.2	69	47.9	79	53.4	29	54.7	486	66.1	0.001
	female	81	20.8	75	52.1	69	46.6	24	45.3	249	33.9	
	Total	390	100	144	100	148	100	53	100	735	100	
address	urban	213	54.6	89	61.8	79	53.4	32	60.4	413	56.2	0.03
	rural	177	45.4	55	38.2	69	46.6	21	39.6	322	43.8	
	Total	390	100	144	100	148	100	53	100	735	100	

Table 7. Analytic tables for gender, visual acuity in different addresses

		Visual acuity						P value
		Normal		abnormal		total		
		N	%	N	%	N	%	
gender	male	322	72.6	164	56.1	486	66.1	0.001
	female	120	27.4	129	43.9	249	33.9	
	total	442	100	293	100	735	100	
address	urban	230	52	183	62.6	413	56.1	0.005
	rural	212	48	110	37.4	322	43.9	
	Total	442	100	293	100	735	100	

Table 8. Analytic tables for gender, visual acuity in different Visual level

		Visual level											
		1.0		0.2		0.3		0.5		0.6		0.8	
		N	%	N	%	N	%	N	%	N	%	N	%
gender	male	29	56.9	43	59.7	47	51.6	23	54.8	15	60.0	7	58.3
	female	22	43.1	29	40.3	44	48.4	19	45.2	10	40.0	5	41.7
address	urban	30	58.8	45	62.5	66	72.5	25	59.5	13	52.0	6	50
	rural	21	41.2	27	37.5	25	27.5	17	40.5	12	48.0	6	50
	Total	51	100	72	100.0	91	100	42	100	25	100.0	12	100

## Discussion

The real data about the refractive error and vision impairment in south of Iraq, especially in Missan governorate, is not clear yet. Therefore, this study is considered as the first academic study that was conducted in Missan governorate which deals with this important subject.

In this study, the response rate was (95.7%) most of them were male children (66.1%), while 33.9% were female, with age mean  $\pm$  SD of (6.1  $\pm$  0.34) years and there was no significant differences among age and sex. Most of the children who participated in the study lived in urban areas. This result was in agreement with other studies that were conducted in different areas and countries, including (Saadoon, 2017) a study conducted in south of Iraq, (Jamali, 2009) a study carried out in Shahrood, Iran, also one that was conducted in southern China (He, 2004) and in Hong Kong (Fan, 2004). Meanwhile, a study by Estes et al. (Estes, 2007) was conducted among Mexican School- children which was not in conformity with the results of this current study.

This variation may be a result of cultural believes of our society, that most families prefer to register only their male children in schools and not the females, especially in rural areas. Such an interpretation may explain our results in this matter. Or maybe this variation could have been due to the sampling method type that was used, the population size that was screened or due to the geographical location variation of these studies.

The refractive error prevalence present in the current study was high (47%). Hyperopia was higher than Myopia followed by Astigmatism and Amblyopia (20.1%, 19.6%, 7% and 4.8 respectively). This result was higher than the usual value noted by WHO (20%) and more than the findings of other studies in which prevalence of refractive error was 2.2% -35%. These studies include: Opubiri et al (Opubiri, 2013) which found that refractive error prevalence was 2.2% in both eyes. In Saadoon report, (Saadoon, 2017) the refractive error prevalence was about 35% while the Pi, et al. (Pi, 2012) in China found the prevalence of

refractive error was about 20.69%.

Nevertheless, other studies like AbuBakar et al 2011 reported that the overall refractive error prevalence among the population was 47.7% which is in agreement with the current study (NurulFarhana , 2012).

In our study we considered that abnormal visual acuity when eye examination was equal or more than (6/9) level, and this represents about 39.9% of our study results which means a high prevalence rate. The highest frequency of children was found in visual acuity of (6/12) level and the less frequency was in (6/36) level. This result was in consistence with another study conducted by EL-Bayoumy et al in Cairo, which found the prevalence of visual acuity of (6/12) level was high (22%) (EL-Bayoumy, 2007). However, Opubiri et al reported that prevalence was low and this disagrees with our study (Opubiri, 2013).

The refractive error prevalence after cyclo-refraction changed to higher than before cyclo-refraction especially in hyperopia which became double the rate (21.1% to 43.9) while prevalence of myopia was slightly elevated also it was found the mean  $\pm$  SD of refractive error types was different in pre and post cyclo-refraction especially in myopic children. This finding was similar to the result of another study that was conducted in other places by Hu Y.Y. et al. which found that all examined eyes of non-cycloplegic myopia stayed myopic after cycloplegia while about 33.6% of the remaining eyes became emmetropic (18.0%) or hyperopic (15.7%) under cycloplegia and decreased the prevalence of emmetropia (Yuan, 2015).

The present study found that most of myopic children were female while most of hyperopia and astigmatism were male children with association between gender and types of refractive error being statistically significant ( $P= 0.001$ ). This result disagrees with the findings of other studies like Saadoon, et al. which found that the prevalence of refractive error for all its type were more in female than in male with no significant difference (Saadoon, 2017) also it was not similar to finding of EL-Bayoumy et al. where the female prevalence of refractive error was higher than that in male



children (EL-Bayoumy, 2007). Meanwhile results at Romín et al. were the reverse, where the prevalence of refractive error with all its type was higher in male children than in female children (Romín, 2015).

Most of the children in this study with refractive error lived in urban areas and showed an association between refractive error and address ( $P=0.03$ ). This result agrees with another study done by Saadoon et al. with a high prevalence of refractive among urban population (Saadoon, 2017). This result may be due to the fact that most of the children who participated in the study were from urban areas or it can be that high refractive errors' prevalence in urban areas may be attributed to the rapid urbanization in our city with easy access to abundance of computers and electronic gadgets that have been motivating children to remain in houses and has made them involved in activities which cause more eye problems.

The abnormal visual acuity was high and most common among male children than among female children at all its levels. Also this result is the same for children who lived in urban areas, where the prevalence of abnormal visual acuity was common with statistically significant association between gender, address and visual acuity level. This result was in conformity with other study results like He et al. which found that abnormal visual acuity represents about 22%, which is also in agreement with other studies that found high prevalence of abnormal visual acuity (HE 2004).

Regarding the refractive error pre and post (cyclo-refraction); the study showed that mean  $\pm$  Std. Deviation of myopia (right and left eye) was higher in pre than post cyclo-refraction with statistical significant association ( $P=0.001$ ). While this result was reversed in hyperopia where mean  $\pm$  Std. Deviation was higher in post cyclo-refraction with statistical significant association ( $P=0.001$ ). For astigmatism the mean  $\pm$  Std. Deviation was similar in pre and post cyclo-refraction with no statistical significant association ( $P=0.09$ ,  $P=0.3$ ). All these results were in agreement with other studies that conducted comparison between the prevalence of myopia and hyperopia in the non-cycloplegic state and the cycloplegic state. These found that about sixty-six percent of all eyes with a non-cycloplegic myopic refractive error stayed as myopic under cycloplegic refractometry while the rest (34%) of eyes became emmetropic (18.0%) or hyperopic (15.7%) under cycloplegia, the emmetropia prevalence decreased from 37.5% before cycloplegia to 19.8% after cycloplegia while the remaining eyes became hyperopic under cycloplegia

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### Conflict of Interest

Authors declared no conflict of interest.

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## مقاله پژوهشی

## شیوع عیوب انکساری در کودکان پایه اول ابتدایی شهر اماره در جنوب عراق

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چکیده	اطلاعات مقاله
<p><b>زمینه و هدف:</b> عیوب انکساری یکی از مشکلات بهداشتی - درمانی کودکان دبستانی است که می‌تواند مشکلات زیادی در پی داشته باشد. هدف این مطالعه بررسی شیوع عیوب انکساری در دانش‌آموزان پایه اول ابتدایی شهر اماره در جنوب عراق است.</p> <p><b>روش کار:</b> مطالعه مقطعی به‌صورت تمام‌شماری (۷۶۸) در پایه اول ۷۵ دبستان و در مناطق شهری و روستایی شهر اماره انجام شد. تمام کودکانی (دختر و پسر) که با هماهنگی مراکز بهداشتی به مطالعه دعوت شده بودند، تحت معاینهٔ رفرکشن سایکلو و بدون قطره و تیزیبی قرار گرفتند.</p> <p><b>یافته‌ها:</b> در این مطالعه ۹۵/۷٪ کودکان پایه اول ابتدایی در مطالعه شرکت کردند. ۶۶/۱٪ از کودکان حاضر در مطالعه، پسر و ۳۳/۹٪ دختر بودند. شیوع انواع عیوب انکساری (دوربینی، نزدیک بینی و آستیگماتیسم) در کودکان حدود ۴۷٪ (۳۶۰ نفر) بود. ۲۰/۱٪ دوربینی، ۱۹/۶٪ نزدیک‌بینی و ۷٪ آستیگماتیسم داشتند. ۳۹/۹٪ کودکان مبتلا به اختلال بینایی بوده و ۴/۸٪ از آنها به آمبلیوپی مشکوک بودند. اغلب کودکان مبتلا به نزدیک‌بینی دختر بودند (۵۲/۱٪)؛ در حالی که اغلب پسران به‌طور معنی‌داری دچار دوربینی (۵۳/۴٪) و آستیگماتیسم (۵۴/۷٪) بودند (<math>P=۰/۰۰۱</math>).</p> <p><b>نتیجه‌گیری:</b> مقایسهٔ نتایج به‌دست‌آمده نشان می‌دهد شیوع اختلالات بینایی و عیوب انکساری در شهر امارهٔ عراق زیاد است. به نظر می‌رسد برنامه‌های غربالگری و معاینات مبتنی بر پیشگیری در این منطقه ضروری باشد.</p> <p><b>واژه‌های کلیدی:</b> عیب انکساری، تنبلی چشم، تیزیبی، مدارس ابتدایی</p>	<p>تاریخ وصول: ۱۳۹۶/۰۱/۰۳</p> <p>تاریخ پذیرش: ۱۳۹۶/۰۳/۱۵</p> <p>انتشار آنلاین: ۱۳۹۶/۰۸/۰۷</p> <p><b>نویسندهٔ مسئول:</b> <b>ابراهیم جعفرزاده پور</b> استاد، گروه توانبخشی، دانشگاه علوم پزشکی ایران، تهران، ایران</p> <p><b>پست الکترونیک:</b> jafarzadehpour.e@iums.ac.ir</p>