Ocular Diseases: Public Knowledge and Awareness in Malaysia

Khairunnisa Bakar[1], Hanish Singh Jayasingh Chellammal[1]*, Ravi Sheshala[1,2], Mohd Faiz Mustafa[1].

[1]*Department of Pharmacology and Life Sciences, Faculty of Pharmacy, Universiti Teknologi MARA (UiTM), Puncak Alam Campus 42300 Bandar Puncak Alam, Selangor, Malaysia*
[2]*Department of Pharmaceutics, School of Pharmacy, Anurag University, Venkatapur, Ghatkesar, Medchal–Malkajgiri District, Hyderabad, Telangana, India. 500088*

***Corresponding author:**
Hanish Singh Jayasingh Chellammal
Department of Pharmacology and Life Sciences,
Faculty of Pharmacy,
Universiti Teknologi MARA (UiTM) Selangor Branch,
Puncak Alam Campus 42300 Bandar Puncak Alam,
Selangor, Malaysia.
Email: hanishsinghjc@uitm.edu.my

KEYWORDS

Glaucoma, Cataract, Diabetic retinopathy, Dry eye syndrome, Conjunctivitis, Knowledge, Awareness, Malaysia population

ABSTRACT

Eye diseases such as cataract, glaucoma, diabetic retinopathy, dry eye syndrome and conjunctivitis are the common medical problems that can affect the population at any age and may lead to visual impairment or blindness if untreated or not treated at early stages. Symptoms for eye diseases usually start with blurring vision, itchy eyes, red eyes or pain in the eyes. Globally, these diseases have become a major public health concern in many developing countries and Malaysia is of no exception. Public knowledge and awareness about eye diseases are important as it play a pivotal role in the prevention and control of eye disease. The purpose of this study is to determine the knowledge and awareness about eye diseases and its relationship with socio-demographic factors among the public in Malaysia. A cross-sectional study was conducted among 303 participants (online) via a pre-validated questionnaire that includes socio-demographic information and 21 questions on knowledge of eye diseases. The knowledge of eye diseases was scored and divided into poor (0-7), fair (8-14), and good knowledge (15-21), respectively. The mean (± SD) knowledge score of the participants was 11.54 ± 3.75. The levels of good, fair, and poor knowledge were 23%, 61.7%, and 15.3%, respectively. The results showed that participants who were students are found to be significantly associated with a good knowledge score ($p<0.05$). This study has revealed that the public in Malaysia has moderate knowledge about eye diseases, with a very small proportion having poor knowledge. However, imparting training and awareness by the health experts including both optometrist and ophthalmologist may play a pivotal role in creating knowledge about eye diseases among the public, especially among older people. In conclusion, early education on eye health and regular eye screening are believed to have a positive impact in preventing visual impairment.

1.0 Introduction

According to the Computer Retrieval of Information on Scientific Projects (CRISP) Thesaurus, eye diseases or eye disorders or ocular disorders are described as a sort of health impairment or a condition in which the organ of sight functions abnormally (1). Eye diseases including glaucoma, cataract, diabetic retinopathy, dry eye syndrome, and conjunctivitis are considered to be a leading cause of blindness globally (2).

Glaucoma is a form of eye disease caused by an imbalance of outflow and aqueous humor production leading to high intraocular pressure which damages the optic nerve (3). The damaged optic nerve disturbs the transmission of signals from the photoreceptor and thus causes visual impairment (4). Cataracts occur when the lens of the eyes begins to become cloudy or opaque which blocks the passage of light through the lens of the retina, thus causing the vision to become blurry (5). Some forms of cataract will form dots in the middle of the lens and may turn the whole center of the lens into white in advance stage (6). Another kind of eye disease is diabetic retinopathy which occurs due to the complication of diabetes mellitus (DM). It is categorized as microvascular diseases and induced by hyperglycemia or increased in blood sugar level thus leading to retinal microvascular damage and later result in visual loss (7). Dry eye syndrome is caused by reduced tear production from lacrimal glands or increased tear evaporation (8). Dry eyes syndrome is considered as a significant health problem as it may disturb the daily activities, which impacts the quality of life due to its symptoms such as tired eyes, burning or gritty sensation in the eyes, including blurry vision (9,10). Although the main drug treatment is commonly use in treating dry eye disease, however, Traditional Chinese medicine (TCM) such as herbal decoction, acupuncture, cupping and moxibustion also have a good effect in treatment of this ailment (9,11). Finally, pink eyes, also known as conjunctivitis, is an inflammation or infection of the conjunctiva, the membrane that covers the outer surface of the eye (12). As a result, people frequently experience red eyes and feel itchy and gritty in one or both of their eyes. This problem worsen to the point that people begin to feel pain and their vision become blurry, thus resulting in light sensitivity (13).

Basically, most of the symptoms of eye diseases tend to develop slowly and worsen day by day starting from causing low vision, whether near or distant impairment then leading to blindness if not treated early. It tends to affect the lens, retina, and optic nerve, and once these parts of the eyes are damaged, they cannot be treated anymore. At this point, people tend to become permanently blind.

According to World Health Organization (WHO) (14), about 2.22 billion people worldwide have a near or distance vision impairment, with at least 1 billion of these cases progressing to moderate or severe distance vision impairment, including blindness caused by cataract (94 million), glaucoma (7.7 million) and diabetic retinopathy (3.9 million). Besides, a study conducted in Malaysia by Chew et al. (15), the prevalence of blindness, severe visual impairment and moderate visual impairment were 1.2%, 1.0% and 5.9%, respectively, with untreated cataract (58.6%), diabetic retinopathy (10.4%) and glaucoma (6.6%) being the most common cause of blindness. In relation to this, lack of symptoms awareness could be a factor for delaying in eye examination at the early stage thus resulting in late presentation, diagnosis and treatment. This proved that health awareness and knowledge play an important role in reducing eye diseases which are treatable and sometimes avoidable through early detection and timely treatment (16).

An increase in prevalence implies that the public's knowledge of eye diseases is still insufficient, and they are still unaware of the importance of eye examination. For instance,

Mera F.Haddad *et al.* (2) conducted a survey to assess the public awareness of common eye diseases in Jordan, and the results was shown that only about 31%, 38%, 37% and 52% of the study population were aware of cataract, glaucoma, diabetic retinopathy and dry eye syndrome respectively. In addition, according to a research conducted in Malaysia by Chew et al. (17), the prevalence of the awareness of cataracts, diabetic retinopathy and glaucoma is 88.2%, 83.5%, and 71.5%, respectively. It was observed that the studies related to eye diseases are still very limited and has not been significantly explored, therefore; the findings from our present study helps to find a knowledge level of eye diseases among the public in Malaysia.

Knowledge and awareness about eye diseases will encourage and promote the public to seek eye examinations regularly which helps in the early diagnosis of visual problems. This would also assist in lowering the risk of visual impairment or permanent blindness, (2). People with complications like diabetes may be benefited with increase in their awareness about associated complications and risks of ocular problems. It also helps the diabetic patients to modify their lifestyle such as improve self-care by constantly monitoring and controlling their blood glucose level. Moreover, this study can also help healthcare professionals and public health to create awareness of eye disease and expand the ophthalmological services to encourage people to seek eye examinations regularly, especially those living in rural areas. Thus, this study is aimed to determine the knowledge level on eye diseases among the public in Malaysia. The second objective of this study is to determine the relationship between socio-demographic factors and level of knowledge and awareness about eye diseases. This is because the level of knowledge and awareness about eye diseases among the public may vary depending on socio-demographic factors such as age, gender, occupation, educational status, marital status and living area.

2.0 Materials and methods

2.1 Study design

A cross-sectional study was conducted for 3 months from March to May 2022to evaluate the level of knowledge and awareness about eye diseases among the public in Malaysia.

2.2 Target population

The study was conducted among Malaysian citizens, which include men and women, married and unmarried. The respondents are aged 18 years old and above among the Malaysian population. The adult aged 18 years old, and above having competency to read, understand English and Bahasa Melayu and having access to online platforms. This study excluded respondents: (i) aged 17 years old and below; (ii) Malaysia citizen staying abroad; (iii) non-Malaysians; and (iv) incomplete response of questionnaire.

2.3 Sampling method

Malaysian citizens aged 18 years old above were selected by using a convenient sampling method. A sample size of 272 participants was calculated using Daniels equation (18). An additional 10% sample size was compensated for the incomplete data, and the total sample size was rounded to 300 participants. The questionnaire was then distributed through an online platform using Google forms and circulated around public. Participants in this study was voluntary with emphasis on their anonymity and confidentiality of responses.

2.4 Ethical consideration

This was conducted after obtaining consent and a written permission letter from the Human Ethics Committee of UiTM Shah Alam, Selangor (Reference number:600-FF-

(PT.5/4) REC (PH)/09/2022). Participants were informed of the aim of the study and participated voluntarily and were allowed to withdraw at any time without penalty. The participants were assured about their anonymity and confidentiality of the research findings.

2.5 Questionnaire

A set of questionnaires was prepared in two languages, English, and Bahasa Melayu. The questionnaire is pre-validated and adopted and modified from previous study (9,19–21). The questionnaire consists of closed-ended questions to collect information on the public's knowledge and awareness of eye diseases. The first section of the questionnaire included 15 questions on socio-demographic information. The second section included 28 validated questions related to eye diseases and 21 questions among them are related to knowledge and awareness on eye diseases.

2.6 Composite score for knowledge of eye diseases

Questions on knowledge of eye diseases were analyzed and scoring was performed. The participants were divided into three groups consisting of those with poor knowledge, fair knowledge, and good knowledge. A score of 0-7 is considered poor knowledge, 8-14 is fair knowledge, and 15-21 is good knowledge on the eye diseases (Table 1).

Table 1: Category of knowledge based on the score.

Score	Category
0 to 7	Poor knowledge
8 to 14	Fair knowledge
15 to 21	Good knowledge

2.7 Data analysis

All the data were analyzed using Statistical Package for the Social Sciences (SPSS) (IBM) version 26. The continuous variables were presented as mean ± standard deviation (SD) and categorical data as number (percentage). The knowledge and awareness level about eye diseases were summarized using descriptive statistics analysis. Both independent t-test and One-Way ANOVA were utilized to compare differences of means between the knowledge. The knowledge and awareness association with various factors was tested using Chi-Square test. A multiple response test was used to obtain the number and percentage of participants who answered each multiple-choice question. A p-value <0.05 was considered to be a statistically significant difference.

3.0 Results

Table 2 shows the socio-demographic characteristics of the study participants. The age of the study participants was 23.76 ± 4.0 years, ranging from 18 to 57 years . Among 300 participants, about 84.7% were between 18 and 24 years and the remaining 15.3% were aged between 25 and 64 years old. About 77.3% of the study participants were female and 22.7% were male; 2% of the participants had secondary education and 98% had tertiary educational level. Additionally, 12.3%, 5%, 76.7% and 6% of participants were employed, unemployed, student, and health professional, respectively. About 94.7% of the study participants were single, 5% were married and 0.3% were divorced. More than half (59.3%) of the participants belonged to urban areas; 63% had visual problem but only 39% that had visit ophthalmologist so far. The mean knowledge score (±SD) was 11.54 ± 3.75.

Table 2: Socio-demographic characteristics of the respondents. (Number = 300)	
Variables	Descriptive measure
Age (years), mean ± SD	23.76 ± 3.98
Age categories, number (%)	
18-24 years	254 (84.7)
25-64 years	46 (15.3)
Gender, number (%)	
Female	232 (77.3)
Male	68 (22.7)
Highest educational level, number (%)	
Primary	0 (0)
Secondary	6 (2)
Tertiary (diploma, degree, master, master's degree)	294 (98)
Employment status, number (%)	
Employed	
Unemployed	37 (12.3)
Student	15 (5)
Health professional	230 (76.7)
	18 (6)
Marital status, number (%)	
Single	284 (94.7)
Married	15 (5)
Divorce	1 (0.3)
Living area, number (%)	
Rural	122 (40.7)
Urban	178 (59.3)
Participants with visual problem, number (%)	189 (63)
Participants that visit ophthalmologist so far, number (%)	117 (39)
Knowledge score, mean ± SD	11.54 ± 3.75
SD: Standard deviation	

The internal consistency of the questionnaire was calculated using Cronbach's alpha. The result was found to be 0.738. This indicate that the questions had done an acceptable job in measuring eye disease knowledge. Table 3 shows the knowledge regarding eye diseases among study participants. Knowledge was recorded based on the correct answer (at least one), incorrect answer, and do not know. The results were presented in frequency and percentage. Question number 1 (93%) and 2 (90.3%) about cataract had recorded the highest number of correct answers. Most of the participants had answered *do not know* for question numbers 6 (40.3%), 7 (39.7%), 8 (59.3%), 11 (35%), 12 (36%), and 13 (43.7%). Meanwhile,

the maximum number of wrong answers was recorded for question numbers 17 (69%) and 18 (79.7%).

Table 3: Knowledge regarding eye diseases among the study participants.

Variables	Correct answer (≥1)	Incorrect answer	Do not know
1. Awareness about cataract	279 (93)	21 (7)	0 (0)
2. Simple definition of cataract	271 (90.3)	0 (0)	29 (9.7)
3. Worst effect of cataract	192 (64)	76 (25.3)	32 (10.7)
4. Cataract a treatable condition	223 (74.3)	10 (3.3)	67 (22.3)
5. Awareness about diabetic retinopathy (DR)	150 (50)	150 (50)	0 (0)
6. Simple definition of diabetic retinopathy (DR)	179 (59.7)	0 (0)	121 (40.3)
7. Worst effect of diabetic retinopathy (DR)	131 (43.7)	50 (16.7)	119 (39.7)
8. Diabetic retinopathy (DR) a treatable condition	94 (31.3)	28 (9.3)	178 (59.3)
9. First presentation of diabetic retinopathy (DR) in most cases	134 (44.7)	130 (43.3)	36 (12)
10. Awareness about glaucoma	214 (71.3)	86 (28.7)	0 (0)
11. Simple definition of glaucoma	195 (65)	0 (0)	105 (35)
12. Worst effect of glaucoma	112 (37.3)	80 (26.7)	108 (36)
13. Glaucoma a treatable condition	140 (46.7)	29 (9.7)	131 (43.7)
14. First presentation of glaucoma in most cases	78 (26)	186 (62)	36 (12)
15. At any time, problem with the eye accompanied with tearing	193 (64.3)	107 (35.7)	0 (0)
16. At any time, problem with the eye accompanied with difficulty in looking toward lights	140 (46.7)	160 (53.3)	0 (0)
17. At any time, problem with the eye accompanied with feeling of sand in the eyes	93 (31)	207 (69)	0 (0)
18. Awareness about allergic conjunctivitis	61 (20.3)	239 (79.7)	0 (0)
19. Treatment of dry eye	253 (84.3)	0 (0)	47 (15.7)
20. Symptoms of dry eye	258 (86)	0 (0)	42 (14)
21. Dry eye is a significant health problem and needs a lot of health resources	68 (22.7)	187 (62.3)	45 (15)

Data is presented as number (%).

Out of 300 participants, 279 (93%) had heard about cataracts and 271 (90.3%) could give a simple, correct definition of cataract. About 192 participants (64%) mentioned cataract as a cause of vision loss and 74.3% believed that the disease is treatable (Table 3). The main sources of information about cataract were found to be media (44.7%) and friends and relatives (18.7%) (Table 4).

Table 4: Source of information about cataract

Information source	Number (%)
Ophthalmologist	37 (12.3)
Family / friends	56 (18.7)

Health workers	28 (9.3)
Media	134 (44.7)
Books or magazines	34 (11.3)
Others	8 (2.7)
No source	3 (1)

Information source	Number (%)
Ophthalmologist	25 (8.3)
Family / friends	23 (7.7)
Health workers	42 (14)
Media	115 (38.3)
Books or magazines	38 (12.7)
Others	7 (2.3)
No source	50 (16.7)

Table 5: Source of information about diabetic retinopathy (DR)

Among all the participants, 50% were aware of and 59.7% had basic knowledge about diabetic retinopathy. The majority (43.7%) of individuals mentioned DR as a reason for vision loss and 31.3% believed that the disease is treatable (Table 3). About 38.3% individuals mentioned the media and 14% of individuals mentioned the health workers as their main source of information, respectively (Table 5). Only 44.7% of individuals believed that diabetic retinopathy may start without any signs or symptoms and most of them had no information about the initiating symptoms (Table 3). About 71.3% of participants had heard about glaucoma and more than half (65%) could give a simple correct definition of the disease. About one third of individuals (37.3%) mentioned glaucoma as a cause of vision loss and 46.7% of the participants believed that the disease is treatable (Table 3). About 40% participants mentioned the media and 15.3% of participants mentioned the books or magazines as their main source of information, respectively (Table 6).

Table 6: Source of information about glaucoma (DR)	
Information source	Number (%)
Ophthalmologist	25 (8.3)
Family / friends	30 (10)
Health workers	42 (14)
Media	120 (40)
Books or magazines	46 (15.3)
Others	4 (1.3)
No source	33 (11)

Table 7: Treatment of dry eye syndrome	
Treatment	Number (%)
Acupuncture	4 (1.1)
Herbal decoction taken orally	12 (3.4)
Herbal eye wash or hot compress	64 (17.9)
Western topical eye drops	230 (64.4)
Not sure	47 (13.2)

Only 78 participants (26%) believed that the onset of glaucoma may be without any signs or symptoms and the majority of individuals had no information about the initiating symptoms (Table 3). About 64.3%, 46.7% and 31% of participants reported that at any time, problems with the eye can be accompanied with tearing, difficulty in looking toward lights and feeling of sand in the eyes, respectively (Table 3). For the treatment of dry eye syndrome, more participants considered the use of external forms of treatment such as hot compress or

external herbal wash, or use of lubricant eye drops to be appropriate as compared to herbal and acupuncture modalities. About 13.3% percent of respondents believed that at least one of these two forms of treatment (hot compress or external herbal wash, or lubricant eye drops) could be useful in treating dry eye syndrome (Table 7). In general, the level of knowledge concerning dry eye symptoms was low. Out of 4 symptoms of dry eye evaluated, 6.3% of the participants were aware that all 4 were dry eye symptoms, whereas 12.7% thought that only 3 of those were dry eye symptoms, and 26.3% were aware that 2 of those were dry eye symptoms. 40.8% percent of the respondents were aware of only one of those symptoms as a part of dry eye disease. Among all respondents, 29.9-34.6% knew that foreign body sensation, burning/pain, or eyelids sticking together (at least one of these symptoms) was a symptom of dry eye. Fewer participants (8.6%) knew that photophobia was a symptom of dry eye syndrome (Table 8).

Table 8: Symptoms of dry eye syndrome

Symptoms	Number (%)
Burning sensation or pain in eye	177 (34.6)
Grittiness of eye	96 (18.8)
Phobia of light	22 (8.6)
Tiredness in eyes or eyelids sticking together	153 (29.9)
Not sure	42 (8.2)

Table 9: Perceived health impacts of dry eye syndrome

Perceived health impacts of dry eye	Number (%)
Not common or significant	40 (13.3)
Common but does not affect lifestyle	147 (49)
Significant social burden	68 (22.7)
Not sure	45 (15)

About half (49%) of the participants thought that dry eye syndrome is a common condition and should be treated but is not severe enough to affect daily activities or not significant enough to be a socioeconomic burden (Table 9). The results indicated by the mean score of the participants in employment status and participants visiting ophthalmologists have a better knowledge ($p<0.05$) [Table 10].

Table 10: Mean number of knowledge score by participants' characteristics.

Variables	Mean ± SD (95% CI)	*p*-value
Age categories		0.50
18-24 years	11.48 ± 3.772 (11.01-11.95)	
25-64 years	11.85 ± 3.66 (10.76-12.94)	
Gender		0.950
Female	11.54 ± 3.67 (11.07-12.02)	
Male	11.51 ± 4.04 (10.54-12.49)	

Highest educational level Secondary Tertiary (diploma, degree, master, master's degree)	 12.00 ± 5.18 (6.57-17.43) 11.53 ± 3.73 (11.10-11.96)	0.431
Employment status Employed Unemployed Student Health professional	 10.30 ± 3.71 (9.06-11.54) 10.60 ± 4.17 (8.29-12.91) 11.56 ± 3.66 (11.08-12.03) 14.61 ± 3.03 (13.10-16.12)	0.001
Marital status Single Married Divorce	 11.49 ± 3.82 (11.05-11.94) 12.07 ± 2.12 (10.89-13.24)	0.38
Living area Rural Urban	 11.75 ± 3.71 (11.08-12.41) 11.39 ± 3.78 (10.83-11.95)	0.48
Participants with visual problem Yes No	 11.74 ± 3.68 (11.21-12.27) 11.19 ± 3.86 (10.46-11.91)	0.21
Participants that visit ophthalmologist so far Yes No	 12.02 ± 3.65 (11.35-12.68) 11.23 ± 3.80 (10.68-11.78)	0.05
In all the analysis, *p* value of $P<0.05$ was considered as not significant followed by Kruskal Wallis and Mann-Whitney test: Standard deviation.		

Figure 1 shows the level of knowledge about eye diseases among study participants. Out of 300 study participants, 23% had good knowledge regarding eye diseases, and both fair and poor knowledge recorded 61.7% and 15.3% of the study participants, respectively. Participants aged between 25 and 64 years. The participants who are employed and the participants who visit ophthalmologist have significant ($P<0.05$) knowledge in comparison to other participants [Table 11].

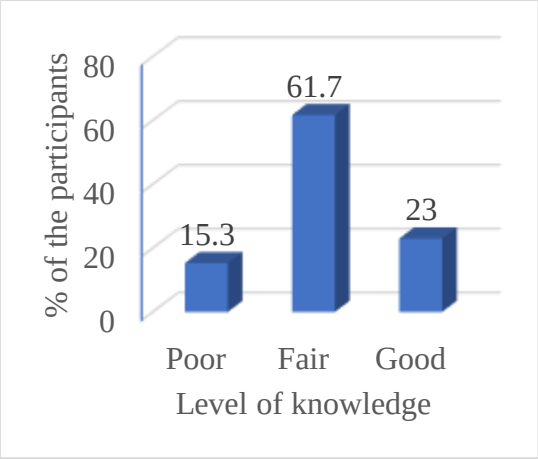

Figure 1: Level of knowledge regarding eye diseases among study participants.

Table 11: Level of good knowledge (knowledge score>14) by participants' characteristics.		
Variables	Number (%)	*p*-value
Age categories 18-24 years 25-64 years ≥ 65 years	55 (18.3) 15 (5.0) 0 (0)	0.233
Gender Female Male	49 (16.3) 21 (7.0)	0.240
Highest educational level Primary Secondary Tertiary (diploma, degree, master, master's degree)	0 (0) 3 (1.0) 67 (22.3)	0.265
Employment status Employed Unemployed Student Health professional	7 (2.3) 3 (1.0) 50 (16.7) 10 (14.3)	0.011
Marital status Single Married Divorce	67 (22.3) 2 (0.7) 1 (0.3)	0.050
Living area Rural Urban	29 (9.7) 41 (13.7)	0.300
Participants with visual problem Yes	46 (15.3) 24 (8.0)	0.252

No		
Participants visit ophthalmologist so far Yes No	30 (10.0) 40 (13.3)	0.672
In all the analysis, *p* value of <0.05 was considered as statistically significant. *p* values were obtained using the *Chi-square test*.		

4.0 Discussion

To our knowledge, this is one of the very few studies in Malaysia to determine the level of knowledge about eye diseases among the public in Malaysia. This study showed that the mean knowledge score for eye diseases knowledge in Malaysia was 11.54 ± 3.75 in scale. The findings of this study had also reflected that 93%, 50% and 71.3% of the study participants were aware of a few types of eye diseases such as cataract, diabetic retinopathy (DR) and glaucoma, respectively. Besides, more than half of the participants (90.3%, 59.7% and 65%) could give a correct and simple definition for those types of eye diseases. In this context, knowing about different types of eye diseases is beneficial as it helps to reduce the risk of visual impairment through an early detection and treatment. Even though different types of eye diseases may have a different type of vision loss and vision impairment, but all those eye diseases may lead to blindness at their worst effect if they are not treated early (22).

In addition, around 80% of participants were still not aware of other kind of eye diseases which is allergic conjunctivitis. This is line with the study conducted by Al-Ghofaili et al., (23) who have reported that only 30.1% out of 382 students have heard about ocular allergy. In this sense, people might not aware that they might have allergic conjunctivitis as this type of eye diseases usually bilateral with common eye symptoms and signs such as tearing and gritty feeling or foreign body sensation in the eye (24). From the result obtained, it showed that more than half of participants knew that eye problems may be associated with tearing but do not acknowledge that difficulty in looking toward light and feeling of sand in the eyes also could happen with eye problems and these symptoms are actually could be related to allergic conjunctivitis. This finding was similar to a previous study reported by Kyei et al. (25), out of the 347 respondents, more than half (52.2%) recognized tearing as a symptom of ocular allergy but only 26.2% respondents recognized photophobia were also its symptoms.

The knowledge of the participants about dry eye syndrome was satisfying as 84.3% of the participants had answered the question correctly about the treatment of it. Only 13.2% participants do not know about the treatment for dry eye syndrome while the other 64.4%, 17.9%, 3.4%, and 1.1% acknowledged that dry eye can be treated with western topical eye drops and Traditional Chinese Medicine (TCM) such as herbal eye wash or hot compress, herbal decoction and acupuncture, respectively. Alshammari et al. (26), reported that 64% of the study participants have little knowledge about the treatment for dry eye. It indicates that the participants are well aware that this kind of eye disease can be treated. In addition, about 74.3% of participants also know that cataract problem also can be treated. This is similar to a finding of Samuel et al, (27) by which it showed that 84.8% out of 623

participants answered that cataract is a treatable eye disease in which it can be treated through surgery.

However, not even half of the participants (43.7% and 46.7%) are aware that diabetic retinopathy and glaucoma also can be treated. This finding is supported by a study performed by Alammar et al., (28) in which the results showed that only around 37% and 38.4% of the participants answered that loss of vision due to glaucoma can be restored or could be treated with medications. Mersha et al., (29) have also conducted a study to identify whether diabetic retinopathy can be treated and only 9.9% and 17.3% believed that diabetic retinopathy can be treated with laser or surgery. In contradictory, a study conducted by Alswaina (30), in Saudi Arabia, among the patients with type 2 diabetes regarding awareness of diabetic retinopathy revealed that about 81.8% of the participants aware that diabetic retinopathy can be treated. This may be due to the awareness of diabetic patient as they knew that diabetic retinopathy is one of the major complications of diabetes mellitus.

This study exhibited that more than one third of the participants (64%, 43.7% and 37.3%) acknowledged that the worst effect of eye diseases such as cataract, diabetic retinopathy (DR) and glaucoma is blindness. According to the study by Steinmetz et al., (31) it is found that main contribution of individual causes to global visual impairment which then lead to blindness were cataract, glaucoma and diabetic retinopathy. All these types of eye diseases may lead to blindness as in severe stage, it may damage the structure of the eye such as the optic nerve, lens, vitreous humor, cornea or conjunctive (32). The results of the present study can be supported to the results reported by Samuel et al., (27), which had been conducted in Southern Ethiopia among adult population. About 88.6% of participants identified that blindness as the worst effect of cataract. Even the study by Alzahrani et al., (33) revealed that 59% of the participants thought that diabetic retinopathy (DR) could lead to blindness. Other than that, a study conducted by Kizor-Akaraiwe et al., (34) in Southeast Nigeria regarding knowledge of glaucoma reported that most of the people (83.6%) knew that glaucoma may causes blindness.

Furthermore, less than half (44.7% and 26%) of the study participants that answered correctly about the first presentation of eye diseases in most cases. This means that they are still not aware that the onset of eye diseases may be without any signs or symptoms. For example, eye diseases such as glaucoma and diabetic retinopathy have no symptoms or warning signs at early stage. This indicates that it is important to have a regular eye screening so that early detection and treatment can be given in order to avoid worst effect of eye diseases which is irreversible visual impairment (32). However, looking at the result obtained, only 39% had visited ophthalmologist so far while the other 61% had not visited ophthalmologist due to certain reasons such as a limited time (13.6%), no need felt (39.6%) and other reasons (3.8%). This proves that people are still not aware of the importance of eye screening. A previous report by Li et al., (35) have showed that 71.9% of the subjects had never been to a hospital for an eye examination with an impression that ‘no need’ (73.6%) and lack of time (28.3%). Moreover, as diabetes also can be considered as leading cause of blindness due to diabetic retinopathy, it is important for diabetic patients to visit the ophthalmogist for eye screening. The American Diabetes Association (ADA) guidelines also had recommended that adults with diabetes to undergo yearly eye screening and if there is

no evidence of diabetic retinopathy, screening every 2 years thereafter may also be considered (36).

In this study, it is evident that the study participants possessed some knowledge about the symptoms of eye diseases. Over 80% of participants had identified the symptoms of dry eye and only 8.2% that are still unsure about the symptoms. Usually, symptoms such as burning sensation in the eye, grittiness of eye, and phobia of light may also be related with other kind of eye diseases such as ocular allergy, so different diagnoses must be considered when symptoms are severe or unilateral (37). A study conducted with 1619 participants by Shrestha et al., (38) was revealed that the participants had experienced eye-related symptoms such as "burning, itching, foreign body sensation, or grittiness" (32.5%) and "pain or soreness in the eye" (24.6%) although they are not diagnosed with dry eye disease.

In our findings, no significant difference in mean knowledge was found among participants of different age groups, gender, educational level, marital status, living area, participants with visual problems and participants that had visit ophthalmologist so far ($p > 0.05$). However, there is a significant difference in mean knowledge among participants of different employment status ($p > 0.05$). To elucidate, participants aged between 25-64 years had the highest mean knowledge score among all age categories. This result is interchangeable with a study by Zhao et al., (39) in which a study population aged over 60 years old had more awareness of eye diseases. However, Katibeh et al., (19) showed that there is no correlation between age and knowledge of eye diseases. This previous study was in line with our study in which the knowledge of eye diseases was independent of age.

Our findings showed that female participants had the highest mean knowledge when compared to male participants. The finding from a study by Zhao et al., (39) stated that there is a significant association between gender and knowledge of eye diseases in which females were significantly higher in awareness than males. This may be due to the likeliness of women to seek for eye care services than men as stated in study by Katibeh et al. (19). Our present study was also showed that the mean knowledge score for female is higher than male, however there is no significant difference between gender and awareness of eye diseases. It indicates that male also could??? have a knowledge on eye diseases and this could be proved another study by Islam et al., (40) in which its result indicated that there is a significantly higher level of awareness about eye diseases among males.

In addition, educational level can also influence someone's health literacy, which in turn affects their knowledge. This is because health literacy helps people to understand and engage in the management of their health status (37). However, in this study, participants with secondary educational levels had the highest knowledge score than participants who had tertiary educational levels. The result of this study were contradict with the research findings that education has a significant impact on health literacy. In this matter, usually low educational levels may result in low health literacy, which lead to lack of disease's information (38,39). A study conducted in Riyadh by Al Rashed WA et al., (41) proved that participants with a pre-university educational level had a lower score on knowledge of eye diseases than those with higher educational level. This is because educated people are mostly able to easily understand health information given by health professionals and can easily access information from health-related journals, articles, literature, and internet sources. This

proved that the higher the level of education attained, the greater the percentage of people with good knowledge compared to people with no education (42).

Health professionals were included in this study, together with general participants, to access their knowledge on eye diseases. Participants who work in a health profession had significantly higher mean knowledge scores than those in other occupations. They may have greater understanding about eye diseases as they may have already received health information on each type of disease during their education or professional training. Contrarily, a study by Alshammari F et al. (26) stated that participants who are still students having a higher understanding of different forms of eye diseases. Besides, research performed by Katibeh et al. (19) also mentioned that someone who has already retired or a woman who is a housewife also could have a better knowledge of eye diseases.

Not even that, various study findings have also revealed that participants who were married had significantly higher mean knowledge scores than their opponents. The underlying reason behind this may be that majority of older people at around 40 years of age have a tendency to get these diseases, and most of them were married, thus proving that married population had greater information exposure on eye diseases (43). Al Rashed WA et al., (41) have mentioned that participants that are still unmarried have lower acceptable knowledge compared to those who have been married, divorced, or widowed. However, our study finding showed that there is no significant difference between marital status and mean knowledge score. Even eye diseases is more prone to older people who already married, but there is also a study that shows that there is no significant between age group and knowledge level thus proving that even younger people can also have tendency to get the eye diseases and most of them are single or unmarried (19). Besides, the younger people may also easily get the knowledge about eye diseases from media or books thus causing them to be exposed to knowledge about eye diseases. Study by Alswaina (30) proved that younger patient were statistically significant more knowledgeable about eye diseases like diabetic retinopathy (DR) than the older one.

Our findings, on the other hand, had showed that there is no significant difference between the living area and the knowledge of the study participants. Nowadays, people who live either in the rural or urban areas still have access to the facilities, in which health-related information can be obtained. This finding is similar to a previous study. However, when comparing the mean knowledge score, participants living in rural areas had higher mean knowledge than participants living in urban areas. This finding is contradicted with the finding from previous study. Mersha et al., (29) have stated that there is a statistically significant between knowledge level and residency in which people who reside in the city had higher knowledge than participants living outside of the capital. Previous study conducted on assessment of knowledge about common eye diseases among general population have reported the same results, in which people living in rural areas have poor knowledge about eye diseases (39).

In this study, participants with visual problems and who have visit ophthalmologist so far had a higher mean knowledge score. However, this study shows that there is no significance difference between participants with visual problems and knowledge score. This finding is in line with study by Abdulrahman Mohammad Ibrahim et al., (44) which revealed that there is no statistically significant differences between patient with eye diseases

and knowledge score level. This shows that patient with visual problems such as cataract or conjunctivitis may also have poor knowledge score. Besides, study by Li (35) also stated that there is no significant association between level of knowledge and practices such as having a regular vision examination. This is line with our study as there is no significant difference between participants that visit ophthalmologist and the knowledge even the result shows that participants who visit the ophthalmologist so far have a higher mean knowledge score. However, Mohammed Hamad Aldebasi et al., (45) had proved that people who had previous eye examination had a greater knowledge than those who have never been examined. The rationale of this may be due the exposed knowledge by the physician who counseled the patient about the eye disease every time they go for eye screening thus causing them to become aware of the compulsory for ophthalmic examination (46).

Analysis of our data had revealed that 15.3% of the study participants were in the poor eye diseases knowledge category. Another study conducted among the public was by Abdulrahman Mohammad Ibrahem et al., (44). They assessed eye diseases knowledge among Iraqis and the results illustrated that approximately 26.7% of study participants had average knowledge, 32.8% had good knowledge and 40.5% had poor knowledge regarding eye diseases. Even our findings shows that participants with poor knowledge is lower than study in Iraq, however our findings still illustrated a lower number of participants who have a good knowledge level which is only 23%. The result of this study had indicated the Malaysian are less knowledgeable regarding eye diseases than Iraqis. One of the key factors for the poor knowledge among the public in Malaysia could be a lack of promotion of eye diseases education and limitation of ophthalmological services. In order to increase community understanding and knowledge regarding this illness, eye health promotion and education campaigns are recommended (47). Besides, by enhancing the eye care facilities, comprehensive eye care service can be provided to public thus improving their awareness on the importance of regular eye testing with eye health care professional so that early detection of eye diseases can be done (48,49).

Our key findings of this study had showed a significant difference in the level of good knowledge score (score >14), which was found according to employment status ($p< 0.05$). However, there was no significant association found between age, living areas, gender, educational level, marital status, participants with visual problems and who had visit ophthalmologist so far. Studies suggest that knowledge is a crucial factor which can help to manage the eye vision efficiently (50,51). The result showed most of study participants with good knowledge level were student with a tertiary educational level. Student already received health information during their study, thus reflected better knowledge about eye diseases. Moreover, the fact that the student can easily access health information whether through media or lecturers has also contributed to higher eye knowledge level. However, the overall results had showed that the knowledge of the public on eye diseases was fair. This indicates that the health professional such as ophthalmologist or optometrist must be more active in creating awareness about eye diseases among the public.

5.0 Conclusion

In conclusion, the findings from this study confirmed that that the study participants possessed very moderate knowledge about eye diseases, with a very small proportion having poor knowledge. This study results also identified a significant association between

knowledge of eye diseases and students as well as good knowledge in employed and ophthalmic clinic visitors. Knowledge plays a crucial role in disease prevention and control. Poor knowledge about eye diseases may result in a delayed diagnosis or refusal to take suggested treatment, resulting in poor management of the condition. Therefore, continuous health awareness and education programs should be conducted to improve the knowledge and awareness among the public, especially among older people and diabetic patients for the better utilization of health services. Moreover, early education and regular eye screening should be encouraged in all health care centres, thereby, decreasing the prevalence of eye diseases in the country.

Study limitations

Considering the limitation of the present study, there was a very limited number of studies that were conducted to explore the knowledge evaluation among the public. This survey was conducted with a limited number of participants Moreover, this survey was distributed via Google Forms through an online platform, therefore only a minimum number of participants from the middle age group had participated in this study. Finally, the sample size was limited to certain population geographically in Malaysia. Hence, a survey with a larger number of participants representing a global population could provide a clearer picture of knowledge and awareness regarding eye diseases worldwide.

Acknowledgement

The authors are very much thankful to Prof Dr Louis Tong (Singapore Eye Research Institute, 11 Third Hospital Avenue, Singapore; Yong Loo Lin School of Medicine, National University of Singapore, Singapore; Duke-NUS Graduate Medical School, Singapore; Singapore National Eye Centre, Singapore) for his kind support by granting permission for using the content (questionnaire) from the article “Knowledge, Attitude, and Practice of Dry Eye Treatment by Institutional Chinese Physicians in Singapore”. The authors also acknowledge Dr Marzieh Katibeh, MD, MPH (Ophthalmic Epidemiology and Prevention of Blindness Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran) for the questionnaire from “Knowledge and Awareness of Age Related Eye Diseases: a Population-Based Survey”, Dr Maritta Kilpeläinen (Department of Pulmonary Diseases and Clinical Allergology, Turku University Central Hospital, Kiinamyllynkatu 4-8, FIN-20520 Turku, Finland) for the questionnaire from “Validation of a new questionnaire on asthma, allergic rhinitis, and conjunctivitis in young adults”, and Dr Marcos Geraldini (Service in Pediatric Allergy and Immunology, Hospital of Clinics, Federal University of Parana (UFPR), Curitiba, PR, Brazil) for the questionnaire from “Epidemiology of ocular allergy and comorbidities in adolescents”. The authors express their gratitude to the study participants for their active cooperation.

Funding: The authors would like to thank Universiti Teknologi MARA (UiTM), Selangor, Malaysia and Faculty of Pharmacy, UiTM, Malaysia for providing the funding through DUCS grant (600-UiTMSEL (PI. 5/4) (152/2022) for the scientific communication in this survey and study.

Conflicts of interest

The authors declare that there are no conflicts of interest.

References

1. Eye disorder - Definition | OpenMD.com [Internet]. National Institutes of Health. 2006 [cited 2021 Dec 20]. Available from: https://openmd.com/define/eye+disorder
2. Haddad MF, Bakkar MM, Abdo N. Public awareness of common eye diseases in Jordan. BMC Ophthalmology. 2017 Oct 2;17(1):1–7.
3. Dietze J, Blair K, Havens SJ. Glaucoma. StatPearls [Internet]. 2022 Jan 2 [cited 2022 Jan 27]; Available from: https://www.ncbi.nlm.nih.gov/books/NBK538217/
4. Schuster AK, Erb C, Hoffmann EM, Dietlein T, Pfeiffer N. The Diagnosis and Treatment of Glaucoma. Deutsches Ärzteblatt International [Internet]. 2020 Mar 27 [cited 2022 Jun 11];117(13):225. Available from: /pmc/articles/PMC7196841/
5. Nizami AA, Gulani AC. Cataract. StatPearls [Internet]. 2021 Aug 1 [cited 2022 Jan 27]; Available from: https://www.ncbi.nlm.nih.gov/books/NBK539699/
6. Cataracts - Causes, Symptoms, Risk Factors, Diagnosis, Treatment, and Prevention [Internet]. [cited 2022 Jun 12]. Available from: https://www.webmd.com/eye-health/cataracts/what-are-cataracts
7. Wang W, Lo ACY. Diabetic Retinopathy: Pathophysiology and Treatments. International Journal of Molecular Sciences. 2018 Jun 20;19(6).
8. Findlay Q, Reid K. Dry eye disease: when to treat and when to refer. Australian Prescriber [Internet]. 2018 Oct 1 [cited 2022 Jun 12];41(5):160. Available from: /pmc/articles/PMC6202299/
9. Lan W, Lee SY, Lee MX, Tong L. Knowledge, attitude, and practice of dry eye treatment by institutional chinese physicians in singapore. The Scientific World Journal. 2012;2012.
10. Golden MI, Meyer JJ, Patel BC. Dry Eye Syndrome. StatPearls [Internet]. 2021 Aug 19 [cited 2021 Dec 24]; Available from: https://www.ncbi.nlm.nih.gov/books/NBK470411/
11. Xu J, Chen S, Hao X, Wu G, Wang S, Yuan H, et al. Traditional Chinese medicine Xiaosheng Powder for dry eye disease: A protocol for systematic review and meta analysis. Medicine [Internet]. 2020 Aug 8 [cited 2022 Jun 12];99(35):e22019. Available from: /pmc/articles/PMC7458267/
12. Ryder EC, Benson S. Conjunctivitis. StatPearls [Internet]. 2021 Aug 11 [cited 2021 Dec 24]; Available from: https://www.ncbi.nlm.nih.gov/books/NBK541034/
13. Pink eye (conjunctivitis) [Internet]. Mayo Clinic. 2020 [cited 2021 Dec 20]. Available from: https://www.mayoclinic.org/diseases-conditions/pink-eye/symptoms-causes/syc-20376355
14. Blindness and vision impairment [Internet]. World Health Organization. 2021 [cited 2021 Dec 20]. Available from: https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment
15. Chew FLM, Salowi MA, Mustari Z, Husni MA, Hussein E, Adnan TH, et al. Estimates of visual impairment and its causes from the National Eye Survey in Malaysia (NESII). PLoS ONE [Internet]. 2018 Jun 1 [cited 2021 Dec 20];13(6). Available from: /pmc/articles/PMC6019397/
16. Wong PW, Lau JK, Choy BN, Shih KC, Ng AL, Chan JC, et al. Epidemiological factors associated with health knowledge of three common eye diseases: A community-based pilot survey in Hong Kong. SAGE Open Medicine [Internet]. 2020 Jan [cited 2022 Jun 12];8:205031212094304. Available from: /pmc/articles/PMC7372619/
17. Chew YK, Reddy SC, Karina R. Awareness and Knowledge of Common Eye Diseases Among the Academic Staff (Non-Medical Faculties) of University of Malaya. Med J Malaysia . 2004;59(3):305–11.
18. Naing L, Winn T, Rusli BN. Practical Issues in Calculating the Sample Size for Prevalence Studies. Archives of Orofacial Sciences. 2006;1:9–14.

19. 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. Journal of Ophthalmic & Vision Research. 2014 Apr;9(2):223–31.
20. Geraldini M, Neto HJC, Riedi CA, Rosário NA. Epidemiology of ocular allergy and co-morbidities in adolescents. J Pediatr (Rio J). 2013 Jul;89(4):354–60.
21. Kilpeläinen M, Terho EO, Helenius H, Koskenvuo M. Validation of a new questionnaire on asthma, allergic rhinitis, and conjunctivitis in young adults. Allergy: European Journal of Allergy and Clinical Immunology. 2001 May;56(5):377–84.
22. Schmidt CH, Volpe NJ, Bryar PJ. Eye Disease in Medical Practice: What You Should Know and Why You Should Know It. Med Clin North Am [Internet]. 2021 May 1 [cited 2022 Jul 1];105(3):397–407. Available from: https://pubmed.ncbi.nlm.nih.gov/33926637/
23. Saleh Al-Ghofaili R, Abdullah Al-Lahim W, ALBalawi H. Assessment of Knowledge and Awareness of Ocular Allergy Among Undergraduate Students, University of Tabuk, Tabuk City, Saudi Arabia. Original Research Article [Internet]. 2018 [cited 2022 Jul 1];459(1):459–64. Available from: www.ijmrp.com
24. Villegas BV, Benitez-Del-castillo JM. Current Knowledge in Allergic Conjunctivitis. Turkish Journal of Ophthalmology [Internet]. 2021 [cited 2022 Jul 1];51(1):45. Available from: /pmc/articles/PMC7931656/
25. Kyei S, Tettey B, Asiedu K, Awuah A. Knowledge and awareness of ocular allergy among undergraduate students of public universities in Ghana. BMC Ophthalmology [Internet]. 2016 Oct 28 [cited 2022 Jul 1];16(1):1–8. Available from: /pmc/articles/PMC5084332/
26. Alshammari F, Shaikh S, Hussain A, Alafnan A, Almuzaini I, Alshammari B. Public Awareness of Common Eye Diseases and the Role of Pharmacists in Raising This Awareness in Saudi Arabia: A Cross-Sectional Study. Healthcare [Internet]. 2021 Jun 1 [cited 2022 Jul 1];9(6). Available from: /pmc/articles/PMC8226453/
27. Samuel M, Abdulkadir H, Girma M, Glagn M. Assessment of Knowledge and Attitude of Cataract and Their Associated Factors Among Adults in Arba Minch Zuria Woreda, Southern Ethiopia. Clinical Ophthalmology (Auckland, NZ) [Internet]. 2021 [cited 2022 Jul 1];15:2913. Available from: /pmc/articles/PMC8274240/
28. Alammar AA, Alabdulkareem AM, Abu-amara AB, Kalantan H. Assessment of the Levels of Knowledge Regarding Cataract and Glaucoma in Saudi Arabia and Measurement of the Ability to Differentiate Between the Two. Cureus [Internet]. 2021 Nov 24 [cited 2022 Jul 1];13(11). Available from: /pmc/articles/PMC8614166/
29. Mersha GA, Alimaw YA, Woredekal AT, Assaye AK, Zeleke TC. Awareness and knowledge of diabetic retinopathy in diabetic patients at a General Hospital in Northwest Ethiopia. SAGE Open Medicine [Internet]. 2021 Jan [cited 2022 Jul 1];9:205031212110549. Available from: /pmc/articles/PMC8649097/
30. Alswaina NF. Awareness of diabetic retinopathy among patients with type 2 diabetes mellitus in Qassim, Saudi Arabia. Journal of Family Medicine and Primary Care [Internet]. 2021 [cited 2022 Jul 1];10(3):1183. Available from: /pmc/articles/PMC8140237/
31. Bourne RRA, Steinmetz JD, Saylan M, Mersha AM, Weldemariam AH, Wondmeneh TG, et al. Causes of blindness and vision impairment in 2020 and trends over 30 years, and prevalence of avoidable blindness in relation to VISION 2020: the Right to Sight: an analysis for the Global Burden of Disease Study. The Lancet Global Health [Internet]. 2021 Feb 1 [cited 2022 Jul 1];9(2):e144. Available from: /pmc/articles/PMC7820391/
32. Zhang J, Tuo J, Wang Z, Zhu A, Machalińska A, Long Q. Pathogenesis of Common Ocular Diseases. Journal of Ophthalmology [Internet]. 2015 [cited 2022 Jul 1];2015. Available from: /pmc/articles/PMC4736228/

33. Alzahrani SH, Bakarman MA, Alqahtani SM, Alqahtani MS, Butt NS, Salawati EM, et al. Awareness of diabetic retinopathy among people with diabetes in Jeddah, Saudi Arabia. Therapeutic Advances in Endocrinology and Metabolism [Internet]. 2018 Apr 1 [cited 2022 Jul 1];9(4):103. Available from: /pmc/articles/PMC5871062/
34. Kizor-Akaraiwe NN, Monye HI, Okeke S. Awareness and knowledge about glaucoma and proportion of people with glaucoma in an urban outreach programme in Southeast Nigeria. BMJ Open Ophthalmology [Internet]. 2017 Mar 1 [cited 2022 Jul 1];1(1):18. Available from: /pmc/articles/PMC5721634/
35. Li LS, Ge ZY, Lohfeld L, Zhou K, Zhou WH, Cui L le, et al. Knowledge, attitudes and practices related to seeking medical eyecare services by adults with moderate-to-severe visual impairment in rural Yueqing, Wenzhou, China: a cross-sectional survey. International Journal of Ophthalmology [Internet]. 2020 Jul 18 [cited 2022 Jul 2];13(7):1115. Available from: /pmc/articles/PMC7321945/
36. Liu Y, Swearingen R. Diabetic Eye Screening: Knowledge and Perspectives from Providers and Patients. Curr Diab Rep [Internet]. 2017 Aug 8 [cited 2022 Jul 2];17(10):94. Available from: /pmc/articles/PMC6389265/
37. Findlay Q, Reid K. Dry eye disease: when to treat and when to refer. Australian Prescriber [Internet]. 2018 Oct 1 [cited 2022 Jul 2];41(5):160. Available from: /pmc/articles/PMC6202299/
38. Shrestha G, Sigdel R, Shrestha J, Sharma A, Shrestha R, Mishra S, et al. Awareness of Eye Health and Diseases among the Population of the Hilly Region of Nepal. Journal of Ophthalmic & Vision Research [Internet]. 2018 Oct 1 [cited 2022 Jul 2];13(4):461. Available from: /pmc/articles/PMC6210871/
39. Zhao M, Gillani AH, Islam FMA, Ji W, Hayat K, Li Z, et al. Factors Associated with Knowledge, Attitude and Practices of Common Eye Diseases in General Population: A Multicenter Cross-Sectional Study from Pakistan. International Journal of Environmental Research and Public Health [Internet]. 2019 May 1 [cited 2022 Jul 2];16(9):1568. Available from: /pmc/articles/PMC6539305/
40. Islam FMA, Chakrabarti R, Dirani M, Islam MT, Ormsby G, Wahab M, et al. Knowledge, Attitudes and Practice of Diabetes in Rural Bangladesh: The Bangladesh Population Based Diabetes and Eye Study (BPDES). PLoS ONE [Internet]. 2014 Oct 14 [cited 2022 Jul 2];9(10). Available from: /pmc/articles/PMC4196995/
41. al Rashed WA, bin Abdulrahman AK, Zarban AA, Almasri MS, Mirza AS, Khandekar R. Public Awareness regarding Common Eye Diseases among Saudi Adults in Riyadh City: A Quantitative Study. Journal of Ophthalmology. 2017;2017.
42. Baldev VF, Chopra R, Batra N, Singh S. Pattern of Ocular Morbidity in the Elderly Population of Northern India. Journal of Clinical and Diagnostic Research : JCDR [Internet]. 2017 Aug 1 [cited 2022 Jul 2];11(8):NC20. Available from: /pmc/articles/PMC5620814/
43. M. Ibrahem A, Q. Mahmood S, Babakir-Mina M, Ibrahim Ali S, Kamal Talabany B. Assessment of Knowledge and Practice of Various Eye Diseases in Sulaimani: A Descriptive Study. Kurdistan Journal of Applied Research. 2018 Jul 23;1–6.
44. Aldebasi MH, Alsobaie NA, Aldayel AY, Alwusaidi KM, Alasbali T. Public Awareness regarding the Differences between Ophthalmologists and Optometrists among Saudi Adults Living in Riyadh: A Quantitative Study. Journal of Ophthalmology. 2018;2018.
45. Sen A, Pathak P, Shenoy P, Kohli GM, Bhatia P, Shetty S. Knowledge, attitude, and practice patterns and the purported reasons for delayed presentation of patients with sight-threatening diabetic retinopathy at a tertiary eyecare facility in Central India: A questionnaire-based study. Indian J Ophthalmol [Internet]. 2021 Nov 1 [cited 2022 Jul 6];69(11):3118–22. Available from:

https://journals.lww.com/ijo/Fulltext/2021/11000/Knowledge,_attitude,_and_practice_patterns_and_the.32.aspx
46. Raising awareness on eye care [Internet]. [cited 2022 Jul 7]. Available from: https://www.who.int/activities/raising-awareness-on-eye-care
47. Holloway EE, Constantinou M, Xie J, Fenwick EK, Finkelstein EA, Man REK, et al. Improving eye care in residential aged care facilities using the Residential Ocular Care (ROC) model: Study protocol for a multicentered, prospective, customized, and cluster randomized controlled trial in Australia. Trials [Internet]. 2018 Nov 26 [cited 2022 Jul 7];19(1):1–10. Available from: https://trialsjournal.biomedcentral.com/articles/10.1186/s13063-018-3025-5
48. Y S, M R, AR B, A DN. Eye Heroes: A Model of Raising Awareness about Eye Health by Training Children to Be Eye Health Champions. Journal of Community Medicine & Health Education [Internet]. 2018 Dec 10 [cited 2022 Jul 7];8(6):1–5. Available from: https://www.omicsonline.org/open-access/eye-heroes-a-model-of-raising-awareness-about-eye-health-by-training-children-to-be-eye-health-champions-2161-0711-1000639-106552.html
49. Parfitt A, Boxell E, Amoaku WM, Bradley C. Patient-reported reasons for delay in diagnosis of age-related macular degeneration: a national survey. BMJ Open Ophthalmology [Internet]. 2019 Oct 1 [cited 2022 Jul 7];4(1):276. Available from: /pmc/articles/PMC6830468/
50. Burton MJ, Ramke J, Marques AP, Bourne RRA, Congdon N, Jones I, et al. The Lancet Global Health Commission on Global Eye Health: vision beyond 2020. The Lancet Global Health [Internet]. 2021 Apr 1 [cited 2022 Jul 7];9(4):e489–551. Available from: http://www.thelancet.com/article/S2214109X20304885/fulltext