Review Article

J Babol Univ Med Sci
Vol 20, Issu 9; Sep 2018. P:72-79

Prevalence of Amblyopia in Iranian Children

M. Mohammadi (MSc)[1], A.A. Vaisi Raiegan (PhD) [*1], R. Jalali (PhD)[1], S. Salimpour (MD)[2], A. Ghobadi (MSc)[1], P. Abbasi (PhD)[1]

1.Department of Nursing, School of Nursing and Midwifery, Kermanshah University of Medical Sciences, Kermanshah, I.R.Iran
2.Geriatric Ophthalmology Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, I.R.Iran

J Babol Univ Med Sci; 20(9); Sep 2018; PP: 72-9

Received: Apr 9th 2018, Revised: Jul 28th 2018, Accepted: Aug 1st 2018.

ABSTRACT

BACKGROUND AND OBJECTIVE: Amblyopia is one of the common eye diseases in children and the risk of vision loss is possible. Therefore, the aim of this study is systematic review and meta-analysis in order to align the studies on the prevalence of amblyopia in Iranian children.

METHODS: In this systematic review and meta-analysis relevant articles in scientific databases including SID, Science Direct and Medline (PubMed) and Google Scholar in March 1999- February 2017, using the Persian and English Keywords of Amblyopia, children, Iran.

FINDINGS: In the review of internal and external journals and search on SID databases 22 articles, PubMed 126 articles, Science Direct 112 articles and 116 Google Scholar search engines were obtained. Then the articles that had the initial conditions for entry into the study were 162 cases based on preliminary studies, with the elimination of 214 repetitive articles. Finally, removing 120 articles unrelated to the topic of the study and removing 24 articles in the secondary studies ultimately 18 papers entered the meta-analysis process. The overall Prevalence of amblyopia in Iranian children was 5.4 % (Cl-95%: 3.1%-9.1%).

CONCLUSION: According to the results of this study, the prevalence of amblyopia in Iranian children is high.

KEY WORDS: *Prevalence, Amblyopia, Children, Iran, Meta-Analysis.*

Please cite this article as follows:

Mohammadi M, Vaisi Raiegan AA, Jalali R, Salimpour S, Ghobadi A, Abbasi P. Prevalence of amblyopia in Iranian children. J Babol Univ Med Sci. 2018;20(9):72-9.

[*]**Corresponding Author: AA. Vaisi Raiegan (PhD)**

Address: Department of Nursing, School of Nursing and Midwifery, Kermanshah University of Medical Sciences, Kermanshah, I.R.Iran

Tel: +98 83 34274618

E-mail: Visi_akbar@yahoo.com

Introduction

Amblyopia (eye laziness) is the reduction of visual acuity unilaterally or bilaterally without a physical cause or specific pathological factors, which is defined as an acquired defect in vision due to an abnormal vision experience in childhood (1). This disease is a form of abnormal vision development that reduces the best corrected rhythm of the Snellen chart to less than 6.9 (30/20) in one eye or to the difference of more than two rows of the Snellen chart between the two eyes without symptoms (1, 2).

Amblyopia itself does not change the appearance of ophthalmic structures, but it is almost always associated with conditions that are evident during the physical examination, and these situations are responsible for the known abnormal experiences (2), the vision system is sensitive to unusual visual experiences during a limited period, and only during the infancy and childhood, and in the case of humans this period usually lasts from birth to the end of the first decade of life (3). Many cases of childhood ocular abnormalities may be responsible for the abnormal vision of the amblyopia that arises. Usually physicians examine ambulance subjects with obvious causes such as strabismus, anisometropia, isometropia, due to abnormalities and intraocular opacities (4).

It is estimated that 2 to 5 percent of children and adolescents in most societies suffer from this problem (1, 3), which, however, According to various definitions and criteria for determining amblyopia, this rate varies from (0.2 to 4.3%) in preschool to (0.8 to 4.6%) in the elementary school (5,6). The prevalence and incidence of ambulatory disease in different countries varies, in Iran, and studies have been reported varying degrees. In a study by Hamidi et al. (7) in Bojnourd, the prevalence of amblyopia was 11.8%, in the study of Ostadi Moghaddam et al. (8) in Mashhad, the prevalence of amblyopia was 1.9%, and in Owji et al. (9) in Fasa, a prevalence of amblyopia were reported14.2%. Various factors such as selected population, diagnostic criteria including selective visual acuity and screening methods affect the rate of prevalence (6-9).

In order to implement the primary health care plan for the eye, it is important to study and accurately determine the incidence of amblyopia and the causes of visual impairment in the pediatric population. Since in Iran and in different regions, various studies and inconsistencies prevalence, were reported for prevalence of amblyopia. In general, the prevalence of amblyopia in children in the country is not clear, therefore, the aim of this study is to systematically review and Meta-analyzes of the prevalence of amblyopia in Iranian children in order to increase precautionary and control proceedings.

Methods

In this study, the systematic and meta-analysis of published articles in internal and external journals at SID, Medline (PubMed) and Science Direct and Google Scholar databases in the period from March 1999 to March 2012 using Persian Keywords laziness, amblyopia, children, Iran, and English words equivalent of them was collected (Amblyopia, children, Iran), and then all articles related to amblyopia prevalence in Iranian children in different parts of Iran, including Persian and English articles based on cross-sectional studies, were selected and listed. Review articles, interventional, cohesive, case-control, and articles that were about other eye problems as well as amblyopia risk factors were removed from the list.

Then, a checklist of selected articles including the name of the researcher, the title of the article, the year and place of the study, the number of samples and the amblyopia prevalence in the children examined in terms of the four steps of PRISMA including the identification of the articles, initial screening, eligibility, and eventually the articles entered into the study was prepared (Fig 1). The review of the articles was done using Comprehensive Meta-analysis (version 3) and Egger Test, and $p<0.05$ was considered significant.

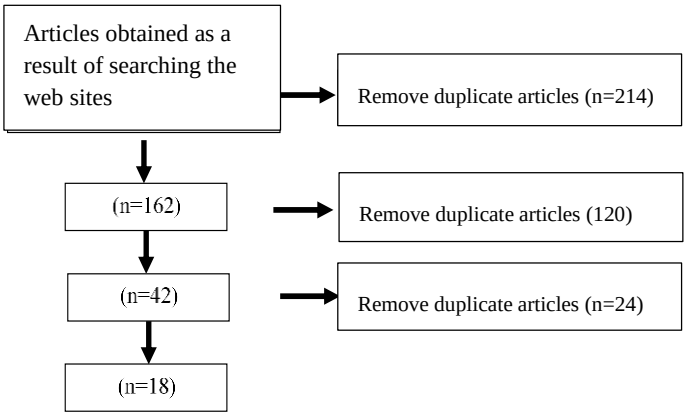

Figure 1. Flowcharts for inclusion stages of studies to systematic and meta-analysis review according to PRISMA

Results

Based on the findings of the studies on amblyopia prevalence in Iranian children, 22 articles from the SID

database, 126 articles from Medline (PubMed), 112 articles from Science direct, and 116 articles from Google Scholar search engines were obtained. The articles that had the initial conditions for entering the study were 162 articles, based on preliminary studies, with the elimination of 214 repetitive articles. Finally, removing 120 articles unrelated to the topic of study and removing 24 articles in secondary studies ultimately, Finally, 18 articles entered the meta-analysis process (Fig 1). The information of these articles according to the name of the researcher, the title of the article, the year and place of the study, the number of samples and the amblyopia prevalence were entered in Table 1. Accordingly, the total number of participants in the study was 143854 patients aged 6 to 19 years. The heterogeneity of the studies was evaluated using I ^ 2 test, which according to its results (99% = I ^ 2) and the high heterogeneity of the studies entered into the study, the random effects model was used to combine the results of studies together.

Table 1. characteristics of studies entered to the study

Row	Author (Ref)	Publication year	Region	Age	Sample size	Prevalence
1	Hamidi (7)	2014	Bojnourd	3-6	587	11.8
2	Ostadi Moghaddam(8)	2008	Mashhad	13.5±3.2	2137	1.9
3	Owji (9)	2004	Fasa	-	196	14.2
4	Salehi(10)	1999	Shahrkord	-	2000	2.5
5	Sharifi(11)	2004	uromia	6-10	2187	41.7
6	Bamdad(12)	2017	Boyer ahmad	-	95	25.2
7	Heshmat(13)	2007	uromia	6-10	2955	41.8
8	Rajavi(14)	2015	Tehran	9.4±1.7	2410	2.3
9	Khataminia(15)	2000	Khozestan	3-6	20858	1.03
10	Hashemi(16)	2014	Iran (seven town investigated)	7	3547	1.8
11	Eshraghi(17)	2014	Tehran	After one years old	431	9.5
12	Yekta (18)	2010	Shiraz	12.5	2638	2.2
13	Khandekar(19)	2009	Iran	3-6	90319	12.3
14	Faghihi(20)	2011	Mashhad	13.2±3.2	2150	1.9
15	Rajavi(21)	2015	Tehran	7-12	2410	2.3
16	Moradabadi(22)	2014	Bandar Abbas	-	4418	7.6
17	Yekta(23)	2016	Mashhad	4-6	3701	0.4
18	Jamali(24)	2009	Shahroud	6	815	6.3

The probability of bias in the publication of the results by the funnel graph (Fig 2) shows that the publication bias was not statistically significant, then, according to the high sample size entered into the study, the publication bias by Begg and Manzumdar tests with a significant level of 1/0 was also considered that this test did not show significant bias (p=0.733). According to the final analysis, the prevalence of amblyopia in children of Iran (4.5%) (95.1%-1.3-1.9%) was the highest prevalence of amblyopia in Urmia children with (41.8%) The lowest prevalence of amblyopia was observed in Mashhad children with (0.4%) (CI-95%=0.3-0.7%) (24%) (Fig 3). To investigate the effects of potentially effective factors on heterogeneity in the prevalence of amblyopia in Iranian children, meta-regression was used for two factors of sample size and year of study (Fig 4,5). Based on these figures, with increasing sample size and years of research in the studies on the prevalence of amblyopia in children are reduced, which was statistically significant (p<0.05).

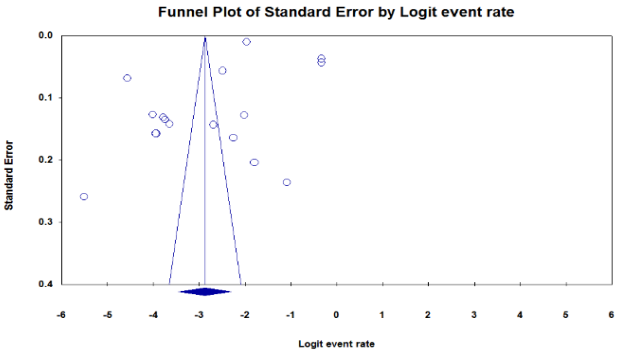

Figure 2. Funnel Plot for results of the prevalence of amblyopia in Iranian children

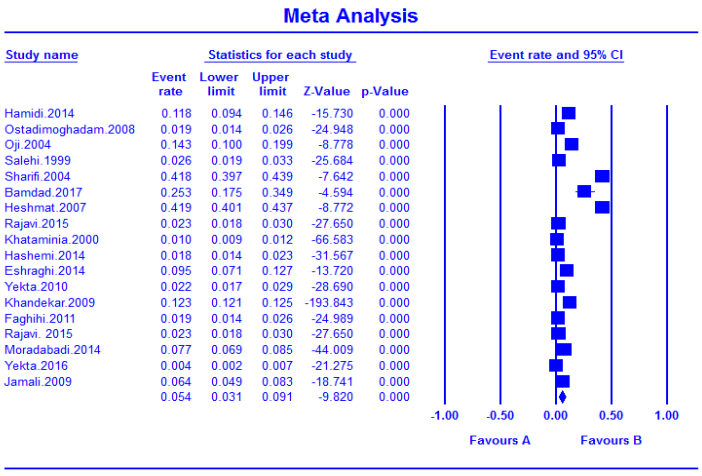

Figure 3. Amblyopia prevalence in Iranian children based on randomized model

The prevalence of amblyopia in Iranian children is based on the random effects model in which the black square is the prevalence and the length of the line segment which square is located on is the 95% confidence interval for each study. The rhomboid symptom rates the prevalence across the country for the entire studies.

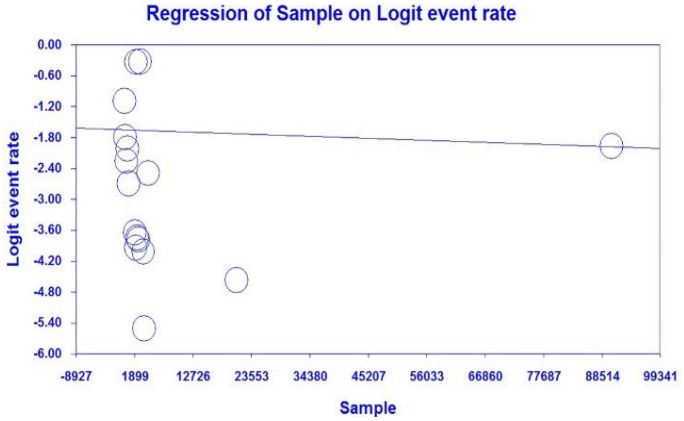

Figure 4. Meta-regression of the frequency of amblyopia in Iranian children by sample size

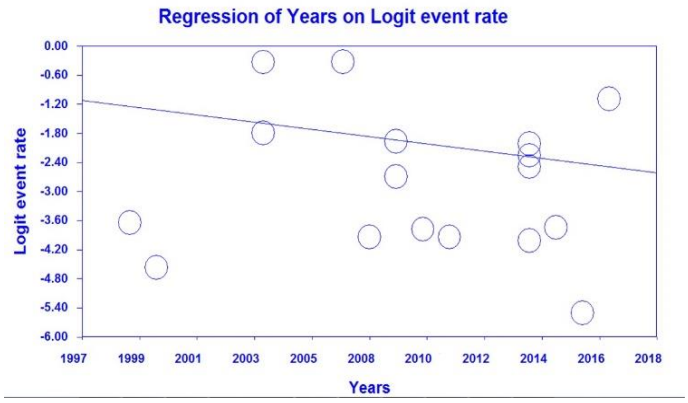

Figure 5. Meta-regression chart of the frequency of amblyopia prevalence in Iranian children by year of study

Discussion

In the present study, the overall prevalence of amblyopia was found in Iranian children (4.5%), amblyopia is an acquired impairment in one or both eyes that results from an abnormal vision experience in childhood (25), amblyopia is only created in the period of the development of the nervous system of vision. This period is referred to as a sensitive period in various studies which extends from birth until the age of 7 years, the sensitivity of the visual system is not the same in this period, and the most sensitivity is below the age of 36 months, and this sensitivity gradually decreases from this age (26, 27).

According to previous studies, the highest prevalence of amblyopia in children of Urmia with (41.8%) (13) and the lowest prevalence of amblyopia in children of Mashhad with (0.4%) (23) and the obtained results of meta regression with the increase in years of research indicates that the prevalence of amblyopia in children decreases so that over the past two decades from years 2008 to 2017, with the efforts to screen the disease in children, the prevalence of amblyopia has decreased over the past years.

The prevalence of amblyopia in different parts of the world shows a different prevalence, in a study in the United Kingdom (28), the incidence of amblyopia in preschool children (5%), in a study in Denmark (29), an equivalent prevalence (1.1%) and reported in Belgium (3.5%) (30). In other studies, the prevalence of amblyopia in the Western countries (1.2 to 5.6%) (31-33), while another study has reported this prevalence in Western countries (2-4%) (10). The rest of the world, including in Oman (34), India (35), Colombia (36), Denmark (29), Madagascar (37), and Saudi Arabia (38) between (0.92% to 1.8%), in China 1.9% has been reported (39).

In various studies, the most common cause of amblyopia in children is attributed to refractive errors (1-4), although some of its causes are the main cause of strabismus (1), other studies report that amblyopia in children due to being asymptomatic, except for the causes of strabismus, its diagnosis will be entirely coincidental, unless the conditions for screening have been processed and the cases have been detected. Studies indicate that Amblyopia is higher in the Asian race compared with European and North American countries due to anisometropy and its possible reason has been announced exotropia in the Asian countries (40). amblyopia created through anisometropia is usually detected later and is not usually associated with

apparent symptoms, and the visual acuity screening, especially at age 3-5 years is less than 5 to 6 years of age (9). This delay in diagnosis can disturb the treatment, because if the children with amblyopia do not receive treatment until the age of 5-6 years, they will not fully benefit from treatment (41).

Soleymani et al. in their study report that 55% of amblyopia in patients is due to anisometropia (42). Therefore, it is necessary in Iran, which is one of the important factors of amblyopia is anisometropy, more attention to screening and eye examinations before age 5 (41, 42), so the early diagnosis of amblyopia through screening, as the only method in identifying a disease from the beginning, has had satisfactory results and for conducting therapeutic interventions are recommended (43). One of the best screening methods that is very much considered is the use of the Snellen Chart, or a panel that embeds the E Latin letters and is randomly positioned in different directions and gets lowered from top to bottom (44-46). Using this method is cost-effective, it is very beneficial to implement on a large scale and to be able to use through school health educators. In the present study, the overall prevalence of amblyopia in children is reported to be 4.5%, which is high, although in different parts of the country, various prevalence and declines have also been reported, which can be indicative of the impact of screening programs in recent years on children aged 3 to 6 years in different parts of the country, but are still far from lower prevalence in the advanced countries, such as Sweden (47) and Australia (48), with a prevalence of 0.7, and so it is necessary that health policy makers pay more attention to use and the development of screening methods in the country at a younger age. In addition to interventions to reduce this prevalence, necessary educations to raise awareness among parents by the country's health practitioners should be provided.

Acknowledgment

Hereby, we would like to thank the officials and faculty members of the Faculty of Nursing and Midwifery, Kermanshah University of Medical Sciences, for their guidance in preparing this manuscript.

References

1.Cordonnier M, de Maertelaer V. Screening for amblyogenic factors in preschool children with the retinomax hand-held refractor: do positive children have amblyopia and is treatment efficacious? Strabismus. 2005; 13(1):27-32.

2.Newman DK, East MM. Prevalence of amblyopia among defaulters of preschool vision screening. Ophthalmic Epidemiol. 2000;7(1):67-71.

3.Greenberg AE, Mohney BG, Diehl NN, Burke JP. Incidence and types of childhood esotropia: a population-based study. Ophthalmology. 2007; 114(1):170-4.

4.Webber AL, Wood J. Amblyopia: prevalence, natural history, functional effects and treatment. Clin Exp Optom. 2005;88(6):365-75.

5.Quah BL, Tay MT, Chew SJ, Lee LK. A study of amblyopia in 18-19 year old males. Singapore Med J. 1991; 32(3):126-9.

6.Williamson TH, Andrews R, Dutton GN, Murray G, Graham N. Assessment of an inner city visual screening programme for preschool children. Br J Ophthalmol. 1995;79(1):1068-73.

7.Hamidi A, Jalalifar S, Yaghubi M, Akaberi A, Ghuparanlu M, Shojaei Sh. The prevalence of amblyopia in children aged 3 to 6 years old in bojnourd in 2013. J North Khorasan Univ Med Sci. 2014; 6(3): 565-72. [In Persian]

8.Ostadi Moghaddam H, Fotouhi A, KhabazKhoob M, Heravian J, Yekta A, Javaherforoushzadeh A. Prevalence of Amblyopia in School Children in Mashhad. Bina J Ophthalmol. 2008; 13(3): 289-94. [In Persian]

9.Owji N, Pasalar M, Fazel M, Nekoi F, Owji N. An evaluation of common visual disorders in primary school children in fasa city. Armaghane Danesh. 2005; 9(4):17-25.[In Persian]

10.Salehi A, lotfizade M. Prevalence of amblyopia in 2000 first year student of Shahrekord primary schools, 1997. J Shahrekord Univ Med Sci. 1999; 1(1):46-53. [In Persian]

11.Sharifi N, Heshmat R. Screening of amblyopia among 6-10 year-old children. Med J Tabriz Univ Med Sci. 2004; 38(62):32-5. [In Persian]

12.Bamdad Sh, Bolkheir AR, Khorrami MK. Common causes of visual impairment among sixth grade students in boyer ahmad city. Iran South Med J. 2017; 20(1): 104-14.[In Persian]

13.Heshmat R, Sharifi N, Salari lak SH, Aghdami N, Rahimi A. Sensitivity and specificity of screening test of snellen chart, applied for amblyopia among 6-10 year old children. J Urmia Univ Med Sci. 2007; 18(1): 373-8.[In Persian]

14.Rajavi ZH, Sabbaghi H, Shojaee A, Yaseri M, Moein HR, Akbariania S, et al. The Prevalence of Amblyopia among 7-12 year old Primary School Children of Tehran, Iran in 2013. Bina J Ophthalmol. 2015; 20(2): 117-30. [In Persian]

15.Khataminia GHR, Dezhagah H. Prevalence and causes of amblyopia in childhood mothers in Khuzestan province in 1997. Jundishapur Sci Med J. 2001; 29: 69-74. [In Persian]

16.Hashemi H, Yekta A, Jafarzadehpur E, Nirouzad F, Ostadimoghaddam H, Eshrati B, et al. The prevalence of amblyopia in 7-year-old schoolchildren in Iran. Strabismus. 2014; 22(4):152-7.

17.Eshraghi B, Akbari MR, Fard MA, Shahsanaei A, Assari R, Mirmohammadsadeghi A. The prevalence of amblyogenic factors in children with persistent congenital nasolacrimal duct obstruction. Graefes Arch Clin Exp Ophthalmol. 2014; 252(11):1847-52.

18.Yekta A, Fotouhi A, Hashemi H, Dehghani C, Ostadimoghaddam H, Heravian J, et al. The prevalence of anisometropia, amblyopia and strabismus in schoolchildren of Shiraz, Iran. Strabismus. 2010; 18(3):104-10.

19.Khandekar R, Parast N, Arabi A. Evaluation of 'vision screening' program for three to six-year-old children in the Republic of Iran. Indian J Ophthalmol. 2009; 57(6):437-42.

20. Faghihi M, Ostadimoghaddam H, Yekta AA. Amblyopia and strabismus in Iranian schoolchildren, Mashhad. Strabismus. 2011;19(4):147-52.

21.Rajavi Z, Sabbaghi H, Baghini AS, Yaseri M, Moein H, Akbarian S, et al. Prevalence of amblyopia and refractive errors among primary school children. J Ophthalmic Vis Res. 2015; 10(4):408-16.

22.Moradabadi AS, Ghanbarnejad A, Bani-Hashemi A, Pourshoorijeh LT, Tofighi M, Zamzam T, et al. Amblyopia screening in children in Bandar Abbas (Iran) during 2011-2012. Electron Physician. 2014; 6(3):906-11.
23.Yekta A, Hashemi H, Ostadimoghaddam H, Haghighi B, Shafiee H, Mehravaran S, et al. Strabismus and Near Point of Convergence and Amblyopia in 4-6 Year-Old Children. Strabismus. 2016; 24(3):113-9.
24.Jamali P, Fotouhi A, Hashemi H, Younesian M, Jafari A. Refractive errors and amblyopia in children entering school: Shahrood, Iran. Optom Vis Sci. 2009; 86(4):364-9.
25.Birnbaum MH, Koslowe K, Sanet R. Success in amblyopia therapy as a function of age: a literature survey. Am J Optom Physiol Opt. 1977; 54(5):269-75.
26.Vaegan, Taylor D. Critical period for deprivation amblyopia in children. Trans Ophthalmol Soc UK. 1979; 99(3): 432-9.
27.Billson FA, Fitzgerald BA, Provis JM. Visual deprivation in infancy and childhood: clinical aspects. Aust N Zealand J Ophthalmol. 1985; 13: 279-286.
28.Govindan M, Mohney BG, Diehl NN, Burke JP. Incidence and types of childhood exotropia: a population-based study. Ophthalmology. 2005;112(1): 104-8.
29.Jensen H, Goldschmidt E. Visual acuity in Danish school children. Acta Ophthalmol (Copenh). 1986; 64(2):187-91.
30.Evens L, Kuypers C. [Incidence of fonctional amblyopia in Belgium]. Bull Soc Belge Ophtalmol. 1967; 26(147):445-9.
31.Laatikainen L, Erkkilä H. Refractive errors and other ocular findings in school children. Acta Ophthalmol (Copenh). 1980;58(1):129-36
32.Oliver M, Nawratzki I. Screening of pre-school children for ocular anomalies. II. Amblyopia. Prevalence and therapeutic results at different ages. Br J Ophthalmol. 1971; 55(7):467-71.
33.Friedmann L, Biedner B, David R, Sachs U. Screening for refractive errors, strabismus and other ocular anomalies from ages 6 months to 3 years. J Pediatr Ophthalmol Strabismus. 1980; 17(5):315-7.
34.Lithander J. Prevalence of amblyopia with anisometropia or strabismus among schoolchildren in the Sultanate of Oman. Acta Ophthalmol Scand. 1998; 76(6):658-62.
35.Kalikivayi V, Naduvilath TJ, Bansal AK, Dandona L. Visual impairment in school children in southern India. Indian J Ophthalmol. 1997; 45(2):129-34.
36.Rodríguez MA, Castro González M. Visual health of schoolchildren in Medellin, Antioquia, Colombia. Bol Oficina Sanit Panam. 1995; 119(1):11-4.
37.Auzemery A, Andriamanamihaja R, Boisier P. A survey of the prevalence and causes of eye disorders in primary school children in Antananarivo. Sante. 1995; 5(3):163-6.
38.Abolfotouh MA, Badawi I, Faheem Y. Prevalence of amblyopia among schoolboys in Abha city, Asir Region, Saudi Arabia. J Egypt Public Health Assoc. 1994; 69(1-2):19-30.
39.He M, Zeng J, Liu Y, Xu J, Pokharel GP, Ellwein LB. Refractive error and visual impairment in urban children in southern china. Invest Ophthalmol Vis Sci. 2004;45(3):793-9.
40.Shaw DE, Fielder AR, Minshull C, Rosenthal AR. Amblyopia--factors influencing age of presentation. Lancet. 1988; 23; 2(8604):207-9.
41.Campbell LR, Charney E. Factors associated with delay in diagnosis of childhood amblyopia. Pediatrics. 1991; 87(2):178-85.
42.Soleymani A, Khafri S, Baheshmatt H. Evaluating the Results of Amblyopia Treatment iChildren Under 9 Years Using Full-Time Eye Closing with a Gradual Time Reduction (1370-1392). J Babol Univ Med Sci. 2016; 18 (11):29-34. [In Persian]
43.Appelboom TM. A history of visionscreening. J Sch Health. 1985; 55(4):138-141.
44.Magramm I. Amblyopia: Etiology, detection and treatment. Pediatr Rev. 1992; 13(1): 7-14.

45.Hohmann A, Haase W. Effective vision screening can decrease the rate of amblyopia. Ophthalmologe. 1993 Feb;90(1):2-5.

46.Gobin CV, Gobin MH. Photographic screening for amblyopia, strabismusand refraction. Bull Soc Belge Ophthalmol. 1992; 243: 37-44.

47.Gronlund MA, Andersson S, Aring E, Hård AL, Hellström A. Ophthalmological findings in a sample of Swedish children aged 4-15. Acta Ophthalmol Scand. 2006;84(2):169-76

48.Robaei D, Rose K, Ojaimi E, Kifley A, Huynh S, Mitchell P. Visual acuity and the Causes of visual loss in a population-based sample of 6-year-old Australian children. Ophthalmology. 2005; 112(7):1275-82.