Prevalence of refractive error among a sample of children from two primary schools from Al-Rusafa in Baghdad

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ABSTRACT

INTRODUCTION: Refractive error may appear through childhood and adolescent. If refractive error left untreated it can result in amblyopia and strabismus. Visual impairment has significant implication for the affected child and family in terms of education, future employment and personal and social welfare throughout life.

OBJECTIVE: To estimate the prevalence of refractive errors among a sample of children from two primary schools in Al-Rusafa district in Baghdad. And to detect some factors that may be associated with refractive errors.

METHODS: A cross sectional study was carried at two primary schools in Baghdad from 15 February to 1 April 2009. The two primary schools were selected conveniently. All students were included in this study apart from those with eye infections ,traumatic eye disease. Snellen's chart was used to assess visual acuity and retinoscope was used to detect the type of refractive errors for those with abnormal acuity. .

RESULTS: eight hundred sixty students from two primary schools were participated, and 732 were examined (85%). The prevalence of refractive errors (ametropia) was 7%. The prevalence of myopia was (5.32%), hyperopia was (1.09%), and astigmatism was (0.68%), while the rest (92.91%) were normal (emmetropia).Twenty-four (3.2%) students wore glasses on the day of examination. These students with glasses had uncorrected visual acuity equal or less than 6/12. Among students who had refractive errors, 46% of them were wearing corrective lenses, while more than half of them with uncorrected refractive error.

CONCLUSION: The prevalence of refractive errors in primary school children of Baghdad was 7%. Factors that were found to be associated with refractive errors in Baghdad primary school children were age, reading hours per day, computer usage, siblings' history of wearing glasses. .

Key words: Primary schools, refractive errors, myobia, hyperopia, astigmatism

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INTRODUCTION

Refractive errors are the fourth leading cause of blindness, and in many areas, they are the second cause of curable blindness, with cataract standing the first, and are one of the most common causes of visual impairment.[1] In light of its burden on the society and the remedy, refractive errors are one of the five priorities of the global initiative for elimination of avoidable blindness, Vision 2020, launched by the World Health Organization (WHO) and the International Agency for Prevention of Blindness.[2] In addition, several studies have shown that a considerable number of people with miscorrected vision can benefit from appropriate corrections. This issue is considerable in developed countries, especially among particular groups such as elderly people or minority groups.[3-7] Visual impairment has been reported to be associated with higher rates of morbidity and mortality; in particular, uncorrected refractive errors increase morbidity. [8–12]

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In normal eyes without accommodation, the parallel light is focused on the retina; emmetropia. Any optical departure from this condition is called a refractive error or ametropia.[13,14]

There are three types of refractive errors: *Hyperopia* which is defined as parallel rays of light come to focus posterior to the retina with the eye in a state of rest i.e. nonaccommodating, *Myopia* where parallel rays of light come to focus anterior to the retina, and *Astigmatism* where the refractive power of the various meridians of the eye differs.[13] A refractive error can be classified as spherical or cylindrical according to the type of the lens necessary to correct it.[14]

Causes of refractive error: Emmetropization is guided by genetics but is modified by environmental influences.[15] Parents with Myopia are more prone to have myopic offspring. Similarly, a child with high myopia is more likely to have myobic parents.[16] Sustained near work, accommodative variability, accommodative lag, decreased time spent outdoors, and parental cigarette smoking are all recognized as environmental aggravating factors.[17-20]

Correction of refractive error: Refractive errors can be easily corrected with glasses. It is estimated that 2.3 billion people worldwide have refractive errors. The majority of these could have their sight restored by spectacles, but only 1.8 billion people have access to eye examination and affordable correction. This leaves approximately 500 million people, mostly in developing countries and mainly children, with uncorrected error causing blindness and impaired vision.[21] Undetected or under corrected refractive error particularly myopia, is specially a problem in school children. Poor vision and the inability to read material written on the blackboard can have a serious impact on a child's participation and learning in class and this can adversely affect a child's education, occupation and socioeconomic status for life.[22]

In our country, researches that tackle the prevalence of refractive errors at primary school children and their associated factors are limited. This study designed to estimate the prevalence of refractive error among children from two primary schools in Al-Rusafa district in Baghdad. And to detect some factors that may be associated with refractive errors.

METHODS

Study design and settings: A cross-sectional study was carried out at two primary schools; Al-Knooz and Al-Bawasil primary schools, from the Directorate of Education of Al-Rusafa/2 in Baghdad from 15 February to 1 April 2009.

Ethical consideration: This study has been approved by the Iraqi Board for Medical Specialization and the Directorate of Education of Al-Rusafa/2. Aims of the study were explained to the managers and teachers of the primary schools, and children's parents and there verbal consents were taken before conducting the study.

Inclusion and exclusion criteria: All students from first to sixth class were included in this study. Students with eye infections, traumatic eye diseases, failed to provide their questionnaires during the day of screening, and those who were absent from school on the day of the examination were excluded from the study.

Data collection procedure: The sample size was 860 students, distributed between the primary schools. Two primary schools were selected conveniently. The authors collected the data through four-hour daily visits to the school according to a scheduled programme prepared for this purpose. Out of 860 students, 732 (85%) have responded by filling the questionnaire form. The respondents were 331 (45.2%) boys and 401 (54.8%) girls, aged 6 to 13 years.

Risk factors assessment: Questionnaires were distributed to parents or guardians of the children with the help of the teachers to obtain information about the student regarding basic demographic data such as age, gender, class, parents' occupation, family history of wearing glasses for any refractive error, hours of reading per day defined as ≤ 2 hours/day and > 2 hours/day, student performance, use of the computer and playing video games by the student defined as ≤6 hours/week or > 6 hours/week.

Refractive error measurement: Visual acuity assessment was done by an ophthalmological technician "subjective method". The students were examined in their respective classes. The screening was done in the following way: From 6-meter distance the students were shown the Snellens' E chart. The students were requested to indicate the direction of the E optotype either

by pointing with his or her finger, or by calling out the direction. The lowest line read successfully was assigned as the visual acuity for the eye undergoing testing. A line on the chart was accepted as being read if the direction of more than half the optotypes had been identified correctly. The right eye was tested first followed by the left eye, each time occluding the fellow eye. The child either indicated the direction correctly (eye sight good) or incorrectly (eye sight not good). In case of doubt, the eye sight was recorded as not good. Visual acuity equal to or less than 6/12 in one or both eyes was taken as a cut off point for refractive error in this study.[2]

Retinoscopy was used as a confirmatory test "objective method". Students who were suspected of having refractive errors, using a criterion of uncorrected visual acuity equal to or less than 6/12, were further evaluated using autorefraction and retinoscopy in the primary health centre with the help of an ophthalmological technician. In case of visual impairment in distant vision, estimation of the type and lens power by using trial frame lenses and retinoscopy. Students who wear spectacles were tested with and without their glasses. The presenting vision was measured with the student current distance refractive correction, if worn, for each eye in turn. Students with 6/12 visual acuity or less, in either eye were then retested for visual acuity in each eye, with their autorefraction result placed in a trial frame using trial lenses. This was performed to estimate the contribution of refractive error to these students' visual disabilities.[2]

Definition of variables: for sake of this study, *myopia* was defined as spherical equivalent refractive error of at least –0.50 D or more, *hyperopia* as spherical equivalent of at least +0.50 D or more and *astigmatism* as cylinder of at least –0.50 D or more.[13] Children were considered to have refractive error (ametropic) if one or both eyes were myopic, hyperopic or astigmatism and emmetropic if neither eye was myopic, hyperopic or astigmatism.[13]

Data management and statistical analysis: Data entry and analysis was carried out using the statistical package for social science (SPSS version 16) and EXCEL 2003 software Programs. Frequencies and statistical test like Chi-square was used as appropriate and p-value less than or equal to 0.05 were considered significant.

RESULTS

Prevalence of refractive error: The prevalence of refractive errors (ametropia) was 7%. The prevalence of myopia was 5.32%, hyperopia was 1.09%, and astigmatism was 0.68%, while the rest 92.91% were normal (emmetropia) as shown in table 1.

Types of refractive errors with age and gender: Table 2 shows that there is a statistically significant association between age and type of refractive errors. Although more girls were noted to have myopia and hyperopia, (51.9% and 11.5%), this finding was not statistically significant. Myopia was the most common type of refractive error, detected in 39 students (75%) of the total refractive error. Followed by hyperopia in 8 students (15.3%), then by astigmatism in 5 students (9.6%). The mean age for refractive errors among primary school children was 8.95±2S.D.years. This finding was not statistically significant. See table 2

Table 3 shows the effect of reading hours a day, student's age in years, gender, usage of computers and video games, and usage of glasses by the parents and siblings of the students on having refractive errors. Reading for more than two hours a day, being a girl, using computer for more than 6 hours a week, and using glasses by siblings are found to have statistically significant effect on development of refractive errors.

Table 1: Distribution of the sample by eye conditions in primary school children of Baghdad city.

Eye condition	No.	%
Emmetropia	680	92.91
Myopia	39	5.32
Hyperopia	8	1.09
Astigmatism	5	0.68
Total	732	100

Table 2: Association of age and gender on the types of refractive error.

		Myopia		Hyperopia		Astigmatism		Total	
		No.	%	No.	%	No.	%	No.	%
Age (Years)	≤9	10	19.3	5	9.6	4	7.7	19	36.6
	>9	29	55.7	3	5.7	1	1.9	33	63.4
		$\chi2 = 8.39$		DF = 2		p value = 0.01			
Gender	Male	12	23.1	2	3.8	3	5.8	17	32.7
	Female	27	51.9	6	11.5	2	3.8	35	67.2
		$\chi2 = 1.97$		DF =2		p value = 0.37			
Total		39	75	8	15.3	5	9.6	52	7

Table 3: Effect of some participants' criteria on the presence of refractive errors.

		No refractive error		Refractive Error		Total
Participants' Criteria		No.	%	No.	%	No.
Reading hours per a day	≤ 2 hrs /day	321	96.1	13	3.9	334
	> 2 hrs/day	359	90.2	39	9.8	398
		$\chi 2 = 13.8149$	DF = 1	p value = 0.002		
Students' age in years	≤9	426	95.7	19	4.3	445
	>9	254	88.5	33	11.5	287
		$\chi 2 = 3.546$	DF = 1	p value = 0.059		
Gender	Male	314	94.8	17	5.2	331
	Female	366	91.2	35	8.3	401
		$\chi 2 = 9.601$	DF = 1	p value = 0.001		
Computer usage	≤6 hrs/wk	457	94.6	26	5.4	483
	>6 hrs/wk	223	89.5	26	10.5	249
		$\chi^2 = 6.371$	DF = 1	p value = 0.01		
Parents on glasses	Yes	457	91.7	41	8.3	498
	No	223	95.2	11	4.8	234
		$\chi^2 = 3.01$	DF = 1	p value = 0.08		
Siblings on glasses	Yes	289	96.9	9	3.1	298
	No	391	90	43	10	434
		$\chi^2 = 12.70$	DF= 1	p value = 0.0003		
Total		680		52		

(p value = 0.002, 0.001, 0.01, 0.0003 respectively)

DISCUSSION

Primary school education is the most crucial educational years since children acquire the most learning during this particular period. Thus, good visual acuity in children is important to ensure optimum educational potential. Our study has certain limitations; it is a school-based study and of a convenient sample. Population-based studies of refractive errors are better than school-based design of this study, because many school aged children may not attend school due to their refractive error or due to other social and economic reasons. This may affect the generalizability of the results.

In the current study the prevalence of refractive error among students of two primary school children in Baghdad was 7%, which is lower than the 26.73 % reported by a study conducted on students' college in Iraq,[23] Kathmandu in Nepal[26] (8.1%), Chile[27] (8.8%) and Shunyi in China[28] (11.3%). On the other hand it is higher than that reported in New Delhi[24] (5.2%) and Mechi Zone in Nepal[25] (2.6%).

The prevalence of myopia was 5.32%, it is similar to that reported in Malay from East Malaysia[29] (5.4%), but higher than that reported in Kathmandu in Nepal[26] (4.3%), New Delhi[24] (4.9-10.8) %, Chile[27] (3.4-18.7)%, and Mechi Zone in Nepal[25] (1.2%). Our result is lower than that reported in Australia[30] (8.4%), Hong Kong[31] (36.7%), Singapore[32] (36.3%) and Shunyi in China[28] (36-43) %.

The prevalence of hyperopia was 1.09 %. It comparable to that reported in Kathmandu in Nepal,[26] Mechi Zone, Nepal [25], Singapore [32] and East Malaysia[29] (1.3%, 1.4%, 1.7% and 1.0% respectively). On the other hand it is lower than that reported in Hong Kong,[31] Australia,[30] Chile[27] and Shunyi in China[28] (4.0%, 6.2%, 7-22% and 10% respectively).

The prevalence of astigmatism was 0.68%, the finding is less than that found in Mechi Zone in Nepal[25] (2.2%), China[28] (15%) and Chile[27] (19%), but similar to that found in Malay (East Malaysia)[29] (0.6%). The wide variations of the reported prevalence rates of refractive errors could be attributed to several factors. These may include the definition of study populations, definition of myopia, hyperopia and astigmatism, methods of measurement and the types of environmen-

tal factors considered. However, as only students with visual acuity of ≤ 6/12 were picked, a proportion of students with a low degree of refractive error may have gone undetected. Hyperopic children may compensate by accommodation while some myopic children may squint, masking the actual level of poor visual acuity.[29]

Refractive errors were significantly associated with age group of children (p=0.002). This finding is consistent with that from Dezful in Iran; a study has stated that myopia and hyperopia were correlated with age (p=0.030) and (p<0.001) respectively.[33] The finding is also agree with that of India, where myopia and astigmatism were found to be significantly associated with increase in age, while hyperopia was not associated with age.[34] Other studies in Australia,[30] Malay (East Malaysia)[29] and Gombak District from Malaysia,[35] revealed a positive association between refractive errors and age group. Whereas, other researchers from Karachi[36] and Kolkata[37] found no association between refractive error and age in children. The association between age and the prevalence of refractive error might be explained by other environmental confounders, such as higher school level and greater hours of near-work per day (more than 2 hours per day).

In the current study, refractive error was not associated with sex. This finding disagrees with that reported previously in Iraq,[23] Nigeria,[38] Cairo,[39] Gombak District in Malaysia,[35] India (Haryana),[34] Southern China[40] and Karachi.[36] It is similar to that reported in Malay (East Malaysia),[29] Kolkata[37] and Australia.[30]

We found an association between development of refractive error, computer usage and reading hours per a day. This finding is similar to that in East Malaysia (Malay).[29] A Cross-sectional study which was conducted in Singapore to study the factors related to progression of myopia in Singaporean children has also found a positive association between refractive error development and near-work activity such as reading and writing.[41]

CONCLUSION

The prevalence of refractive errors among a sample of primary school children in Baghdad was 7%; myopia was the most common type with a prevalence of 5.32%, then hyperopia 1.09% and finally astigmatism 0.68%. The prevalence of uncorrected refractive error was 54%.

Factors that were found to be associated with refractive errors in Baghdad primary school children were age, reading hours per day, computer usage, siblings' history of wearing glasses. Sex and parents' history of wearing glasses were not significantly associated with refractive errors.

REFERENCES

1. Dandona R, Dandona L. Refractive error blindness. ***Bull World Health Organ*** 2001; 79:237–43.
2. World Health Organization. Vision 2020. Global initiative for the Elimination of avoidable blindness, Fact Sheet No 1213. Geneva: WHO,2000.
3. Thiagalingam S, Cumming RG, Mitchell P. Factors associated with under corrected refractive errors in an older population: the Blue Mountains Eye Study. ***Br J Ophthalmol*** 2002; 86:1041–5.
4. Munoz B, West SK, Rodriguez J, et al. Blindness, visual impairment and the problem of uncorrected refractive error in a Mexican American population: Proyecto VER. ***Invest Ophthalmol Vis Sci*** 2002; 43:608–14.
5. Liou H, Mccarty CA, Jin CL, et al. Prevalence and predictors of under corrected refractive errors in the Victorian population. ***Am J Ophthalmol*** 1999; 127:590–6.
6. Attebo K, Mitchell P, Smith W. Visual acuity and the causes of visual loss in Australia. ***Ophthalmology*** 1996; 103:357–64.
7. Tielsch JM, Sommer A, Witt K, Katz J, Royall RM. Blindness and visual impairment in an American urban population: the Baltimore Eye Survey. ***Archives of Ophthalmology***. 1990 Feb 1;108(2):286-90.
8. Klein BE, Klein R, Lee KE, Cruickshanks KJ. Performance-based and self-assessed measures of visual function as related to history of falls, hip fractures, and measured gait time: the Beaver Dam Eye Study. ***Ophthalmology***. 1998 Jan 1;105(1):160-4.
9. Ivers RQ, Norton R, Cumming RG, Butler M, Campbell AJ. Visual impairment and hip fracture. ***American journal of epidemiology***. 2000 Oct 1;152(7):633-9.
10. Wang JJ, Mitchell P, Simpson JM, Cumming RG, Smith W. Visual impairment, age-related cataract, and mortality. ***Archives of Ophthalmology***. 2001 Aug 1;119(8):1186-90.
11. McCarty CA, Nanjan MB, Taylor HR. Vision impairment predicts 5 year mortality. ***British Journal of Ophthalmology***. 2001 Mar 1;85(3):322-6.
12. 12. Klein R, Klein BEK, Moss SE. Age related eye disease and survival. The Beaver Dam Eye Study. ***Arch Ophthalmol*** 1995; 113:333–9.
13. 13. Behraman R, Kligman R, jenson H, et al. Nelson Textbook of pediatrics, 17th edition, Philadelphia: W.B.Saunders Co 2004; 2086-2087.
14. 14. Holden B .A .Sulaiman S.lmock K.the challenge of providing spectacles in the developing world .comm. eye health 2000; 13: 9-10.
15. 15. Harvey EM, Dobson V, Miller JM. Prevalence of high astigmatism, eyeglass wear, and poor visual acuity among Native American grade school children. Optom Vis Sci 2006; 83:206–12.
16. Gwiazda J, Hyman L, Dong LM, Everett D, Norton T, Kurtz D, et

al. Comet Group. Factors associated with high myopia after 7 years of follow-up in the Correction of Myopia Evaluation Trial (COMET) Cohort. *Ophthalmic Epidemiol* 2007; 14:230–7.

17. Rose KA, Morgan IG, Ip J, Kifley A, Huynh S, Smith W, Mitchell P. Outdoor activity reduces the prevalence of myopia in children. *Ophthalmology*. 2008 Aug 1;115(8):1279-85.
18. Ip JM, Rose K, Morgan I, Burlutsky G, Mitchell P. Myopia and the urban environment: findings for a sample of 12-year old Australian school children. *Invest Ophthalmol Vis Sci* 2008; 49:3858-3863.
19. 19. Quinn GE, Shin CH, Maguire MG, Stone RA. Myopia and ambient lighting at night. *Nature* 1999; 399:113–4.
20. Stone RA, Wilson LB, Ying GS, Liu C, Criss JS, Orlow J, et al. Associations between childhood refraction and parental smoking. *Invest Ophthalmol Vis Sci* 2006; 47:4277–87.
21. Taylor H.R. Refractive errors: magnitude of need. *J Comm. Eye health* 2000; 13: 1-2.
22. Friendly DS. Development of vision in infants and young children. *Pediatric Clin North America* 1993; 40:693-703.
23. Mohamed J, Mohamed J. A thesis of clinico-epidemiological study of visual acuity among students of three colleges in AL-Mustansiriya University; 1991. [Unpublished]
24. AL-Nuaimi AA, Salama RE, Eljack I. E. Study of refractive errors among school children Doha. *World Family Medicine Journal*. 2010; 8(7):41–48.
25. Al Wadaani FA, Amin TT, Ali A, Khan AR. Prevalence and pattern of refractive errors among primary school children in Al Hassa, Saudi Arabia. *Glob J Health Sci* 2012; 5 (1):125-134.
26. Ostadi MH, Fotouhi A, Khabaz KM, Heravian SJ, Yekta AA. Prevalence and risk factors of refractive errors among schoolchildren in Mashhad, 2006-2007. *Iranian Journal of Ophthalmology* 2008;20(3): 3-9.
27. Nepal BP, Koirala S, Adhikary S. Ocular morbidity in school children in Kathmandu. *Br J Ophthalmol* 2002; 87:531-4.
28. Maul E, Barroso S, Munoz SR, Sperduto RD, Ellwein LB. Refractive Error study in children: results from La Florida, Chile. *Am J Ophthalmol* 2000; 129:445-54.
29. Zhao J, Pan X, Sui R, Munoz SR, Sperduto RD, Ellwein LB. Refractive error study in children: results from Shunyi district, China. *Am J Ophthalmol* 2000; 129:427-35.
30. Murthy GV, Gupta SK, Ellwein LB, Munoz SR, Pokharel GP, Sanga L,et al. Refractive error in children in an urban population in New Delhi. Invest Ophthalmol Vis Sci 2002; 43:623-31.
31. 31. Pokharel GP, Negrel AD, Munoz SR, Ellwein LB. Refractive error study in children: results from Mechi Zone, Nepal. *Am J Ophthalmol* 2000; 129:436-44.
32. Syaratul-Emma Hashim, Hui-Ken Tan, Wan-Hazabbah WH, Mohtar Ibrahim. Prevalence of Refractive Error in Malay Primary School Children in Suburban Area of Kota Bharu, Klantan, Malaysia. *Ann Acad Med Singapore* 2008; 37:940-6.
33. Khader YS, Batayha WQ, Abdul-Aziz SM, Al-Shiekh-Khalil MI. Prevalence and risk indicators of myopia among schoolchildren in Amman, Jordan. *East Mediterr Health J*. 2006 May-Jul; 12(3-4):434-9.
34. Junghans BM, Crewther SG. Little evidence for an epidemic of myopia in Australian primary school children over the last 30 years. *BMC Ophthalmol* 2005; 5:1, available on http://www.biomedcentral.com/1471-2415-5-1.
35. Fan DS, Lam DS, Lam RF, Lau JT, Chong KS, Cheung EY, et al. Prevalence, incidence and progression of myopia of school children in Hong Kong. *Invest Ophthalmol Vis Sci* 2004; 45:1071-5.
36. Saw SM, Goh PP, Cheng A, Shankar A, Tan DT, Ellwein LB. Ethnicity specific prevalences of refractive errors vary in Asian children in neighbouring Malaysia and Singapore. *Br J Ophthalmol* 2006; 1230-5.
37. Akbar Fotouhi, Hassan Hashemi, Mehdi Khabazkhoob and KazemMohammed. The prevalence of refractive errors among school children in Dezful, *Iran Br J Ophthalmo* 2007; 91:287-292.
38. Sharma Seema, BM Vashisht, Kalhan Meenakshi and Geol Manish. Magnitude of Refractive Errors among school children in a rural block of Haryana. *The Internet Journal of Epidemiology* 2009; 6(2):1540-2614.
39. Goh PP, Abqariyah Y, Pokharel GP, Ellwein LB. Refractive error and visual impairment in school-age children in Gombak District, Malaysia. *Ophthalmology* 2005; 112:678-85.
40. Haseeb Alam, M. Irfanullah Siddiqui, Syed Imtiaz Ahmed Jafri, Abdul Sattar Khan, Syed Ishtiaq Ahmed, Mohammad Jafar. Prevalence of refractive error in school children of Karachi. *JPMA*. 2008; 58:322.
41. Angshuman Das, Himadri Dutta, Gautam Bhaduri, Ajay De Sarkar Sarkar, Manas Bannerjee. A Study on Refractive Errors among School Children in Kolkata. *J Indian Med Assoc*. 2007; 105-69.
42. Faderin MA, Ajaiyeoba AI. Refractive errors in primary school children in Nigeria. *Nigerian Journal of Ophthalmology*. 2001;9(1):10-4.
43. El-Bayoumy BM, Saad A and Choudhury AH. Prevalence of refractive error and low vision among school children in Cairo. *Eastern Mediterranean health journal* 2007; 13(3):575-9.
44. He M, Zeng J, Liu Y, Xu J, Pokharel GP, Ellwein LB. Refractive error and visual in urban children in Southern China. *Invest Ophthalmol Vis Sci* 2004; 45:793-9.
45. Saw SM, Nieto FJ, Katz J, Schein OD, Levy B, Chew SJ. Factors related to the progression of myopia in Singaporean children. *Optom Vis Sci* 2000; 77:549-54.

Abbreviations: Statistical Package for the Social Sciences (**SPSS**), World Health Association (**WHO**)

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