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Research Article

Age-Related Macular Degeneration Understanding and Awareness in Pakistan: A Realistic Epidemiological Survey

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ABSTRACT

Background: Age-Associated Macular Degeneration (AMD) has been a pre-eminent purpose of blindness and a rely of network fitness challenge because of its excessive prevalence in older populations above 40 years of age. Literature regarding AMD cognizance many of the city Pakistani populace is very restricted. Therefore, the goal of this observe was to conduct a comprehensive survey at the city populace of Karachi, Pakistan, to assess their information and preventive practices (KAP) regarding AMD. Any other objective was to look the impact of demographic elements on information level in individuals and to assess the principle source of records regarding the sickness a few of the participants.

Methods: The observe was conducted on 385 members over a length of six months among September 2022 and February 2023. To be expecting the KAP stage regarding AMD among participants, the knowledge section of the questionnaire changed into divided into 17 recommendations that included 1 correct definition of the disorder, 12 proper/wrong chance factors and four proper/incorrect signs of the disorder. Individuals who were capable of solution ≥ 9 guidelines, *i.e.*, >50% effectively, have been taken into consideration to have "above average" information. Data were analyzed the use of SPSS model 24.0. Descriptive facts of individuals' sociodemographic elements, knowledge, mindset and preventive practices were analyzed. Chi-rectangular tests have been used to examine sociodemographic factors with the know-how catalog.

Results: Most effective 161 (41.8%) individuals knew approximately AMD, at the same time as 224 (58.2%) did no longer know approximately it. The definition of the ailment turned into successfully selected by 86 (53.4%) individuals. the best threat factors (weight problems, age and own family history of AMD, smoking, loss of multivitamins, alcohol and unprotected publicity to mild) were diagnosed by means of 11.2%, 23.9%, 17.1%, 11.9%, 9.6%, 8.3% and 9.4%, respectively. The proper signs and symptoms of AMD, including blurring of imaginative and prescient, were replied by means of 109 (28.3%) contributors, and visible hallucinations and flashes of light had been answered effectively by way of 29 (7.5%) participants. "Above average" information approximately AMD become determined to be statistically significant with the level of training ($p<0.01$) and month-to-month profits ($p<0.02$) of contributors. Social media/newspaper/television (23.40%) changed into the maximum commonplace source of information amongst members.

Conclusion: Those figures call for an immense need for eye health schooling campaigns, both widespread or targeted closer to AMD, to boom the level of consciousness and preventive and health-searching for behaviors the various populace. Tasks for public health are probably launched to explicitly address those gaps.

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Keywords: Age-related macular degeneration; AMD; Blindness; Urban population

INTRODUCTION

Age-associated Macular Degeneration (AMD) has been a preeminent purpose of vision loss and a count of community health subject due to its excessive occurrence in older populations above 50 years of age [1]. The total range of people globally affected with AMD become 196 million in 2020 and is predicted to increase to 288 million with the aid of 2040, with the Asian population expected to have the highest variety of cases inside the destiny. As a result, the sickness will now not best have a great influence on an individual's first-rate of existence and dependency however also on the general society and health care budget [2]. The disease exists in two essential forms: The "dry or atrophic" form, which accounts for 85% to 90% of AMD cases and the "moist" form, which debts for 10 to 15% of cases. AMD is a multifactorial disorder, however the most important threat factors are increasing age, genetics, smoking, high LDL cholesterol, obesity, alcohol and immoderate exposure to daylight. It is expected that smoking increases the chance of dry AMD to 5.32 to 6.65 instances in people who smoke as compared to nonsmokers [3]. Primarily based on mixed statistics from 3 population-based totally cohorts, the chances ratio (OR) for the prevalence of dry AMD from total serum cholesterol became 1.08 for each 10 mg/dL boom. In line with the Blue Mountain Eye study, for each 10 mg/dL boom in overall LDL cholesterol, the chance of developing dry AMD extended by way of 16%. Moreover, growing age was continually determined to be a risk factor for dry or late AMD globally, showing that each weight problems and increasing age are foremost risk factors for AMD [3]. In line with a post hoc analysis published in 2020 on a complete of 14, 135 problem eyes, there has been a considerably decrease prevalence of overdue AMD associated with diet A, diet B_6, vitamin C, folate, carotene, lutein and zeaxanthin, magnesium, copper and alcohol intake (P 0.0005) [4].

Although AMD is considered to be extra normal in evolved Western populations, it has these days become more and more commonplace among Asian communities because of swiftly changing demographics and changes in Asian diets and lifestyles in Western tradition [5]. In line with a current take a look at in 2021, the general occurrence of AMD inside the Pakistani population is 5.27%, with dry AMD being greater not unusual (65.7%) than moist AMD (34.3%) [6]. In keeping with records published in a latest look at, 21.78 million human beings had been laid low with blindness and vision impairment in 2017 out of a complete populace of 207.7 million humans in Pakistan, of whom AMD was liable for 0.05 million human beings [7]. In light of these kinds of records and figures, the significance of locating awareness and knowledge among the Pakistani population concerning AMD may be estimated.

In Pakistan, there have not been many studies conducted to gauge people's understanding of eye illnesses. One look at through Zhao M, et al., in 2019 assessed the general populace's KAP concerning various eye diseases. but, no examine from Pakistan has in particular assessed understanding, attitudes and preventive practices with regard to AMD. Consequently, the primary goal of this observe became to behavior a complete survey examine at the urban populace of Karachi, Pakistan, to evaluate their know-how and preventive practices (KAP) regarding Age-Associated Macular Degeneration (AMD). any other objective become to see the have an effect on of demographic elements on know-how degree in individuals and to assess the principle source of information concerning the disorder a few of the individuals.

MATERIALS AND METHODS

The observe turned into carried out in the biggest city of Karachi, Pakistan. The take a look at happened over a duration of six months among September 2022 and February 2023. The pattern size become calculated to be 540 at a 95% confidence C program language period using percentage calculations for pattern size on OpenEpi, taking the anticipated frequency to be 50%. Contributors classified as center-aged adults or older adults, *i.e.,* 40 years and above (according to the Countrywide Eye Institute (NIH) in Maryland, United States, the mean age of AMD is 55 years or above) [8], irrespective of gender and socioeconomic degree, had been covered inside the study. Interviews of inclined contributors had been conducted after describing the take a look at's goals to them during door-door outreach for the survey. Houses have been selected at random from various city districts. Individuals have been given the proper to withdraw consent at any second at some point of the interview. All interviews were performed and responses were tabulated with the aid of educated investigators. Of the 540 participants approached, 385 spoke back and agreed to be protected in the survey.

A dependent questionnaire became used to assess their expertise and preventive practices toward AMD. The questionnaire included questions about hazard elements, signs, remedy alternatives and preventive measures for AMD. Each open-ended and closed-ended question had been blanketed. The sociodemographic section blanketed age, gender, level of education, occupation and monthly earnings. The information phase assessed simple expertise concerning AMD, along with its definition, standard signs (1: Painless progressive loss of central vision, 2: Visual contrast (Inability to distinguish objects clearly), 3: Defect in color vision (difficulty in differentiating colors), 4: Metamorphopsia (distortion of visual images)) and threat elements (obesity, age, own family history of AMD, smoking, high LDL cholesterol weight loss plan, lack of vitamins/minerals intake, alcohol abuse, diabetes mellitus, immoderate use of laptops/smartphones, unprotected exposure to daylight, previous cataract surgical operation, eye infections). The members have been given the option to choose multiple hazard aspect. The mind-set and preventive practice section consisted of questions with sure/no/on occasion alternatives to evaluate the player's attention level. A separate query concerning the source of information (friends/family/social media/TV/educational

background) about the sickness turned into additionally included. The questions were derived the usage of previous literature on AMD [8-12]. To be expecting the KAP level regarding AMD amongst members, the options of questions within the knowledge section had been divided into 17 hints that covered 1 correct definition of the ailment, 12 right/wrong risk elements and 4 accurate/wrong symptoms of the disorder. Contributors who had been able to answer ≥ 9 accurate hints, *i.e.*, >50%, have been categorized to have "above common" knowledge, at the same time as people who were no longer able to answer were taken into consideration to have "underneath average" knowledge about the disorder.

The questionnaire's content material validity and consistency with our look at populace were additionally tested. A pilot test examine became carried out with 20 contributors from a single district previous to the questionnaire's finalization. The phrasing, appropriateness and comprehension of the questionnaire have been all evaluated with the aid of the contributors. The final evaluation did no longer consist of the pretest records.

SPSS model 24.0 became used to research the facts. Descriptive data of individuals' sociodemographic elements, information, mind-set and preventive practices were analyzed. *Chi-square* assessments were used to compare and partner sociodemographic elements with the information catalog. A p value of <0.05 changed into taken into consideration statistically good sized.

RESULTS

The study was conducted on age groups 40-49 (46.5%), 50-59 (34.8%), 60-69 (16.1%) and 70 and older (2.6%). A total of 220 (42.9%) participants were males, and 165 (51.7%) were females. Approximately 164 (42.6%) participants were graduates and the majority of the participants, *i.e.*, 174 (45.2%), were retired/stay-at-home. Approximately 144 (37.4%) participants had a monthly income of Rs 50,000-100,000 and 27 (7.0%) had a monthly income of less than Rs 10,000. Details of the demographic characteristics of the participants can be seen in Table 1.

Table 1: Demographic characteristics of the study population.

Characteristics	Frequency (n)	Percentage (%)
Age		
40-49	179	46.50%
50-59	134	34.8
60-69	62	16.10%
70 onward	10	2.60%
Gender		
Male	220	42.90%
Female	165	57.10%
Level of education		
None	31	8.10%
Primary	61	15.80%
Secondary	70	18.20%
High school degree	59	15.30%
Graduate/college degree	164	42.60%
Occupation		
Office work	82	21.30%
Field work	79	20.50%
Factory worker	50	13.00%
Stay at home/Retired	174	45.20%

Monthly income of the family		
Less than Rs 10,000	27	7.00%
Rs 10,000-30,000	115	29.90%
Rs 30,000-50,000	99	25.70%
Rs 50,000-100,000	144	37.40%

Table 2 shows the attitudes and preventive practices regarding AMD among the participants. On enquiring about their last visit to an eye hospital, 90 (23.4%) had their last visit less than one year ago, and 102 (26.5%) had never been to an eye specialist before. Approximately 260 (67.5%) were nonsmokers, and 125 (32.5%) participants were smokers. Approximately 308 (80%) had green leafy vegetables in their daily diet. Only 146 (37.9%) participants took multivitamins daily, 80 (14%) took them sometimes and 185 (48.1%) did not take multivitamins at all. Approximately 240 (62.3%) participants said that they exercised sometimes and 92 (23.9%) did not exercise at all. The majority of the participants 219 (56.9%) did not wear sunglasses while going out.

Table 2: Attitudes and preventive practices of participants regarding Age-Related Macular Degeneration (ARMD).

Characteristics	Frequency (n)	Percentage (%)
Last visit to an eye hospital		
Less than a year ago	90	23.40%
2 years ago	73	19.00%
2-5 years ago	71	18.40%
Cannot recall	49	12.70%
Have never been to an eye specialist before	102	26.50%
Family history of visual disturbances/eye diseases?		
Yes	101	26.20%
No	227	59.00%
Cannot recall	57	14.80%
Do you smoke?		
Yes	125	32.50%
No	260	67.50%
How many cigarettes per day?		
1-4 per day	54	14.00%
5-9 per day	41	10.60%
10-14 per day	24	6.20%
15 or more per day	6	1.60%
How long have you been smoking?		

Less than a year	16	4.20%
More than a year	41	10.60%
More than 5 years	68	17.70%
Do you include green/leafy vegetables in your diet?		
Yes	308	80.00%
No	77	20.00%
Do you take multivitamins?		
Yes	146	37.90%
No	185	48.10%
Sometimes	54	14.00%
How often do you take multivitamins?		
Daily	44	11.40%
Once every 2-3 days	43	11.20%
Once a week	64	16.60%
Once a month	28	7.30%
Every few months	21	5.50%
Do you exercise?		
Yes	53	13.80%
No	92	23.90%
Sometimes	240	62.30%
Do you wear sunglasses while going out?		
Yes	85	22.10%
No	219	56.90%
Sometimes	81	21.00%

Regarding know-how approximately Age-Associated Macular Degeneration (AMD), best 161 (41.8%) members stated yes, whilst 224 (58.2%) had no information regarding it and had been now not further questioned. Best the remaining 161 (41.8%) members had been in addition puzzled concerning unique know-how about AMD. The proper definition of the disorder (problems due to deterioration if the retina/a part of the attention induced blurred vital vision or blindness in the elderly) became decided on by simplest 86 (53.4%) participants. The ideal risk elements (weight problems, age, circle of relatives history of AMD, smoking, lack of multivitamins, alcohol and unprotected publicity to light) have been identified through 11.2%, 23.9%, 17.1%, 11.9%, 9.6%, 8.3% and 9.4% of members, respectively. While interviewing approximately the symptoms of AMD, painless modern lack of principal vision became picked by means of 109 (28.3%) contributors, decreased visible assessment (inability to distinguish objects actually) by 48 (12.5%) individuals, illness in colour vision (issue in differentiating hues) through 32 (8.3%) participants and metamorphopsia (distortion of visible images) become answered correctly by means of 29 (7.5%) participants. similarly info concerning the knowledge section can be visible in Table 3.

Table 3: Knowledge regarding Age-Related Macular Degeneration (ARMD).

Characteristics	Frequency (n)	Percentage (%)
Have you ever heard of Age related Macular Degeneration (AMD)?		
Yes	161	41.80%
No	224	58.20%
How would you describe it?		
Problems due to deterioration if retina/part of the eye causing blurred central vision or blindness in elderly individuals	86	53.40%
Infection of the eye	26	16.10%
Problem that arises due to us of eyeglasses	29	18.00%
Disease due to consistent exposure to irritants (smoke, dust etc.)	20	12.40%
Risk factors for the disease		
Obesity	43	11.20%
Age	92	23.90%
Family history of AMD	66	17.10%
Smoking	46	11.90%
High cholesterol diet	41	10.60%
Lack of vitamins/minerals intake	37	9.60%
Use of alcohol	32	8.30%
Diabetes mellitus	54	14.00%
Excess use of laptops, smartphones etc.	41	10.60%
Unprotected exposure to sunlight	36	9.40%
Previous cataract surgery	21	5.50%
Eye infections (Conjunctivitis, chlamydia etc.)	29	7.50%
Symptoms of the disease?		
Painless progressive loss of central vision	109	28.30%
Decreased visual contrast (Inability to distinguish objects clearly)	48	12.50%
Defect in color vision (difficulty in differentiating colors)	32	8.30%
Metamorphopsia (distortion of visual images)	29	7.50%

Above average knowledge about AMD had a statistically significant relationship with the level of education of participants ($p<0.01$). Approximately half of the participants, *i.e.*, 47 (78.3%) with above average knowledge, were at least graduates/had a college degree. Monthly income also had a statistically significant relationship with above average

knowledge regarding AMD (p<0.02). No statistically significant relationship was found between participants having above average knowledge regarding AMD and their age, gender or occupation. Details can be seen in Table 4.

Table 4: Association analysis between knowledge about ARMD and demographic characteristics of participants (N=161).

Participant's characteristics	Above average knowledge (≥ 9 correct pointers)		Below average knowledge (≤ 9 correct pointers)		(p value)
	n	%	n	%	
Age					
40-59	49	70.00%	21	30.00%	0.29
50-59	32	59.30%	22	40.70%	
60 onward	21	56.80%	16	43.20%	
Gender					
Male	61	67.80%	29	32.20%	0.19
Female	41	57.70%	30	42.30%	
Level of education					
None	2	25.00%	6	75.00%	0.01*
Primary	16	55.20%	13	44.80%	
Secondary	21	61.80%	13	38.20%	
Undergraduate	16	53.30%	14	46.70%	
Graduate/College degree	47	78.30%	13	21.70%	
Occupation					
Office work	24	66.70%	12	33.30%	0.38
Field work	20	60.60%	13	39.40%	
Factory worker	10	47.60%	11	52.40%	
Stay at home/Retired	48	67.60%	23	32.40%	
Monthly income of family					
Less than Rs 10,000	7	63.60%	4	36.40%	0.02*
Rs 10,000-30,000	28	57.10%	21	42.90%	
Rs 30,000-50,000	18	48.60%	19	51.40%	
Rs 50,000-100,000	49	76.60%	15	23.40%	

The main source of information about the disease was social media/newspaper/TV (23.40%) and friends and relatives (8.80%). Details can be seen in Figure 1.

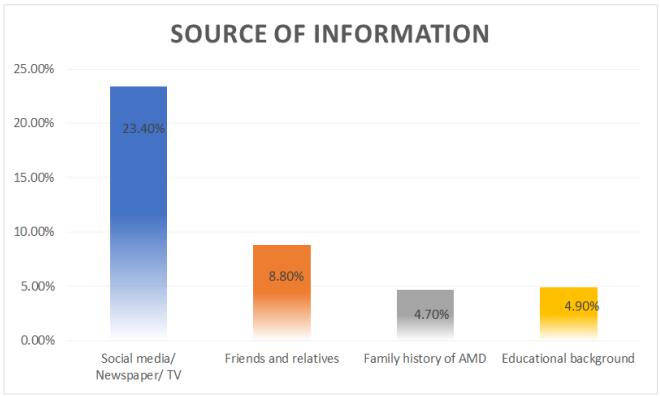

Figure 1: Source of information regarding AMD among participants.

DISCUSSION

AMD is a senile condition characterised by way of degenerative changes inside the valuable place of the retina, the macula, inflicting modern loss of visual acuity. Currently, it's far the 0.33 main purpose of irreversible blindness globally, but with growing community cognizance, early screening and current remedy modalities, the prevalence of the ailment has decreased appreciably [13]. Our look at investigated the extent of fundamental understanding approximately AMD hazard elements, signs and preventive practices some of the city Pakistani population.

Our take a look at confirmed that the general public of members lacked sufficient knowledge approximately age-associated macular degeneration. The effects are just like a pass-sectional survey with the aid of Pallerla SR et al. [14], at the Southern Indian populace, in which it changed into concluded that out of the six main eye sicknesses, age-related macular degeneration had the bottom consciousness ranges. however, a have a look at on a Saudi Arabian populace through Al Shammari A et al. [15], discovered that out of 1700 contributors, 56% of people knew about AMD and approximately 90% furnished correct know-how regarding the ailment, that is contradictory to our take a look at, in which only 41.8% of members had expertise approximately AMD. This suggests that the notice regarding AMD among the South Asian population is under great compared to other demographic populations.

The major locating of our take a look at was that expertise regarding the threat elements for AMD was underneath average. Age and smoking were identified correctly via most effective a small wide variety of members; but, they're taken into consideration to be the 2 primary danger factors for AMD. In their overview, Heesterbeek TJ, et al. discovered that the incidence of early AMD multiplied from 3.5% in people aged 55-59 years to 17.6% in people 85 years or above. Smoking is related to a 2-4 fold increase in the chance of AMD. Even after quitting smoking, ex-smokers have a much better hazard of AMD development than nonsmokers [16], exact understanding about AMD become related to the extent of schooling of the contributors, suggesting that an boom in health literacy level will sooner or later improve the behavior of human beings towards seeking adequate prevention [17]. About 50% of participants did now not consist of micronutrient dietary supplements as part of their daily consumption and handiest 9.6% of members had been capable of pick out their loss of consumption as a danger element for AMD in our have a look at. However Agrón E, et al. [4], in their submit hoc analysis, concluded that a better intake of multivitamins, including minerals, nutrients and carotenoids, is related to a decreased danger of progression to overdue AMD. Zampatti S, et al. [18], elaborated the synergistic impact of diverse multivitamins and dietary factors, inclusive of nutrients A, E and C; carotenoids, such as lutein and β-carotene; zinc; copper; nutritional fatty acids, together with mono and polyunsaturated fatty acids; and nutritional ldl cholesterol, in protective towards AMD.

We also found that expertise regarding AMD had a statistically big relationship with the level of education of the individuals. Approximately 78.4% of the contributors with top knowledge approximately AMD had been graduates. Wong PW et al. [19], of their network-based survey, also concluded that subjects who had at least a secondary degree of education were more likely to have true expertise of the sickness. Our look at pronounced no statistically great relationship between proper understanding regarding AMD and the age, sex or occupation of the members. Our outcomes additionally said that 26.5% of contributors had in no way visited an eye professional before of their existence. A neighborhood survey in 2006 found that individuals with as a minimum a number one qualification had been 70% much less in all likelihood to have extreme visual impairment than people who did not loss of training is probably the purpose why a not unusual man is unaware of the significance of getting an everyday eye examination [20].

The foremost source of information regarding AMD amongst members became social media/newspaper/television. However, Kloosterboer A, et al. [21], in his cross-sectional survey on the reliability of content of freely available online records on age-related macular degeneration, discovered variations in the nice of content material available on exceptional websites and simplest one website had accurate data approximately the disease and executed a full four JAMA benchmark. This may be the cause why most of the members opted for the wrong symptoms and threat elements for AMD.

Our study had a few obstacles. The houses in the town's districts had been first selected at random for the list of shortcomings. However, efforts had been made to include every neighborhood within the metropolis. To guarantee the accuracy and validity of records collection, our look at used face-to-face interviews performed by trained investigators. Additionally, face-to-face interviews assisted in describing the targets of the research and in clarifying any uncertainties inside the questionnaire most of the contributors. The pattern size became tremendously small, which made subgroup analysis difficult. We additionally did not inquire about the names of the vitamins the contributors take.

CONCLUSION

This observes provides insights into the know-how and preventive practices related to AMD a few of the urban population in Pakistan. Our study showed that simplest 23.4% of the individuals visited an ophthalmologist much less than a year in the past, while 26.5% had by no means been to an eye hospital in any respect. those figures demand a tremendous need for eye health education campaigns, either fashionable or targeted toward AMD, to boom the level of cognizance and preventive and health-seeking behaviors some of the population. The older network additionally wishes to recognize the importance of ordinary eye examinations, which might assist in early analysis, treatment prevention and progression. As an end result, projects for public health might be launched to explicitly cope with these gaps. It's far viable to create educational materials, online movies, and social media awareness campaigns that as it should be describe AMD, its danger factors, signs and the cost of early detection and care. Network-based measures ought to be done to educate the general public approximately the importance of taking multivitamins often, wearing sun shades whilst going out, taking recurring eye examinations and smoking cessation. Public health campaigns may be altered to efficaciously target those demographics. In place of being in English, campaigns may, as an instance, be created in the languages that those communities make use of most customarily and allotted *via* these channels of communique.

ETHICAL APPROVAL

The study followed all the protocols and was approved by the Institutional Review Board (IRB) of Dow Medical College, Dow University of Health Sciences Karachi.

COMPETING INTERESTS

The authors have no personal or financial interest to declare.

FUNDING

No external resource funding was provided to conduct this study.

CONSENT TO PARTICIPATE

All participants of the study had an informed written consent signed before including them in the study. The consent form is attached in the supplementary data.

AVAILABILITY OF DATA AND MATERIAL

Not applicable.

AUTHORS CONTRIBUTION

MAK: Conceptualisation of the study, manuscript writing, final review of the manuscript, supervision.

AM: Manuscript writing and data collection, drafting of manuscript.

MS: Data curation, manuscript writing and drafting.

SAA: Data curation and formal analysis, methodology.

FI: Critical analysis of the manuscript, IRB approval and manuscript drafting, validation.

REFERENCES

1. Ambreen F, Khan WA, Qureshi N, Qureshi IZ. Assessment of serum lipids in patients with age related macular degeneration from Pakistan. J Pak Med Assoc. 2014;64(6):664e9.
2. Keenan TD, Cukras CA, Chew EY. Age-related macular degeneration: epidemiology and clinical aspects. Adv Exp Med Biol. 2021:1256:1-31.
3. Schultz NM, Bhardwaj S, Barclay C, Gaspar L, Schwartz J. Global burden of dry age-related macular degeneration: A targeted literature review. Clin Ther. 2021;43(10):1792-1818.
4. Agrón E, Mares J, Clemons TE, Swaroop A, Chew EY, Keenan TD. Dietary nutrient intake and progression to late age-related macular degeneration in the Age-Related Eye Disease Studies 1 and 2. Ophthalmol. 2021;128(3):425-442.
5. Velez-Montoya R, Oliver SC, Olson JL, Fine SL, Quiroz-Mercado H, Mandava N. Current knowledge and trends in age-related macular degeneration: genetics, epidemiology and prevention. Retina. 2014;34(3):423-441.
6. Tariq M, Iqbal K, Zaheer W. Prevalence of age-related macular degeneration at a tertiary care hospital in Pakistan. Anna King Edward Med Univer. 2021;27(4):551-556.
7. Hassan B, Ahmed R, Li B, Noor A, Hassan ZU. A comprehensive study capturing vision loss burden in Pakistan (1990-2025): Findings from the Global Burden of Disease (GBD) 2017 study. PloS One. 2019;14(5):e0216492.
8. Thornton J, Edwards R, Mitchell P, Harrison RA, Buchan I, Kelly SP. Smoking and age-related macular degeneration: A review of association. Eye. 2005;19(9):935–944.
9. Cougnard-Grégoire A, Delyfer MN, Korobelnik JF, Rougier MB, Malet F, Le Goff M, et al. Long-term blood pressure and age-related macular degeneration: the ALIENOR study. Invest Ophthalmol Visual Sci. 2013;54(3):1905–1912.
10. Dasari B, Prasanthi JR, Marwarha G, Singh BB, Ghribi O. Cholesterol-enriched diet causes age-related macular degeneration-like pathology in rabbit retina. BMC Ophthalmol. 2011; 11(1):22.
11. Maller J, George S, Purcell S, Fagerness J, Altshuler D, Daly MJ, et al. Common variation in three genes, including a noncoding variant in CFH, strongly influences risk of age-related macular degeneration. Nature Gen. 2006;38(9):1055-1059.
12. Mitchell P, Liew G, Gopinath B, Wong TY. Age-related macular degeneration. The Lancet. 2018;392(10153):1147-1159002E.
13. Pallerla SR, Khanna RC, Sannapaneni K, Keeffe J. Public knowledge, attitudes and practices related to eye diseases in Southern Indian population. Int J Community Med Public Health. 2020;7(12):4993.
14. Shammari A, Alotaibi A, Albalawi A, Almedhadi F, Alruwaili R, AlZahrani A, et al. Knowledge, attitudes and self-care practices associated with age-related eye disease in Saudi Arabia. Int J Med Dev Ctries. 2020;4(12):2115–2119.
15. Heesterbeek TJ, Lorés-Motta L, Hoyng CB, Lechanteur YT, Den Hollander AI. Risk factors for progression of age-related macular degeneration. Ophthal Physiol Opt. 2020;40(2):140-170.

16. Zhao M, Gillani AH, Amirul Islam FM, 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. Int J Environ Res Public Health. 2019;16(9):1568.
17. Zampatti S, Ricci F, Cusumano A, Marsella LT, Novelli G, Giardina E. Review of nutrient actions on age-related macular degeneration. Nutr Res. 2014;34(2):95-105.
18. 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 Med. 2020;8:2050312120943044.
19. Jadoon MZ, Dineen B, Bourne RR, Shah SP, Khan MA, Johnson GJ, et al. Prevalence of blindness and visual impairment in Pakistan: the Pakistan National Blindness and Visual Impairment Survey. Invest Ophthalmol Vis Sci. 2006;47(11):4749-4755.
20. Kloosterboer A, Yannuzzi N, Topilow N, Patel N, Kuriyan A, Sridhar J. Assessing the quality, content, and readability of freely available online information for patients regarding age-related macular degeneration. Semin Ophthalmol. 2021;36(5-6):400-405.
21. Mathenge W. Age-related macular degeneration. Community Eye Health. 2014;27(87):49-50.