# Awareness of Emergency Eye Diseases and Red Flag Symptoms in Population of Western Province


## ABSTRACT

**Background:** Emergency eye disease can lead to visual loss when the patient delay seeking medical care quickly due to poor knowledge and awareness of red flags and symptoms that eventually end by late diagnosis then possibly devastating outcomes for example permanent visual loss. This study aims to examine the level of awareness and knowledge regarding different emergency eye diseases in Western Province, kingdom of Saudi Arabia.

**Methodology:** This is a cross sectional study conducted via online questionnaire and approved by research ethics of Taif university. SPSS version 25 was used for statistical analysis. Chi-squared, Mann-Whitney and Kruskal Wallis tests were applied, and a P-value of <0.05 was considered as statistically significant.

**Result:** A total of 702 participants to the online questionnaire from the western province of Kingdom of Saudi Arabia, with 565 (80.5%) females and 137 (19.5%) males. Regarding the awareness of different emergent ocular diseases, acute angle closure glaucoma has the highest awareness level (41.7%) and the least was giant cell arteritis (12.4%).

**Conclusion**: This study reflected the awareness and knowledge of retinal detachment, giant cell arteritis and central retinal occlusion in average population of the western province, Kingdom of Saudi Arabia which was extremely low. This will have an impact on seeking medical care early with delay in diagnosis and implementation of treatment that results in significant visual complications. So, we need to raise awareness of society about different emergency ocular conditions and red flags to help overcome the negative outcomes.



*Keywords: Emergency Eye Disease, Red Flag Symptoms, Makkah region.*


## 1. INTRODUCTION

Emergency eye disease is considered one of the important ophthalmological diseases because patients usually fail to recognize the symptoms quickly or to understand the severity and that will lead to late recognition and diagnosis which will lead subsequently to progressive, rapid and irreversible visual loss and eventually blindness [1,2]. First is the chemical injury in which the eye comes in contact with chemical agent either liquid or gas is a common way by which the eye is exposed to chemicals, eye injury from alkali agent is more dangerous than acids and the severity depends on the chemical's PH concentration. Chemical injury is the only ocular emergency in which the treatment should not be delayed to evaluate the visual acuity of the patient. [3–5] Retinal Detachment (RD) is the second eye emergency in which separation of the neurosensory layer of the retina from the underlying pigmented epithelium and choroid occurs. Although

RD is uncommon (affecting one in every 10000 person/year) it can lead to a rapid degeneration of the photoreceptors due to ischemia and results in permanent vision loss and this can be prevented by early diagnosis and treatment [6,7]. Red eye which is the fourth emergency we involved in our assessment is a clinical problem encountered on a daily basis in most emergency departments. The majority of cases are benign and self-limiting, which is good; however, many conditions that are potentially vision threatening and associated with high morbidity may manifest as a red eye [8]. The fifth condition included in our assessment is Central retinal artery occlusion (CRAO), it is an ophthalmic emergency and the ocular analogue of cerebral stroke. In CRAO occlusion of the central retinal artery which supplies blood to Inner retinal layers will lead to ischemia and severe visual loss. Best evidence confirms that over three-quarters of patients has a poor visual acuity of 20/400 or worse which results in a reduced functional capacity and quality of life [9]. The other similar researches focused on common causes of progressive visual loss and other eye diseases. These Studies have reported consistently low levels of knowledge and varying levels of awareness [10,11].

These emergent conditions are clinically important. Patient may come in late presentation, which can lead to delayed medical attention, with rapid and irreversible visual loss and blindness. Many patients delay medical attention after onset of symptoms, which leads to low visual acuity and blindness that can affect and decrease patient quality of life and could lead to significant economic costs to the patient. So, it's important to increase the level of awareness and knowledge of the patients and the whole society. Awareness and knowledge of these emergent ophthalmic diseases may help to preserve quality of life and achieve the best possible visual outcome for patients [12].

A study that was conducted in New York in 2016 assessing the public awareness and knowledge about the emergent eye diseases found that the overall awareness and knowledge were low where only (27.7%) of participants were aware of retinal detachment, (14.6%) were aware of Acute angle closure glaucoma, (5.1%) were aware of Giant cell arteritis, and (4.6%) were aware of Central retinal artery occlusion [1]. There are few articles discussing the public awareness of common eye diseases, and a fewer one discussing the awareness of emergency vision threatening conditions. There have been no studies undertaken in the Kingdom of Saudi Arabia, Makkah region in particular to evaluate the public knowledge and awareness about the emergent ocular situations. In this study we aimed to assess the general population awareness and knowledge about the common ophthalmological emergencies in Western Province, Kingdom of Saudi Arabia.

## 2. MATERIAL AND METHODS

A descriptive cross-sectional study was conducted from November 2020 to April 2021 at Western Province. The study conducted by online questionnaire distributed to general public via WhatsApp, Facebook, and Twitter. in western region of Saudi Arabia. The questionnaire included questions directed to collect information regarding demographics, levels of awareness and knowledge of different emergency eye disease.

Information obtained from all the online questioner respondent after giving consent. We included all adults, both gender and who accepts to answer the questionnaire. we excluded who refused or didn't complete answering the questionnaire, and those who were not able to read or understand the questionnaire.

### Data Analysis

All data entered in Microsoft EXCEL software and coded for management statistical analysis performed using SPSS software package, version 25. Qualitative data was expressed as numbers and percentages, and applied Chi- squared test ($\chi 2$) to test the relationship between variables. Quantitative data was expressed as mean and standard deviation (Mean ± SD), while Mann-Whitney and Kruskal Wallis Tests were applied for non-parametric variables. A p-value of $<0.05$ was considered as statistically significant.

## 3. RESULTS AND DISCUSSION

This study aimed to assess the awareness and knowledge related to various ocular emergencies among the people residing in the Western province of Saudi Arabia. A total of 702 participants from three cities who gave consent to participate were included in our analysis. The sociodemographic details of the participants are given in Table 1.

**Table 1. Sociodemographic details of the participants (n=702)**

| Parameter | Frequency | Percent |
|---|---|---|

| | | | |
|---|---|---|---|
| **Gender** | Male | 137 | 19.5 |
| | Female | 565 | 80.5 |
| Age (in years) | 18-30 | 395 | 56.3 |
| | 31-50 | 234 | 33.3 |
| | 51-60 | 69 | 9.8 |
| | >60 | 4 | 0.6 |
| Income level | 3000-5000 | 49 | 7 |
| | 6000-15000 | 444 | 63.2 |
| | >15000 | 209 | 29.8 |
| Education | Uneducated | 1 | 0.1 |
| | Elementary | 6 | 0.9 |
| | Middle school | 11 | 1.6 |
| | Secondary | 125 | 17.8 |
| | University or more | 559 | 79.6 |
| Residence city | Taif | 531 | 75.6 |
| | Makkah | 78 | 11.1 |
| | Jeddah | 93 | 13.2 |
| Job sector | Non-health sector | 567 | 80.8 |
| | Health sector | 135 | 19.2 |

The most common disease that participants were aware of was Angle-closure glaucoma (41.7 percent), while the least knowledgeable was Temporal arteritis (giant cell arteritis) (12.4 percent ) [Table 2].

**Table 2. Awareness of different eye disorders**

| Parameter | | Frequency | Percent |
|---|---|---|---|
| Eye disorders | Retinal detachment | 185 | 26.4 |
| | Angle-closure glaucoma | 293 | 41.7 |
| | Temporal arteritis (giant cell arteritis) | 87 | 12.4 |
| | Central retinal artery occlusion | 98 | 14.0 |

We also assessed the knowledge regarding different ocular disorders based on the response given for questions asked. There was a total of 27 items that assessed the knowledge related to ocular disorders. Each correct response was given a score of '1' and the wrong response a score of '0'. The total knowledge score was then calculated by adding the scores of all the 27 items and then converted to percentages, which were then classified as Good (>75%), Average (50-75%), and Poor (<50%). It was found that only 3.1% had 'Good' knowledge regarding different ocular diseases, and 68.7% showed poor knowledge regarding the same. There was no statistically significant association seen with awareness related to different ocular diseases and city of residence ($p<0.05$). When we compared the participants' awareness and educational level, it was found that only awareness related to GCA showed a statistically significant association, in which participants who had university or higher educational level had more awareness ($p=0.04$). Participants who worked in the health sector showed better awareness related to different ocular diseases and showed a statistically significant relationship with all diseases except with GCA ($p=0.140$) [Table 3].

**Table 3. Awareness regarding ocular diseases and its relationship with sociodemographic details**

| Parameter | | | Retinal detachments | | P value | Angle-closure glaucoma | | P value | Temporal arteritis | | P value | Central retinal artery occlusion | | P value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | No | Yes | | No | Yes | | No | Yes | | No | Yes | |
| Gender | Male | N | 98 | 39 | 0.531 | 64 | 73 | 0.002 | 100 | 37 | <0.001 | 110 | 27 | 0.030 |
| | | % | 71.5 | 28.5 | | 46.7 | 53.3 | | 73.0 | 27.0 | | 80.3 | 19.7 | |
| | Female | N | 419 | 146 | | 345 | 220 | | 515 | 50 | | 494 | 71 | |
| | | % | 74.2 | 25.8 | | 61.1 | 38.9 | | 91.2 | 8.8 | | 87.4 | 12.6 | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | 18-30 | N | 273 | 122 | 0.002 | 214 | 181 | 0.088 | 317 | 78 | <0.001 | 310 | 85 | <0.001 |
| | | % | 69.1 | 30.9 | | 54.2 | 45.8 | | 80.3 | 19.7 | | 78.5 | 21.5 | |
| | 31-50 | N | 181 | 53 | | 147 | 87 | | 227 | 7 | | 226 | 8 | |
| | | % | 77.4 | 22.6 | | 62.8 | 37.2 | | 97.0 | 3.0 | | 96.6 | 3.4 | |
| | 51-60 | N | 61 | 8 | | 45 | 24 | | 68 | 1 | | 65 | 4 | |
| | | % | 88.4 | 11.6 | | 65.2 | 34.8 | | 98.6 | 1.4 | | 94.2 | 5.8 | |
| | >60 | N | 2 | 2 | | 3 | 1 | | 3 | 1 | | 3 | 1 | |
| | | % | 50.0 | 50.0 | | 75.0 | 25.0 | | 75.0 | 25.0 | | 75.0 | 25.0 | |
| City | Taif | N | 395 | 136 | 0.657 | 301 | 230 | 0.167 | 470 | 61 | 0.087 | 461 | 70 | 0.143 |
| | | % | 74.4 | 25.6 | | 56.7 | 43.3 | | 88.5 | 11.5 | | 86.8 | 13.2 | |
| | Makkah | N | 57 | 21 | | 53 | 25 | | 70 | 8 | | 69 | 9 | |
| | | % | 73.1 | 26.9 | | 67.9 | 32.1 | | 89.7 | 10.3 | | 88.5 | 11.5 | |
| | Jeddah | N | 65 | 28 | | 55 | 38 | | 75 | 18 | | 74 | 19 | |
| | | % | 69.9 | 30.1 | | 59.1 | 40.9 | | 80.6 | 19.4 | | 79.6 | 20.4 | |
| Education | Uneducated | N | 0 | 1 | 0.246 | 0 | 1 | 0.267 | 0 | 1 | 0.045 | 0 | 1 | 0.061 |
| | | % | 0.0 | 100.0 | | 0.0 | 100.0 | | 0.0 | 100.0 | | 0.0 | 100.0 | |
| | Elementary | N | 6 | 0 | | 5 | 1 | | 6 | 0 | | 5 | 1 | |
| | | % | 100.0 | 0.0 | | 83.3 | 16.7 | | 100.0 | 0.0 | | 83.3 | 16.7 | |
| | Middle school | N | 8 | 3 | | 8 | 3 | | 11 | 0 | | 10 | 1 | |
| | | % | 72.7 | 27.3 | | 72.7 | 27.3 | | 100.0 | 0.0 | | 90.9 | 9.1 | |
| | Secondar | N | 95 | 30 | | 78 | 47 | | 111 | 14 | | 102 | 23 | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | y | % | 76.0 | 24.0 | | 62.4 | 37.6 | | 88.8 | 11.2 | | 81.6 | 18.4 | |
| | University or more | N | 408 | 151 | | 318 | 241 | | 487 | 72 | | 487 | 72 | |
| | | % | 73.0 | 27.0 | | 56.9 | 43.1 | | 87.1 | 12.9 | | 87.1 | 12.9 | |
| Job sector | Non-Health Sector | N | 452 | 115 | 0.140 | 381 | 186 | <0.001 | 545 | 22 | <0.001 | 523 | 44 | <0.001 |
| | | % | 79.7 | 20.3 | | 67.2 | 32.8 | | 96.1 | 3.9 | | 92.2 | 7.8 | |
| | Health sector | N | 65 | 70 | | 28 | 107 | | 70 | 65 | | 81 | 54 | |
| | | % | 48.1 | 51.9 | | 20.7 | 79.3 | | 51.9 | 48.1 | | 60.0 | 40.0 | |

**Table 4. Knowledge regarding eye orders and its relationship with sociodemographic details**

| Parameter | | | Knowledge | | | Total | P value |
|---|---|---|---|---|---|---|---|
| | | | Poor | Average | Good | | |
| Gender | Male | N | 88 | 38 | 11 | 137 | 0.002 |
| | | % | 64.2 | 27.7 | 8.0 | 100.0 | |
| | Female | N | 394 | 160 | 11 | 565 | |
| | | % | 69.7 | 28.3 | 1.9 | 100.0 | |
| Age | 18-30 | N | 244 | 133 | 18 | 395 | <0.001 |
| | | % | 61.8 | 33.7 | 4.6 | 100.0 | |
| | 31-50 | N | 175 | 56 | 3 | 234 | |
| | | % | 74.8 | 23.9 | 1.3 | 100.0 | |
| | 51-60 | N | 59 | 9 | 1 | 69 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | % | 85.5 | 13.0 | 1.4 | 100.0 | |
| | >60 | N | 4 | 0 | 0 | 4 | |
| | | % | 100.0 | 0.0 | 0.0 | 100.0 | |
| **Education level** | Uneducated | N | 1 | 0 | 0 | 1 | 0.413 |
| | | % | 100.0 | 0.0 | 0.0 | 100.0 | |
| | Elementary | N | 3 | 3 | 0 | 6 | |
| | | % | 50.0 | 50.0 | 0.0 | 100.0 | |
| | Middle school | N | 9 | 2 | 0 | 11 | |
| | | % | 81.8 | 18.2 | 0.0 | 100.0 | |
| | Secondary | N | 88 | 37 | 0 | 125 | |
| | | % | 70.4 | 29.6 | 0.0 | 100.0 | |
| | University or more | N | 381 | 156 | 22 | 559 | |
| | | % | 68.2 | 27.9 | 3.9 | 100.0 | |
| **Job sector** | Non- Health sector | N | 431 | 128 | 8 | 567 | <0.001 |
| | | % | 76.0 | 22.6 | 1.4 | 100.0 | |
| | Health sector | N | 51 | 70 | 14 | 135 | |
| | | % | 37.8 | 51.9 | 10.4 | 100.0 | |
| **Diagnosed with ocular diseases** | Yes | N | 105 | 46 | 4 | 155 | <0.001 |
| | | % | 67.7 | 29.7 | 2.6 | 100.0 | |

| | | | | | |
|---|---|---|---|---|---|
| No | N | 377 | 152 | 18 | 547 |
| | % | 68.9 | 27.8 | 3.3 | 100.0 |

When we evaluated this knowledge's relationship with various sociodemographic characters, it was found that gender, age, job sector, and history of ocular disease showed a statistically significant relationship. The male participants showed comparatively more 'good' knowledge (8%) than females' participants (1.9%) (p=0.002). Participants aged 18-30 years demonstrated more 'good' knowledge than other age groups (p<0.001). Participants working in the health sector were 19.5% (n=135), and among this, 10.4% (n=14) had shown 'good' knowledge compared to those working in the non-health sector (n=8) (p<0.001). It was also found that participants who had been previously diagnosed with some ocular diseases had more 'good' knowledge than those who had no history of the same (p<0.001) [Table 4]. The participants' responses related to some of the knowledge items are given in Table 5.

**Table 5. Responses to knowledge items related to different ocular diseases.**

| **Parameter** | | Wrong (%) | Correct (%) |
|---|---|---|---|
| Retinal detachment | Definition | 63 | 37 |
| | Seeing bright flashing lights can be a symptom of retinal detachment. | 62.7 | 37.3 |
| | Retinal detachment can be cured if you take medication (pills or eye drops) immediately after it happens | 71.2 | 28.8 |
| Acute angle-closure glaucoma | Definition | 56.3 | 43.7 |
| | Pain and blurry vision are common symptoms in acute angle-closure glaucoma | 54.0 | 46 |
| | All patients with acute angle-closure glaucoma must have emergency surgery. | 85.9 | 14.1 |
| Temporal arteritis | Definition | 88.3 | 11.7 |
| | Pain in your jaw while eating and scalp pain (for example, pain while brushing your hair) may be symptoms of a disease that can cause | 84.2 | 15.8 |

| | | | |
|---|---|---|---|
| | blindness | | |
| | Blindness from temporal arteritis in one eye may be permanent but you can prevent blindness in the other eye by taking steroids | 81.8 | 18.2 |
| Central retinal artery occlusion (CRAO | Definition | 85.3 | 14.7 |
| | People with central retinal artery occlusion often have a painful, red eye. | 93.6 | 6.4 |
| | Keeping blood pressure and cholesterol under control can help prevent central retinal artery occlusion. | 60.1 | 39.9 |
| Chemicals | How dangerous is the exposure of the eye to chemicals | 8.8 | 91.2 |
| | Chemicals that cause serious eye injury are in the form | 15.4 | 84.6 |
| | What is the best and first action when the eyes are exposed to chemicals | 43.6 | 56.4 |
| Redness | Redness of the eye may indicate a serious problem | 54.7 | 45.3 |
| | Definition | 40.2 | 59.8 |

## DISCUSSION

In this study we aimed to assess the awareness and knowledge of different ocular conditions among population of the western province, Kingdom of Saudi Arabia. Data from studies around the world has shown variable level of awareness, where data from the Middle East regarding this topic is unfortunately insufficient.

In general, the level of awareness in our study of different emergency eye disease is very low. our result shows that AACG has higher percent of awareness (41.7%). In contrast there is a study conducted at Mount Sinai Hospital showed that RD had higher percent of awareness than AACG. While GCA is considered one of the least emergency eye diseases in our study in terms of awareness (12.4%) . When comparing males to females regarding their awareness, males had a better awareness of each disease. There was research conducted in 2016 revealed that the rate of female awareness was higher than the rate of males which corresponds to our findings (Uhr et al., 2016). However, such results can be attributed to the large number of female participants as compared to males. Awareness of eye diseases was higher among those with a university education than among those with a secondary education. As it is expected because the higher the educational level, the greater the awareness.

The level of awareness of RD, GCA and CRAO was significantly associated with age. The age group between18-30 years are the most aware of these conditions that could be related to the lifestyle of this young age and the increase of level of awareness in general by using the electronic devices and the social networking. On the other hand, AACG was not significantly associated with age, with high levels of awareness reported in older age and the highest being among 18–30-year-old, the increased level of awareness in older age group might be explained by the higher incidence of the disease among those population.

No difference in awareness was noticed between the three main cities populations (Makkah, Taif and Jeddah) without any significant relation between the city and the awareness of the disease and with generally poor awareness level which confirms that the public campaigns regarding these diseases and their symptoms are important, in order to raise the awareness and improve the outcome by seeking medical assistance early in the disease process. A significantly higher levels of awareness of AACG, GCA and CRAO was reported in health workers, assuming most of the respondents were not ophthalmologist's health care workers explaining these results. Anyway, it's not assuring since the awareness of health care professionals is essential for the implantation of efficient awareness campaigns by those workers. Literature indicates that the education of health workers will help to improve the outcomes of stroke by campaigns and programs targeted physicians, nurses, medical students (Wilson et al., 2007). We think the same hypothesis will apply to our recommendation regarding rising the levels of the awareness.

In our study, females have poor knowledge about emergency eye diseases than males. The percentage estimated poor knowledge of females (69.7%). According to age, the least group having poor knowledge about emergency eye diseases was age group18-30 years. Regarding to work in the field of health care, a significant positive average correlation was found between work in the health field and knowledge of emergency eye diseases possibly due to the nature of the work and their general medical knowledge of common diseases.

As we assessed the response to knowledge items related to RD, AACG, GCA, CRAO and Redness of the eye and we found that all have poor knowledge, as compared to a study that was conducted in New York, Mount Sinai revealed that the knowledge of emergency ophthalmic diseases were found very low for various socio demographic characters. This comes in agreement with our results (Uhr et al., 2016).where the Chemicals that cause serious eye injury were found to have relatively excellent knowledge. Nearly 91% got the correct definition, 84% know that chemicals can cause serious eye injury, and this can be related to the general life experiences and emergent events especially at home. While 43% thought that the first action to be done when exposed to chemicals is going to the emergency department, and applying sanitizing eye drops, which is completely wrong first aid act that can costs one's eyes, such result stress the need to raise the awareness of these conditions. 56% answered the appropriate first action for this emergency which is continuously irrigate the eyes with water. Red eye definition has a good knowledge by almost 60% of our respondents while 54% thought it doesn't indicate or cause a serious problem. As these common ocular emergencies can cause a serious threat to the vision which has a significant negative impact on the individual's life and can result in considerable costs for the health system. We recommend conducting awareness campaigns in the schools, universities, public facilities, and for health care workers. we also recommend assessing the level of awareness and knowledge in different province across the kingdom in order to help building a general statement regarding the awareness in Kingdom of Saudi Arabia. In the future studies regarding the effects of the campaigns on early presentation and implementation of treatment and outcome can be done. One of the limitations we faced in this study is the inability to construct and distribute a hard copy of the questionnaire due to the COVID-19 pandemic restrictions, so we were unable to target specific populations like for example school and university students for more accurate feedback, also we weren't able to make sure that the respondents understood the questionnaire well.

## 4. CONCLUSION

This study reflected that awareness and knowledge of RD, GCA and CRAO are extremely low in the average population of the western province, Kingdom of Saudi Arabia across all segments of society. Lack of awareness about this serous disease has an important significance for obtaining eye care. The delaying of getting medical care may lead to permanent visual impairment, which could have been avoided. Furthermore, it can affect patient's quality of life and the essential economic costs of the individuals and society. Therefore, the need for educating the public about these diseases and red flags symptoms are critical to increase awareness and knowledge.

## CONSENT (WHERE EVER APPLICABLE)

Informed consent was obtained from all participants included in the study

## ETHICAL APPROVAL (WHERE EVER APPLICABLE)

Ethical approval was obtained from Research Ethics Committee at Taif university.

## REFERENCES


1. Uhr JH, Mishra K, Wei C, Wu AY. Awareness and Knowledge of Emergent Ophthalmic Disease Among Patients in an Internal Medicine Clinic. JAMA Ophthalmol. 2016 Apr;134(4):424–31.
2. Hamilton WD, Henderson PA, Moran NA. Fluctuation of environment and coevolved antagonist polymorphism as factors in the maintenance of sex. Nat Sel Soc Behav (Eds R D Alexander D W Tinkle), Chiron Press New York. 1981;311(18):363–81.
3. Pokhrel PK, Loftus SA. Ocular emergencies. Am Fam Physician. 2007 Sep;76(6):829–36.
4. Davis AR, Ali QH, Aclimandos WA, Hunter PA. Topical steroid use in the treatment of ocular alkali burns. Br J Ophthalmol. 1997;81(9):732–4.
5. Bagley DM, Casterton PL, Dressler WE, Edelhauser HF, Kruszewski FH, McCulley JP, et al. Proposed new classification scheme for chemical injury to the human eye. Regul Toxicol Pharmacol. 2006;45(2):206–13.
6. Feltgen N, Walter P. Rissbedingte netzhautablösung - Ein ophthalmologischer notfall. Dtsch Arztebl Int. 2014;111(1–2):12–22.
7. IOLs T, Alio JL. SYMPOSIUM ON THE TREATMENT OF TRAUMATIC OPTIC NEUROPATHY RESOLVED: CORTICOSTEROIDS SHOULD NOT BE USED. Ophthalmology. 1999;106:1268–77.
8. Mahmood AR, Narang AT. Diagnosis and management of the acute red eye. Emerg Med Clin North Am. 2008 Feb;26(1):35–55, vi.
9. Varma DD, Cugati S, Lee AW, Chen CS. A review of central retinal artery occlusion: Clinical presentation and management. Eye [Internet]. 2013;27(6):688–97. Available from: http://dx.doi.org/10.1038/eye.2013.25
10. Katibeh M, Ziaei H, Panah E, Moein HR, Hosseini S, Kalantarion M, et al. Knowledge and awareness of age related eye diseases: A population-based survey. J Ophthalmic Vis Res. 2014;9(2):223–31.
11. Casini G, Sartini F, Loiudice P, Benini G, Menchini M. Ocular siderosis: a misdiagnosed cause of visual loss due to ferrous intraocular foreign bodies—epidemiology, pathogenesis, clinical signs, imaging and available treatment options. Doc Ophthalmol. 2020;1–20.
12. Morris B, Imrie F, Armbrecht AM, Dhillon B. Age-related macular degeneration and recent developments: New hope for old eyes? Postgrad Med J. 2007;83(979):301–7.

13. Wilson DL, Beyth RJ, Linn P, Berger P. Systematic review of public education and policy for stroke prevention. Curr Drug Targets. 2007 Jul;8(7):874–9.