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Original article

Causes of irreversible unilateral or bilateral blindness in the Al Baha region of the Kingdom of Saudi Arabia

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Abstract

Purpose: To determine the causes of irreversible unilateral and bilateral blindness that cannot be rehabilitated medically, optically nor surgically in Al Baha province, Kingdom of Saudi Arabia.
Methods: There were a retrospective chart review and examination of patients presenting to King Fahad Hospital Al Baha, Saudi Arabia, with unilateral or bilateral blindness from June 2011 to September 2011. Blindness was defined as best corrected visual acuity (BCVA) of less than 0.05 (Snellen, 20/400) or a visual field no greater than 10° around central fixation. Data were collected on patient demographics, ocular disease either primary or secondary to systemic diseases and laterality if unilateral involvement.
Results: One hundred consecutive patients were enrolled in the study. The mean age of the study sample was 58 ± 2.28 years (range, 1–90 years). The male to female ratio was 3:2. The most common cause of blindness in one or both eyes per person was diabetes (30% of patients) followed by glaucoma (23%). Reclassification of the causes of the blindness according on World Health Organization (definition of blindness which included both eyes) did not change the causes of blindness. There were 76% patients with unilateral blindness. The most common causes of unilateral blindness were diabetes mellitus (DM) (19 patients; 27%), glaucoma (17 patients; 23%) and retinal diseases (other than that caused by DM) (17 patients; 23%). In the entire study sample, the male-to-female ratio for patients with blindness from DM was 2:1. Diabetic macular edema caused 87% of the cases of blindness in patients with DM mostly in the left eye.
Conclusion: Diabetes mellitus and then glaucoma are the major causes of irreversible blindness in the Al Baha region in Saudi Arabia. Public health plans should be developed to encourage proper patient health education in the region. Additionally, effective screening should be performed at the primary health care centers for diabetes.

Keywords: Blindness, Irreversible, Diabetes Mellitus, Al Baha

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Introduction

Blindness can be due to numerous ophthalmic and systemic diseases.[1] Additionally the cause of visual loss varies between countries and may be even within region of some countries.[2,6,9] In developing countries there is an urgent need to properly allocate resources for optimal delivery of healthcare. Hence, regional data on the causes of vision loss would allow better allocation of resources and public health care planning.

Diabetes is a worldwide disease with ocular sequelae including diabetic retinopathy. Currently diabetic retinopathy is a major cause of visual morbidity and blindness worldwide.[7]

To understand the effect of systemic and ocular disease of blindness in various regions of Saudi Arabia, regional studies

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of the prevalence of blindness are required. Additionally studies that evaluate irreversible blindness in a group of subjects without age-exclusion criteria will provide a realistic estimate of the burden of blindness in a region.

In the current study we evaluate the causes of irreversible unilateral and bilateral blindness that could not be surgically or visually rehabilitated in Al Baha, a province in southwest Saudi Arabia.

Methods

This cross-sectional study was performed to determine the causes of irreversible unilateral and bilateral blindness that could not be rehabilitated medically or surgically in Al Baha, a province in southwest Saudi Arabia. All patients in the study presented to the King Fahad Hospital in Al Baha. King Fahad Hospital is a tertiary hospital that services a population of 400,000–500,000. Most of the population in Al Baha reside in a mountainous region and are relatively homogenous. In addition to examining the patients attending the ophthalmology clinic, a chart review was performed to collect data of patients who attended the clinic during holidays. This study was performed from June 1, 2011 to the end of September 2011. Subjects who were screened were either new, referred or presented for follow-up or seen in the emergency department.

Blindness was defined as BCVA of less than 0.05 (Snellen, 20/400) or a visual field no greater than 10° around central fixation. The staff at KFH referred any patient with BCVA $\leqslant$ 0.05 in one or both eyes or VF < 15° in one or both eyes to the study coordinator.

Patients were included if they were blind in one or both eyes. Patients were excluded if the cause of vision loss was treatable such as cataract and, corneal opacity occurring in patients older than 5 years, keratoconus, refractive error, recent vitreous hemorrhages, operable retinal disease, and recent diabetic maculopathy. For patients with multiple ophthalmic diseases, only the disease with the greatest effect on vision was recorded. If co-existing systemic disease was considered the primary cause of vision loss then it was recorded.

Data were collected on patient demographics, ocular disease either primary or secondary to systemic diseases and laterality if unilateral involvement. The mean, standard deviation and range were calculated for continuous variables.

Results

Out of 115 with unilateral or bilateral blindness, 100 consecutive patients were enrolled in the study. The mean age of the study sample was 58 ± 2.28 years (range, 1–90 years; median, 64 years; mode 80 years). The male to female ratio was 3:2. The distribution of age based on gender is presented in Fig. 1. The most common cause of blindness per person was diabetes (30% of patients) followed by glaucoma (23%) (Table 1). Reclassification of the causes of blindness was based on World Health Organization (WHO) criteria, and patients blinded bilaterally showed diabetes as the most common cause of blindness (10/24 = 41%) followed by glaucoma 5/24 = 20% (Table 2). There were 76% of patients with unilateral blindness of which there were 38 right eyes and 36 left eyes (two patients laterality were not recoded clearly but included in the study for their diagnoses when analyzing the unilateral causes of blindness). The most common causes of unilateral blindness were diabetes mellitus (19 patients; 26%) followed by glaucoma (17 patients; 23%) and retinal diseases (excluding retinal diseases caused by diabetes) (17 patients; 23%) (Table 3). The most common causes of blindness in the right eye (total recorded 38) were retinal diseases (12 cases; 32%), followed by glaucoma (10 cases; 26%), diabetes mellitus (6 cases; 16%), deep amblyopia (4 cases;

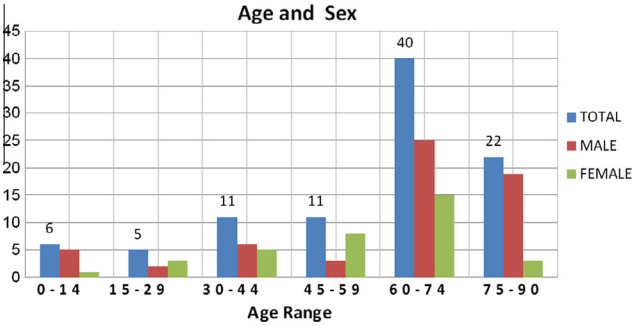

Figure 1. Distribution of age based on gender of patients with irreversible unilateral or bilateral blindness in Al Baha region, Saudi Arabia.

Table 1. Causes of irreversible unilateral or bilateral blindness in the Al Baha region, Saudi Arabia.

Pathology	Proportion of patients (N = 100 patients) (%)
Diabetes mellitus	30
Glaucoma	23
Retinal diseases	17
Deep amblyopia	7
Congenital ocular diseases	6
Trauma	5
Iatrogenic	4
Neurologic	4
Inflammatory	3
Hereditary	1

Includes severe visual impairment defined as best corrected visual acuity $\leqslant$0.05 decimal acuity.

Table 2. Causes of irreversible bilateral blindness based on World Health Organization definition of bilateral involvement, in the Al Baha region, Saudi Arabia.

Pathology	Number of patients (%): 24 patients
Diabetes mellitus	10 (41%)
Glaucoma	5 (20%)
Congenital	4 (16%)
Neurologic	3 (12%)
Retinal disease	1 (4%)
Hereditary	1 (4%)

I defined as best corrected visual acuity $\leqslant$0.05 in the better eye.

Table 3. The major causes of unilateral blindness of patients in the Al Baha region, Saudi Arabia.

Pathology	Number of patients (%)
Diabetes mellitus	19 (27%)
Glaucoma	17 (23%)
Retinal diseases	17 (23%)

Table 4. Laterality of major causes of unilateral blindness in patients in the Al Baha region, Saudi Arabia.

Right eye		Left eye	
Pathology	Number of patients (%)	Pathology	Number of patients (%)
Retinal disease	12 (32%)	Diabetes mellitus	13 (36%)
Glaucoma	9 (24%)	Glaucoma	8 (22%)
Diabetes mellitus	6 (16%)	Retinal disease	5 (14%)

Best corrected visual acuity ⩽0.05 in RT and LT eye respectively.

11%), iatrogenic (3 cases; 8%), trauma (2 cases; 5%), and congenital (one case; 2%) (Table 4). The most common causes of blindness in the left eye (total recorded 36) were DM (13 cases; 36%), glaucoma (8 cases; 22%), retinal diseases (5 cases; 14%), amblyopia (2 patients; 6%), inflammatory (2 patients; 6%), trauma (3 patients; 8%) and (1 patient; 3%) with congenital, neurologic and iatrogenic causes respectively (Table 4).

In the entire study cohort, the male-to-female ratio for patients with blindness due to diabetes mellitus was 2:1. Diabetic macular edema caused 87% of the cases of blindness in patients with diabetes mellitus mostly in the left eye. There were 23 patients with blindness due to glaucoma and our preliminary data indicate that 25% cases had secondary glaucoma. There were 17 (17%) patients with blindness due to retinal disease mostly in the right eye. There were 8 (47%) patients with age related macular degeneration, 5 (29%) patients with retinal detachment, 3 (17%) patients with central retinal vein occlusion and 1 patient (6%) with macular hole.

Discussion

This is the second study of causes of irreversible blindness at a major government hospital in Saudi Arabia. The first study was performed in Dammam 7 years ago by the same investigator and was presented at the 2010 Saudi Ophthalmic meeting.[2] Both studies are unique because they evaluated irreversible causes of blindness in one or both eyes that could not be treated further. These studies were performed to help develop a plan for early detection and prompt treatment (e.g. peripheral iridotomy (PI), focal or grid treatment), as most of diseases causing blindness tend to occur in the elderly.[2–6]

The outcomes of our study concur with the previous literature (2–6) as more than 64% of the subjects were 60 years or older. In an era of increasing life spans and a growing population of elderly, early detection of disease and pathology is fundamental for reducing visual morbidity and allowing patients to keep functional vision over their entire lifespan.

Other studies evaluating blindness in Saudi Arabia mainly focused on treatable causes such as refractive errors, cataract, and corneal opacity, which are far more common than irreversible causes.[3,4,6,9] Although these studies[3,4,6,9] were community based, they would tend to underestimate diseases such as glaucoma (e.g. normal tension glaucoma) which may be hidden among diseases causing optic atrophy instead. Additionally these studies,[3,4,6] were performed in different provinces in the Kingdom of Saudi Arabia with different surrounding geographies. The local geography can affect accessibility to healthcare. A previous study in the Al-Hejaaz mountainous area (Sourawat mountains) in Taif, Saudi Arabia,[9] had similar geographic topography to our study. Some of the previous studies[3,4] were performed 1–2 decades ago and may not be indicative of current conditions as significant development has occurred over time.

Studies of blindness that were performed at Saudi institutions or schools[8,10] dealt with causes in a younger segment of blind patients.[8,10] On the other hand other population based studies[6,9] did not deal with the entire range of population age. For example, subjects less than 18 years were excluded by Al-Shaaln et al.[6] wherein Al-Ghamdi et al.[9] study had excluded subjects less than 50 years. Hence both studies,[6,9] did not identify all the significant causes of blindness because causes of childhood visual morbidity differ from adult causes (e.g. retinopathy of prematurity).

As diagnoses of the causes of eye disease are best performed at secondary and tertiary hospitals, King Fahad Hospital is an appropriate hospital for evaluating and studying cases of blindness in the region. King Fahad Hospital evaluates referred cases from primary health care centers and smaller secondary hospitals and is responsible for diagnosing medico-legal cases and social compensation cases.

The main causes of blindness in the Al Baha province (located in southwestern Saudi Arabia) differed from Dammam,[2] a major city in eastern province. These differences may be due to a number of different situations (Table 5). Dammam is a relatively new city (greater than 60 years old) with a heterogenous population living at sea level, whereas Baha is located in more remote region at a height of 2150 m above sea level and the population is relatively homogenous to ancestors who had inhabited the region for more than 20,000 years (Table 5).

The most common cause of unilateral blindness and bilateral blindness in Al Baha province was diabetes mellitus followed by glaucoma (Tables 1 and 2). On the other hand in the Dammam study the most common cause of unilateral and bilateral blindness was glaucoma and longstanding inflammatory diseases.[2] Comparison of major causes of blindness shows that diabetes was not a major cause in Dammam[2] and inflammatory processes were not a major factor in Al Baha (Tables 6 and 7 respectively).

Diabetic complications in the Al Baha tribes are likely caused by other risk factors such as low oxygen tension because of the height above sea level or specific ethnic risk factors.[7] A study[9] on avoidable blindness in Taif province reported that diabetic retinopathy was responsible for 10% of reversible and irreversible blindness (WHO criteria for blindness). In the Taif based study,[9] the majority with sight threatening diabetic retinopathy did not receive laser treatment. This may be another risk factor for blindness due to the prevalence diabetes in our study.

Table 5. Differences in the current study of the Baha province and the Dammam in Saudi Arabia.

Baha province (current study)	Dammam province
High altitude	Low altitude
Homogenous population (mainly two tribes)	Heterogeneous population
>70 patients/day are seen per day	>200 patients/day
Study duration = 3–4 months	Study duration = 4–5 months
Sample size, 116 patients with SVI or blindness	Sample size, 121 blind patients

Table 6. Common causes of unilateral blindness in the current study of the Baha province and the Dammam province in Saudi Arabia.

Baha province		Dammam province	
76% of subjects	*R*:*L* ratio 1:1 (%)	80% of subjects	*R*:*L* ratio 7:9 (%)
Diabetes mellitus	19	Glaucoma	25
Glaucoma	17	Inflammatory	14
Retinal diseases	17	Amblyopia	11
Amblyopia	6	Retinal disease	10
Trauma	5	Trauma	9

Table 7. Common causes of bilateral blindness using World Health Organization criteria in the current study of the Baha province and the Dammam province in Saudi Arabia.

Baha province (*N* = 24 patients)		Dammam (*N* = 20 patients)	
Diabetes mellitus	44%	Glaucoma	40%
Glaucoma	17%	Hereditary	20%
Congenital	17%	Retinal disease	15%

In the Gulf Council Countries the most common cause of irreversible blindness varies. In Bahrain, glaucoma related blindness is most common followed by diabetic retinopathy.[11] In Qatar, it is glaucoma in the adults over than 50 years of age (causes of blindness in ages less than 50 years were not studied).[12] In Kuwait the study was not inferential because 70% of the study samples were less than 40 years of age, presenting for blindness allowances.[13] Currently there is no similar study from Oman on irreversible blindness. However the National Eye Health Care Committee has consented in 2010 to adopt a retrieval system for patients with avoidable blindness due to sight threatening diabetic retinopathy.[14] A study[15] from Yemen reported that glaucoma followed by diabetic retinopathy was the common cause of blindness based on WHO criteria after excluding cataract (i.e. bilateral blindness). However, the Yemen-based study excluded patients less than 17-years-old.[15]

Blindness associated with diabetic retinopathy comprises approximately 4.8% of global blindness out of 37 million blind individuals (Fig. 2).[1] It is interesting to note the temporal change in causes of visual loss over time in the Kingdom of Saudi Arabia due to the improved health services and the change in lifestyles. For example, if the reversible causes of blindness are excluded from the Tabbara and Ross-Degnan[3] and Al Faran et al.[4] studies, the most common causes of unilateral blindness were amblyopia and iatrogenic causes for bilateral blindness.

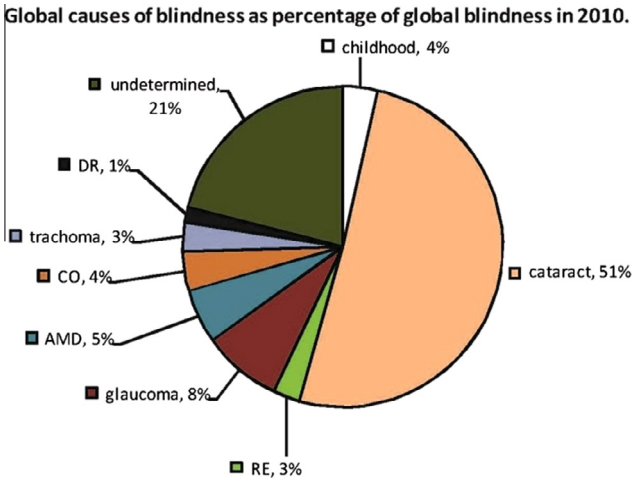

Figure 2. Cause of blindness worldwide. Source: Silvio P. Mariotti, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerlan.

In conclusion diabetes mellitus is the major cause of irreversible blindness in Al Baha, Saudi Arabia. Public health plans should be developed to encourage proper patient health education in the region and to arrange for solutions provided by low vision aid facilities if available for those with bilateral profound visual impairment. Additionally, effective screening should be performed at the primary health care centers. Future studies should be collaborative efforts from all the regions within the Kingdom to collect data on patient demographics, ocular disease either primary or secondary to systemic disease, and laterality if unilateral involvement.

Conflict of interest

The author has no conflict of interest in the materials presented in this paper.

Acknowledgments

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