RESEARCH ARTICLE

Visual impairment and blindness in Alkharj, Saudi Arabia

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Abstract

Objective: To determine the incidence and causes of visual impairment and blindness among patients attending eye clinics in a tertiary care setting.

Method: The retrospective study was conducted in Alkharj city, Saudi Arabia, from May to November 2022, and comprised records of patients who visited eye clinics of two main hospitals in the city with complaints of low vision or blindness between January 2021 and December 2021. Medical history, family history and ophthalmological examination results of each patient were reviewed, and the causes and frequency of occurrence of visual impairment and blindness were determined. Data was analysed using SPSS 21.

Results: Of the 433 patients, 269(62.1%) were female and 164(37.9%) were male. The overall mean age was 38.52±21.90 years (range; 5-90 years) with a median age of 37 years (IQR: 19-58). Refractive error 271(62.6%), cataract 69(15.9%) and diabetic retinopathy 37(8.5%) were the major causes of visual impairment, followed by amblyopia 15(3.5), corneal opacity 12(2.8), and glaucoma 8(1.8). Refractive errors, amblyopia, and corneal opacity were more common among those aged 5-20 years, while visual impairment caused by cataract, diabetic retinopathy and glaucoma was more common in older age groups.

Conclusion: Refractive error was found to be the major cause among the participants with mild to severe visual impairment.

Keywords: Visual impairment, Refractive error, Cataract, Diabetic retinopathy. (JPMA 75: 418; 2025)

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Introductio

The clarity of vision, or visual acuity (VA), is the degree of perception of the details and contours of objects to be precisely recognised. The VA definition refers to the shortest distance via which two lines can be visually separated and still be perceived as two lines by the person being tested. In the clinical practice, VA for distant vision is commonly measured via using the Snellen-letter charts that are viewed at a distance of 6m (20ft).[1]

In adult populations, impairment of visual (IV) and blindness continue to be among the critical health challenges in Saudi Arabia as well as most of the countries of the Eastern Mediterranean region. Among the population in northern Saudi Arabia, 13.9%[2] and 23.5%[3] of the adult participants were found to have IV in two different studies. A study in Pakistan on 4,416 surveyed adults, found that 27% of the participants presented with reduced VA (<6/12 in the better eye) and 3.4% of them were blind.[4] Distribution of IV and blindness varies when comparing different age groups. Over 80% of the blind people or those who have moderate to severe IV are aged 50 years or older.[5] Uncorrected errors and cataract are the most common IV aetiologies in the adult population. The other common aetiologies include corneal opacity, uncorrected aphakia and macular degeneration.[4,6]

As noted by the World Health Organisation (WHO) in its 2019 report on vision, some of the pathological causes of low vision and IV are treatable or sometimes preventable, highlighting the need to obtain accurate estimate of the magnitude of the eye condition.[7]

The current study was planned to determine the incidence and causes of IV and blindness among patients attending eye clinics in a tertiary care setting.

Materials and Methods

The retrospective study was conducted in Alkharj city, Saudi Arabia, from May to November 2022, and comprised records of patients who visited eye clinics of two main

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hospitals in the city with complaints of low vision or blindness between January 2021 and December 2021. The sample was raised using convenience sampling technique from among those visiting the Prince Sattam bin Abdulaziz University Hospital and the Military Hospital, and all eligible patients presenting within the study time frame were included. The study included patients with complete medical records containing demographic information, medical history, family history and ophthalmological examination results. Patients with incomplete or and unavailable record, or having unreliable examination results were excluded. Each patient's medical history, family history, and ophthalmological examination results were reviewed to determine the causes and frequency of IV and blindness.

Low VA or IV was classified as no or mild IV (grade 0) for VA 6/18 or more, moderate IV (grade 1) for VA from <6/18 to 6/60 or more, severe IV (grade 2) for VA from <6/60 to 3/60 or more, and blindness (grades 3-5) for VA from <3/60 to no light perception.[8] Refractive error was defined as an error of ±0.50D or more for myopia and hyperopia, and a cylindrical error of ≥0.50D.[9,10]

Data was collected after approval from the ethics review committee of Prince Sattam bin Abdulaziz University, Saudi Arabia, and the study was conducted in line with the Declaration of Helsinki approved by the World Medical Association in 2013.[11]

Data was analysed using SPSS 21. The rate of occurrence, mean values and relative mean values were estimated. Association of causes of IV and blindness with age, gender and socioeconomic and demographic status of the patients was evaluated. Categorical variables were expressed as frequencies and percentages, and were analysed using chi-square test. P<0.05 was considered significant.

Results

Of the 433 patients, 256(59.1%) were from the Prince Sattam bin Abdulaziz University Hospital, and 177(40.9%) were from the Military Hospital. Overall, 269(62.1%) were female patients and 164(37.9%) were male. The overall mean age was 38.52±21.90 years (range; 5-90 years) with a median age of 37 years (IQR: 19-58). Positive history of ocular disease was recorded in 90(20.8%) patients, and the diseases included cataract, refractive errors, chalazion, strabismus, corneal aberration/opacity, glaucoma, diabetic retinopathy (DR), misdirected lash, eye trauma, dry eyes, uveitis and others. Use of spectacles was noted in 113(26.1%) participants, 264(61%) presented with complaints of low or blurred vision, 112(25.9%) had been found to have IV when they came for general check-up or were referred to the eye clinics. Other presenting complaints included eye trauma, headache, dizziness+ flashes+black objects or floaters, dry eyes, eye itching or foreign body sensation, fleshy mass in the eyes, eye deviation, pigmented lesion in conjunctiva, eye redness+ photophobia, and squeezing the eye while watching television (Table 1).

Table-1: Demographic and clinical characteristics.

Variable	n (%)
Hospital	
University Hospital	256 (59.1)
Military Hospital	177 (40.9)
Total	433 (100)
Gender	
Male	164 (37.9
Female	269 (62.1)
Total	433 (100)
Age Groups (years)	
5-20	127 (29.3)
21-40	108 (24.9)
41-59	96 (22.2)
≥60	102 (23.6)
Total	433 (100.0)
Present history of ocular disease	
Yes	90 (20.8)
No	343 (79.2)
Total	433 (100)
Use of spectacles	
Yes	113 (26.1)
No	320 (73.9)
Total	433 (100)
Presenting complaint	
Blurred Vision	106 (24.5)
Low Vision	158 (36.5)
Check up or referred	112 (25.9)
Eye trauma	9 (2.1)
Headache or eye pain	23 (5.3)
Other	25 (5.8)
Total	433 (100)

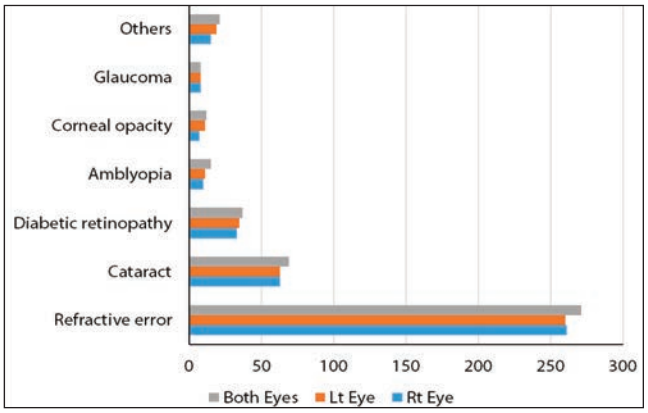

Figure: Frequency of the causes of visual impairment among the patients.

Refractive error 271(62.6%), cataract 69(15.9%) and DR 37(8.5%) were the major causes of IV, followed by amblyopia 15(3.5%), corneal opacity 12(2.8%), and glaucoma 8(1.8%). There were 21(4.8%) cases identified as 'other' causes, including retinal detachment, keratoconus, macular degeneration, papilloedema, macular photo

Table-2: The causes of visual impairment with respect to gender and age.

Groups		Causes of visual impairment							Total	*p*-value
		Refractive error	Diabetic retinopathy	Cataract	Glaucoma	Corneal opacity	Amblyopia	Others		
Gender										
Male	Count	96	18	28	2	8	2	10	164	
	% within Gender	58.5%	11.0%	17.1%	1.2%	4.9%	1.2%	6.1%	100.0%	
	% within Causes	35.4%	48.6%	40.6%	25.0%	66.7%	13.3%	47.6%	37.9%	
Female	Count	175	19	41	6	4	13	11	269	0.057
	% within Gender	65.1%	7.1%	15.2%	2.2%	1.5%	4.8%	4.1%	100.0%	
	% within Causes	64.6%	51.4%	59.4%	75.0%	33.3%	86.7%	52.4%	62.1%	
Total	Count	271	37	69	8	12	15	21	433	
	% within Gender	62.6%	8.5%	15.9%	1.8%	2.8%	3.5%	4.8%	100.0%	
	% within Causes	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
Age Groups (years)										
5-20	Count	109	0	0	0	6	7	5	127	
	% within Age Groups	85.8%	0.0%	0.0%	0.0%	4.7%	5.5%	3.9%	100.0%	
	% within Causes	40.2%	0.0%	0.0%	0.0%	50.0%	46.7%	23.8%	29.3%	
21-40	Count	89	5	1	1	0	6	6	108	
	% within Age Groups	82.4%	4.6%	0.9%	0.9%	0.0%	5.6%	5.6%	100.0%	
	% within Causes	32.8%	13.5%	1.4%	12.5%	0.0%	40.0%	28.6%	24.9%	
41-59	Count	56	16	17	0	4	1	2	96	<0.001*
	% within Age Groups	58.3%	16.7%	17.7%	0.0%	4.2%	1.0%	2.1%	100.0%	
	% within Causes	20.7%	43.2%	24.6%	0.0%	33.3%	6.7%	9.5%	22.2%	
≥60	Count	17	16	51	7	2	1	8	102	
	% within Age Groups	16.7%	15.7%	50.0%	6.9%	2.0%	1.0%	7.8%	100.0%	
	% within Causes	6.3%	43.2%	73.9%	87.5%	16.7%	6.7%	38.1%	23.6%	
Total	Count	271	37	69	8	12	15	21	433	
	% within Age Groups	62.6%	8.5%	15.9%	1.8%	2.8%	3.5%	4.8%	100.0%	
	% within Causes	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	

(*) There is a statistically significant relationship at (0.05) or less.

Table-3: The causes of visual impairment with respect to gender and age.

Grades of VI		Causes of visual impairment							Total
		Refractive error	Diabetic retinopathy	Cataract	Glaucoma	Corneal opacity	Amblyopia	Others	
Category									
Mild	Count	170	15	31	3	5	5	4	233
	% within VAR	73.0%	6.4%	13.3%	1.3%	2.1%	2.1%	1.7%	100.0%
	% within Causes	65.1%	45.5%	49.2%	37.5%	71.4%	50.0%	26.7%	58.7%
Moderate	Count	78	16	23	3	1	3	5	129
	% within VAR	60.5%	12.4%	17.8%	2.3%	0.8%	2.3%	3.9%	100.0%
	% within Causes	29.9%	48.5%	36.5%	37.5%	14.3%	30.0%	33.3%	32.5%
Severe	Count	12	1	3	0	0	0	1	17
	% within VAR	70.6%	5.9%	17.6%	0.0%	0.0%	0.0%	5.9%	100.0%
	% within Causes	4.6%	3.0%	4.8%	0.0%	0.0%	0.0%	6.7%	4.3%
Blind	Count	1	1	6	2	1	2	5	18
	% within VAR	5.6%	5.6%	33.3%	11.1%	5.6%	11.1%	27.8%	100.0%
	% within Causes	0.4%	3.0%	9.5%	25.0%	14.3%	20.0%	33.3%	4.5%
Total	Count	261	33	63	8	7	10	15	397
	% within VAR	65.7%	8.3%	15.9%	2.0%	1.8%	2.5%	3.8%	100.0%
	% within Causes	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

VAR: Visual acuity of right eye, *p*-value <0.001. Statistically significant relationship.

Table-4: The causes in relation to the grade of visual impairment in the left eye.

Grades of VI		Causes of visual impairment							Total
		Refractive error	Diabetic retinopathy	Cataract	Glaucoma	Corneal opacity	Amblyopia	Others	
Category									
Mild	Count	172	17	38	1	9	7	8	252
	% within VAL	68.3%	6.7%	15.1%	0.4%	3.6%	2.8%	3.2%	100.0%
	% within Causes	66.2%	48.6%	60.3%	12.5%	81.8%	63.6%	42.1%	61.9%
Moderate	Count	77	14	17	4	2	2	3	119
	% within VAL	64.7%	11.8%	14.3%	3.4%	1.7%	1.7%	2.5%	100.0%
	% within Causes	29.6%	40.0%	27.0%	50.0%	18.2%	18.2%	15.8%	29.2%
Severe	Count	11	1	4	0	0	1	2	19
	% within VAL	57.9%	5.3%	21.1%	0.0%	0.0%	5.3%	10.5%	100.0%
	% within Causes	4.2%	2.9%	6.3%	0.0%	0.0%	9.1%	10.5%	4.7%
Blindness	Count	0	3	4	3	0	1	6	17
	% within VAL	0.0%	17.6%	23.5%	17.6%	0.0%	5.9%	35.3%	100.0%
	% within Causes	0.0%	8.6%	6.3%	37.5%	0.0%	9.1%	31.6%	4.2%
Total	Count	260	35	63	8	11	11	19	407
	% within VAL	63.9%	8.6%	15.5%	2.0%	2.7%	2.7%	4.7%	100.0%
	% within Causes	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

VAL: Visual acuity of left eye, p-value < 0.001. Statistically significant relationship.

coagulopathy, pseudophakia, anterior uveitis, optic atrophy, and central serous chorioretinopathy (Figure). Most of the causes were significantly predominant among females except corneal opacity which was more prevalent among males (p<0.05). Refractive errors, amblyopia and corneal opacity were more common among those aged 5-20 years, while IV caused by cataract, DR and glaucoma was more common in older age groups (p<0.001) (Table 2).

In the right eye, refractive error was the major cause among those with mild to severe IV in both eyes, whereas cataract was the predominant cause of blindness (Table 3). In the left eye, major cause of blindness was the 'other' causes, followed by cataract, DR and glaucoma (Table 4).

Discussion

To the best of our knowledge, the current study is the first to assess the causes of IV and blindness in the Alkharj region of Saudi Arabia. Young children with early-onset severe impairment may experience delays in motor, language, emotional, social and cognitive development, with lifelong consequences. School-age children with IV may also experience deterioration in academic performance. Adults with visual impairments often have lower labour force participation and productivity, and higher rates of depression and anxiety than the general population. In older adults, IV may contribute to social isolation, walking difficulty, and higher risk of falls and fractures, especially hip fractures.[7]

The current study showed that majority of the participants (62.1%) were female. Most of the IV causes were significantly predominant among females except for the corneal opacity that was more common in males. Similar findings have been reported by other studies.[2,3,12,13] There is no known mechanism for this gender inequality in IV distribution so far. However, possible explanations include exposure to risk factors, barriers to accessing health services among women, or less help-seeking behaviour leading to delayed diagnosis and treatment among men.[13] Moreover, gender disparity could be due to differences in mortality rates, as women are known to have a longer life expectancy than men, making them more susceptible to age-related diseases.[14,15]

Refractive errors (62.6%) and cataract (15.9%) were the most frequent leading causes of IV in the current study. Refractive error was especially the major cause among the participants with mild to severe IV. This was consistent with earlier findings in Saudi Arabia[2,6,16,17] and other countries.[4,18] Several studies have shown that uncorrected refractive errors are the leading cause of IV and the second leading cause of preventable blindness worldwide, after cataract.[5,19,20] However, a 2017 study reported that cataract was the most common cause of IV in the study population.[3] This variation may be due to differences in study populations and methodology.

Refractive errors, corneal opacity and amblyopia were more common among those aged 5-20 years. These conditions decreased with increasing age. The current findings were in line with other studies.[7,19]

IV caused by cataract, DR and glaucoma was found to be more common in older individuals. About 88% of patients with glaucoma, 73.9% with cataract, and 43.2% with DR were in aged 60 years or above ($p<0.001$). Similar results were also reported by other studies.[21-23]

The current study has limitations as data was collected from two government hospitals in a single city over a limited period of time. This has affected the generalisability of the findings.

Despite the limitations, the findings underscored the need for targeted interventions and public health policies, particularly to address gender disparity, where women are more affected. Moreover, the high prevalence of refractive errors among economically productive age groups emphasised the importance of accessible and affordable vision correction services. Furthermore, the age-related shift in the causes of IV highlighted the need for tailored strategies to address conditions like cataract, DR and glaucoma among the elderly.

Conclusion

Refractive error was the most common cause of IV and blindness among the participants.

Recommendation: Establishing easily accessible and affordable vision correction services is highly recommended. Further research is warranted to delve deeper into the underlying factors contributing to gender disparities and age-related patterns in visual impairment.

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References

1. Barrett KE, Barman SM, Brooks HL, Yuan J. Vision. In: Ganong's Review of Medical Physiology, 26th ed. New York, USA: McGraw-Hill Education; 2019: 439-485.
2. Al-Shaaln FF, Bakrman MA, Ibrahim AM, Aljoudi AS. Prevalence and causes of visual impairment among Saudi adults attending primary health care centers in northern Saudi Arabia. Ann Saudi Med 2011;31:473-80. doi: 10.4103/0256-4947.84624
3. Parrey MU, Alswelmi FK. Prevalence and causes of visual impairment among Saudi adults. Pak J Med Sci 2017;33:167-71. doi: 10.12669/pjms.331.11871
4. Dineen B, Bourne RR, Jadoon Z, Shah SP, Khan MA, Foster A, et al. Causes of blindness and visual impairment in Pakistan. The Pakistan national blindness and visual impairment survey. Br J Ophthalmol 2007;91:1005-10. doi: 10.1136/bjo.2006.108035.
5. Alswailmi FK. Global prevalence and causes of visual impairment with special reference to the general population of Saudi Arabia. Pak J Med Sci 2018;34:751-6. doi: 10.12669/pjms.343.14510
6. Flaxman SR, Bourne RRA, Resnikoff S, Ackland P, Braithwaite T, Cicinelli MV, et al. Global causes of blindness and distance vision impairment 1990-2020: a systematic review and meta-analysis. Lancet Glob Health 2017;5:e1221-34. doi: 10.1016/S2214-109X(17)30393-5
7. World Health Organization (WHO). World report on vision. [Online] 2019 [Cited 2022 February 07]. Available from URL: https://www.who.int/publications/i/item/world-report-on-vision
8. World Health Organization (WHO). International classification of diseases and related health problems 10th revision (ICD-10). [Online] 2019 [Cited 2022 February 07]. Available from URL: https://icd.who.int/browse10/2019/en#/H53-H54.
9. Gao H, Truong J, Taylor B, Robles-Morales G, Aitken T. Prevalence and Distribution of Refractive Errors Among Members of the U.S. Armed Forces and the U.S. Coast Guard, 2019. MSMR 2022;29:7-12.
10. Niroula DR, Saha CG. Study on the refractive errors of school going children of Pokhara city in Nepal. Kathmandu Univ Med J (KUMJ) 2009;7:67-72. doi: 10.3126/kumj.v7i1.1769
11. World Medical Association (WMA). WMA declaration of Helsinki – ethical principles for medical research involving human participants. [Online] 2013 [Cited 2022 February 09]. Available from URL: https://www.wma.net/policies-post/wma-declaration-of-helsinki/
12. Bourne RRA, Flaxman SR, Braithwaite T, Cicinelli MV, Das A, Jonas JB, et al. Magnitude, temporal trends, and projections of the global prevalence of blindness and distance and near vision impairment: a systematic review and meta-analysis. Lancet Glob Health 2017;5:e888-97. doi: 10.1016/S2214-109X(17)30293-0
13. Rius Ulldemolins A, Benach J, Guisasola L, Artazcoz L. Why are there gender inequalities in visual impairment? Eur J Public Health 2019;29:661-6. doi: 10.1093/eurpub/cky245
14. Bailey RL, Dog TL, Smith-Ryan AE, Das SK, Baker FC, Madak-Erdogan Z, et al. Sex Differences Across the Life Course: A Focus On Unique Nutritional and Health Considerations among Women. J Nutr 2022;152:1597-610. doi: 10.1093/jn/nxac059
15. Case A, Paxson C. Sex differences in morbidity and mortality. Demography 2005;42:189-214. doi: 10.1353/dem.2005.0011
16. Al-Ghamdi AS. Adults visual impairment and blindness - An overview of prevalence and causes in Saudi Arabia. Saudi J Ophthalmol 2019;33:374-81. doi: 10.1016/j.sjopt.2019.10.001
17. Alghamdi W, Ovenseri-Ogbomo GO. The prevalence and causes of visual impairment in Dariyah, a rural community in Saudi Arabia. Afr Vis Eye Health J 2021;80:a579. Doi: 10.4102/aveh.v80i1.579
18. Bourne RRA, Jonas JB, Bron AM, Cicinelli MV, Das A, Flaxman SR, et al. Prevalence and causes of vision loss in high-income countries and in Eastern and Central Europe in 2015: magnitude, temporal trends and projections. Br J Ophthalmol 2018;102:575-8. doi: 10.1136/bjophthalmol-2017-311258
19. Kahiel Z, Aubin MJ, Buhrmann R, Kergoat MJ, Freeman EE. Incidence of visual impairment in Canada: the Canadian Longitudinal Study on Aging. Can J Ophthalmol 2022;57:2-7. doi: 10.1016/j.jcjo.2021.01.020
20. Malhotra S, Vashist P, Gupta N, Kalaivani M, Rath R, Gupta SK. Prevalence and causes of visual impairment among adults aged 15-49 years in a rural area of north India - A population-based study. Indian J Ophthalmol 2018;66:951-6. doi: 10.4103/ijo.IJO_1333_17
21. Alghamdi HF. Causes of irreversible unilateral or bilateral blindness in the Al Baha region of the Kingdom of Saudi Arabia. Saudi J Ophthalmol 2016;30:189-93. doi: 10.1016/j.sjopt.2016.06.001

22. Song P, Wang H, Theodoratou E, Chan KY, Rudan I. The national and subnational prevalence of cataract and cataract blindness in China: a systematic review and meta-analysis. J Glob Health 2018;8:010804. doi: 10.7189/jogh.08.010804

23. Wong TY, Chong EW, Wong WL, Rosman M, Aung T, Loo JL, et al. Prevalence and causes of low vision and blindness in an urban malay population: the Singapore Malay Eye Study. Arch Ophthalmol 2008;126:1091-9. doi: 10.1001/archopht.126.8.1091

Author Contribution:

NOB, AIG, AIA, MMA, MSA, MFA, AH, ASA, AMA, SHAG: The authors contributed collectively to the study, including design, data collection, analysis, preparation, reviewing and approved the final manuscript.