

Refractive Errors among Primary Schools Children in Assiut District, Egypt

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Abstract:

BACKGROUND: Uncorrected refractive errors are a public health problem especially among school children. It has a direct effect on learning and academic performance. **AIMS OF THE STUDY:** This study aims to assess the refractive errors among a representative sample of school children under ten in Assiut City, Egypt and to manage the discovered cases early. **SUBJECTS AND METHODS:** Descriptive cross sectional study design was used. The students of primary schools in the first, second and third grades under ten years old were the focus of the study and they were selected by stratified random sampling technique. The calculated sample size was 196. Two tools were used in the study; the first one was a self administered questionnaire to collect sociodemographic data as child age, birth order, father's and mother's education and occupation, family history of wearing glasses, watching TV or using computer etc. The second tool was the eye examination by a Portable Auto-refractometer which has the advantages of accuracy, easy examination, being movable everywhere and provide printable eye status report. An eye examination record was used to register data about student's name, age. Data collection started from the first of March 2012 until the end of April 2012. Data were analyzed using SPSS soft program version 16. **RESULTS:** 241 students (107 males and 134 females) participated in the study but 142 only agreed to perform eye examination with 59% response rate. Ninety-five children (66.9%) had a significant refractive error of ± 0.50 or worse in one or both eyes. **CONCLUSION AND RECOMMENDATIONS:** Significant refractive errors occur among primary school children aged 6 to 10 years. Therefore, there is a need to have regular and simple vision testing in primary school children to screen for refractive errors. This will enable to start corrective measures at the early stage and decrease visual disability.

Key words: refractive errors- children- primary schools- Egypt

1. Introduction:

Refractive error is one of the most common causes of visual impairment and the second leading cause of blindness following cataract (Dandona and Dandona, 2001). There are an estimated 500 million people, mostly in developing countries including children that do not have access to eye examination and affordable correction. Many are not aware that there is a cure for their compromised vision or cannot afford the appliance they need for correction (Brien et al, 2000). Childhood visual impairment due to refractive errors is one of the most common problems among school-age children and is the second leading cause for treatable blindness (Lian-Hong et al., 2010). World Health Organization and a coalition of non-government organizations launched a global initiative; Vision 2020: The Right to Sight (Pizzarello et al., 2004), one of its priorities is correction of refractive errors and low vision to eliminate avoidable visual impairment and blindness on a global scale (Pararajasegaram, 1999). In order to reduce the occurrence of avoidable visual impairment and blindness caused by refractive errors, there is an urgent need for obtaining the epidemiological information on refractive errors and other eye diseases among school-age children. In China, the problem of uncorrected refractive error is particularly common, and the refractive errors have become one of the leading causes for visual impairment and blindness, especially among children (Dandona and Dandona, 2001). Refractive errors affected approximately more than half of the students between the 7 to 15 years in Qavin-Iran (Khalaj et al., 2009).

Children with refractive errors are less likely to opt for correction until they are significantly visually impaired and have difficulty performing specific visual tasks. This is especially so in rural and urban poor regions where there are inadequate eye care services. Regular eye screening programs in schools will help in the early detection and correction of refractive errors. Schools with long established tradition of engaging in vision screening have proven to be effective in detecting previously undiagnosed conditions including refractive errors (Yawn, 1996). Impairment due to refractive error in any population suggests that eye care services are inadequate. This is because the treatment of refractive errors is perhaps the simplest and most cost effective healthcare interventions. Uncorrected refractive error in schoolchildren portends significant implications for a

child's academic achievement as well as social interactions (Taylor, 2000). Poor vision has been correlated with poor academic performance (Vaughn et al., 2006).

In Egypt there are few studies showing the prevalence of errors of refraction. A survey conducted among 5839 Egyptian schoolchildren aged 7–15 years found that the prevalence of refractive errors (visual acuity \leq 6/12) was 22.1% (El-Bayoumy et al., 2007). A preliminary national survey done in the Helwan area of Cairo reported that 34% of the recorded disabilities were visual disability (Shukrallah et al., 1997)

2. Aims of the study:

- 1- Detection and estimation of refractive errors among children under ten years in Assiut District, Egypt.
- 2- Early correction of diagnosed children with refractive errors.

3. Subjects and Methods:

A Cross sectional study design was carried out. The students were selected by random sampling technique. Assiut District was divided into 7 educational sectors affiliated to Assiut Educational Administration. Four schools were selected randomly representing private and governmental schools. The sample was calculated by the use of Epi-Info program version 3.3 with power 80%, and confidence interval 95%. Using the lowest frequency reported in previous studies (15%) as the expected one (Saad and El-Bayoumy, 2007) and the worst acceptable as 10%, the sample size was calculated to be 196 which were increased to 240 students to safeguard against non response rate.

The proposal of the study was reviewed by the Ethical Committee in Faculty of Nursing. Administrative approval letters were taken from Assiut Directorate of Education. Two tools were used in the study; the first one a questionnaire and a written consent were distributed to the student in the selected class rooms to take the approvals of the students' parents and filling the self administered questionnaire that include information about the personal data of the student (age, sex, birth order...etc) and socioeconomic status of the family (education, job, residence...etc). The questionnaire also asked about the near eye activities (reading, watching T.V. / computer). Family history of wearing glass and history of consanguinity were taken. The second tool was the eye examination by an Automatic refractometer which has the advantages of accuracy, easy examination, being movable everywhere and provide printable eye status report. A pilot study was done on 10 students to test the clarity of the tools. Three stages were followed in the field work; the first stage was visits of the chosen schools. The aim of the study was fully explained to the school administrators, teachers and students. The second stage of data collection was started by visiting the school by the next day of questionnaire distribution to collect it from the classes. Only 142 of students' parents agreed to examine their sons/daughters ophthalmologically. In the third stage, cycloplegic refraction was used to determine refractive errors of the students in this study. The examination was done as much as possible on Thursdays so that not to interfere with the academic activities of the schoolchildren. Pupils were dilated with 2 drops of 1% cyclopentolate eye drops, administered 3 times 5 minutes apart. After 45 minutes, light reflex and pupil dilation were evaluated. Cycloplegia was considered complete if the pupil dilated to 6 mm or greater and light reflex was absent. After cycloplegia, the Ophthalmologist begin to examine the eye using the Automatic refractometer. First, the right eye was tested and then the left eye, and examination of the anterior segment, media and fundus. After completion of eye examination, every student was given an examination report about his/her eye status. Cases with refractive error were given written eye examination reports to their parents. An offer of free spectacles provided by an optician for needed students. Also the school nurse and school manager were notified about the eye examination results with a written copy of students who need early correction. Data were analyzed using SPSS (version 16). The frequencies, percentages, the mean and standard deviation were computed. The chi-squared test was used as the test of significance. The 5% level was chosen as the level of significance and 95% confidence interval. Myopia was defined as spherical equivalent refractive error of at least -0.5 D, hypermetropia as $+0.5$ D or more, and astigmatism as a cylindrical power of ≤ -0.5 D.

4. Results:

The present study included 241 students from four primary schools in Assiut District as shown in Table (1). The majority of them (82.2%) from three governmental schools and 17.8% from one private school. The studied school children were in the first, second and third grades as follows; 23.2%, 44.4% and 32.4%, respectively. Less than one third of the students achieved success with excellent performance in the first term versus 0.8% failed and 33.6% just passed.

Table (2) shows personal characteristics of the studied students, two thirds (68%) of them were aged 8 years and more. 44.4% were males and 55.6% were females. Nearly 62% were urban residents. Regarding parents education, it was revealed that nearly 21% of both mothers and fathers were illiterates while more than one quarter of them had university education. More than one third of children's fathers were employees while two thirds of their mothers were not work for cash (Table 3).

Table (4) presents the activities that practiced by studied students. Almost all of them except two were showing Television and nearly half of them watched it for three hours or more and one quarter (24.7%) were in a distance less then one meter from it. Nearly 45% of the students were using computers and the majority of them used them less than 5 hours in the day. Reading was reported by 54.4% of the participants and 56% of them reported that they were practicing sports as walking, footballs, running etc.

The study revealed that more than two thirds of the students their parents had no history of consanguinity. Nearly 30%, 26.6% and 16.6% their fathers, mothers or brothers and sisters were wearing eyeglasses, respectively as shown in Table (5).

Table (6) reveals that 26.6% of the students previously went to the ophthalmologists and more than the half for follow up and 45.3% due to eye inflammations.

Out of 142 students who had performed eye examination with 59% response rate; 60 were males and 82 were females. Ninety-five children (66.9%) had a significant refractive error of ± 0.50 or worse in one or both eyes and needed eyeglasses (Table 7). None of the children in the study had ever had correction for a refractive error; therefore none was wearing eyeglasses. Among the refractive error, myopia was the most common with 93.7%, followed by Hypermetropia 5.3%. All students had clear media except one female student who had repaired ruptured globe, aphakia, and lost anterior chamber, so she was referred to the Assiut University Hospital for further evaluation and management. All students had normal fundus except two with hazy, large cup disk ratio). There were no squint cases seen in our study. 84.5% of the examined students had astigmatism (Figure 2)

According to Table (8), overall, mean score for myopia in the right eye was -0.40 ± 1.20 (range: from -4.0 to +5.0) and left eye was -0.30 ± 1.18 (range: from -4.5 to +5.8), hypermetropia in the right eye was 0.62 ± 0.51 (range: from 0.0 to +2.75) and left eye was 0.76 ± 0.71 (range: from 0.0 to +5.5).

Distribution of examined students with myopia according to their personal characteristics is shown in Table (9). There are no statistical significant difference as regards age, residence, sex, and history of consanguinity. On the other hand, myopia was more frequent among children whose fathers and siblings are not wearing eyeglasses (76.4% and 89.9%, respectively). These differences are statistically significant.

Myopia was more frequent among students who used to read for not more than one hour. As shown in table (11), about two thirds of myopic students just pass in the exams of the first term. But these differences are not statistically significant.

Table (1): Distribution of the studied students in selected schools, Assiut District, 2012

School	No. (241)	%
Name of the school:		
Ali Ibn Abi Taleb	136	56.4
Arab El-Madabegh	44	18.3
Noterdam	43	17.8
Mosha Algededa	18	7.5
Type of the school:		
Governmental	198	82.2
Private	43	17.8
Grade:		
First	56	23.2
Second	107	44.4
Third	78	32.4
Result of the first term:		
Excellent	73	30.3
Very good	37	15.4
Good	48	19.9
Pass	81	33.6
Failed	2	0.8

Table (2): Personal characteristics of the studied students, Assiut District, 2012

	No. (n= 241)	%
Age:		
6 – 7 years	77	32.0
8 years or more	164	68.0
Mean ± SD (Range)	7.97 ± 1.06 (6 – 10)	
Sex:		
Male	107	44.4
Female	134	55.6
Birth order:		
The only child	17	7.1
First	73	30.3
Middle	102	42.3
Last	49	20.3
Residence:		
Urban	149	61.8
Rural	92	38.2

Table (3): Some socioeconomic characteristics of the students' parents, Assiut District, 2012

	No. (n= 241)	%
Father education:		
Illiterate	50	20.7
Read & write	42	17.4
Basic education	28	11.6
Secondary	49	20.3
University	69	28.6
Postgraduate	3	1.2
Mother education:		
Illiterate	52	21.6
Read & write	45	18.7
Basic education	17	7.1
Secondary	65	27.0
University	62	25.7
Father job:		
Employee	85	35.3
Farmer	24	10.0
Free business	68	28.2
Professional	12	5.0
Skilled worker	14	5.8
Unskilled worker	38	15.8
Mother job:		
Working for cash	65	27.0
Not working for cash	176	73.0

Table (4): Practicing activities among studied students, Assiut District, 2012

	No. (n= 241)	%
Watching TV:		
Yes	239	99.2
No	2	0.8
Duration of watching TV: (hours)		
1 – 2	119	49.8
3 – 4	86	36.0
5 or more	34	14.2
Distance between child and TV:		
< 1 meter	59	24.7
1 meter	78	32.6
2 meters	79	33.1
3 meters or more	23	9.6
Using computer:		
Yes	108	44.8
No	133	55.2
Duration of using computer: (hours)		
1 – 2	67	62.0
3 – 4	36	33.3
5 or more	5	4.6
Reading:		
Yes	131	54.4
No	110	45.6
Duration of reading: (hours)		
One hour	59	28.7
Two hours	45	33.3
Three hours or more	27	38.0
Practicing any type of sports:		
Yes	135	56.0
No	106	44.0
Type of sports:		
Walking	59	43.7
Football	43	31.9
Running	35	25.9
Basketball	2	1.5
Others	5	3.7

Table (5): Family history of wearing eyeglasses among studied students, Assiut District, 2012

	No. (n= 241)	%
family history of consanguinity:		
Yes	76	31.5
No	165	68.5
Father wearing eyeglasses:		
Yes	72	29.9
No	169	70.1
Cause of wearing:		
Nearsightedness	35	48.6
Farsightedness	27	37.5
Others	10	13.9
Mother wearing eyeglasses:		
Yes	64	26.6
No	177	73.4
Cause of wearing:		
Nearsightedness	32	50.0
Farsightedness	27	42.2
Others	5	7.8
Brother/ sister wearing eyeglasses:		
Yes	40	16.6
No	201	83.4

Table (6): Previous history of ophthalmological examination among studied students, Assiut District, 2012

	No. (n= 241)	%
Going to ophthalmologist:		
Yes	64	26.6
No	177	73.4
Complaint:		
Eye inflammation	29	45.3
Hazy vision	2	3.1
follow up examination	33	51.6

Table (7): Refractive errors among examined students, Assiut District, 2012

Need eyeglasses	No.	%
Yes	95	66.9
No	47	33.1
Total	142	100.0
Refractive errors	No. (n= 95)	%
Myopia	89	93.7
Hypermetropia	5	5.3
Total	94*	99.0

- one female student had repaired ruptured globe, aphakia, lost anterior chamber

Table (8): Mean score of myopia, hypermetropia and astigmatism among examined students, Assiut District, 2012

	Right		Left	
	Mean ±SD	Range	Mean ±SD	Range
S	-0.40 ± 1.20	From -4.0 to +5.0	-0.30 ± 1.18	From -4.5 to +5.8
C	0.62 ± 0.51	From 0.0 to +2.75	0.76 ± 0.71	From 0.0 to +5.5
A	112.51 ± 56.89	From 0.0 to +180.0	112.49 ± 55.37	From 0.0 to +180.0

Myopia S \geq -0.5 Hypermetropia S \geq +0.2 Astigmatism C \leq -0.5

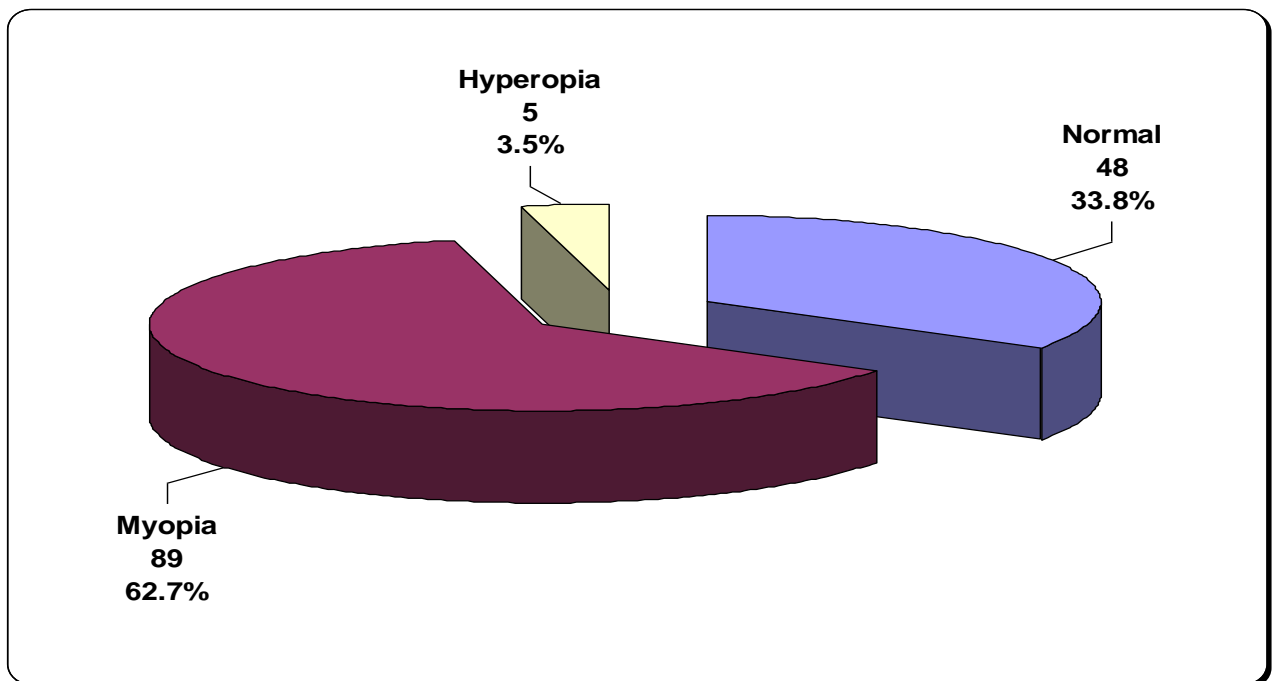


Figure (1): Results of eye examination among the studied students, Assiut District, 2012

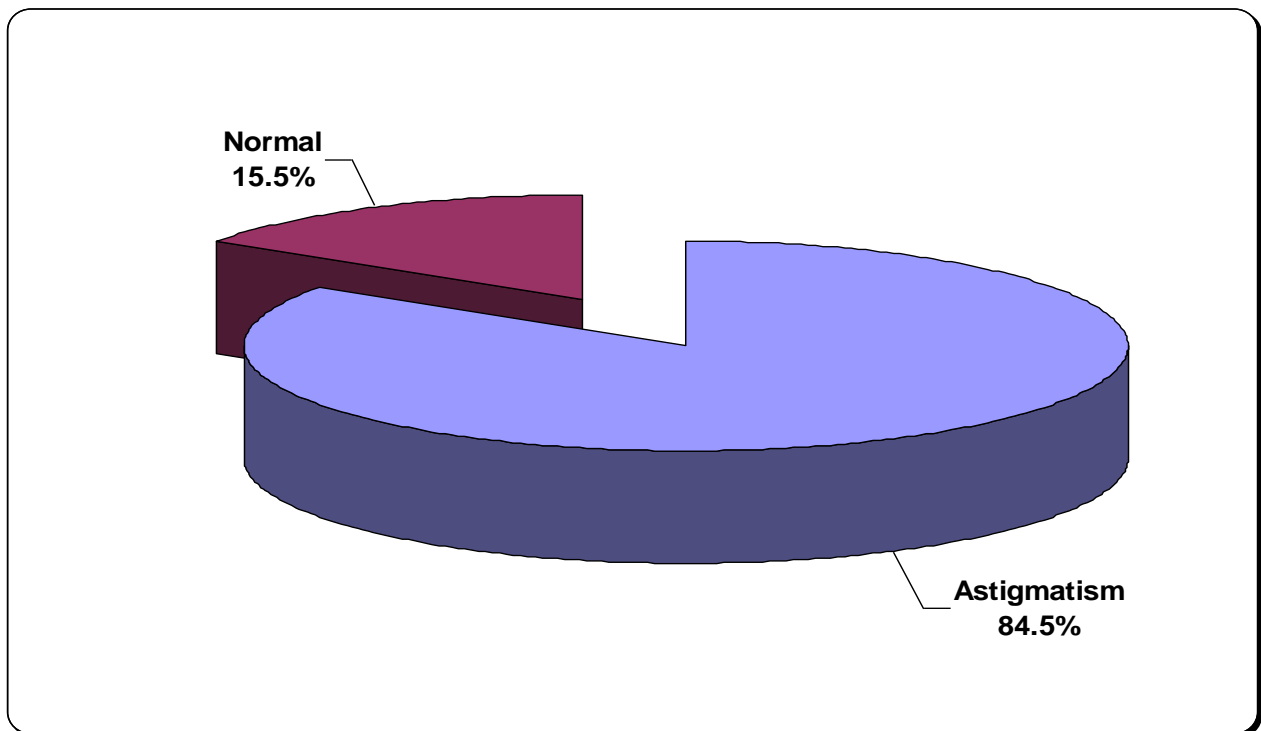


Figure (2): Distribution of examined students with astigmatism, Assiut District, 2012

Table (9): Distribution of examined students with myopia according to their personal characteristics, Assiut District, 2012

	Myopia				P-value
	Yes (n= 89)		No (n= 53)		
	No.	%	No.	%	
Age:					0.331
< 8 years	25	28.1	11	20.8	
≥ 8 years	64	71.9	42	79.2	
Residence:					0.883
Urban	56	62.9	34	64.2	
Rural	33	37.1	19	35.8	
Sex:					0.223
Male	41	46.1	19	35.8	
Female	48	53.9	34	64.2	
Consanguinity:					0.503
Yes	30	33.7	15	28.3	
No	59	66.3	38	71.7	
Father wearing eyeglasses:					0.043*
Yes	21	23.6	21	39.6	
No	68	76.4	32	60.4	
Mother wearing eyeglasses:					0.908
Yes	26	29.2	15	28.3	
No	63	70.8	38	71.7	
Brother/ sister wearing eyeglasses:					0.022*
Yes	9	10.1	13	24.5	
No	80	89.9	40	75.5	

Table (10): Distribution of examined students with myopia according to their daily activities, Assiut District, 2012

	Myopia				P-value
	Yes (n= 89)		No (n= 53)		
	No.	%	No.	%	
Duration of watching TV:					0.284
1 – 2	54	60.7	26	32.5	
3 – 4	23	25.8	15	39.5	
5 or more	12	13.5	12	50.0	
Space between child and TV:					0.928
< 1 meter	23	25.8	15	39.5	
1 meter	30	33.7	15	33.3	
2 meters	30	33.7	19	38.8	
3 meters or more	6	6.7	4	40.0	
Using computer:					0.256
Yes	44	49.4	21	39.6	
No	45	50.6	32	60.4	
Reading hours: (n=73)	43		30		0.047*
One hour	30	69.8	14	46.7	
Two hours or more	13	30.2	16	53.3	

Table (11): Relation of myopia and academic performance of examined students, Assiut District, 2012

Results of the first term	Myopia				P-value
	Yes (n= 89)		No (n= 53)		
	No.	%	No.	%	
Pass	31	66.0	16	34.0	0.456
Good	17	54.8	14	45.2	
Very Good	13	76.5	4	23.5	
Excellent	28	59.6	19	40.4	

4. Discussion:

Refractive error was shown to be the leading cause of visual impairment among schoolchildren as reported in numerous studies. But many young children with such a condition are asymptomatic. Visual screening can be useful for detecting asymptomatic visual problems, however compliance with spectacle wearing may be very low for many reasons, such as forgetting to wear glasses, concern about appearance, or not feeling that glasses are needed (Castanon et al., 2006).

Because most refractive errors can be corrected in early life and because visual impairment can have a detrimental impact on education and development in a child's life, cost-effective strategies to eliminate this easily treatable cause of visual impairment are warranted (Khalaj et al., 2009).

From our findings, 26.6% of the students previously went to the ophthalmologists for follow up and eye inflammations. With no of them wear eyeglasses. This may reflect social stigmatization of spectacles. Furthermore, there are some misconceptions regarding wearing eyeglasses at young age as it associated or may lead to blindness later on. The prevalence of refractive errors from eye screening in school children worldwide have been found to be 10% to 40% (Naidoo et al., 2003; Khandekar and Abdu-Helmi, 2004; Matsuo and Matsuo, 2005 and Łuczyńska et al., 2005)).

In the present study, 66.9% children had a significant refractive error of ± 0.50 or worse in one or both eyes and need eyeglasses. Among the refractive error, myopia was the most common with 93.7%, followed by Hypermetropia 5.3%. This is higher compared to other studies done in many regions as Cairo; 22.1% of students

aged 7 -14 years (El-Bayoumy and Saad, 2007). This may be attributed to lack of awareness of the parents of testing their children vision and children who get such an opportunity are few, and only those whose conditions are so severe as to be noticed by the parents or the teachers perform an ophthalmological examination. Also, visual screening can be useful for detecting asymptomatic visual problems.

The prevalence of abnormal visual acuity in general population of children aged 7 and 8 years in Poland was estimated on the base of results from studied sample on the level of 17.7% \pm 5.0% for confidence interval 95% and was in the range 12.3-24.9% (Łuczyńska et al., 2005).

In the year 2005 Muszyńska-Lachota and his colleagues studied 138 children in 7-8 year of age from West Pomeranian region, Poland proving that among 7 years old children hypermetropia was the dominating refraction error affecting 75% of girls and 75.3% of boys. Myopia was detected in 3.2% girls and 2.5% boys. Among 8 years old children hypermetropia was also a common problem (80.8% girls and 74.1% boys); astigmatism in 2.1% girls and 3.7% boys. The prevalence of particular refraction errors among both age groups showed no statistically significant difference (Muszyńska-Lachota et al., 2005).

Myopia and astigmatism were 65% and 16.1% respectively (Khalaj et al., 2009). Myopia is the most common type of refractive error among Malaysian children aged 6 to 12 years with prevalence of 5.4%, followed by hyperopia at 1.0% and astigmatism at 0.6%. A significant positive correlation was noted between myopia development with increasing age ($P < 0.005$), more hours spent on reading books ($P < 0.005$) and background history of siblings with glasses ($P < 0.005$) and whose parents are of higher educational level ($P < 0.005$) (Syaratul-Emma et al., 2008).

One hundred seven of the 122 subjects (87.7%) were considered to have a refractive error with or without one or more other eye conditions (Tengtrisorn et al., 2009). Cross-sectional studies have also found a positive association between myopia and near-work activity such as reading and writing. 60.7% of myopic students watched Television for less than one hour and about one third of them watched it at a distance from 1 to 2 meters. These findings may be explained by that myopia made the students watched Television for short duration and at close distance than the other students (Saad and El-Bayoumy, 2007).

Syaratul-Emma (2008) found that myopia was the most common type of refractive error detected in 38 students, contributing 77.5% of the total refractive error. The prevalence of myopia was 5.4% in the study population. Hyperopia was detected in 7 students (1%), followed by astigmatism in 4 students (0.6%) There was a statistically significant association of students in the upper primary group, longer hours spent for reading books, background history of siblings with glasses, parent's educational level and household income in the development of myopia. There was no significant association between myopia development and the history of parents with glasses

In our study astigmatism was detected among 84.5% of the examined students with or without other refractive errors. This result is higher than that reported by Kawuma and Mayeku (2002) as 73 children had a significant refractive error of ± 0.50 or worse in one or both eyes, giving a prevalence of 11.6% and the commonest single refractive error was astigmatism which accounted for 52% of all errors. This was followed by myopia was the least common.

In our study, myopia was more frequent among children who their fathers and siblings are not wearing eyeglasses (76.4% and 89.9%, respectively). These differences are statistically significant. Refractive error services in Egypt are expensive. There is lack awareness about the importance of regular eye examination among many people even the highly educated ones. Moreover, compliance with spectacle wearing may be very low for many reasons, such as forgetting to wear glasses, concern about appearance, or not feeling glasses are needed.

Poor vision has been correlated with poor academic performance (Tengtrisorn et al., 2009). In the present study about two thirds of myopic students just pass in the exams of the first term.

5. Conclusions and Recommendations:

Refractive errors affected approximately more than half of the students. Myopia was the more frequent refractive problem. Most of the children are unaware of their refractive errors. The majority of students were never examined for the visual acuity. Most refractive error can corrected in early of life. Therefore, every child should receive eye examination by an ophthalmologist at school entrance. Screening in school and pre-school

ages should be carried out periodically. In addition, children in these ages and their parents should be educated about signs and symptoms of refractive errors, ocular hygiene and for the risk factors involved in the development of these errors especially myopia and other ocular pathological problems.

Acknowledgements:

Firstly, the authors wish to thank the students and their parents for their participation. Secondly, the authors wish to thank school administrators and school nurses for their help and cooperation. Finally, the authors wish to thank Dr.Wael for his kind help and assistance.

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