

# Awareness of Age-related Macular Degeneration and Its Risk Factors among Beijing Residents in China

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## Abstract

**Background:** Age-related macular degeneration (AMD) is a major cause of irreversible blindness, and awareness of this disease is important in the prevention of blindness. However, lack of public awareness of AMD was shown in previous studies, and there was no report of AMD awareness in the Mainland of China. Therefore, the aim of our study was to assess the awareness of AMD and its risk factors among Beijing residents in China.

**Methods:** A cross-sectional, computer-assisted, telephone investigation was conducted to measure the awareness of AMD among Beijing residents. All the contacts of potential respondents were randomly generated by computer. Only those above 18 years of age and willing to participate in the study were included. The questionnaire for the study was modified from the AMD Alliance International Global Report. Pearson's Chi-square test and binary logistic regression analysis were used to identify the factors that affected the knowledge of AMD.

**Results:** Among 385 Beijing residents who agreed to participate, the awareness of AMD was 6.8%, far below than that of cataract and glaucoma. Participants who were above 30 years of age (odds ratio [OR] 6.17, confidence interval [CI] 1.44–26.57), with experience of health-related work (OR 8.11, CI 3.25–20.27), and whose relatives/friends or themselves suffering from AMD (OR 32.18, CI 11.29–91.68) had better AMD awareness. Among those familiar with AMD, only 35% of them identified smoking as a risk factor, and only 23.1% of the residents believed that smoking could lead to blindness.

**Conclusions:** The sample of Chinese population had limited knowledge of AMD. Educational programs need to be carried out to raise public awareness of AMD.

**Key words:** Age-related Macular Degeneration; Awareness; Chinese; Risk Factor; Smoking

## INTRODUCTION

As a major cause of irreversible blindness among elderly, age-related macular degeneration (AMD) accounted for 8.7% of blindness globally according to the report of World Health Organization in 2004.<sup>[1]</sup> In China, the prevalence of AMD is 15.5% among adults aged 50 years or above and is estimated to increase with the arrival of aging society in China.<sup>[2]</sup>

While AMD is still incurable so far, the fundamental approach to reduce the risk of development of AMD and avoid related irreversible vision loss is to be early aware of this condition and make behavior modification to its risk factors. However, almost all the previous studies demonstrated a lack of public awareness of AMD.<sup>[3-9]</sup> In 2005, a global survey commissioned by the AMD Alliance

International in 14 countries showed the awareness of AMD ranged from 4% to 30%, highest in the USA, while lower than 10% in Japan and Hong Kong (China).<sup>[4]</sup> Another study among Chinese population in Hong Kong found that 90% of respondents had never heard of AMD, and only 0.2% could describe both symptoms and pathophysiology correctly.<sup>[6]</sup>

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Being aware of risk factors associated with AMD, especially the modifiable, will facilitate people to implement targeted preventive actions before the disease develops. To date, the consistently reported risk factors for AMD include age, genetics, and smoking, with smoking being the only modifiable established risk factor. However, a worrying lack of awareness of smoking as a risk factor for AMD was demonstrated in AMD Alliance International Global Report 2005. Only 32% of respondents who were aware of AMD identified this risk factor. Furthermore, in 8 of the 14 countries surveyed, more than half of the participants did not even know that smoking could harm the sight.<sup>[4]</sup> Similar results were found in Singapore residents. Only 36.7% of respondents were aware that smoking was associated with AMD.<sup>[5]</sup>

The aim of this study was to measure the awareness of AMD and its risk factors among Beijing residents in China.

## METHODS

The study population consisted of Chinese people aged 18 years or above who had been residing in Beijing for at least 6 months. Specially designed computer software was used to identify potential participants by generating randomized mobile phone numbers (11 digits) with segment number attribution (first seven digits) limited to Beijing. These numbers were assigned to computer-assisted, telephone interview system automatically. Only those respondents who met the age and length of residence criteria and were willing to participate in this study after a brief introduction were involved. This study adhered to the guidelines of the *Declaration of Helsinki* and was reviewed and approved by our Institutional Review Board. Verbal consent was achieved before questionnaire was administrated.

The interview assessed respondent knowledge of AMD with a structured questionnaire derived from the AMD Alliance International Global Report.<sup>[4]</sup> Demographic details such as age, gender, education, and work experiences in healthcare industry were collected. Respondents' familiarity with AMD was explored and stated within "very familiar," "somewhat familiar," "not too familiar," and "not at all familiar." The participants in the first two groups were considered to be "aware of AMD." The awareness level of cataract and glaucoma was also established in the same way. Those who were "aware of AMD" were further asked to describe symptoms and affected ocular microstructure of AMD and to identify factors for developing AMD from a list of possible risk factors (age, sex/gender, race, genetics, unprotected exposure to sunlight, computer use, smoking, alcohol, obesity, lack of vitamins/nutrients, hypertension, diabetes, and hyperlipidemia). We also assessed the awareness of relationship between smoking and blindness among all respondents and evaluated the willingness of respondents who smoked to change their smoking habit to reduce the risk of blindness. Finally, respondents were asked to choose the most fearful health problem from stroke, dementia, heart attack, blindness, deafness, cancer, and amputation of one lower limb.

Participants were assigned into two groups based on their familiarity with AMD. The "aware" group was made up with participants who were "very familiar" and "somewhat familiar" with AMD, while participants who were "not too familiar" and "not at all familiar" with AMD were assigned to the "unaware" group. Pearson's Chi-square test and binary logistic regression analysis were performed to identify the factors that could affect the knowledge of AMD. SPSS statistics software (IBM SPSS Statistics version 20, Armonk, New York, USA) was used for data analysis.  $P < 0.05$  was considered statistically significant.

## RESULTS

In our study, 385 Beijing residents agreed to participate after a brief introduction, including 195 males (50.6%) and 190 females (49.4%). The average age of the participants was 41.9 years (range 18–80 years), and the respondents aged between 31 and 50 years took the majority. The education level ranged from no formal education to postgraduate education. Thirty-one (8.1%) respondents had work experience in healthcare industry, and 19 (5.0%) declared themselves or their relatives/friends suffering from AMD. Baseline characteristics of the respondents were showed in Table 1.

### General awareness of age-related macular degeneration

Of the 385 respondents, nearly 70% (267/385) were "not at all familiar" with AMD. Only 26 (6.8%) were "somewhat familiar" with this disorder, and no one stated "very familiar" based on their self-assessment. Compared to the limited knowledge of AMD, self-reported awareness of cataract ( $\chi^2 = 59.6$ ,  $P < 0.001$ ) and glaucoma ( $\chi^2 = 18.2$ ,  $P < 0.001$ ) were both significantly higher, with 27.8% (107/385) and 16.6% (64/385), respectively [Figure 1].

**Table 1: Demographic features of participants of survey on awareness of AMD among Beijing residents ( $n = 385$ )**

Demographic features	Values, $n$ (%)
Gender	
Male	195 (50.6)
Female	190 (49.4)
Age	
18–30 years	124 (32.2)
31–50 years	155 (40.3)
$\geq 51$ years	106 (27.5)
Education	
Junior secondary or below (no formal education, primary school, middle school)	88 (22.9)
Senior secondary (high school)	187 (48.6)
Tertiary (college, university)	92 (23.9)
Postgraduate	18 (4.6)
Work experiences in healthcare industry	
Yes	31 (8.1)
No	354 (91.9)
Medical history of AMD (participants themselves/relatives/friends)	
Yes	19 (5.0)
No/do not know	366 (95.0)
Total	385

AMD: Age-related macular degeneration.

Of the 26 respondents classified as familiar with AMD, only ten of them could correctly describe the affected ocular microstructure of AMD judging by the senior ophthalmologist (YC). Furthermore, AMD-related symptoms could only be described by 13 (50%) of the 26 respondents. “Decreased vision,” “metamorphopsia,” and “central scotoma” as three main symptoms of AMD were described by ten, three, and two respondents, respectively (data not shown). The responses above suggested that the accurate knowledge level of AMD may be lower than the self-reported awareness.

Participants who stated that they were with experience in healthcare industry (odds ratio [OR] 8.11, confidence interval [CI] 3.25–20.27) or those themselves or their relatives/friends (OR 32.18, CI 11.29–91.68) suffering from AMD were more likely to be familiar with this condition, while respondents younger than 30 years were less aware with AMD (OR 0.16, CI 0.04–0.70) compared to those above 30 years of age [Table 2]. Statistically, gender ( $\chi^2 = 0.005$ ,  $P = 0.945$ ) and education ( $\chi^2 = 2.555$ ,  $P = 0.279$ ) were not

factors predicting the familiarity of AMD [Table 2]. Same results were shown in binary logistic regression analysis. As to cataract, age ( $\chi^2 = 17.241$ ,  $P < 0.001$ ) was the only significant predictor of awareness. Factors in favor of the awareness of glaucoma included older age and experience in healthcare industry ( $\chi^2 = 8.181$ ,  $P = 0.017$  and  $\chi^2 = 19.811$ ,  $P < 0.001$ , respectively) [Table 2].

### Awareness of risk factors among participants familiar with age-related macular degeneration

Among the 26 respondents familiar with AMD, “unprotected exposure to sunlight” was identified as a risk factor in the development of AMD by the highest percentage of respondents (96%, 25/26), which was followed by “lack of vitamins/nutrients” (88%, 23/26) and “age” (85%, 22/26). However, the main modifiable risk factor, smoking, was only named by 35% (9/26) of respondents who were aware of AMD, ranking second to last among all the 13 possible risk factors associated with AMD. The awareness of various risk factors for AMD is shown in Table 3.

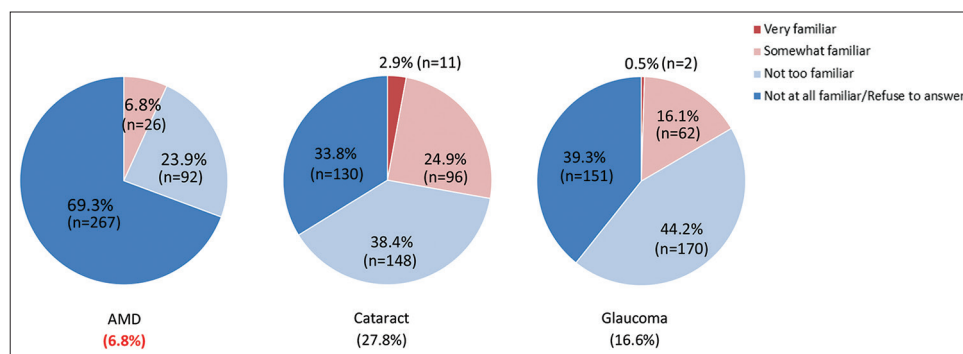


Figure 1: Awareness of age-related macular degeneration, cataract, and glaucoma among Beijing residents ( $n = 385$ ).

Table 2: Factors associated with awareness of AMD, cataract, and glaucoma (Pearson Chi-square test)

Items	AMD ( $n = 385$ )		Cataract ( $n = 385$ )		Glaucoma ( $n = 385$ )	
	OR (95% CI)	$\chi^2$ , $P$	OR (95% CI)	$\chi^2$ , $P$	OR (95% CI)	$\chi^2$ , $P$
Gender		0.005, 0.945		0.002, 0.965		0.875, 0.350
Male	1.00	–	1.00	–	1.00	–
Female	1.03 (0.46–2.28)	0.005, 0.945	0.99 (0.63–1.55)	0.002, 0.965	1.29 (0.75–2.22)	0.875, 0.350
Age		7.816, 0.020		17.241, <0.001		8.181, 0.017
18–30 years	1.00	–	1.00	–	1.00	–
31–50 years	6.54 (1.47–29.15)	7.830, 0.005	2.72 (1.49–4.98)	11.035, 0.001	2.47 (1.18–5.15)	6.040, 0.014
$\geq 51$ years	5.66 (11.20–26.81)	5.936, 0.015	3.57 (1.89–6.74)	16.339, <0.001	2.85 (1.32–6.16)	7.464, 0.006
Education		2.555, 0.279		0.477, 0.788		0.792, 0.673
Secondary or below	1.00	–	1.00	–	1.00	–
Postsecondary	2.65 (0.75–9.35)	2.465, 0.116	1.18 (0.67–2.08)	0.316, 0.574	1.31 (0.64–2.68)	0.538, 0.463
Tertiary or above	1.93 (0.48–7.67)	0.890, 0.345	1.01 (0.54–1.91)	0.001, 0.971	1.41 (0.65–3.06)	0.745, 0.388
Work experience in healthcare industry		26.574, <0.001		3.361, 0.067		19.811, <0.001
No	1.00	–	1.00	–	1.00	–
Yes	8.11 (3.25–20.27)	26.574, <0.001	2.00 (0.94–4.24)	3.361, 0.067	5.01 (2.32–10.79)	19.811, <0.001
Medical history of AMD (selves, friends and relatives)		83.011, <0.001		–		–
No/do not know	1.00	–	–	–	–	–
Yes	32.18 (11.29–91.68)	83.011, <0.001	–	–	–	–

AMD: Age-related macular degeneration; OR: Odds ratio; CI: Confidence interval; –: Not applicable.

**Table 3: Awareness of risk factors among participants familiar with AMD (in descending order, n = 26)**

Risk factors	Awareness, n (%)
Unprotected exposure to sunlight	25 (96)
Lack of vitamins/nutrients	23 (88)
Age*	22 (85)
Hypertension	21 (81)
Hyperlipidemia	21 (81)
Computer use	19 (73)
Diabetes	19 (73)
Alcohol	17 (65)
Obesity	15 (58)
Genetics*	12 (46)
Sex/gender	11 (42)
Smoking*	9 (35)
Race	4 (15)

\*Consistently reported risk factors of AMD. AMD: Age-related macular degeneration.

### Awareness of relationship between smoking and blindness

Of all the 385 participants, only 89 (23.1%) respondents realized that smoking can cause blindness. Similar awareness (26.9%, 7/26) was found among those familiar with AMD.

In our study, there were 99 current smokers. Seventy-seven (72.7%) of them were willing to smoke less (54/72) or stop smoking completely (18/72) if they were told that smoking causes blindness. Of the 26 participants familiar with AMD, there were four smokers, and all of them would attempt to change their smoking habit if they were informed that smoking is a risk factor of developing AMD, with two smoking less and two ceasing smoking. Of the 22 ex-smokers, four admitted that the reason for their smoking cessation was or partly was AMD or fear for blindness.

### Most feared health concern

Of the seven health problems listed (stroke, dementia, heart attack, blindness, deafness, cancer, and amputation of one lower limb), the top three most feared among all the participants were cancer (48.6%, 187/385), blindness (19.0%, 73/385), and heart attack (12.5%, 48/385). The same sort of order applied to the participants aware of AMD.

## DISCUSSION

Despite of the increased prevalence of AMD, the general awareness of AMD is still worrying low.<sup>[3-9]</sup> In our study, the awareness of AMD among Beijing residents was 6.8%, and nearly 70% of participants were not at all familiar with this condition. This is consistent with the awareness levels measured in Hong Kong (China) (6%) and Japan (4%) in AMD Alliance International Global Report 2005 but well below than that of western developed countries such as the USA (30%), Canada (25%), and the United Kingdom (16%),<sup>[4]</sup> and an online national poll in the USA published recently showed half of the respondents could be aware of macular degeneration. The awareness of Singapore, an

Asian country as also, has reached 28.1% in 2011 after 5 years of annual “AMD Awareness Week” campaign though the baseline awareness of AMD was 7.3% in 2006, similar to our current level.<sup>[5,10]</sup> Furthermore, only five of the 26 participants familiar with AMD in our study could describe both symptoms and affected structures correctly, which implied a lower level of correct knowledge of AMD in the presence of unsatisfactory self-reported awareness.

Compared to AMD, Beijing residents were more aware of cataract (27.8%) and glaucoma (16.6%). These findings are comparable to similar surveys conducted by Lau *et al.* and Livingston *et al.*<sup>[6,11]</sup> The former research showed that 92.9% and 78.4% of the adults 40 years or above in Chinese population in Hong Kong had heard of cataract and glaucoma, respectively, while only 9.2% had heard of AMD.<sup>[6]</sup> The latter Australian study also reported that only 2% of respondents had correct knowledge of AMD, significantly lagging behind that of cataract (74%) and glaucoma (19%).<sup>[11]</sup> Some studies even demonstrated that the awareness level of AMD was lower than that of night blindness and ocular hypertension in specific populations.<sup>[12]</sup> These findings clearly indicated that much more efforts would be needed to raise awareness of AMD than other common eye conditions.

In our study, participants with experience in healthcare industry or those themselves or their relatives/friends suffering from AMD were more likely to be aware of AMD. This may be associated with their higher medical professionalism and knowledge demand. Similar findings that participants with family history of AMD had better knowledge of AMD were demonstrated in a previous study by Attebo *et al.*<sup>[13]</sup> In our study, age was also identified to play a role in AMD awareness that older respondents were more familiar with this disease, in line with the findings shown by Noertjojo *et al.* and Huang *et al.*<sup>[14,15]</sup> Moreover, education was indicated associated with AMD awareness in most studies, and such relevance was also shown in our study even though it was not statistically significant.<sup>[6,14,15]</sup>

Not only being the scientifically proven avoidable risk factor of AMD, but smoking has also been proven to be associated with several blinding eye diseases, such as cataract and anterior ischemic optic neuropathy.<sup>[16-18]</sup> However, a few people are aware of the link between smoking and AMD/blindness. In AMD Alliance International Global Report 2005, only 32% were aware of that relationship, and less than half respondents in majority surveyed countries (8/14) realized that smoking could impair vision.<sup>[4]</sup> Smoking was regarded as risk factor of AMD only by 36.7% Singapore residents.<sup>[5]</sup> Moreover, only half of the USA population were aware of smoking risks on vision loss. Furthermore, in a hospital-based study, Bidwell *et al.* reported much better perceptions of smoking related to lung cancer (92.2%), heart disease (87.6%), and stroke (70.6%) than blindness (9.5%) among adult patients.<sup>[19]</sup> Consistently, with these studies, only 23.1% of Beijing residents believed that smoking causes blindness. Moreover, only nine of the 26 participants (35%) familiar with AMD thought of smoking as a risk

factor, significantly lower than the proportion identifying age and genetics.

In contrast with the limited knowledge of smoking as a risk factor of blindness/AMD, 72.2% smokers surveyed in our study were willing to cease smoking or smoking less if they were told smoking could cause blindness, and this proportion was even up to 100% in the subgroup of participants familiar with AMD. These results were comparable with findings reported by Sanjay *et al.* that about 90% of smokers in Singapore would change their smoking habit if they knew the association between smoking and blindness.<sup>[5]</sup> Furthermore, blindness ranked as the second most fear health condition just behind cancer in our study, higher than the ranking reported by Sanjay *et al.* and Bidwell *et al.*, making it an important motivation to quit smoking in China.<sup>[5,19]</sup> Therefore, raising awareness of the link between smoking and AMD/blindness by taking advantage of the fear of blindness will facilitate public behavior change, beneficial to the prevention of visual impairment.

As to our knowledge, there were no studies on the awareness of AMD and its risk factors in the mainland of China before, and it derived its value from assessing the current knowledge level of AMD against others (cataract, glaucoma) and establishing the benchmark for future comparison. However, there are still some limitations needed to be elaborated. First, the results could be biased by the voluntary participation. The people suffering from or interested in eye diseases were more likely to be involved in our survey. Second, residents who used landline phones instead of mobile phones, especially some elderly, were unintentionally left out from our study.

In conclusion, a low level of awareness of AMD and its risk factors was demonstrated among Beijing residents in China. Moreover, since awareness is the essential step toward disease prevention and early detection, educational programs and large-scale public campaigning need to be designed to enhance awareness of AMD in general population in China. Moreover, early detection and treatment of this disorder will prevent patients from unnecessary blindness and improve their life equality.

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### Conflicts of interest

There are no conflicts of interest.

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