Prevalence and Causes of Blindness and Low Vision in Khuzestan Province, Iran

Mostafa Feghhi,[1] MD; Gholamreza Khataminia,[1] MD; Hossein Ziaei,[2] MD; Mahmood Latifi,[1] MSc

[1]Imam Khomeini Hospital, Jondishapour Medical University, Ahvaz, Iran
[2]Labbafinejad Medical Center, Shahid Beheshti University, MC, Tehran, Iran

Purpose: To determine the prevalence and causes of blindness and low vision in Khuzestan province, Iran in 2006.

Methods: This population-based cross-sectional study included residents of Khuzestan province during the year 2006. The study was designed according to World Health Organization (WHO) recommendations. Multi-stage proportionate clustered random sampling was employed. Sample size was calculated according to the latest national census and estimated rates of blindness. Initially data accumulation including general information and optometrists' findings was performed at local health centers, followed by referral of subjects with best-corrected visual acuity less than 20/60 for a comprehensive ophthalmologic examination. Categorization of blindness and low vision was based on WHO criteria and causes of visual impairment were classified according to the International Classification of Diseases version 10.

Results: Overall, 6,960 subjects with mean age of 24.7±18.3 years (range 3 months to 87 years) participated in the study (74.5% response rate). The prevalence of bilateral blindness and low vision in subjects older than 5 years was 1.3% and 2.6%, respectively; a significant positive trend was observed with increasing age (P<0.001) but no significant correlation was noted with sex and domicile. The leading causes of visual impairment included cataracts (39.0%), refractive errors (37.9%) and amblyopia (23.6%). A minority of cases were due to surgical complications (1.9%) and trauma (1.3%).

Conclusion: Blindness and low vision in Khuzestan province occurred at an average rate as compared to similar countries. It is estimated that there are 28,537 and 105,995 cases of bilateral blindness and low vision respectively in this province.

Key words: Blindness; Vision, Low; Prevalence

J Ophthalmic Vis Res 2009; 4 (1): 29-34.

Correspondence to: Mostafa Feghhi, MD. Associate Professor of Ophthalmology; Department of Ophthalmology, Imam Khomeini Hospital, Ahvaz, Iran; Tel: +98 611 3330074, Fax: +98 611 3332036; e-mail: mfeghhi563@hotmail.com

Received: August 12, 2008 **Accepted:** November 10, 2008

INTRODUCTION

According to the World Health Organization (WHO) estimates, every 5 seconds one person goes blind in the world. There were 40 to 45 million blind individuals worldwide in 2004 and about three times this figure suffered from visual impairment, most of whom reside in low-resource countries.[1,2] With the increasing trend and without effective interventions, it is estimated that the number of blind people worldwide will reach 76 million in 2020.[1] The prevalence of visual impairment varies from 0.3% to 5.6% for blindness and from 1.1% to 3%

for low vision in different communities.[3] Cataracts, glaucoma and age-related macular degeneration have been recognized as the leading causes of blindness worldwide.[1]

Surveys on the prevalence and causes of blindness and low vision have been initiated in many countries since 1995. Most such studies have been conducted in accordance with methods recommended by the WHO and based on nomenclature from the International Classification of Diseases. The Iranian Ministry of Health has accepted to comply with the Vision 2020 WHO program[1] as a health care priority in order to eliminate avoidable blindness. The prerequisite for such an undertaking is to acquire population-based vision and eye health data from different parts of our country. The aim of this study was to determine the prevalence and causes of visual impairment including blindness and low vision in urban and rural areas of Khuzestan, a southern province of Iran, in 2006.

METHODS

This population based cross-sectional study was performed in accordance with WHO recommendations.[4,5] Systematic multi-stage proportionate clustered random sampling was employed. Sample size was calculated based on an estimated population of 4,200,000 according to the 1996 national census,[6] an assumed prevalence of 1% for blindness (BCVA<20/400), design effect of 1.5 for cluster sampling, a cluster size of 15 households, and a mean household size of 4 individuals. These assumptions led to a sample size of 6,337 including 105 clusters and 1,584 households. A household was defined as a family group including the family head and other members who live together in a housing unit.

The number of clusters was selected based on the distribution of populations in urban and rural areas according to the above-mentioned national census. Cluster heads were randomly selected according to the home address of newborns referred for their initial vaccination to each urban or rural health center starting from the latest entries. A written invitation letter was sent to each selected household to attend the health center for an interview and examination. All households were informed of the study goals by the field worker via written and verbal explanations. Individuals who did not attend the health center at the specified date were re-invited one week later. Subjects who failed to make an appearance following the second invitation or those who refused to participate were considered as non-respondents.

Data was collected by project coworkers including a health center worker, an optometrist and an ophthalmologist. General information was obtained using the study questionnaire, which included domicile, age, sex and history of systemic or ocular disease, by the health center worker or the optometrist. Best-correct visual acuity (BCVA) was determined using standard Snellen charts at 6 m distance. Visual acuity in children less than 3 years was estimated according to monocular and binocular fixation patterns (central, steady and maintained or CSM). Participants were referred to ophthalmologists in the presence of BCVA $\leq$20/60 (abnormal CSM in subjects $\leq$3 years), squint, nystagmus or red reflex less than 10/10. Upon referral, the ophthalmologist reviewed the general information of the subject, re-evaluated BCVA and performed a comprehensive ophthalmologic examination to determine the cause(s) of visual impairment. Records of all visually impaired subjects were re-evaluated by the senior investigator. All observers including health center workers, optometrists and ophthalmologists were adequately trained for the study protocol and the project manager checked the performance of field workers regularly.

Blindness and low vision were classified according to the 10th revision of the International Classification of Diseases (ICD-10)[7] as follows: blindness was defined as BCVA less than 20/400, low vision as BCVA less than 20/60 but better than or equal to 20/400 and normal vision as BCVA of 20/60 or better.

Ethical Considerations

The study protocol was approved by the ethics committee of the Ophthalmic Research Center at Shahid Beheshti University, MC and the

ethics committee at Jondishapour Medical University. All participants were informed about the goals and methods of the project and provided written consent. All services were free of charge.

Data Analysis

Data was entered into a computerized data bank using SPSS software, version 12. Point prevalence estimates of blindness and low vision and 95% confidence intervals (CIs) were calculated. Chi-square test was used to compare frequency values with significance level set at 0.05. To further address visual impairment in children, data analysis was performed in 2 age strata, below and above 5 years of age.

RESULTS

Out of a total of 9,339 invited subjects, 6,960 individuals participated in the study (74.5% response rate). Mean age of enrolled subjects was 24.7±18.3 years (range 3 months to 87 years). Table 1 summarizes the distribution of the study population according to domicile, age and sex along with the prevalence of visual impairment in each subgroup. The distribution of the study subjects was not different from that of the 1996 census in terms of age and domicile. The prevalence of bilateral blindness and low vision in subjects older than 5 years of age was 1.3% and 2.6%, respectively. Table 2 details the different types of visual impairment. A significant positive trend (P<0.001) was observed for blindness and low vision with increasing age (Figures 1 and 2) but no significant correlation was noted with sex or domicile. Children less than 5 years of age were categorized for visual impairment separately, the prevalence and distribution of which are detailed in Table 3.

The most prevalent causes of visual impairment included cataracts (39.0%), refractive errors (37.9%) and amblyopia (23.6%) and the least common included surgical complications (1.9%) and ocular trauma (1.3%) (Table 4).

Table 1 Demographics of the study population and the prevalence of visual impairment

	No	%	Visual impairment (%)
Domicile			
Urban	4315	62.0	9.45
Rural	2645	38.0	9.3
Sex			
Female	4146	59.5	9.7
Male	2814	40.5	10.2
Age (Years)			
<5	818	11.8	8.7
5-9	743	10.7	0.8
10-19	1749	25.1	4.3
20-29	1352	19.4	6.4
30-39	877	12.6	6.3
40-49	606	8.7	11.4
50-59	420	6.0	31.7
60-69	204	3.0	46.5
≥70	191	2.7	51.8
Total	6960	100	9.9

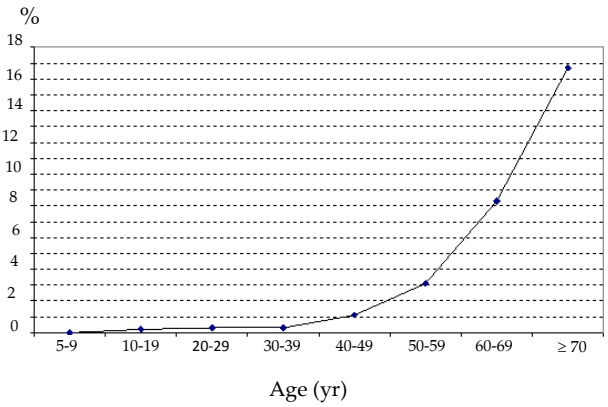

Figure 1 Age stratified prevalence of bilateral blindness.

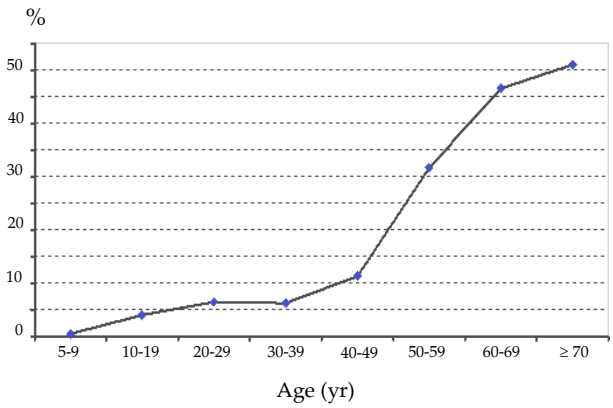

Figure 2 Age stratified prevalence of visual impairment in at least one eye.

Table 2 Prevalence of different types of visual impairment in subjects ≥5 years by domicile, sex and age

	No (%)					
	Population	Blind in both eyes	Low vision in both eyes	Blind in one eye and low vision in fellow eye	Blind in one eye and normal in fellow eye	Low vision in one eye and normal in fellow eye
Domicile						
Urban	3807 (62.0)	49 (1.3)	106 (2.9)	35 (0.9)	46 (1.2)	152 (4.0)
Rural	2335 (38.0)	31 (1.3)	56 (2.4)	21 (0.9)	41 (1.8)	83 (3.6)
Sex						
Female	3659 (59.6)	47 (1.3)	94 (2.6)	33 (0.9)	41 (1.1)	145 (4.0)
Male	2483 (40.4)	33 (1.3)	68 (2.7)	23 (0.9)	46 (1.9)	90 (3.6)
Age (year)						
5-9	743 (12.1)	0	0	0	1 (0.1)	5 (0.7)
10-19	1749 (28.5)	4 (0.2)	26 (1.5)	4 (0.2)	10 (0.6)	32 (1.8)
20-29	1352 (22.0)	4 (0.3)	33 (2.4)	6 (0.4)	8 (0.6)	36 (2.7)
30-39	877 (14.3)	3 (0.3)	24 (2.7)	4 (0.5)	6 (0.7)	18 (2.1)
40-49	606 (9.9)	7 (1.2)	8 (1.3)	6 (1.0)	8 (1.3)	40 (6.6)
50-59	420 (6.8)	13 (3.1)	34 (8.1)	11 (2.6)	21 (5.0)	54 (12.9)
60-69	204 (3.3)	17 (8.3)	17 (8.3)	10 (4.9)	19 (9.3)	32 (15.7)
≥70	191 (8.1)	32 (16.7)	20 (10.5)	15 (7.8)	14 (7.3)	18 (9.4)
Total	6142 (100)	80 (1.3)	162 (2.6)	56 (0.9)	87 (1.4)	235 (3.8)

Percentages calculated based on columns for the population and based on rows for other data.

Table 3 Visual impairment in children <5 years by domicile and sex

	No (%)		
	Population	Blind at least in one eye	Low vision at least in one eye
Domicile			
Urban	507 (62.0)	4 (0.8)	40 (7.9)
Rural	311 (38.0)	2 (0.6)	25 (8.0)
Sex			
Female	487 (59.5)	4 (0.8)	39 (8.0)
Male	331 (40.5)	2 (0.6)	26 (7.8)
Total	818 (100)	6 (0.7)	65 (7.9)

Percentages calculated based on columns for the population and based on rows for other data.

Table 4 Causes of visual impairment among 525 affected individuals based on sex and laterality

	No (%)				
	Female (n=313)*	Male (212)*	One eye**	Both eyes**	Total (n=525)**
Senile cataracts	112 (35.8)	93 (43.8)	52 (9.9)	153 (29.1)	205 (39.1)
Corneal opacities	40 (12.8)	34 (16.0)	22 (4.2)	52 (9.9)	74 (14.1)
Refractive errors	129 (41.2)	70 (33.0)	34 (6.5)	165 (31.4)	199 (37.9)
Amblyopia	75 (24.0)	49 (23.1)	87 (16.6)	37 (7.1)	124 (23.6)
Ocular dysmotility	32 (10.2)	23 (10.9)	41 (7.8)	14 (2.7)	55 (10.5)
Congenital ocular disease	11 (3.5)	7 (3.3)	8 (1.5)	10 (1.9)	18 (3.4)
Glaucoma	8 (2.6)	7 (3.3)	7 (1.3)	8 (1.5)	15 (2.9)
Vitreoretinal disease	9 (2.9)	9 (4.2)	6 (1.1)	12 (2.3)	18 (3.4)
Diabetic retinopathy	12 (3.8)	8 (3.8)	3 (0.6)	16 (3.1)	19 (3.6)
Ocular trauma	4 (1.3)	3 (1.4)	7 (1.3)	0	7 (1.3)
Surgical complications	6 (1.9)	4 (1.9)	10 (1.9)	0	10 (1.9)
Miscellaneous	15 (4.8)	11 (5.2)	22 (4.2)	4 (0.8)	26 (5.0)

*Percents calculated based on the sex. ** Percents calculated based on total.
Some cases had more than one cause for visual impairment.

DISCUSSION

This study is the first epidemiologic survey on the prevalence and causes of visual impairment in Khuzestan and includes a large sample from all age groups. Evaluation and classification of the visual impairment was based on WHO recommendations[4,5] in order to facilitate comparisons between the findings of different studies. The cut-off point for referral to an ophthalmologist was BCVA less than 20/60 which is consistent with WHO criteria.

In order to highlight the importance of visual impairment in children, data analysis was performed in two subgroups (younger and older than 5 years). Overall, 1.3% of the ≥5 year population suffered from bilateral blindness and 2.6% had bilateral low vision, both of which had an increasing trend with age. However, there was no difference between male and female subjects or between urban and rural residents in this regards.

According to the estimated population of Khuzestan province at the time of the study (approximately 2,873,000 in urban and 1,200,000 in rural areas) it is expected that about 20,000 and 8,500 cases of bilateral blindness and 75,000 and 31,000 cases of low vision exist in urban and rural areas of the province, respectively. The prevalence of bilateral blindness in this population (1.3%) is comparable to that in Tehran (1.1%),[8] Bangladesh (1.5%),[9] Tunisia (1.2%)[10] and Pakistan (1.9%)[11] however higher than those reported from Saudi Arabia (0.7%),[12] Malaysia (0.3%),[13] Denmark (0.5%),[14] Italy (0.6%),[15] and Canada (0.04%).[16] The prevalence of bilateral low vision (2.6%) was lower than the mean global prevalence (3.4%)[17] as well as Tehran (4.0%),[8] Tunisia (3.0%),[10] Indonesia (5.8%)[18] and Bangladesh (13.8%)[9] but higher than those in Malaysia (2.4%),[13] Italy (1.8%)[15] and Canada (0.4%).[16]

The most prevalent causes of visual impairment in this study included cataracts, refractive errors and amblyopia which is in line with most studies in similar populations from Bangladesh,[9] Pakistan,[11] Saudi Arabia,[12] Malaysia,[13] Indonesia[18] and India;[19] however the main causes of visual impairment in developed countries such as Denmark,[14] Italy[15] and Canada were cataracts, glaucoma, myopia and age-related macular degeneration. Trachoma complications are still a major cause of visual impairment in some developing countries such as Nigeria,[20] Oman[21] and Ethiopia.[22] In the current survey, certain areas such as Dezfool which experienced an epidemic of trachoma about 40 years ago, had a high prevalence of corneal blindness. The prevalence of glaucoma was higher in our study (2.9%) as compared to the study by Soori et al[7] in Tehran province (1.2%) and the study by Amini et al[23] on urban residents of Tehran City aged ≥40 years (1.4%). The higher rate of glaucoma in our province necessitates further investigations and a more vigorous approach for early diagnosis and treatment.

One remarkable finding in this study was the different patterns of ocular disease among subjects with visual impairment in different areas of the province which may be due to different living conditions or variable ethnicity. For instance Dezfool had the highest prevalence of cataracts and corneal blindness while Dashte-Azadegan had the highest prevalence of refractive errors. These features are important for making a better problem-oriented health promotion program.

This study suffered from some certain limitations such as the scattered distribution of the population in rural areas, difficulty in obtaining access to ophthalmologic examination facilities in certain locations, less participation by household heads (mostly male subjects) especially in rural areas which may have affected the results. We emphasize the need for expanding such studies across the nation and underscore the necessity of employing preventive and therapeutic strategies to decrease the burden of visual impairment in Khuzestan province and eliminate avoidable blindness. This study is also of value for developing a better health promotion policy for the Vision 2020 program.

Acknowledgements

This study was supported by the Governor of Khuzestan province. We thank the following people and organizations for their invaluable

help: Mr. Ali Hashemi (Deputy of education, at Governor of Khuzestan province), Dr Bijan Keikhahei, Dr Abdolrasul Nikkhooi, Miss Fatemeh Mohammadi (Deputy of Health at Jondishapour Medical University), Mr. Mohammad Hakim-Manesh, Mr. Mehdi Abdideh (School of Health, Jondishapour Medical University), Dr Arash Anisian, Dr Nasrin Rafati (Ophthalmic Research Center, Shahid Beheshti University, MC), Dr Farzad Nematollahi (Abadan), Dr Morteza Ghanavati (Behbahan), Dr Habib Gheibi (Dezful), Dr Bijan Ab-Azar (Andimeshk), Dr Ghasem Rahmani (Mahshahr), Dr Farahnaz Azizidoost (Masjed-Soleiman), Dr Zeinab Miralaei (Ramhormoz), and the principals of the urban and rural health centers of Khuzestan Province and the staff of the Deputy of Health at Khuzestan Medical University.

REFERENCES

1. Pizzarello L, Abiose A, Ffytche T, Duerkson R, Thulasiraj R, Taylor H, et al. Vision 2020: The right to sight. *Arch Ophthalmol* 2004;122:615-620.
2. Summer A. Global heath, global vision. *Arch Ophthalmol* 2004;122:911-912.
3. Resnikoff S, Pascolini D, Etya'ale D, Kocur I, Pararajasegaram R, Pokharel GP, et al. Global data on visual impairment in the year of 2002. *Bull World Health Organ* 2004;82:844-851.
4. Dandona L, Dandona R, Strinivas M. Blindness in the India State of Antha Pradesh. *Invest Ophthalmol Vis Sci* 2001;42:903-916.
5. World Health Organization. Strategies for the prevention of blindness in national programs. 2nd ed. Geneva: WHO; 1997.
6. Khuzestan Statistical Database, Budget and Program Organization, Statistical and Information Deputy. 1996: 38-46.
7. World Health Organization. International Statistical Classification of Diseses and Related Health Problems. 10th Revision Version. 2nd ed. Geneva: WHO; 2005.
8. Soori H, PhD, Javadi MA, MD; Rafati N, MD; Rabbanikhah Z, MD, Delavari AR, MD; Parsi Kia A, MD. Prevalence and causes of blindness and low vision in Tehran province, 2005. *Bina J Ophthalmol* 2005;11:151-163.[Article in Farsi]
9. Dineen BP, Bourne RR, Ali SM, Huq DM, Johnson GJ. Prevalence and causes of blindness and visual impairment in Bangladeshi adults: results of the National Blindness and Low Vision Survey of Bangladesh. *Br J Ophthalmol* 2003;87:820-828.
10. Ayed S, Negrel AD, Nabli M, Kamel N, Jebri AM, Siddhom M. Prevalence and causes of blindness in the Tunisian Republic. Results of a national survery conducted in 1993. Tunisian Team on the Evaluation of Blindness. *Sante* 1998;8:275-282.
11. Ahmas K, Khan MD, Qureshi MB, Munami S, Shah RA, Rasheed H, et al. Prevalence and causes of blindness and low vision in a rural setting in Pakistan. *Ophthalmic Epidmiol* 2005;12:19-23.
12. Al Faran MF, al-Rajhi AA, Acomar OM, al-Ghandi SA, Jabak M. Prevalence and causes of visual impairment and blindness in the south western region of Saudi Arabia. *Int Ophthalmol* 1993;17:161-165.
13. Zainal M, Ismail SM, Ropilah AR, Elias H, Arumugam G, Alias D, et al. Prevalence of blindness and low vision in Malaysian population: results from the National Eye Survey 1996. *Br J Ophthalmol* 2002;86:951-956.
14. Buch H, Vinding T, La Cour M, Appleyard M, Jensen GB, Nielsen NV. Prevalence and causes of visual impairment and blindness among 9980 Scandinavian adults: the Copenhagen City Eye Study. *Ophthalmology* 2004;111:53-61.
15. Cedrone C, Nucci C, Scuderi G, Ricci F, Cerulli A, Culasso F. Prevalence of blindness and low vision in an Italian population: a comparison with other European studies. *Eye* 2005;27:1-9.
16. Maberley DA, Hollands H, Chuo J, Tam G, Konkal J, Roesch M, et al. The prevalance of low vision and blindness in Canada. *Eye* 2006;20:341-346.
17. World Health Organization. Magnitude and cause of visual impairment. Fact Sheet No: 282, November 2004.
18. Saw SM, Husain R, Gazzard GM, Kon D, Widjaja D, Tan DT. Causes of low vision and blindness in rural Indonesia. *Br J Ophthalmol* 2003;87:1075-1078.
19. Dandona L, Dandona R, John RK. Estimation of blindness in India from 2000 through 2020: implications for the blindness control policy. *Natl Med J India* 2001;14:327-334.
20. Mpyet C, Solomon AW. Prevalence and causes of blindness and low vision in leprosy villages of north eastern Nigeria. *Br J Ophthalomol* 2005;89:417-419. Erratum in: *Br J Ophthalmol* 2005;89:878.
21. Khandekar R, Mohammed AJ, Negrel AD, Riyami AA. The prevalence and causes of blindness in the Sultanate of Oman: the Oman Eye Study (OES). *Br J Ophrhalmol* 2002;86:957-962.
22. Melese M, West ES, Almayehu W, Wunoz B, Worku A, Gaydos CA, et al. Characteristics of trichiasis patients presenting for surgery in rural Ethiopia. *Br J Ophthalmol* 2005;89:1084-1088.
23. Amini H, Javadi MA, Pakravan M, Karimian F, Valaei N, Rezaei A, et al. Prevalence of glaucoma among citizens older than 40 in Tehran, Iran. *Bina J Ophthalmol* 2005;9:3-13. [Article in Farsi]