

AN ANALYTICAL STUDY OF AWARENESS ABOUT CATARACTS AND VISUAL IMPAIRMENT AMONG UNIVERSITY STUDENTS

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Abstract: Cataract is the leading cause of blindness worldwide. This study aimed to assess and compare the awareness levels about cataracts leading to visual impairment between health sciences and non-health sciences university students. A comparative cross-sectional study design was conducted on 432 participants aged 19 to 27 (mean 22.75 ± 1.90), with an equal number of 216 participants from health sciences and non-health sciences students. The data was collected using a questionnaire through an online platform (Google form). Most respondents (81.5%) had heard about cataracts and knew that cataract incidence increases with age. Most respondents (72.2%) were aware that radiation risks cataracts. 20.1% of the respondents did not aware that cataract surgery is free in government hospitals for certain circumstances. Cataract awareness was statistically higher among health sciences students (1.73 ± 0.13) compared to non-health sciences students (1.52 ± 0.16), $t(430)=13.68$, $p=0.001$. More than half of the respondents were aware of cataracts and their risk factors, but some still did not know about government hospitals' free cataract surgery service. High awareness among university students will undoubtedly benefit them and raise awareness of those around them, including their families.

Keywords: Visual impairment, cataract, awareness, blindness, student.

Introduction

According to the World Health Organization (WHO) (2020), blindness is the visual acuity of worse than 3/60 in the better eye. Visual acuity worse than 6/12 but better or equal to 6/18 in the better eye is defined as mild visual impairment, while visual acuity worse than 6/18 but better than or equal to 6/60 in the better eye is defined as moderate. Severe visual impairment is described as visual acuity lower than 6/60 but better than or equal to 3/60 in the better eye. Visual impairment is one of the general population's major health issues, with an expected 253 million people experiencing visual impairment where about 36 million are blind, and 217 million have moderate to severe vision impairment (Khairallah *et al.*, 2015). Bourne *et al.* (2013) reported that the leading global causes of blindness are cataracts, uncorrected refractive error, and macular degeneration.

In Malaysia, untreated cataracts (58.6%), diabetic retinopathy (10.4%), other posterior

segment diseases (8.4%), and glaucoma (6.6%) are the most common causes of vision loss (Chew *et al.*, 2018). Another study in Pahang, Malaysia by Thevi *et al.* (2012) has also shown that cataract is responsible for severe visual impairment in 11 out of 12 patients (83.3%) and for blindness in 26 out of 35 patients (74.3%). Thus, this shows that cataract is the main root of visual impairment in Malaysia. There is a hospital-based study done by the eye clinic of the University of Malaya Centre on 1,169 patients, which found that the frequency of 9.8% low vision and 0.9% blindness among the urban population in Kuala Lumpur (Chandrasekhara Reddy & Thevi, 2017). The study has also shown that cataracts are accountable for 32.93% of visual loss, followed by 10.77% for refractive error. The high figures may be the lack of awareness about eye disease in urban areas.

A cataract is when the crystalline lens of the eyes, which is normally clear, becomes opaque and reduces the amount of light entering

the eyes. Cataracts may cause several visual changes, including seeing double images, glare, poor night vision, and total blindness. Fateen *et al.* (2017) reported that cataract occurrence increased with age and life expectancy, which is believed to increase the prevalence of age-related disease and reversible blindness. A cataract is one of the leading causes of progressive and reversible blindness, which can be treated with surgical procedures that promise an excellent prognosis for sight restoration, as stated by the World Health Organization (2020).

The lack of understanding of eye disease is associated with poor prevention and treatment. Hence, the awareness of cataracts about symptoms, progression, and treatment could play a significant part in encouraging people to look for timely eye care, thus lowering the burden of visual impairment (Magliyah *et al.*, 2015). Most people know that cataract affects visual acuity, and its prevalence increases with age. Still, half of the population do not realise that the blindness caused by cataract is treatable (WHO, 2020). Several studies have assessed the awareness of cataracts among university students. Non-science students' awareness level is low (Puri & Elangovan, 2016). Another study has also shown that students' knowledge and awareness about cataracts and their risk factors are not very good (Magliyah *et al.*, 2015). In India, a study reported that the awareness about cataracts leading to visual impairment among university students is not good (Biswas, 2012). A similar study conducted at Hail University by Alshammary *et al.* (2018) showed that non-science students have lower awareness than science students. The desirable knowledge of cataracts could minimise the burden of blindness caused by cataracts because it teaches them how to delay the onset of the disease and thus able to initiate early interventions (Ormsby *et al.*, 2012). Besides, well-informed students are believed to increase the awareness of people surrounding them, including their family, relatives, friends, and the community (Alshammary *et al.*, 2018). Khairallah *et al.* (2015) found that good knowledge about cataracts lessens the implication of blindness due to cataracts. This

can help to slow down the occurrence of the visual impairment caused by the disease and thus allow for a timely intervention.

In Malaysia, no study has been done to assess the level of awareness about cataracts among university students. Hence, this study aimed to assess the cataract awareness leading to visual impairment between health sciences and non-health sciences university students. Healthcare is the backbone of each country. University students, especially health science students, are the future healthcare providers of the country. Students with a higher awareness of cataracts are more likely to learn about impacts and appropriate management. They may understand the community's health needs more and can provide appropriate counselling and advice. Therefore, this study compared the awareness level among the health sciences and non-health sciences students about cataract that leads to visual impairment and its risk factors, which is important for the early prevention of visual impairment and blindness due to cataract in Malaysia.

Materials and Methods

Apparatus

The questionnaire was adapted from a published study by Fateen *et al.* (2017). A pilot study was conducted on 10 participants for reliability. The reliability for the total score showed Cronbach's alpha value of 0.75. Several studies have agreed that the acceptable value for Cronbach's alpha value ranges from 0.70 to 0.95 (Taber, 2018). The questionnaires comprised four sections and a total of 18 questions. All sections need to be answered by the participants. Section A was the socio-demographic data that included age, gender, faculty, and course. Section B comprised questions related to patient awareness about the cataract. Section C included questions about awareness of cataract risk factors, and Section D comprised questions about cataract treatment. All questions were given the option "yes" or "no", where the score ranged from one to two (no = 1 mark, yes = 2 marks). When interpreting the

data, it is important to consider the quantitative and qualitative aspects of the data and ethical considerations.

Subjects

This study was approved by the Research Ethics Committee of MARA University of Technology [REC/04/2021 (UG/MR/3830)]. All respondents who voluntarily participated in this study were selected based on the inclusion and exclusion criteria. The inclusion criteria were full-time undergraduate students from the Faculty of Health Sciences and Faculty of Business Management of UiTM Puncak Alam campus. Postgraduate students, part-time students, and students from other faculties were excluded. Written informed consent was obtained from every participant after explaining the study's purpose through Google Forms. The total population of Faculty of Health Sciences and Faculty of Business Management students were around 1670 and 3500. Using the Raosoft software, the formula is as follows:

$$N = \frac{NX}{(X+N-1)}$$

$$\text{where } X = \frac{Z^2 p(1-p)}{\text{MOE}^2}$$

where;

n = sample size,

N = population size,

Z = critical value,

P = sample proportion, and

MOE = margin of error

N's value was 5170, whereas the Z-statistic was 1.96 for a confidence interval of 95%. The sample proportion was set at 50% to yield the largest sample size with a margin error of 5%. Considering the 20% dropout rate of the participant, a total number of 432 participants (216 participants from the Faculty of Health Sciences and 216 from the Faculty of Business Management) were involved in this study.

Procedure

The questionnaire was disseminated to the potential participants through Google form via WhatsApp application. The time taken to

answer the questionnaire was about 10 minutes. The period for collecting the responses from participants was within two months and a half, from April to mid of June 2021.

The response to the questionnaire was retrieved through Google Forms and was checked for completeness. The incomplete questionnaires were rejected, and the data were analysed using Statistical Package for Social Sciences (SPSS) version 23 (New York, USA). Demographic data were analysed with a descriptive analysis. The data were normally distributed with $p > 0.05$. Hence, an independent T-test was used to compare the awareness level about cataracts leading to visual impairment among health sciences and non-health sciences students.

Results and Discussion

This cross-sectional study was carried out to assess the awareness about cataracts leading to visual impairment among university students and compare the awareness level among health sciences and non-health sciences students. To the best of our knowledge, this is the first population-based study on awareness about cataracts among university students in Malaysia. The results of this study could be utilised in enhancing eye health promotion to scale down the increase of undesired burdens.

A total number of 432 university students, predominantly females (66%) and males (34%) aged between 19 to 27 years (mean 22.75 years \pm 1.90), participated in this study. The socio-demographics are shown in Table 1.

Fourteen questionnaire questions were asked about the awareness of general knowledge of cataract, cataract risk factors, and treatments provided by the government. The response of the respondents is shown in Table 2. Most respondents (82%) had heard about cataracts before, but only 69% knew that the incidence of cataracts increases with age. Besides, more than half of the respondents were aware of cataract risk factors. For the risk factors, most of the respondents (72%) agreed that radiation is the

Table 1: Socio-demographics of respondents.

Variable	Frequency (n)	Percentages (%)
Gender		
Male	146	34
Female	286	66
Age		
19	20	4.6
20	55	12.7
21	40	9.3
22	56	13.0
23	107	24.8
24	59	13.7
25	76	17.6
26	15	3.5
27	4	0.9
Faculty		
Health sciences	216	50
Non-health sciences	216	50

Table 2: Response frequency by respondents

Awareness	Frequency (n)	Percentages (%)
GENERAL		
Have you ever heard about cataracts?		
Yes	352	81.5
No	80	18.5
Incidence of cataract increase with age?		
Yes	298	69.0
No	134	31.0
Can it cause blindness?		
Yes	264	61.1
No	168	38.9
Blindness caused by cataracts is curable?		
Yes	217	50.2
No	215	49.8
It is not preventable		
Yes	350	81.0
No	82	19.0

RISK		
Can radiation cause cataracts?		
Yes	312	72.2
No	120	27.8
Can diabetes cause cataracts?		
Yes	295	68.3
No	137	31.7
Can obesity contribute to cataract development?		
Yes	229	53.0
No	203	47.0
Can smoking cause cataracts?		
Yes	247	57.2
No	185	42.8
Can alcohol cause cataracts?		
Yes	235	54.4
No	197	45.6
TREATMENT		
Is cataract curable?		
Yes	409	94.7
No	23	5.3
What is the treatment option?		
Medicine	151	35.0
Surgery	260	60.2
Spiritual treatment	21	4.9
Have you ever heard about intraocular lens?		
Yes	215	49.8
No	217	50.2
Do you know what cataract surgery is free in government hospitals and exclusives to people earning B40 income, under the hospital's welfare and government retiree?		
Yes	87	20.1
No	345	79.9

risk factor for cataracts while obesity (53%) was the least preferred choice of the respondents. For the treatment, more than half of the respondents (60%) knew that surgery is the effective treatment for the cataract. Most respondents (80%) did not know that cataract surgery is free in government hospitals, exclusive to people earning a B40 income, under the hospital's welfare, and government retirees.

This study presents the level of awareness about cataracts leading to visual impairment between health sciences and non-health sciences students from three aspects: general knowledge of the cataract, cataract risk factors, and treatment options. The mean scores of the responses are shown in Figures 1,2 and 3. Figure 1 shows the mean values of awareness of general cataract knowledge between groups. Overall, the health sciences students had higher

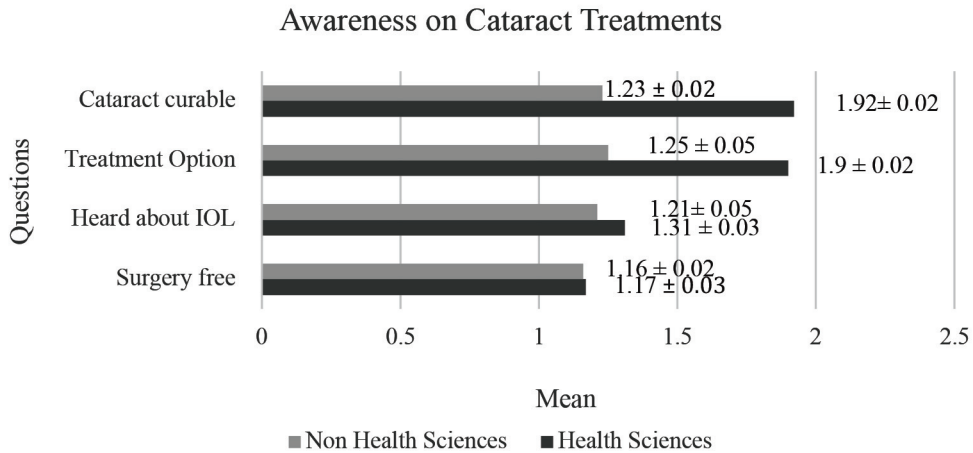


Figure 1: Mean value of awareness on general knowledge of cataract

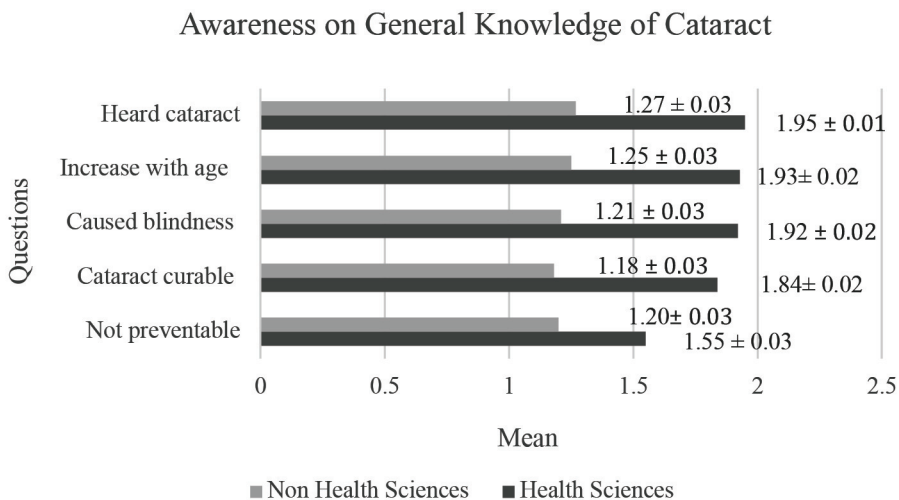


Figure 2: Mean value of awareness of cataract risk factors

awareness levels for all questions regarding general cataract knowledge than non-health sciences students.

This study suggests that the level of awareness about cataracts leading to visual impairment is good among the respondents, but it can be further improved. Most of the respondents in this study were familiar with the term “cataract”. This finding is supported by a study by Balasopoulou *et al.* (2017) showing that most of their participants had heard of cataracts. Another study done by Assaye *et al.* (2020) also reported that two-thirds of their participants had heard of cataracts. These

show that the term “cataract” is familiar to the public. A cataract is the main common factor of blindness in people above 40 years old and has become the world’s most significant cause of vision loss (Zhang *et al.*, 2017). In this study, respondents were well-informed about cataracts as one of the causal factors of age-related vision loss. Cataracts increase with age (Song *et al.*, 2018). A previous study has shown that most of their respondents were aware that cataract is associated with increasing age (Alshammary *et al.*, 2018). Their findings align with the present study, showing that many participants know that vision loss caused by cataracts can

be treated. With early detection and treatment, the blindness caused by the cataract is reversible (Dandona *et al.*, 2001). A previous study also showed that most of their respondents (75.9%) believed that cataract is a treatable disease (Sultan *et al.*, 2019) Saudi Arabia.

Materials and Methods: This cross-sectional study was conducted in Tabuk, Saudi Arabia during the period from June 2017 to December 2017. A convenient sample of 397 participants of adults aged above 18 years old was chosen by a stratified method. A self-administered online survey included multiple choice and true-false questions was used to obtain information about respondent's awareness regarding common eye diseases including cataract, refractive errors, glaucoma and diabetic retinopathy.

Results: 77.6% of participants were females, 41.4% were between 18 and 25 years, 52% of the respondents had sufficient knowledge regarding common eye problems. The most frequent sources of information were the internet (46.7%). A high number of participants were aware that cataract is unpreventable, which correlates with the result from a previous study (Fateen *et al.*, 2017), as half of their participants were aware that cataract is unpreventable.

The mean values of the awareness of cataract risk factors between both groups are shown in Figure 2. Overall, the health sciences students had higher awareness levels for all questions regarding cataract risk factors than non-health sciences students.

A good number of respondents were aware of cataract risk factors. More than half of the respondents agreed that diabetes is the risk factor for cataracts in this present study. This finding correlates with previous studies done by Pizzol *et al.* (2019) and Otaybi *et al.* (2021), which indicates that the respondents aware of diabetes patients have a higher probability of developing cataracts. Diabetes is a major risk factor for lens opacity, the most common cause of vision loss and blindness (Hashim & Zarina, 2012).

Radiation exposure is also one of the risk factors for cataract progression (Söderberg *et al.*, 2016). In radiation-induced cataracts, ionising

radiation is frequently related to posterior subcapsular and on rare occasions, cortical cataracts (Schultz, 2016). Most respondents were aware of the danger of radiation to the lens, which correlates with the study by Assaye *et al.* (2020), in which half of their respondents agreed that the incidence of cataracts increases with increased exposure to radiation. Obesity is one of the risk factors for developing cataracts (Fateen *et al.*, 2017). Half of the respondents in the current study agreed that obesity is a risk factor for cataracts.

Cigarette smoking is associated with cataract formation (Kelly *et al.*, 2005). Smoking increases oxidative stress by lowering endogenous antioxidant levels, which plays a crucial role in cataract formation (Ottonello & Carta, 2000). The present study has shown that half of the participants agreed that smoking activity is one of the risk factors for cataracts. This contradicts a study by Otaybi *et al.* (2021), as only one-fourth of their respondents know that smoking increases the prevalence of cataracts. This result is also not aligned with the study done by Fateen *et al.* (2017), as 80% of their participants agreed that smoking does not contribute to cataract formation. The differences in awareness regarding smoking as one of the cataract risks between the current study and previous study might be due to the different populations of the study.

Figure 3 shows the mean values of awareness of cataract treatment available and provided by the government between both groups. Overall, the health sciences students had higher awareness levels for all questions regarding cataract treatment compared to non-health sciences students, but it is noteworthy to highlight the small difference in awareness levels about free cataract surgery.

Many respondents knew that cataract is treatable, which aligns with previous studies by Sultan *et al.* (2019) Saudi Arabia.

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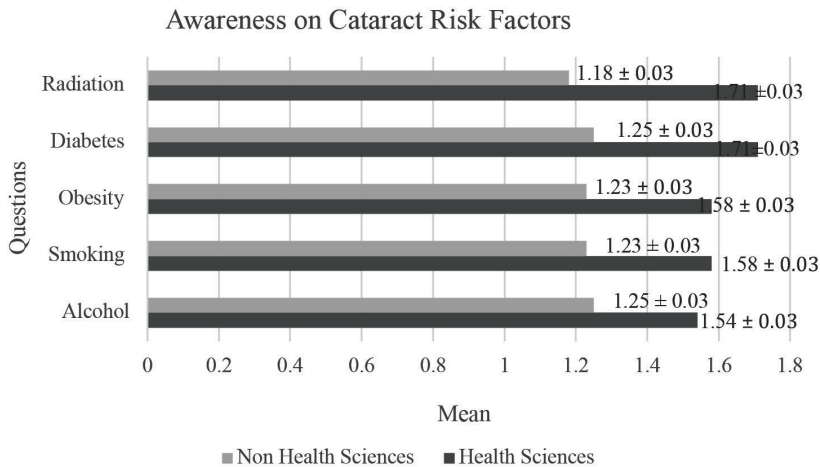


Figure 3: Mean value of awareness of cataract treatments

adults aged above 18 years old was chosen by a stratified method. A self-administered online survey included multiple choice and true-false questions was used to obtain information about respondent’s awareness regarding common eye diseases including cataract, refractive errors, glaucoma and diabetic retinopathy. Results: 77.6% of participants were females, 41.4% were between 18 and 25 years, 52% of the respondents had sufficient knowledge regarding common eye problems. The most frequent sources of information were the internet (46.7% and Katibeh *et al.* (2014). They reported that about half of their respondents knew that cataract is treatable. The effective way to treat a cataract is through surgery (Beyene *et al.*, 2021). Bright lighting, anti-glare sunglasses, magnifying glasses, and new eyeglasses can initially alleviate some cataract symptoms. Still, cataract removal surgery is needed once the routine activities are affected such as watching TV, reading, or driving. Half of the respondents in this study knew that surgery is the treatment choice for cataracts. This result aligns with Dandona *et al.* (2001) study that more than half of their respondents agreed that surgery is the cataract treatment. Surgery is the best treatment option for cataract patients, as two-thirds of the respondents agreed that surgery is a treatment option (Sultan *et al.*, 2019) Saudi Arabia. Materials and Methods: This cross-sectional

study was conducted in Tabuk, Saudi Arabia during the period from June 2017 to December 2017. A convenient sample of 397 participants of adults aged above 18 years old was chosen by a stratified method. A self-administered online survey included multiple choice and true-false questions was used to obtain information about respondent’s awareness regarding common eye diseases including cataract, refractive errors, glaucoma and diabetic retinopathy. Results: 77.6% of participants were females, 41.4% were between 18 and 25 years, 52% of the respondents had sufficient knowledge regarding common eye problems. The most frequent sources of information were the internet (46.7%. Various approaches are being used to remove the damage and opacified lens, followed by implanting an intraocular or artificial lens in the eye during the surgery. In this study, half of the respondents had never heard about the intraocular lens, which correlates with a previous study by Dandona *et al.* (2001). The previous study showed that only 31.4% of participants knew about intraocular lens implantation (Dandona *et al.*, 2001). This shows a lack of awareness regarding intraocular lens implantation as a cataract treatment.

Zakaria (2020), on the official website of University Science Malaysia, reported that under the National Cataract Camp 2020, patients under the selected group of B40 are eligible for free intraocular lenses. Besides, under a

programme called ‘Cataract Finder’, cataract surgery is free for registered patients under the Department of Society Welfare Malaysia (Bernama, 2019). Government retirees are eligible for free medical treatment in hospitals or government clinics (Pekelliling Perkhidmatan BIL 21 2009). The present study shows that most respondents did not know that cataract surgery is free for a selected group of B40 households in government hospitals. This finding is supported by a study done by Puri and Elangovan (2016) in a rural area of Punjab, as most of their respondents did not know that cataract surgery is free in government hospitals. This study is also in line with the study done by Fateen *et al.* (2017) in India, in which the awareness about free cataract surgery services in government hospitals was low. Financial assistance will be given for cataract surgery, including the cost of intraocular lenses by the government for selected people. However, this information was not well known among the respondents in this study. This might suggest that students still lack awareness about medical support for cataracts provided by the government. University students, especially health sciences students, are usually active in providing community services such as health screening. The students must be aware of the cataract campaigns and free treatment service provided by the government, so they can deliver the information when they interact with the public during community services.

The mean scores of awareness level about cataracts leading to visual impairment among health sciences and non-health sciences students are presented in Table 3. The independent t-test was used to compare the level of awareness between two groups of students. The result

showed a significant difference in awareness levels between both groups ($p < 0.05$), as shown in Table 3.

The health sciences students had higher awareness levels about cataracts in all three aspects, including general knowledge of cataracts (1.83 ± 0.17), risk of cataracts (1.62 ± 0.23), and treatment (1.74 ± 0.19) compared to non-health science students. This result correlates with a study done by Puri and Elangovan (2016), as the awareness about cataracts among non-health sciences students were found to be low in their study. Another study conducted among university students also shows that non-sciences students have lower awareness of cataracts than health sciences students (Alshammary *et al.*, 2018). This finding could be due to the different study backgrounds between both groups of students. The studies conducted by Dandona *et al.* (2001) and Fotouhi *et al.* (2006) cross-sectional study, 6497 Tehran citizens were sampled. All participants had complete eye examinations and an interview regarding demographic and socioeconomic status variables, past medical and eye history, and their previous and last eye care visits. Results: Among those sampled, 4565 people participated in the study (response rate of 70.3% also emphasise that respondents from different study backgrounds will have varying levels of awareness and care about their health.

The limitation of this study was the self-report measures of awareness level about cataracts. Self-report measures could be influenced by recall bias, thus this study might have a chance of unconscious responses using an online survey.

Table 3: Mean values of awareness level between health sciences and non-health sciences students

Variable	Health Sciences (n=216) Mean (SD)	Non-Health Sciences (n=216) Mean (SD)	Mean diff. (95% CI)	P value
General	1.83 (0.17)	1.53 (0.26)	0.30 (0.24,0.34)	0.00
Risk	1.62 (0.23)	1.51 (0.18)	0.03(- 0.02, 0.07)	0.00
Treatment	1.74 (0.19)	1.43 (0.27)	0.31(0.27, 0.36)	0.00

Conclusion

This study has shown a good awareness of cataracts leading to visual impairment among university students. The level of cataract awareness among health sciences students is lower than among non-health sciences students. Assuredly, high awareness among university students will benefit them and likely increase awareness of the people surrounding them, including their family, friends, and relatives (Lau *et al.*, 2002). People with good awareness and knowledge are believed to scale down the prevalence of visual impairment due to reversible blindness caused by cataracts. The awareness gap among health sciences and non-health sciences students can be further improved by involving students in a proper eye health education program. Furthermore, various media types are appropriate strategies for university students to overcome barriers to enhancing eye health (Baker H & Murdoch, 2008). Developing a targeted public health awareness-raising campaign such as eye screening and promoting health education to increase student awareness is recommended. It is, however, needed to mention that this study was conducted on a small scale in the student community. Therefore, it is suggested that if a conclusive result about the awareness of cataracts among university students is desired, further large-scale studies should be conducted.

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References

- AlOtaybi, H., Alaslani, N., Calacattawi, R., Althaqafi, M., Alghamy, B., Aljohani, A., & Minqari, K. (2021). Knowledge and awareness of cataract: A population-based survey in Saudi Arabia. *International Journal of Medicine in Developing Countries*, 5(November 2020), 37-43. <https://doi.org/10.24911/ijmhc.51-1603123592>
- Alshammary, M. Z., Alshammari, F. S., & Alsahammari, H. S. (2018). Awareness and knowledge of poor vision among students in Hail University. *The Egyptian Journal of Hospital Medicine*, 70(5), 835-844. <https://doi.org/10.12816/0043991>
- Assaye, A. K., Tegegn, M. T., Assefa, N. L., & Yibekal, B. T. (2020). Knowledge towards strabismus and associated factors among adults in Gondar Town, Northwest Ethiopia. *Journal of Ophthalmology*, 2020, 1-11. <https://doi.org/10.1155/2020/3639273>
- Baker, H., & Murdoch, I. E. (2008). Can a public health intervention improve awareness and health-seeking behaviour for glaucoma? *British Journal of Ophthalmology*, 92, 1671-1675.
- Balasopoulou, A., Kokkinos, P., Pagoulatos, D., Plotas, P., Makri, O. E., Georgakopoulos, C. D., Vantarakis, A., Li, Y., Liu, J. J., Qi, P., Rapoport, Y., Wayman, L. L., Chomsky, A. S., Joshi, R. S., Press, D., Rung, L., Ademola-popoola, D., Africa, S., Article, O., ... Loukovaara, S. (2017). Symposium recent advances and challenges in the management of retinoblastoma Globe - Saving treatments. *BMC Ophthalmology*, 17(1), 1. <https://doi.org/10.4103/ijo.IJO>
- Bernama (2019, October 10). Free cataract surgery for Social Welfare Department-assisted patients. <https://www.thesundaily.my/local/free-cataract-surgery-for-social-welfare-department-assisted-patients-XJ1469011>
- Beyene, A. M., Eshetie, A., Tadesse, Y., & Getnet, M. G. (2021). Time to recovery from cataract and its predictors among eye cataract patients treated with cataract surgery: A retrospective cohort study in Ethiopia. *Annals of Medicine and Surgery*, 65(April), 102275. <https://doi.org/10.1016/j.amsu.2021.102275>
- Biswas, A. K. (2012). Study on awareness and knowledge regarding eye diseases among university students of Bangladesh. *Indian Journal of Ophthalmology*, 157(5).

- Bourne, R. R. A., Stevens, G. A., White, R. A., Smith, J. L., Flaxman, S. R., Price, H., Jonas, J. B., Keeffe, J., Leasher, J., Naidoo, K., Pesudovs, K., Resnikoff, S., & Taylor, H. R. (2013). Causes of vision loss worldwide, 1990-2010: A systematic analysis. *The Lancet Global Health, 1*(6), 339-349. [https://doi.org/10.1016/S2214-109X\(13\)70113-X](https://doi.org/10.1016/S2214-109X(13)70113-X)
- Chandrasekhara Reddy, S., & Thevi, T. (2017). Blindness and low vision in Malaysia. *International Journal of Ophthalmic Research, 3*(2), 234-238. <https://doi.org/10.17554/j.issn.2409-5680.2017.03.63>
- Chew, F. L. M., Salowi, M. A., Mustari, Z., Husni, M. A., Hussein, E., Adnan, T. H., Ngah, N. F., Limburg, H., & Goh, P. P. (2018). Estimates of visual impairment and its causes from the national eye survey in Malaysia (NESII). *PLoS ONE, 13*(6), 1-11. <https://doi.org/10.1371/journal.pone.0198799>
- Dandona, R., Dandona, L., John, R. K., McCarty, C. A., & Rao, G. N. (2001). Awareness of eye diseases in an urban population in southern India. *Bulletin of the World Health Organization, 79*(2), 96-102. <https://doi.org/10.1590/S0042-96862001000200003>
- Fateen, S., Rafique, F., Iram, M., Mehwish, H. H., Malik, A., & Khan, A. K. (2017). Awareness and knowledge about cataract and factors affecting cataract surgery among rural population of Punjab. *Pakistan Journal of Medical and Health Sciences, 11*(4).
- Fotouhi, A., Hashemi, H., & Mohammad, K. (2006). Eye care utilization patterns in Tehran population: A population based cross-sectional study. *BMC Ophthalmology, 6*, 1-5. <https://doi.org/10.1186/1471-2415-6-4>
- Hashim, Z., & Zarina, S. (2012). Osmotic stress induced oxidative damage: Possible mechanism of cataract formation in diabetes. *Journal of Diabetes and Its Complications, 26*(4), 275-279. <https://doi.org/10.1016/j.jdiacomp.2012.04.005>
- Katibeh, M., Ziaei, H., Panah, E., Moein, H. R., Hosseini, S., Kalantarion, M., Eskandari, A., & Yaseri, M. (2014). Knowledge and awareness of age related eye diseases: A population-based survey. *Journal of Ophthalmic and Vision Research, 9*(2), 223-231.
- Kelly, S. P., Thornton, J., Edwards, R., Sahu, A., & Harrison, R. (2005). Smoking and cataract: Review of causal association. *Journal of Cataract and Refractive Surgery, 31*(12), 2395-2404. <https://doi.org/10.1016/j.jcrs.2005.06.039>
- Khairallah, M., Kahloun, R., Bourne, R., Limburg, H., Flaxman, S. R., Jonas, J. B., Keeffe, J., Leasher, J., Naidoo, K., Pesudovs, K., Price, H., White, R. A., Wong, T. Y., Resnikoff, S., & Taylor, H. R. (2015). Number of people blind or visually impaired by cataract worldwide and in world regions, 1990 to 2010. *Investigative Ophthalmology and Visual Science, 56*(11), 6762-6769. <https://doi.org/10.1167/iovs.15-17201>
- Lau, J. T. F., Lee, V., Fan, D., Lau, M., & Michon, J. (2002). Knowledge about cataract, glaucoma, and age related macular degeneration in the Hong Kong Chinese population. *Br J Ophthalmol, 86*, 1080-1084.
- Magliyah, M., Nageeb, M., Abdulmannan, D., Badr, H., Hemmeish, M., Alotaibi, W., & Azhari, E. (2015). Assessment of knowledge regarding cataract among Saudi adult population in Makkah city, Saudi Arabia. *International Journal of Medical Science and Public Health, 4*(5), 595. <https://doi.org/10.5455/ijmsph.2015.02022015121>
- Ormsby, G. M., Arnold, A. L., Busija, L., Mörchen, M., & Keeffe, J. E. (2012). The impact of knowledge and attitudes on access to eye-care services in Cambodia. *The Asia-Pacific Journal of Ophthalmology, 1*(6), 331-335.

- Ottonello, S., & Carta, A. (2000). *Oxidative stress and age-related*. 78-85. *Pekelliling Perkhidmatan BIL 21 Tahun 2009*. (n.d.).
- Pizzol, D., Veronese, N., Quaglio, G., Di Gennaro, F., Deganello, D., Stubbs, B., & Koyanagi, A. (2019). The association between diabetes and cataract among 42,469 community-dwelling adults in six low- and middle-income countries. *Diabetes Research and Clinical Practice*, *147*, 102-110. <https://doi.org/10.1016/j.diabres.2018.12.001>
- Puri, S., & Elangovan, S. (2016). A study of awareness and knowledge about cataract among students. *International Journal of Research in Medical Sciences*, *4*(4), 1024-1026. <https://doi.org/10.18203/2320-6012.ijrms20160722>
- Samuel, M., Abdulkadir, H., Girma, M., & Glagn, M. (2021). Assessment of knowledge and attitude of cataract and their associated factors among adults in Arba Minch Zuria Woreda, Southern Ethiopia. *Clinical Ophthalmology (Auckland, NZ)*, *15*, 2913.
- Schultz, G. R. (2016). Radiation-associated cataracts among interventional physicians and support staff. *Journal of Indian College of Cardiology*, *6*, 102-104. <https://doi.org/10.1016/j.jicc.2015.10.016>
- Söderberg, P. G., Talebizadeh, N., Yu, Z., & Galichanin, K. (2016). Does infrared or ultraviolet light damage the lens? *Eye (Basingstoke)*, *30*(2), 241-246. <https://doi.org/10.1038/eye.2015.266>
- Song, P., Wang, H., Theodoratou, E., Chan, K. Y., & Rudan, I. (2018). The national and subnational prevalence of cataract and cataract blindness in China: A systematic review and meta-analysis. *Journal of Global Health*, *8*(1). <https://doi.org/10.7189/jogh.08.010804>
- Sultan, I., Alsaedi, M. G., & Ahmed, F. A. (2019). Knowledge and awareness of age related eye diseases in the population of the Western Region of Saudi Arabia. *World Family Medicine Journal/Middle East Journal of Family Medicine*, *17*(12), 35-46. <https://doi.org/10.5742/mewfm.2019.93711>
- Taber, K. S. (2018). The use of Cronbach's Alpha when developing and reporting research instruments in science education. *Research in Science Education*, *48*(6), 1273-1296. <https://doi.org/10.1007/s11165-016-9602-2>
- Thevi, T., Basri, M., & Reddy, S. C. (2012). Prevalence of eye diseases and visual impairment among the rural population - A case study of temerloh hospital. *Malaysian Family Physician*, *7*(1), 6-10.
- World Health Organization (WHO). Vision Impairment and blindness. Last updated October 2020. Assessed on November 30, 2020, from <https://www.who.int/news-room/factsheets/detail/blindness-and-visual-impairment>.
- Zakaria, M. Z. (2020, October 8). *National cataract camp bantu 50 pesakit B40 Hospital USM terima kanta mata percuma*. <https://h.usm.my/index.php/en/berita-utama/125-berita-2020/1258-national-cataract-camp-bantu-50-pesakit-b40-hospital-usm-terima-kanta-mata-percuma>
- Zhang, X., Li, E. Y., Leung, C. K. S., Musch, D. C., Tang, X., Zheng, C., He, M., Chang, D. F., & Lam, D. S. C. (2017). Prevalence of visual impairment and outcomes of cataract surgery in Chaonan, South China. *PLoS ONE*, *12*(8), 1-13. <https://doi.org/10.1371/journal.pone.0180769>