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The prevalence and causes of visual impairment in Dariyah, a rural community in Saudi Arabia

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Background: Visual impairment is disproportionately distributed between rural and urban dwellers. Rural dwellers have limited access to the eye care services that are available in urban cities.

Aim: The aim of this study was to determine the prevalence and causes of visual impairment in Dariyah, a rural community in the Qassim region, Saudi Arabia.

Setting: This research comprised a population-based assessment of the vision and visual status of the inhabitants of Dariyah community.

Methods: A cross-sectional descriptive study was conducted amongst the inhabitants of the community of Dariyah. A comprehensive eye examination consisting of visual acuity, ocular health examination, objective and subjective refraction was performed. The examinations were conducted by registered ophthalmologists and optometrists from the Qassim University. Vision impairments were categorised according to the International Classification of Diseases (ICD), Section 9D90, 'Vision impairment including blindness' (2018).

Results: In all, 68 (24.5%) participants had vision impairment (using the better-seeing eye), with refractive errors being the main cause of vision impairment. Other causes of vision impairment included cataract (20, 7.2%), trichiasis (5, 1.8%) and glaucoma (2, 0.7%). Refractive errors were present in 193 (69.7%), with astigmatism being the commonest refractive error. About 60% of those with refractive errors presented without spectacles for correction, and 20% reported that they had never had an eye examination. Refractive errors could not be determined in 19 (6.9%) of the subjects because of conditions such as matured cataract and other ocular abnormalities.

Conclusion: Uncorrected refractive error was found to be the leading cause of vision impairment in this rural community in Saudi Arabia.

Keywords: refractive errors; myopia; astigmatism; cataract; vision impairment.

Introduction

Refractive errors are a common cause of visual impairment globally; hence this was one of the priority conditions targeted in the global initiative for the elimination of avoidable blindness, Vision 2020: the Right to Sight Initiative.[1] The presence of uncorrected refractive errors in a given population could serve as an indicator for evaluating the availability of and access to eye care. This is because refractive error is the cause of visual impairment that is most amenable to prevention, as there is a cost-effective intervention. Refractive error is one of the commonest causes of visual impairment and the second leading cause of blindness after cataract.[2] An estimated 153 million people are reported to be visually impaired globally, of whom 8 million are blind (using the World Health Organization definition).[3] The authors indicated that uncorrected refractive errors can hamper performance at school, reduce employability and impair quality of life, and they drew attention to the public health significance of refractive errors. Using the data from five studies in the Eastern Mediterranean region, Resnikoff et al.[3] estimated that 3.2 million people (a prevalence of 1.2%) have uncorrected refractive errors. Vast differences exist in the prevalence of visual impairment attributable to uncorrected refractive errors between rural and urban areas. This could be a result of the level of awareness of the problem, the availability of refractive error services in urban areas relative to rural areas and the unequal educational status between rural and urban dwellers. Studies on refractive errors in Saudi Arabia have largely been hospital based or reported for urban dwellers or amongst school-children in the cities.[4,5,6,7] A recent review of published and other official reports from the National Committee for the Prevention of Blindness have indicated a large variation in the prevalence of visual impairment in Saudi Arabia over a 40-year period.[8] The study indicated that over the period of the review, cataracts remained the leading cause of blindness in Saudi Arabia.

Despite the high budget of over $20.1 billion for health in 2019 in the Kingdom of Saudi Arabia (representing 6.82% of the annual budget),[9] eye care services aimed at preventing visual impairment are still inadequate. The country report provided by the International Agency for the Prevention of Blindness (IAPB) indicated that there are 1778 ophthalmologists (60 per million), 555 optometrists (19 per million) and 280 allied ophthalmic personnel (9 per million) in Saudi Arabia as of 2015 data.[10] The majority of these eye health workers provide services in large cities, leaving a huge unmet eye care need in the rural areas.

Dariyah is an isolated, rural, small town in the centre of Saudi Arabia. It is part of the Qassim province, with an estimated population of 2000. The town has no access to eye care services, with the nearest eye care facility located in Arass city, which is 165 km away.

As part of its community service, Qassim University, Buraidah, identifies medically underserved communities and then arranges an annual medical outreach event to such communities. This article presents the result of the 2019 community outreach event to the Dariyah community, in the Qassim province of Saudi Arabia. The aim is to determine the prevalence and causes of visual impairment in Dariyah.

Methodology

A cross-sectional study was conducted to determine the prevalence and distribution of refractive errors and other ocular findings in Dariyah, a rural community in the Qassim region, Saudi Arabia. The participants were recruited during a community eye outreach event in Dariyah. Prior to the 5-day outreach event, the community was informed of the exercise. The event was part of a larger medical mission to the community and comprised medical and dental services. The medical mission is an annual event organised by Qassim University to provide health services to underserved rural communities in Saudi Arabia. The participants in the study included the regular inhabitants of the community.

A comprehensive eye examination was performed on each participant comprising visual acuity testing, ocular health examination using a handheld slit lamp biomicroscope (for external eye examination) and a direct ophthalmoscope and 90 D fundus biomicroscopy (for internal eye examination), and objective and subjective refraction. Ocular diagnosis using standardised diagnostic criteria was made by the attending ophthalmologist. All eye examinations were carried out under appropriate illumination at a special purpose-built tent in the community. Vision impairments were classified according to the International Classification of Diseases, Section 9D90, 'Vision impairment including blindness' (2018) (https://www.findacode.com/icd-11/code-1103667651.html). Refractive error was defined as ±0.50 D.

The data were analysed using SPSS version. 24, and the results are presented in tables and charts. The appropriate descriptive and inferential statistics are used to present the relevant results.

Ethical considerations

Ethical approval to conduct the study was sought and obtained from the Regional Research Ethics Committee, registered at the National Committee of Bio and Medical Ethics (NCBE) Registration No. H-04-Q-001 of the Ministry of Health, Kingdom of Saudi Arabia. The study was conducted according to the Declaration of Helsinki on the conduct of medical research on human subjects.

Results

A total of 277 subjects were examined in the community. This figure comprised 98 (35.4%) female participants and 179 (64.6%) male participants. The 269 subjects who reported their ages were between 5–89 years with a mean age of 37.00 ± 18.88 years (95% confidence interval [CI] = 34.75–39.25). The mean age of the male participants was 37.84 ± 19.51 years (95% CI = 34.93–40.75), whilst the mean age of the female participants was 35.49 ± 17.67 years (95% CI = 31.96–39.02). There was no significant difference between the mean age of the male and female participants ($p = 0.330$). Figure 1 shows the distribution of age and sex of the study participants.

Visual impairment

A total of 89 (32.1%) of the study participants had visual impairment. This figure comprised 35 (39.3%) with unilateral visual impairment and 54 (60.7%) bilateral visual impairment. Vision could not be determined in 11 (4.0%) of the subjects. Of the 89 subjects who had visual impairment, 36 (40.4%) were female whilst 53 (59.6%) were male. The male participants were less likely to have visual impairment compared to the female participants (odds ratio [OR] = 0.72, 95% CI = 0.43–1.22). Table 1 shows the categories of visual impairment amongst the study subjects.

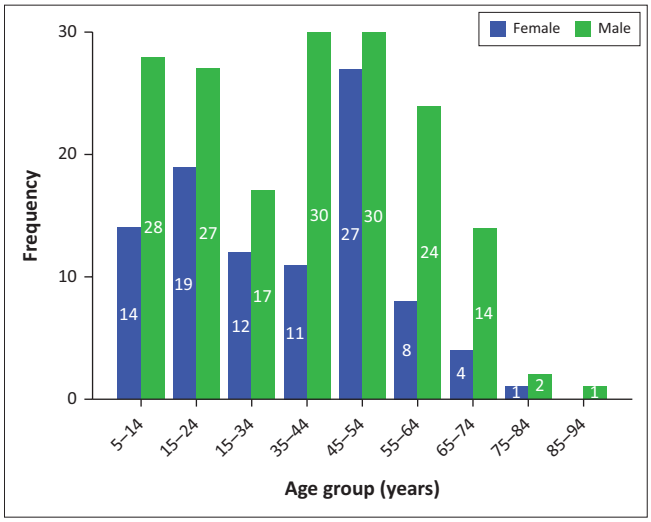

FIGURE 1: Age and sex distribution of subjects.

TABLE 1: Distribution of categories of visual impairment.

Category of visual impairment	Right eye		Left eye	
	n	%	*n*	%
No vision impairment (equal to or better than 6/12)	198	71.5	191	69.0
Mild vision impairment (6/12 > a ≤ 6/18)	22	7.9	28	10.1
Moderate vision impairment (6/18 > a ≤ 6/60)	32	11.6	33	11.9
Severe vision impairment (6/60 > a ≤ 3/60)	4	1.4	5	1.8
Blindness (3/60 > a ≤ 1/60 incl CF@1M)	7	2.5	6	2.2
Blindness (1/60 > a ≤ light perception)	1	0.4	0	0.0
No light perception	2	0.7	2	0.2
Unspecified	11	4.0	12	4.3
Total	**277**	**100.0**	**277**	**100.0**

Note: incl CF@1m, including counting fingers at 1 meter.

TABLE 2: Distribution of visual impairment with age.

Age group	Unilateral VI		Bilateral VI		Total	
	n	%	*n*	%	*n*	%
5–14	5	14.3	5	9.3	10	11.2
15–24	6	17.1	8	14.8	14	15.7
25–34	4	11.4	2	3.7	6	6.7
35–44	3	8.6	3	5.6	6	6.7
45–54	6	17.1	12	22.2	18	20.2
55–64	5	14.3	11	20.4	16	18.0
65–74	5	14.3	10	18.5	15	16.9
75–84	1	2.9	2	3.7	3	3.4
85–94	0	0.0	1	1.9	1	1.1
Total	**35**	**100.0**	**54**	**100.0**	**89**	**100.0**

VI, visual impairment.

Participants aged 45 years and older accounted for nearly 60% of the visual impairment amongst those examined (Table 2).

Refractive error

Of the 277 subjects, refractive error could not be determined in 19 (6.9%) participants. Refractive errors were found in 193 (69.7%), whilst 65 (23.5%) had no refractive error. Thus the prevalence of refractive error amongst the subjects was 74.8%. The refractive errors comprise astigmatism, which was present in 136 (70.4%); hyperopia, 31 (16.1%); and myopia (13.5%). About 60% of those with refractive error presented without spectacle correction for their refractive error, and another 20% had never had an eye examination prior to the time of this study. There was no significant association between sex and the occurrence of refractive error ($\chi^2 = 0.54$, $p = 0.973$).

Of the 89 subjects with visual impairment, 74 (83.1%) had a refractive error. This figure comprised 32 (43.2%) with unilateral visual impairment and 42 (56.8%) with bilateral visual impairment. Table 3 shows the contribution of refractive errors to visual impairment.

Other ocular findings

Besides refractive errors, different ocular conditions were found amongst the study subjects. The commonest ocular finding was ocular surface disease, comprising dry eye and blepharitis. Table 4 shows the ocular conditions presented by the study subjects.

TABLE 3: Contribution of refractive errors to visual impairment.

Visual impairment	Myopia		Hyperopia		Astigmatism	
	n	%	*n*	%	*n*	%
Unilateral	4	25.0	4	57.1	24	47.1
Bilateral	12	75.0	3	42.9	27	52.9
Total	**16**	**100.0**	**7**	**100.0**	**51**	**100.0**

TABLE 4: Ocular presentation amongst the study subjects.

Ocular condition	Frequency	%
Ocular surface disease	34	35.8
Conjunctivitis	13	13.7
Cataract	23	24.2
Posterior segment disease	4	4.2
Glaucoma	2	2.1
Pterygium	8	8.4
Amblyopia	6	6.3
Trichiasis	5	5.3
Total	**95**	**100.0**

Discussion

To the best of our knowledge, this is the first report of the prevalence of visual impairment resulting from refractive error in a rural community in the Kingdom of Saudi Arabia. The present study reported the distribution of refractive errors and visual impairment in Dariyah, a rural community in the Qassim province, Saudi Arabia. The prevalence of refractive error in this study was 74.8%, with astigmatism being the commonest form of refractive error. Previous studies from Saudi Arabia[5,6,7] have reported the prevalence of refractive errors to vary from 9.8% amongst adolescents to 45.8% in adults. There is difficulty in comparing the prevalence of refractive errors amongst different studies in Saudi Arabia because of the difference in case definition, the cut-off point used in designating refractive error, variation in the population studied and so on. The considerably high prevalence of refractive errors reported in this population-based study relative to other hospital-based studies reflects the significance of the absence of eye care services in the community. The usual observation is that hospital-based prevalence studies are higher than population-based studies because of selection bias.

Several factors could account for the high prevalence of refractive errors in this community. There is presently no national programme in Saudi Arabia that promotes school vision screening, where individuals with refractive errors could have been detected and provided with care. There is also a maldistribution of and inadequate number of eye care providers. The few eye care professionals (ophthalmologists, optometrists and allied ophthalmic personnel) are domiciled in urban and city centres. This is further compounded by the policy of the Ministry of Health (the major employer of eye care workers in Saudi Arabia) that optometrists who should be at primary eye care facilities are recruited and posted to government hospitals with no less than a 50-bed capacity. This therefore leaves the vast number of primary healthcare centres without the services of optometrists who are trained and skilled in providing primary healthcare and refractive error services.

There is also the low level of awareness of refractive errors in the general population.[11,12,13]

Astigmatism was the commonest refractive error in this study. This is consistent with a hospital-based study in Riyadh[4] but different from a population study in Arar city,[7] which reported myopia as the commonest refractive error. A population-based study of refractive error in Buraydah, Qassim province, also reported myopia as the commonest refractive error in subjects aged 2–75 years (mean = 28.9 years).[14]

In the present study, as much as 32.1% of the study population had visual impairment (both unilateral and bilateral). Refractive errors were the cause of visual impairment in 83.1% of those with visual impairment (a prevalence of 26.7% of the total study population) (Table 2). This figure represents the proportion of the study sample whose visual impairment would have been avoided had they had access to refractive error services in the community. The prevalence reported in this study is much higher than the 13.9% reported amongst adults 18 years and older visiting Aljouf Primary Health Centre in northern Saudi Arabia.[15] The authors reported refractive errors (36%) as the leading cause of visual impairment, followed by cataract. The difference in the prevalence of visual impairment reported in this study and the values reported by Al Shaaln et al.[15] was a result of the difference in the definition of visual impairment. In the present study, the presenting visual acuity was used to define visual impairment, whereas Al Shaaaln et al. used the best corrected vision. Furthermore, the present study employed a visual acuity cut-off point of 6/12, whilst Al Shaaaln et al.[15] used 6/18. It has been reported that using the best corrected vision to define visual impairment tends to underestimate the proportion of visual impairments caused by refractive errors.[16] The authors therefore recommended the use of presenting visual acuity to define visual impairment.

Other ocular conditions found in the present study are presented in Table 4. In the present study, ocular surface disease (dry eye and blepharitis) was found amongst 35.8% of the subjects examined. Dry eye disease has been found to be quite prevalent in Saudi Arabia, with the prevalence ranging from 32.1% to 93.2%.[17,18,19,20] The high prevalence of ocular surface disease in Saudi Arabia is related to the dry and dusty nature of the environment. Temperatures during the summer are reported to reach 50 °C.

The noteworthy point that needs to be made in this study is that whereas the investigation of dry eye disease reported above was conducted amongst individuals presenting at the hospital or health centre, the Dariyah community does not have access to eye care, with the nearest hospital being 165 km away.

An important limitation of this study is the fact that the participants in the study were obtained from a single community without random selection; this is likely to introduce various biases, and it is therefore also not possible to generalise the findings to the entire Kingdom of Saudi Arabia. However, the study presents some insight into the state of eye health in a rural community in Saudi Arabia, and chances are that some results may be the case for other rural areas with similar socioeconomic characteristics. Further investigations with larger randomised samples remain for the future.

Conclusion

The prevalence of visual impairment in this community with no access to eye care service was found to be 32.1%, with refractive error being the commonest cause of visual impairment. Given the absence of eye care services in the community, we recommend the engagement of primary eye care professionals, including optometrists, as one way to address the identified prevalence of refractive errors and ocular surface disease.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

W.A. was responsible for the conceptualisation and design of the study, data collection and review of the draft manuscript. G.O.O.-O. was responsible for the conceptualisation and design of the study, data extraction, data analysis, and writing and review of the manuscript.

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Data availability

The data for the study are available from the corresponding author, G.O.O.-O., upon reasonable request.

Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

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