

Myopia in patients over 40 years of old: Prevalence and Risk factors

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Abstract

Background: In the Ardabil province, NorthWest of Iran, few studies have been conducted in the field of the risk factors of myopia. The aim of the present study is to detect the prevalence and risk factors of myopia in patients over 40 years of age who was referred to the eye clinic of Imam Reza hospital in Ardabil.

Material and Methods: Overall, 436 patients were included in the study, of which 150 patients met the exclusion criteria and were excluded from the study; 139 people had myopia and were included as the target group, and 147 people with normal eye examination were included as the control group. Data analysis was done in SPSS software version 23.

Results: 139 people out of 436 people had myopia (31.9%). There was statistically significant relationship between myopia and the level of education ($P=0.013$), near vision requiring jobs ($P=0.001$), mean hours of near vision working ($P=0.001$), and family history of myopia ($P=0.018$).

Conclusion: The present study showed that one-third of the eye problems of patients over 40 years of age in Ardabil city is myopia and that myopia has a significant direct relationship with the level of education, hours of reading, jobs requiring near vision, hours of doing activities requiring near vision, and a family history of myopia.

Keywords: *Myopia, Adults, Risk Factors.*

Introduction

Myopia can be considered one of the most common visual problems. According to the report of the World Health Organization (WHO) in 2007, more than 1.6 billion people around the world suffer from myopia, and this amount will increase to 2.5 billion people in 2020 (1). In a person suffering from myopia, in the state of rest, the matching image is formed in front of the retina, and this situation occurs when either the refractive power of the eye is high or the anterior-posterior length of the eye is increased. There may also be a combination of the two (2). There are different types of myopia: 1- Mild myopia, in which the eye has normal growth and its amount is usually less than 3 diopters. 2- Extreme myopia, which is accompanied by extra growth of the anterior-posterior length of the eye. Its value is more than 9 diopters and is associated with retinal and choroidal degenerative changes. 3- Moderate and high myopia, which are between 3 and 9 diopters. The prevalence of progressive myopia in women is 2.5 times that of men, but there is no difference between men and women in the prevalence of mild myopia (3). Maximum prevalence of myopia is 9-10 years old and 11-12 years old in girls and boys respectively. The younger the age of myopia, the more advancing the disease. In 75% of cases, the changes in refractive errors stop at the ages of 13-19 years, and the rest of the changes will continue until the ages of 20-30 years (4). The risk factors of myopia are continuous near work, family history, high social and economic status, female sex, Asian and white race, urbanization, diabetes, and esophoria. It has been determined that 20-40% of people under the age of 25 who had hyperopia or no refractive error but had continuous near work finally became myopic, while this rate was 10% in people who did not

have near work (2, 5-6). In the conducted studies, environmental factors such as near work, tallness, IQ, birth weight, economic and social status, physical activity and nutrition play a role in the etiology of myopia (7). It has been reported that the prevalence of myopia is related to the level of education and occupations that require near vision (8). Myopia in high intensity can be associated with other disorders such as a retinal tear, macular degeneration, cataract and glaucoma (4). Due to the very high prevalence of myopia, treatments incur high costs. The correction of myopia also imposes costs on society such as visits to the optometrist, contact lenses, prescription of glasses, and the cost of refractive surgery with its rare complication of blindness. So the effects of myopia on the general health of society should not be underestimated (9, 10). Considering the high prevalence of this disease and the lack of studies on this issue in Ardabil province, we decided to investigate the frequency and risk factors of myopia in patients over 40 years of age who were referred to Imam Reza Hospital in Ardabil.

Material and Method

Study population

In this cross-sectional Study, all subjects who were referred to the eye clinic of Imam Reza Hospital between October 2018 and October 2019 were included in the study if they agreed to participate in the study and met the inclusion and exclusion criteria. Inclusion criteria was age over 40 years and one and above one diopters of myopia. Exclusion criteria was history of eye trauma or any eye surgery, having cataracts or any other refractive errors. Sampling was based on a census. At first, 436 patients over 40 years of age who had visited the eye clinic of Imam

Reza Hospital in Ardabil for various chief complaints were included in the study, of which 150 patients were excluded from the study due to refractive errors other than myopia or suffering from other eye problems. 139 people had myopia one or above one diopter and were included as the study group, and 147 people without refractive errors and eye problems were included as the control group. Cycloplegic objective refraction was performed half an hour after instillation of cyclopentolate drop in the eyes twice five minutes apart and then the amount of refractive error was checked and recorded using a retinoscope and an auto refractometer (Canon Full Auto Ref-Keratometer RK-F2 Tokyo, Japan).

Data collection and analysis

Detailed information was collected through the designed checklists that contained demographic information and risk factors and were completed for all the studied cases by the respected optometrist, and finally, people were divided into 2 groups (myopic and healthy). The risk factors between these two groups were compared and analyzed through SPSS version 23 statistical software. After collecting the data, central indices (mean) and dispersion indices (standard deviation) were used to analyze the descriptive information in the form of tables and graphs. Chi-square, Fisher's exact, t-test, and binary logistic regression were used for data analysis. p values less than 0.05 were considered significant.

Results

In the present study, 436 patients over 40 years of age who had visited the eye clinic of Imam Reza Hospital in Ardabil for various chief complaints were included in the study, of which 150 patients had refractive errors other than myopia or had other eye problems that were excluded from the study. 139 (31.9%) people had myopia of one or above one diopter and were included as the study group, and 147 people without refractive errors and eye problems were included as the control group. The comparison of the variables between two groups is shown in Tables 1 and 2. Between the incidence of myopia with gender ($P=0.876$), age group ($P=0.368$), place of residence ($P=0.556$), occupation ($P=0.136$), duration of study hours per day ($P=0.072$), income ($P=0.087$), underlying disease (diabetes, high blood pressure, heart disease and hyperlipidemia) ($P=0.180$), and history of drug use (metformin, losartan, atorvastatin and ferrous sulfate) ($P=0.113$) there was no significant relationship. Between the incidence of myopia with education level ($P=0.013$), occupations requiring near vision (any occupation requiring vision less than half a meter) ($P=0.001$), working hours requiring near vision ($P=0.001$) and Family history of myopia ($P=0.018$) had a statistically significant relationship. A binary logistic regression test was used to more closely evaluation of the relationship between the investigated variables with myopia and determine the risk ratio for each variable (Table 3).

Table 1: Distribution of the frequency of variables between groups

		Group (%n)		P- Valu e
		Myopia	Control	
Sex	Male	41.7)58(	40.8)60(	0.876
	Female	(58.3)81	(59.2)87	

	Total	139	147	
Age groups (years)	49-41	(41.7)58	(36.7)54	0.386
	59 -50	(38.1)53	(34.7)51	
	69- 60	(15.2)21	(19.7)29	
	79 - 70	(0 .5)7	(8.8)13	
	Total	139	147	
Address	City	(84.9)118	(82.3)121	0.556
	Village	(15.1)21	(17.7)26	
	Total	139	147	
Education	Illiterate	(4.3)6	(10.9)16	0.013
	Elementary-guidance	(35.97)50	(43.5)64	
	High school-diploma	(34.5)48	(32.7)48	
	university	(25.2)35	(12.9)19	
	Total	139	147	

Table 2 : Frequency distribution of the variables between myopia and control groups

		Group (%)n		P-Value
		Myopia	Control	
Job	Need for near vision	(23.7)33	(9.5)14	0.001
	No need for near vision	(76.3)106	90.5)133 (	
	Total	139	147	
Reading hours	No	(15.8)22	(25.2)37	0.072
	Less than 2	(50.4)70	(49.6)73	
	5 -2	(19.4)27	(18.4)27	
	Above 5	(14.4)20	(6.8)10	
	Total	139	147	
Monthly Income (dollars)	Less than 100	(45.3)63	(52.4)77	0.087
	300-100	(41)57	(41.5)61	
	Above 300	(13.7)19	(6.1)9	
	Total	139	147	
Underlying disease	Yes	(22.3)31	(29.3)43	0.180
	No	(77.7)108	70.7)104 (	
	Total	139	148	
History of drug use	Yes	(15.1)21	(22.4)33	0.113
	No	(84.9)118	77.6)144 (	
	Total	139	147	
	No	(54)75	68.7)101 (	0.018

Family history of myopia	Father or mother	(12.9)18	(8.8)13	
	Sister or brother	(24.5)34	(20.4)30	
	Both	(8.6)12	(2)3	
	Total	139	147	
Mean of near working (hours)		2.6±5.9	2.8±3.9	0.00}1

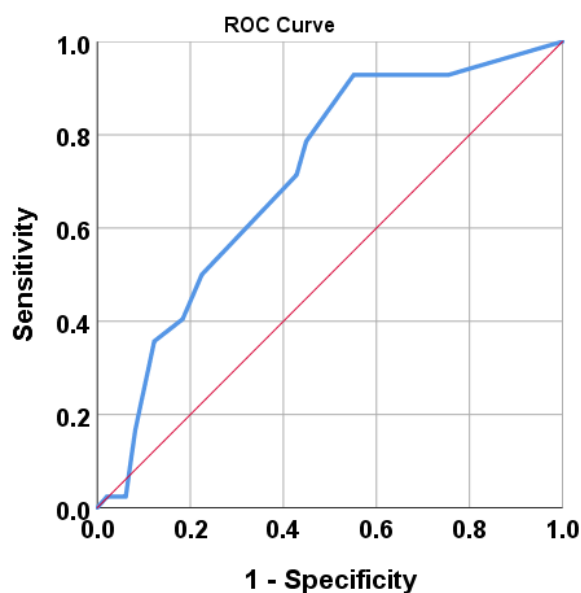
Table 3: Logistic regression fitting results to determine the factors affecting myopia

The dependent variable	Independent variable		Risk ratio	95 %confidence interval		P-Value
				lower limit	upper limit	
Suffering from myopia	sex	Man	Reference			
		Woman	0.963	0.601	1.543	0.876
	Age groups (years)	49-41	Reference			
		59 - 50	0.968	565 .0	1.650	0.904
		69-60	0.974	0.344	0.321	0.251
		79-70	0.501	0.186	1.350	0.172
	Residence	City	Reference			
		Village	0.828	0.442	1.553	0.557
	Education	Illiterate	Reference			
		Elementary	2.083	0.760	5.712	0.154
		Diploma	2.667	0.962	395 .7	0.059
		University	4.912	1.648	14.638	0.004
	Job	Housewife	Reference			
		Employee	2.140	0.753	6.082	0.153
		Driver	5.351	0.607	47.202	0.131
		Tailor	1.873	0.520	6.739	0.337
		Worker	0.584	0.203	1.682	0.319
		Retired	1.070	0.146	7.852	0.947
		Teacher	3.746	1.164	21.049	0.027
		Self-employment	0.841	432/0	1.635	0.609
		/Farmer rancher	0.238	049/0	1.148	0.074
		Unemployed	0.476	0.139	1.630	0.237
		Market	0.856	0.219	347/3	0.823
		Military	0.612	0.170	2.200	0.452
	Jobs requiring near vision	No	Reference			
		Yes	2.958	1.506	5.810	0.002
Suffering from myopia	Reading hours	No	Reference			
		Less than 2	1.613	0.866	3.002	0.198
		5 -2	682 .1	0.794	3.562	0.174
		Above 5	3.364	1.334	8.478	0.010

	Monthly Income (dollars)	Less than 100	Reference			
		300-100	1.142	0.699	1.866	0.596
		Above 300	2.582	0.092	6.099	0.061
	Underlying disease	Yes	Reference			
		No	1.440	844 .0	2.458	181 .0
	History of drug use	Yes	Reference			
		No	1.619	905 .0	2.898	105 .0
	Family history of myopia	No	Reference			
		Father or mother	731 .1	812 .0	691 .3	0.156
		Sister or brother	571 .1	889.0	2.774	0.120
		Both	5.385	1.469	19.731	0.011

The results showed that Compared to uneducated people, having a university education was associated with a significant increase in the risk of myopia (OR = 4.912 and P = 0.004). Compared to housewives, having a teaching job was associated with a significant increase in the risk of myopia (OR=3.746 and P=0.027). Compared to people whose jobs did not require near vision activity, having a job requiring near vision activity was associated with a significant increase in the risk of myopia (OR=2.958 and P=0.002). Compared to people who did not read daily, daily reading for more than 5 hours was associated with a significant increase in the risk of myopia (OR =3.364 and P=0.010). Compared to people who did not have a family history of myopia, having a history of myopia in a parent or sibling was associated with a significant increase in the risk of myopia (OR=5.385 and P=0.011). To determine the amount of risk related to working hours requiring near vision, ROC curve analysis, and then binary logistic regression were used (Figure 1).

Figure 1: ROC curve analysis to determine the relationship between working hours requiring near vision and myopia



The area under the ROC curve was 70.8% and the best cut-off point was 3.5 hours with 79% sensitivity and 55% specificity. Binary logistic regression analysis also showed that having an occupational activity requiring near vision for more than 3.5 hours per day was associated with a 4.5 times increase in the risk of myopia (OR=4.5, 95%CI: 1.780-11.376, Sig. =0.001).

Discussion

In addition to the problems that myopia causes in connection with the need for glasses and contact lenses; it can cause many complications such as glaucoma, retinal detachment, retinal pigmentary changes, myopic crescent and sometimes staphyloma, regional choroidal atrophy, macular atrophic changes, central vision reduction and posterior vitreous detachment (4). In recent years, many studies have investigated the prevalence and factors affecting myopia in the world, but most of these studies have focused on children and the data on the adult population is less (11). In the Ardabil region, few studies have been conducted in the field of factors related to the myopia, while the factors affecting vision disorders may be very different among different races and geographical areas (2). Therefore, the present study was conducted to investigate the frequency of myopia in patients over 40 years of age who were referred to Imam Reza hospital in Ardabil city. The frequency of myopia in the patients of the present study, was 31.9%. In this respect, our findings are consistent with studies conducted in India, Pakistan and China, which showed the prevalence of myopia in adults over 40 years of age to be 34.6%, 32.2%, and 31.5%, respectively. (12-14) The prevalence of myopia in the age group over 40 years has been widespread in other studies, so from lower values such as 16.8% in America, 16.8% in the Yi race of China, 17% in Australia, to higher values of 36.7% reported in France (14-19). The range of prevalence of myopia in studies conducted in other countries was between 16.8% and 51% (14-22), which in our study was almost in the middle of this range with a frequency of 31.9%. The findings of the present study showed that there is a direct relationship between increasing the level of education and suffering from myopia so compared to illiterate

people, the risk of myopia in people with elementary education is 2.08 times higher than in people with secondary education. Diploma was 2.66 times, and in people with university education, it was 4.91 times. The findings of the present study also showed that the increase in daily study hours is associated with an increase in the risk of myopia, so in our research, the daily study duration of more than 5 hours was associated with an increase of 3.4 times the risk of myopia. In line with our finding, in Yaqoubi et al.'s study in Birjand, a statistically significant direct correlation was observed between myopia and students' study hours (23). In a study in South Korea, like the present study, it was found that with the increase in education, the risk of myopia increases significantly, so that compared to illiterate people, having high school and university education increases by 52 times and 46 times the risk of myopia (18). All studies have not shown a direct and significant relationship between the level of education and myopia. Current study showed that there is a significant direct relationship between having a family history and myopia. Interestingly compared to the people without a family history, the risk of myopia in the case of having a family history in a sibling was 1.57, and in the case of having a family history in the father or mother, this risk was 1.73 times increased and if there is a family history in both sister/brother and father/mother, this risk is the highest and increases to 5.38 times. In this regard, our findings are consistent with the study conducted by Fotohi et al. in Tehran, which showed that having a family history of myopia is associated with a 5.2-fold increase in the risk of myopia (24). According to many evidences, it seems that myopia is more observed in children with myopic parents. It has been reported that the ratio of myopia in children with myopia in one parent was 18.2% and in children with myopia in both parents was

33% (25). A similar association between parental myopia and the prevalence of myopia after adjustment for environmental and demographic factors was observed in another population of children in Australia; in this study, it was also found that children with myopia of both parents had the most negative spherical equivalent refraction and the longest axial length (26).

A study in China showed the effect of parental myopia on the onset of myopia in 15-year-old children, so that compared to children with non-myopic parents, children whose parents were myopic were twice as likely to be myopic and children with both myopic parents were three times more likely to be myopic (27). In conclusion, the results of numerous studies show that myopia has high heritability, which shows the importance and necessity of studying the genetic perspective of this disease.

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