



ORIGINAL ARTICLE

Causes of irreversible unilateral or bilateral blindness in the eastern province Saudi population of the Kingdom of Saudi Arabia

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Abstract

Background and objectives: To determine the causes of irreversible unilateral or bilateral blindness in the Saudi population of the eastern province of the Kingdom of Saudi Arabia.

Methods: This observational, exploratory cross-sectional study evaluated patients with irreversible unilateral or bilateral blindness using a nonprobability sampling technique, which was conducted in a major referral hospital of the eastern province in Dammam city. Saudi patients were enrolled if they had <0.05 (3/60 Snellen acuity) vision in the better eye after correction bilaterally, or visual field of 10–15° around fixation in the better eye. The same was done in unilaterally blind eye patients. The primary investigator excluded treatable cases of blindness, such as refractive error and cataract and corneal pathology occurring after 5 years of age, in addition to keratoconus, recent vitreous hemorrhage (<6 -month duration), and operable retinal detachment.

Results: A convenient sample of one hundred consecutive unilaterally or bilaterally blind patients comprised the study sample. The mean age of the study sample was 54 ± 2.26 years. The male: female ratio was 4:5. The most common cause of blindness in an eye(s) was glaucoma. Seventy-eight patients had unilateral blindness. Deep amblyopia (11) turned out to be almost the second most common cause of unilateral blindness occurring mainly in the left eye in majority of the patients (10/11).

Conclusion: Glaucoma is the most common cause of irreversible blindness in one or both the eyes. Although underestimated (due to old corneal scarring and other causes), amblyopia is likely to be the second most common cause of blindness in an eye in the eastern province of Saudi Arabia. Deep amblyopia occurred more frequently in the left eye.

Keywords: Unilateral blindness, bilateral blindness, irreversible blindness, glaucoma, amblyopia.

Introduction

Irreversible blindness is a significant burden on the affected individual and the public healthcare system. The causes of irreversible blindness may vary between the regions of some countries,¹ hence, public healthcare planning must be focused

on regional disparities to effectively allocate personnel and resources. In a growing nation, such as the Kingdom of Saudi Arabia (KSA) with large geographic distances between provinces, cost-effective allocation is especially pertinent. Hence, regional studies of the causes of blindness in the KSA

are required. To achieve this, we provide a different approach to evaluate the causes of irreversible (terminal) unilateral and bilateral blindness in the region of eastern province of the KSA utilizing the advantages of the Ministry of Health regulation system for the referral of patients with blindness in an eye, since in each province there is one major secondary hospital receiving such patients.

Our study was conducted in Dammam Medical Complex, which is a major secondary hospital in the eastern province servicing the patients from almost the entire eastern province of KSA, over the past 50 years. This hospital also receives legal cases, cases for social compensation (providing travelling tickets for handicapped), and cases for referral to the King Khaled Eye Specialist Hospital and King Faisal Specialist Hospital, or for international referral as warranted.

Materials & methods

This observational cross-sectional study evaluated the causes of irreversible unilateral or bilateral blindness in all the patients presented to the Dammam Medical Complex using nonprobability sampling technique.

After approval from the local medical and ethics committee of the hospital, the eye center staff (doctors, optometrists, and nurses) of the Dammam Medical Complex were instructed to gather cases (of Saudi patients) with best correct visual acuity (BCVA; including pinhole vision) <0.05 (3/60 Snellen), or visual field $<10\text{--}15^\circ$ around fixation in one eye for unilateral cases and in the better eye for bilateral cases. The criteria for blindness is consistent with the World Health Organization (WHO)'s definition of blindness in which, blindness is defined as presenting visual acuity (with distance correction if worn normally or unaided) of $<3/60$ in the better eye.² This study uses the same estimation of blindness for unilateral blindness. The cases were referred to the primary investigator who excluded treatable cases of blindness (e.g. cataract and corneal pathology occurring after 5 years of age, recent vitreous hemorrhage, and operable retinal detachment). Data were collected between January 2009 and June 2009. Data (variables) were collected based on age, gender, laterality, and the causes of blindness.

Results

Out of 121 patients, a convenient sample of 100 appropriate consecutive patients with blindness in one or both eyes were included. The mean age was 54 ± 2.26 years; and range was 6 months–94 years. The male: female ratio was 4:5, right eye: left eye ratio was 9:11, and bilateral: unilateral blindness was 1:4.

The causes of unilateral or bilateral blindness were glaucoma, previous inflammation, deep amblyopia, retinal diseases excluding diabetes mellitus (DM), trauma, hereditary (retinitis pigmentosa), DM, neurological, congenital, tumors, and iatrogenic (Table 1). The most common cause of blindness was glaucoma. Previous inflammation was the second most common cause. Inflammatory causes included eight cases of old corneal scars, one case of corneal graft rejection, two cases of endophthalmitis, two cases of uveitis, and three cases of phthisis bulbi.

Table 1: Causes of irreversible unilateral or bilateral blindness in an eastern province of the Kingdom of Saudi Arabia

| Pathology | Proportion of patients, n |
|-------------------------------|---------------------------|
| Glaucoma | 30 |
| Previous inflammation | 16 |
| Deep amblyopia | 11 |
| Retinal diseases excluding DM | 10 |
| Trauma | 8 |
| Hereditary (RP) | 6 |
| DM | 5 |
| Neurologic | 5 |
| Congenital | 5 |
| Tumor | 2 |
| Iatrogenic | 2 |

DM, Diabetes mellitus; RP, Retinitis pigmentosa

The diseases causing amblyopia were squint (4), myopia (6), and macular scar (1). Majority (10/11) of the patients were deeply amblyopic in the left eye.

Although some causes of amblyopia may be due to corneal scar, they were included in the previous inflammation group (Table 1). One case of amblyopia was due to childhood trauma and was

included in trauma group (Table 1). So, it is likely that deep amblyopia is the real second cause of blindness in the eye in this study.

Blindness, secondary to DM, was due to diabetic maculopathy except for one case, which was due to tractional retinal detachment. Previous retinal diseases (excluding those caused by DM) included, five cases of retinal detachment, two cases of age-related macular degeneration, two cases of degenerative myopia, and one case of central retinal vein occlusion. One adult case that underwent surgery for congenital cataract was included in the deep amblyopia group, and was not included in the glaucoma group, although the patient developed pseudophakic glaucoma. In the neurological group, 4:5 patients were due to pituitary adenoma (one of them presented to the center with sudden loss of vision).

The distribution of patients with irreversible unilateral or bilateral blindness based on age and gender are presented in Figure 1. Glaucoma was the most common cause of irreversible blindness among males and females (Table 2). Seventy-eight patients were unilaterally blind with a right eye: left eye ratio of 8-9:11. The most common causes of unilateral blindness were glaucoma (22), previous inflammation (14), amblyopia (11), trauma (8), and retinal diseases (7, excluding retinal diseases caused by DM; Table 3).

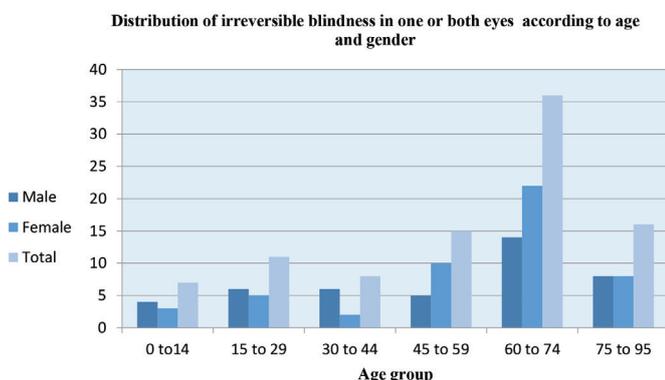


Figure 1: Distribution of patients with irreversible unilateral or bilateral blindness based on age and gender in an eastern province of the Kingdom of Saudi Arabia

Table 2: Causes of irreversible blindness according to gender

| Causes | N | Female, n (%) | Male, n (%) |
|-----------------|----|---------------|-------------|
| Deep amblyopia | 11 | 8 (72.7) | 3 (27.3) |
| Congenital | 4 | 3 (75) | 1 (25) |
| Inflammatory | 16 | 10 (62.5) | 6 (37.5) |
| Glaucoma | 30 | 15 (50) | 15 (50) |
| DM | 5 | 5 (100) | 0 |
| Retinal disease | 10 | 4 (4) | 6 (6) |
| Hereditary | 6 | 3 (50) | 3 (50) |
| Trauma | 9 | 2 (22.2) | 7 (77.8) |
| Neurological | 5 | 1 (20) | 4 (80) |
| Iatrogenic | 2 | 1 (50) | 1 (50) |
| Tumor | 2 | 2 (100) | 0 |

DM, Diabetes mellitus

Table 3: Causes of unilateral blindness among patients with blindness in an eastern province of the Kingdom of Saudi Arabia

| Pathology | Proportion of patients, n | Right eye: left eye ratio |
|-----------------------|---------------------------|---------------------------|
| Glaucoma | 22 | 12:10 |
| Previous inflammation | 14 | 3:11 |
| Deep amblyopia | 11 | 1:10 |
| Trauma | 8 | 5:3 |
| Retinal diseases | 7 | 2:5 |
| Diabetes mellitus | 4 | 3:1 |
| Neurological | 3 | 2:1 |
| Congenital | 3 | 2:1 |
| Tumor | 2 | Right eye only |
| Hereditary | 2 | 1:1 |
| Iatrogenic | 2 | 1:1 |

The most common cause of bilateral blindness was glaucoma (8) followed by hereditary conditions (4) and retinal diseases (3; Table 4).

Table 4: Causes of bilateral blindness among patients with blindness in an eastern province of the Kingdom of Saudi Arabia

| Pathology | Proportion of patients, n |
|-----------------------|---------------------------|
| Glaucoma | 8 |
| Hereditary | 4 |
| Retinal diseases | 3 |
| Neurological | 2 |
| Congenital | 2 |
| Previous inflammation | 2 |
| Diabetes mellitus | 1 |

Discussion

This is the first study in Saudi Arabia that evaluated terminal blindness, after excluding the treatable causes, such as cataract and refractive error.³ The progressive improvement in cataract surgery has resulted in a considerable decrease in the burden of blindness due to the age-related condition.² Hence, studies should investigate early detection of the irreversible causes of blindness, such as end-stage glaucoma, age related macular degeneration, optic neuropathies, deep amblyopia, and other conditions.

Proactively addressing treatable causes of blindness (e.g. cataract) and preventing incurable blindness will alleviate the healthcare, financial, and societal burden in the elderly population, as most of the diseases associated with bilateral blindness are age-related.³⁻⁷

In the current study, glaucoma was the most common cause of terminal blindness, regardless of gender and bilateral or unilateral involvement (Table 1). Although old inflammatory causes were also common, they were associated with various etiologies (majority were corneal scars). Hence, the second most common cause of irreversible unilateral blindness in this study should be amblyopia. In fact, many cases of corneal scars in the current study had already caused amblyopia, resulting in an underestimate of amblyopia in our study.

Amblyopia was more common in the left eye (right eye: left eye was 1/11 patients; Table 3). When this study was presented at the 23rd annual scientific meeting of Saudi Ophthalmological Society, 28

February 2010, there were no other studies in the literature that reported this distribution of laterality in amblyopia. A larger sample size is needed to confirm the significance of this laterality. A later study of laterality of amblyopia in patients aged <18 years was published in August 2010, where the author evaluated visual impairment >20/400, and reported left eyes (59%) more affected by amblyopia than right eyes.⁸

Other studies regarding blindness in the KSA evaluated mostly the treatable causes, such as cataract and refractive error^{4, 5, 7, 9}, which are more common than irreversible causes, and were dealing with both the eyes. Although these studies were community based,^{4, 5, 7, 9} they underestimated diseases such as glaucoma (e.g. normal tension glaucoma) that would be grouped among diseases causing optic atrophy instead. In addition, these surveys missed some neurological diseases such as pituitary adenoma, where there is a need of visual field to diagnose the cases early. Additionally, these studies were performed in different provinces of Saudi Arabia with different geography, which can affect access to healthcare or have more homogenous population than our heterogenous population.¹ Some of the published studies are over 20 years old^{4, 5} and might not be indicative of the current conditions. For instance, there has been significant development in the Saudi healthcare system over time, and development may have resulted in greater access to transportation. However, these population-based studies did not include the causes of blindness in the whole range of population that was evaluated.^{7, 9} For instance, these studies excluded causes of blindness in a population of <50 years⁹ and <18 years of age.⁷ However, our study did not exclude subjects based on age.

Studies that enrolled subjects from institutions or schools for the blind are not indicative of the general population. Additionally, these studies evaluated causes of blindness in the younger segment of the population only.^{10, 11}

Selection of subjects from the Dammam Medical Complex, accurately represent the distribution of terminal eye diseases in the eastern province, as it is the referral center for all cases of blindness in the region. The nonrandom sampling technique used is

a cost effective and practical technique that can be used in all the regions of the kingdom.

The outcomes of the current study concur with other studies from the Gulf region. Glaucoma is the most common cause of blindness in Bahrain followed by diabetic retinopathy.¹² In Qatar, glaucoma is the most common cause in adults over 50 years of age.¹³

A study from Kuwait was not comparable as 70% of the study sample was less than 40 years of age and it was regarding blindness allowances.¹⁴ A study from Yemen reported that glaucoma followed by diabetic retinopathy were the most common causes of blindness. However, the Yemen-based study excluded patients who aged < 17 years.¹⁵

After exclusion of treatable causes of blindness, WHO showed that blindness secondary to glaucoma is the most common cause of unilateral as well as bilateral blindness. The outcomes of our study concur with the WHO conclusions.³

Conclusion

Glaucoma is the most common cause of irreversible blindness in one or both the eyes in the Saudi population of the eastern province of Saudi Arabia. This is almost similar to other countries in the region and worldwide. In this region, deep amblyopia seems to play a role in unilateral blindness, which was more common in the left eye. However, a larger study sample is required to evaluate this observation. A well-planned, cost-effective national screening at primary healthcare centers is needed for early detection of diseases that cause incurable blindness. This focus on prevention will decrease the burden of the disease on society.

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