

Prevalence of Amblyopia in Iranian Children

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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 % (CI-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.

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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 amblyopia 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 amblyopia 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 reported 14.2%. 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.

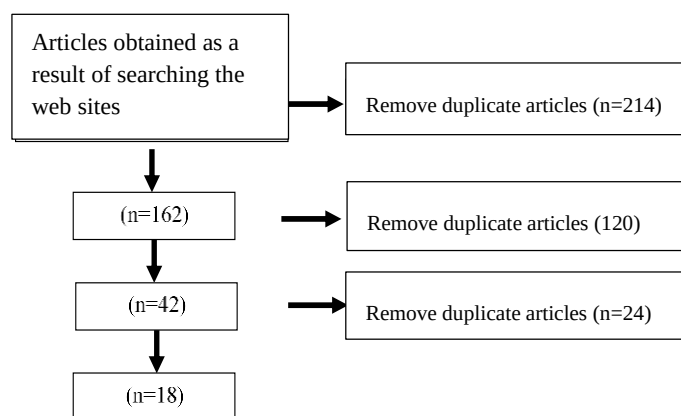


Figure 1. Flowcharts for inclusion stages of studies to systematic and meta-analysis review according to PRISMA

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	Shahrud	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 ($p<0.05$).

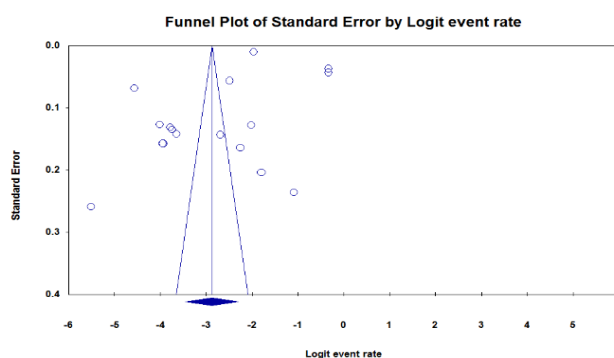


Figure 2. Funnel Plot for results of the prevalence of amblyopia in Iranian children

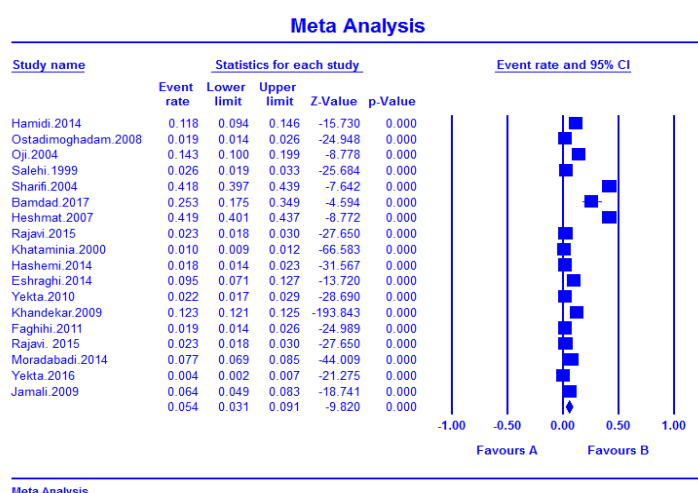


Figure 3. Amblyopia prevalence in Iranian children based on randomized model

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.

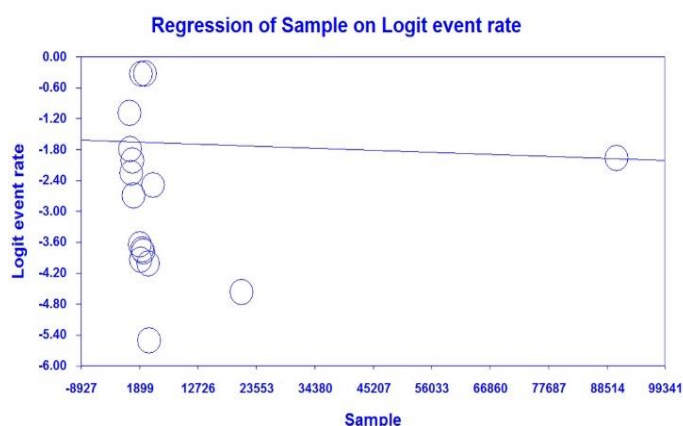


Figure 4. Meta-regression of the frequency of amblyopia in Iranian children by sample size

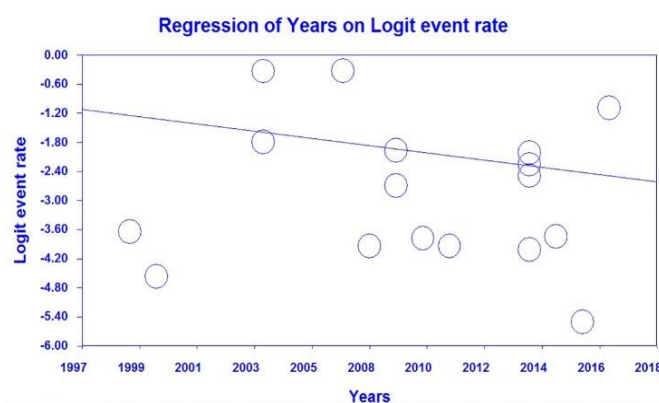


Figure 5. Meta-regression chart of the frequency of amblyopia prevalence in Iranian children by year of study

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 anisometropia 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 anisometropia, 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.

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