A Survey of Impaired Vision and the Common Etiology in the Rural Population of Sabzevar, Iran

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ABSTRACT

Background: Studying the epidemiology of eye diseases in different populations helps both the individuals and ultimately the whole population to develop normal vision. The present study aims at determining the prevalence rates of impaired vision and their common etiology in the rural population of Sabzevar, Iran.

Methods: A population-based cross-sectional study was carried out on a number of 2508 samples, aged 3 days to 92 years old, from 40 clusters in Sabzevar. The subjects received preliminary visual screenings consisting of visual acuity test, retinoscopy and anterior segment examinations at the local clinics. Those with impaired vision were referred to a more specialized eye clinic for further comprehensive eye examinations, including visual acuity test using Snelen E chart and refraction, slit-lamp biomicroscopy, applanation tonometery and dilated fundus examinations. Impaired vision was measured as a visual acuity of < 9/10 or as refractive errors of > 0.5 diopter in either or both eyes.

Results: The subjects ranged from 3 days to 92 years old with the average age of 27.28 years and a standard deviation of 20.32. The prevalence rate of impaired vision was 32% (95% confidence interval [CI], 30.0-34.0). According to the study, refractive errors were the most common etiology of vision disorders rating at 28.30% (95% CI, 27-30.55), followed by cataract 6.0% (95% CI, 5.08-6.95), amblyopia 2.1% (95% CI,1.48- 2.58), strabismus 1.51% (95% CI,1.03-1.99), glaucoma 0.67% (95% CI,0.41-0.94) and nystagmus 0.5%(95% CI,0.19-0.74).

Conclusions: Refractive errors, cataracts and amblyopia were the major causes of visual impairment in the rural population of Sabzevar. Recognizing common causes of visual impairment not only provides a chance for adequate treatment, but also it is necessary for the prevention of the disorders; thus, resulting in great personal, social, and economic benefits.

Keywords: Impaired Vision; prevalence; etiology; rural population; Sabzevar

Introduction

According to the world health organization (WHO) all over the world, there is an estimate of 45 million blind people and an additional 135 million individuals who are visually impaired [1]. People with impaired vision experience many limitations. For example, the legal limitations of restricted or revoked driver's licenses, limitations in job availability, and limitations in basic daily functions [2]. The effects of impaired vision can lead to the lack of confidence, of self-esteem, and of independence. Besides, people with impaired vision are at an increased risk of injury. Almost 50 per cent of legal blindness and 70 per cent of visual impairment are caused by either preventable or treatable conditions [3, 4]. In a study conducted by Fryback et al, [2] visual function accounted for 13 percent of the estimated quality of life that was related to health.

An exhaustive study of the frequency of vision disorders in children, 5-18 years of age, at a Lebanese school revealed that 70% of the ametropic groups were unaware of their visual defects, which could lead to the development of amblyopia. This is of importance, because the longer it takes to treat amblyopia, the lower the chance of complete recovery will be [5]. Prevalence of visual disorders in Chinese-school children showed that approximately 24% had unaided acuity of 6/12 or worse. 33% of students failed the vision-screening test and were referred for further examinations [6]. Therefore, in order to successfully handle the condition of vision impairment, one needs to consider: early detection of signs and symptoms, patient education regarding preventive strategies, and medical or surgical intervention for both established and emerging conditions.

Many studies on ocular diseases associated with impaired vision [2], as having been carried out in the developing countries, have focused on blindness and visual impairment among the elderly and children [1]. However, this population-based study has been done on the subjects from all age groups in the rural areas to determine the prevalence rates of visual impairments and their common etiologies.

Materials and Methods

Sabzevar, with the surface of 21000 square kilometers and the population of over 445000 people is the second largest city of the province of Razavi khorasan after Mashad, as the center of the province, located in the northeast of Iran. About 51.14% of the population live in the rural areas. Cluster sampling was used to select the study population. A sample size of 2508 was determined for this study.

Impaired Vision was defined as a visual acuity of <9/10 or refractive errors of >0.5 diopter in either or both eyes. To achieve validity and reliability, all the members of the teams of examiners were highly trained and used standard instruments. The data were collected through filling out the questionnaires and examination forms. However, the fact that

some of the subjects in the clusters were absent limited the performance. Most of the absentees included the servicemen and the students from other cities as well as the outdoor workers. It took the study two years (from March 2003 to March 2005) to be completed, gaining support from the local authorities like the Sabzevar governor, the villages' councilors, the traditional leaders, among the others. The teams of examiners consisted of: one optometrist, one ophthalmologist, one general practitioner (GP) and one health worker (HW) to conduct the clinical examinations in 40 temporary stations in the health houses or local clinics. The GPs were all fixed in the teams, except one case, whereas the HWs could be replaced. In brief, all the recruited individuals received preliminary screenings such as visual acuity tests, red reflex, retinoscopy, and anterior segment hand light examinations. Subjects with impaired vision were referred to a more specialized eye clinic for further comprehensive eye examinations including: visual acuity test using snelen E charts and refraction, red reflex test, slit-lamp biomicroscopy, applanation tonometery and dilated fundus examinations. Distance visual acuity was measured using a chart with tumbling-E optotypes. Red reflex test was performed with a direct ophthalmoscope (Keeler, UK). Ocular motility was evaluated through a cover test and refraction was performed with a streak retinoscope (Welch-Allyn, NY) at 50 cm, using a fixation target at 4 m. Principal causes of visual impairment were assigned to all the eyes with an impaired visual acuity of <18/20 (9/10). Such impairments included: refractive errors, amblyopia, cataract, glaucoma, strabismus, ptosis, nystagmus, pterygium, pinguecula, and others. Clinical examination data forms were reviewed for accuracy and completeness by a coordinator in charge before they were sent for computer data entry. Data ranges, frequency distributions, and consistency among related measurements were all checked. Statistical analyses were performed, using the computer software (SPSS software for windows, version 11). The tests used were Chi-square test and independent sample t-test. This study was approved by the research committee of Sabzevar School of Medical Sciences and performed in accordance with the tenets of the World Medical Association's Declaration of Helsinki. Being a descriptive type of study, and gaining consent on the part of the local policy makers, the subjects of study and the participants' parents or guardians (in case of children), there is not any legal and or ethical consequence.

Results

The subjects ranged from age 3 days to 92 years with an average age of 27.28 years and a standard deviation of ±20.32. The average age of 1014 males was calculated as 27.84 years ± 22.07 (SD), ranging from 3 days to 84 years, with a median of 18years. As for the 1494 (59.5%) females, the average age was 26.90 years ± 19.05 years (SD), ranging from 3 days to 92 years, with a median of 21 years old. However, an independent sample t-test showed that such a difference was not statistically significant. Demographic characteristics of participants are shown in Table 1.

Table 1. Demographic data regarding 2508 participants

Demographic value	Numerical value
Sex, n (%)	
M[1]	1014 (40.5)
F[2]	1494 (59.5)
Age (y*)	
Mean ± SD	27.28 ± 20.32
Range	0.03-92
Age group, n (%)	
≤4	197 (7.9)
5-15	739 (29.6)
16-30	661 (26.5)
31-45	395 (15.8)
46-70	423 (17)
71-92	79 (3.2)
Age (y)	
M	
Mean ± SD	27.84±22.07
Range	0.03-84
F	
Mean ± SD	26.90±19.05
Range	0.03-92
M / F ratio	1.47
Education (y), n (%)	
Illiterate	967(38.6)
1-5	847(33.8)
6-12	607(24.2)
Academic	13(0.5)
Unknown	74(3.0)
Occupation, n (%)	
≤6y	325 (13)
Housewife	764 (30.5)
Student	720 (28.7)
Farmer	404 (16)
Carpet maker	90 (3.6)
Jobless	39 (1.6)
Worker	24 (1)
Other	141(5.6)

1 - male; 2 - female; * - years old

Based on the findings, in terms of their visual acuity (VA), the subjects were classified into three groups: "normal", the individuals without any vision impairment in any of the eyes; "abnormal", those with some vision impairment in either or both eyes; and "undetermined", whose VA and refractive errors could not be precisely determined (see Table 2).

Table 2. Frequency of eye with VA impairment

Eye	OU		OD		OS	
Impairment	v	%	v	%	v	%
Normal	1575	62.5	27	1.1	24	1
abnormal	747	29.8	25	0.7	28	1.1
unknown	130	5.2	-	-	-	-
Total	2452	97.5	52	1.8	52	2.1

ν - frequency

803 of 2508 subjects were found to have visual disorder. The prevalence rate of impaired vision was 32% (95% confidence interval [CI], 30.0 -34.0). 496 (61.84%) of the individuals with impaired vision were females while another 306 (38.15%) were males. The prevalence rate of impaired vision for the females was calculated as 33.2% (95% CI, 30.80-35.57) and as 30.2% (95% CI, 27.34-32.99) for the males. Therefore, the prevalence rate of impaired vision was higher among females than males; but, the Chi-square test did not reveal a significant difference between the two sexes.

In terms of the factor of age, the findings on the prevalence rate of impaired vision suggest that those individuals at the age of 71-92 are at a higher risk and such a risk is linearly increased with an increase of the age (see Table 3).

Table 3. Prevalence of impaired vision according to age groups

Age (y)	Vision impairment, n (%)			Total, n (%)
	No	Unclear	Yes	
≤ 4	104(41.6)	121(48.4)	25(10)	250(100)
5-15	528(76.9)	7(1.0)	152(22.1)	687(100)
16-30	453(68.5)	2(0.3)	206(31.2)	661(100)
31-45	267(67.4)	0.0(0.0)	129(32.6)	396(100)
46-70	201(47.5)	0(0.0)	222(52.5)	423(100)
71-92	18(22.5)	0(0.0)	61(77.2)	79(100)
Total	1571(62.9)	130(5.2)	795(31.9)	2496(100)

Chi (2) = 1241.526 df = 10 p < 0.001

As for the degree of education, the findings show that the subjects with no academic degree and the illiterates gained the highest prevalence rate, rating at 46.6% and 37.7%, respectively. The Chi square was calculated as 233.228, p < 0.001 (Table 4).

Table 4. Prevalence of impaired vision according to education

Education level	Vision impairment, n (%)			Total, n (%)
	No	Unclear	Yes	
Illiterate	480(49.6)	122(12.6)	365(37.8)	250(100)
≤ 5	611(72.1)	3(0.4)	233(75.5)	687(100)
6-12	426(70.2)	2(0.3)	179(29.5)	661(100)
Academic	6(46.2)	1(7.7)	6(46.2)	396(100)
Unknown	53(71.6)	2(2.7)	19(25.7)	423(100)
Total	1576(62.8)	130(5.2)	795(31.9)	2496(100)

Chi (2) = 233.228 df = 8 p < 0.001

Table 5. Prevalence of impaired vision according to job

Job	Vision impairment, n (%)			Total, n (%)
	No	Unclear	Yes	
≤ 6y	158(48.9)	120(37.2)	45(13.9)	323(100)
Housewife	440(57.6)	1(0.1)	323(42.3)	764(100)
Farmer	238(58.8)	0(0.0)	167(41.2)	405(100)
Student	552(76.7)	4(0.6)	164(22.8)	720(100)
Carpet maker	65(72.2)	2(2.2)	23(25.6)	90(100)
Jobless	16(41.0)	0(0.0)	23(59.0)	39(100)
Worker	15(62.5)	0(0.0)	9(37.5)	24(100)
Other	92(65.2)	3(2.1)	46(32.6)	141(100)
Total	1576(62.9)	130(5.2)	800(31.9)	2508(100)

Chi (2) = 871.156 df = 14 p < 0.001

Table 6. Common Etiologies of vision impairment

Etiology	Frequency, n	Percent
Refractive errors	709	28.30
Cataract	151	6.00
Amblyopia	51	2.10
Strabismus	39	1.50
Glaucoma	17	0.67
Nystagmus	12	0.50

Table 7. Prevalence of vision impairment according to the type of refractive errors, amblyopia, strabismus, glaucoma, and nystagmus. tiologies of vision impairment

Etiology	Frequency, n	Percent
RE type[1]:		
Normal	1669	66.50
Hyp ou [2]	190	7.60
Myo ou [3]	102	4.10
Ast ou [4]	190	7.60
Hyas ou [5]	101	4.00
Myas ou [6]	62	2.50
Mixed	63	2.50
Unknown	131	5.20
Total	2508	100
Amblyopia:		
Normal	2456	97.90
Anisometropia	30	1.20
Deprivative	11	0.43
Strabismatic	8	0.31
Unknown	2	0.07
Total	2507	100
Strabismus:		
Normal	2469	98.50
ET [7]	8	0.32
XT [8]	30	1.19
Total	2507	100
Glaucoma:		
Normal	2488	99.30
OAG [9]	13	0.51
Cong G [10]	2	0.07
ACG [11]	1	0.04
Sec G [12]	1	0.04
Total	2505	100
Nystamus:		
Normal	2496	99.60
Jerk	12	0.40
Total	2508	100

1 - r*efractive error;* 2 *-hyperopia OU ; 3 - myopia OU ; 4 - astigmatism OU;* 5 - hyperopia astigmatism OU; 6 - myopia astigmatism OU; 7 - esotropia; 8 – exotropia; 9 - open angle glaucoma; 10 - congenital glaucoma ; 11 - angle closure glaucoma; 12 - secondary glaucoma

The factor of job was also involved, so much so that the obless, housewives and farmers gained 59%, 42.3% and 41.2% of the rate of prevalence, respectively. (See Table 5).

In respect to the etiology, refractive errors were found to be the most common disorder of impaired vision, with the occurrence percentage of 28.30% (95% CI, 26.54-30.07), followed respectively by cataract: 6.0% (95% CI, 5.08-6.95); amblyopia: 2% (95% CI,1.48- 2.58); strabismus: 1.51% (95% CI,1.03-1.99); glaucoma: 0.67% (95% CI,0.41-0.94) and nystagmus: 0.5%(95% CI,0.19-0.74) (See Table 6).

Prevalence of vision impairment according to the type of refractive errors, amblyopia, strabismus, glaucoma, and nystagmus are shown in Table 7.

Discussion

Due to the vital function of the eyes-vision--, studying the epidemiology of eye diseases in different populations helps with the preservation of healthy eyes and normal vision in individuals and ultimately in the whole population. Our first objective is, therefore, measuring the size of the problem of visual impairment [7]. Visual acuity is an important predictor for visual function and is used clinically to assess visual impairment [8]. In our study Impaired Vision is defined as a visual acuity of <9/10 or refractive errors of >0.5 diopter in either or both eyes. The other relevant studies, as carried out in other countries, have found some prevalence of visual impairment, rating from 5% to 50% [1]. In our study on VA, the rate of visual impairment was 32%. A similar study was done in India to determine the prevalence of blindness and vision impairment in a rural population of Southern India. That study was carried out in 50 clusters, including a number of 17200 subjects, aging 6 on as well as 5150 other subjects who aged 40 years or older. The study revealed that 4.3% of the latter presented a visual acuity of <3/60 while the level of VA for another 11.4% rated at <6/60. In our study, 2508 subjects, aging from 3 days to 92 years, from a rural population were examined for their vision impairment. The data were collected from 40 clusters. 803 subjects of the study were identified as having impaired vision, 412 (51.82%) of whom were older than 31 years old while those older than 45 years made up 283 (36%) of the population, having impaired vision. The cause of such differences could be attributed to the different definitions of visual impairment. The factor of age had a significant role in that the individuals of the age of 71-92 were found to have had higher rate of vision impairment, which is linearly increased as the age goes up. The Chi-square test revealed that there was a statistically significant relation between the rate of VA impairment and the increase of the age (p<0.001). Such a direct relationship more specifically may suggest that RE is a more dominant vision impairment among the middle-aged group of people while for the aged ones, cataract can be the case. Our study revealed that about one third of the subjects had impaired vision; however, its degree of severity can be different, suggesting that there is a need for calling attention to the issue of eye heath in rural populations. In a number of population-based studies, refractive errors have been identified as the leading cause of visual impairment in the developed world, and as a leading cause of blindness in the developing world, as well [9]. Also, refractive errors are considered as one of the most common causes of visual impairment around the world and as the second leading cause of treatable blindness [10]. This study revealed that refractive errors in the rural population of Sabzevar was also the most common cause of vision impairment; thus, conforming the world-wide findings. Although 496 (61.76%) of the individuals with impaired vision were females and only 307 (38.23%) were males, there was not any statistically significant relation between sex and VA impairment. A population-based study on vision and the causes of visual impairment and blindness in a well-defined urban area in Australia has revealed such a relation, too. In that study, a population of 49 years of age and older were found to be suffering from visual impairments the rate of which would increasingly go up with an increase of age. To put it more specifically, the group of patients who fell in the age category of 49 to 54 years old made up only 0.8% of the population while 42% of them aged 85 and above. Other findings suggest that visual impairment was significantly more frequent in females at all ages [11], which contrast those of our study about the relation between sex and visual impairment. However, they are in accordance with our findings on the relationship between age and visual impairments. In one study, age-related cataract was the most common potentially--reversible blinding disorder (72.0%) among the subjects [12]. In this regard, our study showed that cataract was the second cause of vision impairment, though. The relation between sex and cataract was found to be significant (M>F, p<0.001). Another study that was done on the residents of Tehran, aged 40 and above, found out that the overall prevalence rate of cataract (lens opacity with visual acuity of 20/40 or less in the absence of other causes of visual loss) was 12%, which rated 14.3% and 10.6% for males and females, respectively [13]. Our study showed that overall prevalence of cataract and lens opacity (including cataract surgery) was 6.0% (95% CI, 5.08-6.95). Another study, aiming to describe the prevalence of amblyopia and associated refractive errors among an adult Australian population revealed that unilateral amblyopia, with a prevalence rate of 3.06% (95% C.I. 2.59, 3.53), is a significant cause of unilateral reduced visual acuity in a population aged 40 years and older [14]. Our study showed that the overall prevalence rate of amblyopia was 2.1 % and anisometropic type of amblyopia was the highest type (1.20 %). Strabismus has been identified in 2% to 4% of the world's child population. Among the student population of Natal, Brazil it was rated as 2.9% [15]. Another study, carried out from November 1991 to October 1995 in the ophthalmologic unit of Douala General Hospital of Cameroon, found out 1.22% of all patients to be affected by strabismus [16]. According to the findings of the present study, such a rate was measured as 1.51 %. Therefore, it is slightly lower than the related findings of some studies and higher than those of the others and Exotropia with prevalence rate of 1.19 % was the highest type of strabismus. In conclusion, refractive errors, cataracts, and amblyopia remain the major causes of visual impairment in the rural population of Sabzevar; thus, calling for much more attention to be paid to them. It goes without saying that recognizing common causes of visual impairment brings about a lot of privileges. Not only does it provide a chance for adequate treatment, but also it is necessary for the prevention of the disorders, which will ultimately result in great personal, social, and economic benefits.

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