



## Overview of Public's Awareness toward Glaucoma, Cataracts and Keratoconus in Jeddah, Saudi Arabia

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### ABSTRACT

**Introduction:** To assess the public citizens' awareness of cataract, glaucoma and keratoconus in Jeddah city, KSA using a self-administered, cross-sectional survey.

**Methods:** The study survey was administered to 734 participants in the Mall of Arabia, Jeddah, KSA and was designed to measure the public's knowledge about the diseases' definitions, risk factors, signs, symptoms, treatments and complications using quiz-styled questions. A correct response was allocated one point per each question for each participant. No points were deducted for incorrect responses.

**Results:** The results of the study suggest that cataract, glaucoma and keratoconus are poorly understood among the participants with a total performance of less than 31%, as measured by mean score collected via the 24-item scored questionnaire despite being a female being significantly associated with better overall knowledge of the diseases ( $7.82 \pm 4.5$ ;  $p=0.006$ ). In addition, it appears that higher levels of education played a crucial role in the better knowledge of study participants ( $p=0.007$ ).

**Conclusion:** Cataract, glaucoma and keratoconus are all manageable conditions. As a result, raising the public's awareness toward them in a professional medical manner is very crucial to avoid their downsides on an individual's quality of life.

**Keywords:** Risk factors, Saudi Arabia, Cataract, Glaucoma, Keratoconus

## INTRODUCTION

The eye is an organ with multiple constituents that all function to form a very clear image that is perfectly interpreted by the brain. It functions like a camera whose refractive power is generated by the cornea and lens, and whose photographic film is the retina. The cornea is a prolate-shaped spherical and together with the lens, functions to focus light rays on a certain spot on the retina [1]. In there, this light energy will be converted to an electrical one that will be carried by the optic nerve into the vision center in the brain. Due to their pivotal and unquestionable involvement in vision, pathological processes affecting any of the above structures compose the most common causes of impaired vision in different age groups and different ethnicities. The majority of these diseases have well-recognized modifiable risk factors and have prodromal symptoms that should be noticed initially by the patients themselves. Controlling the predisposing factors and detecting those diseases early on is associated with much better outcomes, signifying the importance of public awareness about these illnesses [2].

Intact and clear eye lenses are needed to produce a perfectly refracted light on the retina, thus producing an intact image. When this clarity is lost due as a result of lens opacification, cataract is yielded. According to the World Health Organization (WHO), it is the leading cause of blindness worldwide. It is a very potentially curable disease of a higher social burden especially in low socioeconomic status. Cataract is multifactorial in origin, with multiple potential risk factors. Risk factors can be of metabolic origin like galactosemia or environmental ones, which include advancing age, smoking, diabetes mellitus or medications like steroids use. The typical presentation of a patient with cataract includes a painless blurred vision and extreme sensitivity to glare. The diagnosis is firmly established through detecting lens opacity on the slit-lamp exam. Surgery is the curative modality for cataracts. Keeping in mind that it is a very potentially curable disease with better outcomes if treated early, public awareness should be raised about it to improve outcomes and mitigate potentially unfavorable eye complications [3].

A study in New Delhi concluded that the majority (90%) of 1550 participants in their questionnaire were aware of the existence of cataract as an entity. Yet, only half of the knowledge of its presentation and treatment options. Data in Saudi Arabia about cataract awareness are sparse. The previous statement would for sure sound counterintuitive if one knows that it was shown to be the leading cause of visual impairment in one study conducted in Arar, Saudi Arabia [4].

One the other hand, glaucoma is a group of disorders featured by raised intraocular pressure, which consequently damages the optic nerve. This yields an irreversible progressive loss of the peripheral vision. It is considered the second most common cause of blindness worldwide. Factors that predispose to it include advancing age, positive family history, myopia and various medications [5]. Glaucoma is sub-classified into Open-Angle Glaucoma (OAG), in which there is resistance to aqueous humor efflux out of the trabecular meshwork, and Angle-Closure Glaucoma (ACG), in which there is a mechanical obstruction to flow due to narrowing in the anterior chamber angle. Open-angle glaucoma typically progresses silently without bothering affected individuals. It is typically detected on screening during thorough eye evaluation. On the other hand, angle-closure glaucoma, if developed suddenly, may produce debilitating symptoms like severe headache, nausea and vomiting, halos around the eye and most importantly visual loss. ACG is primarily managed medically followed by surgical laser iridotomy. OAG, on the other hand, is treated mostly through medical therapies [6].

OAG, which largely progresses silently, is the predominant type in Saudi Arabia. Additionally, glaucoma by definition produces irreversible damage to the optic nerve. Therefore, it is very much logical for the population to be aware of it for early detection and treatment. A questionnaire distributed to 700 adults in Ethiopia in 2017 showed that only 35% of those participants knew that glaucoma exists and is related to high eye pressure [7].

Keratoconus is an idiopathic disorder of puberty characterized by progressive thinning of the cornea and subsequent protrusion. There are numerous factors reported to increase the risk of developing it, including positive family history, connective tissue disorders, and frequent and heavy eye-robbling. Patients typically present with a progressive blurry vision, nearsightedness, and astigmatism. Early in the course of the disease, the diagnosis may be challenging due to non-specific symptoms and a normal-appearing cornea on a slit-lamp exam. Management of keratoconus is divided into modalities halting the progressions of the disease and symptomatic management, most importantly reduced visual acuity. The former is achieved through collagen cross-linking to support and strengthen the cornea. The latter involves spectacle correction as an initial intervention. Contact lenses will be utilized when the disease advances and astigmatism accentuates. As soon as contact lenses become of no use, here comes the role of corneal transplantation as a definitive therapy [8].

One can comprehend that keratoconus is a progressive disease, whose progression can be impeded with early detection and appropriate management. The public must be aware of it to seek attention and thus receive targeted management, especially in an area where keratoconus is prevalent like Saudi Arabia, where 4.8% of children are affected. All in all, this paper aims to assess and statistically analyze the awareness of the general population about these common potentially preventable and manageable disorders in the city of Jeddah, Saudi Arabia [9].

## MATERIALS AND METHODS

### Ethical approval

This research study had been approved by the Institutional Review Board (IRB) of the King Abdullah International Medical Research Center (KAIMRC). Participants in this study were anonymous and their privacy was ensured. Informed consent was obtained from research participants before administering the questionnaire [10].

### Study design sitting and participants

This cross-sectional study was conducted at the Mall of Arabia in Jeddah, Saudi Arabia from the 5<sup>th</sup> of March 2020 to the 6<sup>th</sup> of March 2020. Individuals were chosen to participate in this study using a convenient sampling technique (non-probability sampling technique). The enrolled individuals were of both genders, Arabic-speaking adults who are  $\geq 18$  years of age, while the excluded ones were individuals who had been diagnosed with Cataract and/or Glaucoma and/or Keratoconus [11].

### Study questionnaire

The data collection of this research was carried out through a self-distributed survey that was adjusted by research authors in Arabic based on their knowledge about the diseases with the aid of other related sources. The survey consisted of 36 questions that were divided into three parts [12]. The first part included questions about age, gender, educational level, and socioeconomic statuses of survey participants. While the second part was designed to evaluate the participants' general knowledge about cataract, glaucoma, and keratoconus using multiple-choice, dichotomous and open-ended questions; the third section had included 24 item-quiz aimed to assess their knowledge about the diseases' manifestations, risk factors, investigations and therapies by dichotomous questions. Participants were given one point for each correct answer with a total score of 24 points [13].

### Statistical analysis

The study sample size was determined through Raosoft<sup>®</sup> online calculator. The upcoming factors were considered in the calculation: Confidence interval of 95% with an approximate Jeddah population size as 5,000,000 and a margin of error of 5%. Accordingly, the sample size was found to be 385. For data entry and analysis, the IBM Statistical Software for Social Sciences (SPSS) for Windows, version 25 (IBM Corp., Armonk, N.Y., USA) was used. In which, the quantitative variables were interpreted as mean and standard deviation, on the other hand, the qualitative variables were construed as a categorical data and summarized in the form of frequency, percentage, and bar graph. Furthermore, the comparison of the data was illustrated by the t-test and chi-square test within a P-value not more than 0.05 to be significant. Scores were compared based on gender, level of education, income, location in Jeddah, and source of information [14].

## RESULTS

The final number of included participants in this study was 734. The female proportion was slightly higher than the male. The majority of the participants were bachelor's degree holders with only 2.2% were identified as uneducated. Monthly income was variable among participants, with more than half of them receiving 5000 SAR or less per month. Respondents were from all five geographical regions of Jeddah, the largest proportion being from the northern region. More details on the demographic profile of participants are shown in Table 1 [15].

**Table 1 Demographic profile of participants.**

Items	Frequency (n=734)	Score (n/14)
<b>Gender</b>		
Male	325	6.87 ± 4.8
Female	403	7.82 ± 4.5
<b>Educational level</b>		
Uneducated	16	3.88 ± 4.717
Less than secondary	39	7.08 ± 4.613
Secondary	196	7.01 ± 4.162
Bachelor's degree	430	7.79 ± 4.861
Higher degree	54	6.98 ± 4.704
<b>Income</b>		
SAR 0-SAR 5000	416	7.22 ± 4.6
SAR 5001-SAR 10000	132	7.48 ± 4.9
SAR 10001-SAR 15000	99	7.94 ± 4.8
SAR 15001-SAR 20000	53	8.00 ± 4.8
SAR 20001 and above	35	6.86 ± 4.3
<b>Location in Jeddah</b>		
Southern region	109	7.07 ± 5.2
Central region	112	7.21 ± 4.9
Western region	66	7.41 ± 4.4
Eastern region	126	8.12 ± 4.7
Northern region	322	7.30 ± 4.6

**Participants awareness towards cataract**

Awareness of cataract was mainly derived from unidentified sources (50.1%). Almost 80% of the participants did not know anybody who has been diagnosed with cataract. Only 16.3% correctly identified the right description of cataract. When asked about risk factors, participants correctly identified age (53.5%), sunlight exposure (24.7%), and smoking (29.4%). Symptoms of cataract were correctly identified by 40.2%. Total or partial blindness was thought of as a possible complication of cataract among 39.5%. Surgery was believed to be an effective intervention for cataract in 45.5% of participants as shown in Table 2.

**Table 2** Participants' responses to general questions about cataract.

S. no.	Question	Yes		No		Not sure	
		%	n	%	n	%	n
1	Do you think that elderly and younger individuals are affected differently by the disease?	53.5	393	10.6	78	36.6	269
2	Do you think that cataract is caused by sunlight exposure?	24.7	183	24.9	183	51.8	380
3	Do you think that smoking is a risk factor of cataract?	29.4	216	20.3	149	51.8	380
4	Do you think that cataract could be effectively treated with surgery?	45.5	334	11	81	44	323
5	Do you think that blurry vision and problems with night driving, reading road signs, or difficulty with fine print are symptoms of cataract?	40.2	295	13.6	100	46.3	340
6	Do you think that discontinuing systemic steroid use in cataract patients may lower the disease progression?	21.9	161	14.2	104	64.2	471
7	Do you think that cataract could cause partial or total blindness?	39.5	290	9.7	71	51.2	376

**Participants awareness towards glaucoma**

Of all participants, 56.9% reported that they knew someone diagnosed with glaucoma. The largest proportion of participants reported their source of information on glaucoma to be a relative or a friend (31.3%) while only 14.6%

attributed their knowledge to the internet or social media. When asked about the mechanism of glaucoma, 41.1% correctly identified the answer, while the rest thought it was a type of tumor (2.7%), traumatic hemorrhage (6.8%) and infection (10.1%) or did not know the mechanism by which the disease infests itself (39.2%). As presented in Table 3, responding to the question of whether males and females are affected equally by the disease, 42.4% stated that they did not know. Regarding glaucoma risk factors, only 44.8% correctly identified family history as a risk factor, and about half of the respondents thought that hypertension is a risk factor for glaucoma. It was commonly (45.5%) believed that symptoms of glaucoma often appear in the early stages of the disease. Glaucoma was believed to result in blindness by 60.6% of respondents. Among the participants, only 7.9% thought that glaucoma is incurable, while 71.5% thought that it is. Alternative medicine was believed to have effective treatment for glaucoma by 28.6%.

**Table 3 Participants' responses to general questions about glaucoma.**

S.no.	Question	Yes		No		Not sure	
		%	n	%	n	%	n
1	Do you think that glaucoma is curable?	71.5	525	7.9	58	21.4	157
2	Do you think that men and women are affected equally by the disease?	26.8	197	31.6	232	42.4	311
3	Do you think that hypertension is a risk factor for glaucoma?	54.4	399	14.9	109	32.7	240
4	Do you think that a family history of glaucoma may affect the risk of developing the disease?	44.8	329	24.7	181	31.3	230
5	Do you think that glaucoma could be effectively treated with alternative medicine?	28.6	210	39.5	290	32.8	241
6	Do you think that glaucoma could lead to blindness?	60.6	445	12.5	92	27.5	202
7	Do you think that symptoms of glaucoma do often appear in early stages of the onset of the disease?	45.5	334	18	132	37.5	275

### Participants awareness towards keratoconus

More than three-quarters of the participants did not know anybody who has been diagnosed with keratoconus. Family history, gender, and exposure to sunlight were thought to be risk factors for keratoconus among 31.7%, 29.2%, and 22.6% of the participants, respectively. Furthermore, 32.4% thought that blurry vision and gradual decrease of visual acuity are symptoms of keratoconus, and 30.4% thought that the cone-shaped protrusion of the cornea is a manifestation of Keratoconus. Spectacles or contact lenses were effective treatment options for keratoconus in the opinion of 30.4% of the participants as shown in Table 4.

**Table 4 Participants' responses to general questions about keratoconus.**

S.no.	Question	Yes		No		Not sure	
		%	n	%	n	%	n
1	Do you think that men and women are affected differently by the disease?	29.2	214	21.7	159	50.3	369
2	Do you think that keratoconus is caused by elevated exposure of the eye to sunlight?	22.6	166	26.4	194	52	382
3	Do you think that family history is a risk factor of keratoconus?	31.7	233	18.9	139	50.1	368
4	Do you think that keratoconus could be effectively treated with spectacles or contact lenses?	30.4	223	20.6	151	49.6	364
5	Do you think that blurry vision and gradual decrease in visual acuity are symptoms of keratoconus?	32.4	238	15	110	52.7	387

6	Do you think that cone-shaped protrusion of the cornea is a manifestation of keratoconus?	30.4	223	12.3	90	58.2	427
7	Do you think that control of blood pressure levels in keratoconus patients may lower the disease progression?	30	220	13.6	100	57.4	421

#### 24-Item quiz

Analysis of the performance of participants on the full questionnaire (24 items) revealed an overall mean score of  $7.4 \pm 4.69$ . Females performed significantly better than males ( $7.82 \pm 4.5$  versus  $6.87 \pm 4.8$ ;  $P=0.006$ ). There was also a significant difference in awareness among participants with different levels of education ( $P=0.007$ ). Moreover, the source of information was shown to be associated with significantly different levels of awareness ( $P<0.001$ ), with participants answering from a personal experience ranking the highest in the mean knowledge score ( $10.13 \pm 4.941$ ) (Table 5).

**Table 5 Breakdown of participants' scores according to their source of information.**

Variables	Frequency (n)	Mean (n)	Standard deviation (n)
Personal experience	15	10.13	4.941
Relatives and friends	231	8.15	4.316
Television	44	6.91	3.97
Internet and social media	107	8.16	4.483
School or university	83	9.57	4.016
Books, magazines and newspapers	26	7.15	3.585
Physician	32	9.06	4.472
Other	197	4.86	4.728
Total	735	7.4	4.689

## DISCUSSION

This study has been conducted to identify and evaluate the level of knowledge and awareness among the inhabitants of Jeddah city towards glaucoma, cataract and keratoconus. The present study has targeted some of the key principles concerning the understanding of the right description, risk factors, signs, symptoms, treatment and blindness risk pertaining to all three diseases.



Glaucoma, cataract, and keratoconus constitute three of the common eye diseases in the region, yet poorly understood among Jeddah inhabitants. Although better knowledge was significantly associated with female gender ( $7.82 \pm 4.5$ ;  $p=0.006$ ), personal experience as the source of information ( $10.13 \pm 4.941$ ;  $p<0.001$ ) and a higher level of education ( $p=0.007$ ). Despite this, the overall performance of the 734 participants was less than 31% on a questionnaire exploring common knowledge.

In the literature, awareness of glaucoma ranged from 0.33% in rural areas to 65.5% in urban areas, with many of these studies attributing higher levels of awareness with higher levels of education nationally and internationally. Interestingly, more than 60% of the participants have heard about glaucoma. Nonetheless, only 41.1% of the sample were familiar with the right description of glaucoma. While the rest wrongly believed that glaucoma is a type of infection, eye bleeding or a tumor, consistent with a Saudi study conducted in 2018. This reflects an insufficient awareness when compared to the awareness level in the northwestern region of Saudi Arabia, which was evidenced to be 52% among the general public.

On the other hand, less prevalence of awareness was noted about cataract (16.3%) in this study, in contrast to the higher reported awareness rates in different previous studies that ranged from 49.6% to 98%. This may be due to fewer people reported knowing someone with cataract (20.8%) when compared to glaucoma (56.9%). Meanwhile, when describing specific knowledge of cataract symptoms, risk factors, blindness risk and management, poor awareness of Jeddah society was noted similar to that of Makkah, Abha and Tabuk societies.

Likewise, the prevalence of keratoconus awareness was 11.9% in this study. Considering only 21.4% people reported knowing someone with keratoconus. Similarly, to the Al-Amri study in Abha, 32.4% believed that blurry vision and sudden decrease of visual acuity are symptoms of keratoconus. Whereas, 30.4% thought that the cone-shaped protrusion of the cornea is a manifestation of Keratoconus. Spectacles or contact lenses were effective treatment options for keratoconus in the opinion of 30.4% of the participants in contrast to Al-Amri study where the majority of Abha society could not identify any suitable treatment options.

In the present study, only 7.5% did not complete their secondary school education. yet, the overall awareness level was quite low. The same has been reported in different studies. Nevertheless, with a considerable proportion of the study sample being educated, the level of awareness would have been expected to be higher than the reported. One possible reason for the, relatively, low level of awareness is the fact that these diseases are not commonly addressed health issues in Saudi Arabia. This is more prominently evident by the fact that less than a quarter of the participants attributed their knowledge to social media, television or newspapers. Another reason is the limited organizations concerned with eye health as the only recognizable efforts in the region are those of the Saudi Ophthalmology Society in collaboration with King Khaled eye specialist hospital and the society's affiliated regional hospitals.

Awareness of the risk factors associated with these diseases is especially crucial as it may help those predisposed to be more conscious about the importance of seeking early screening. Therefore, aid in preventing the devastating effects of the disease. In this study less than half the participants realized that family history is a risk factor for developing glaucoma. Moreover, only 26.8% and 54.4%, appropriately pointed out the association between females and hypertensive patients as being more affected with glaucoma, respectively. In other studies, fewer proportions of participants were aware of the risk factors of glaucoma.

## CONCLUSION

A systematic review reported that between the years of 1990-2020 at least 2.2 billion people have suffered vision impairment or blindness. Of which, over one billion cases would have been prevented, including 65.2 million cases of cataract, 6.9 million cases of glaucoma, and 4.2 million cases of corneal opacities. Accordingly, the burden of vision impairment and blindness in the view of Saudi Arabia's population growth and aging, along with behavioral and lifestyle changes and urbanization, is anticipated to dramatically increase in the upcoming decades according to the first world report on vision released recently by the WHO. This requires addressing the barriers between the population and health care such as socioeconomic, educational and geographical barriers to further help in the early detection and proper management.

This study was limited by its cross-sectional design which is known to prove only association and not causality. Additionally, the study was conducted in a single mall, which might have limited the responses to a specific class of mall visitors. Furthermore, concerning age, we have only collected responses from participants aged 18 years or older with no age categories considered in survey analysis.

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