

# Awareness of blindness and other smoking-related diseases and its impact on motivation for smoking cessation in eye patients

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## Abstract

**Purpose** Cigarette smoking is a major cause of morbidity and mortality. The association between smoking and eye diseases is less widely recognised relative to other better-known smoking-related conditions. This study aims to assess the awareness and fear of known smoking-related diseases among current smokers attending an ophthalmology outpatient clinic and to evaluate their relative impact on the likelihood of smoking cessation.

**Patients and methods** A cross-sectional survey using a structured interview of randomly selected current smokers attending an eye clinic was conducted. The knowledge of six smoking-related diseases (lung cancer, heart attack, stroke, blindness, other cancers, and other lung diseases) was assessed. The fear of smoking-related conditions and the relative impact of each smoking-related condition on the smoker's motivation to quit smoking were evaluated.

**Results** Out of 200 current smokers aged from 14 to 83 years, only 42.5% (85 patients) were aware that smoking causes blindness. Smokers' perception of harm caused by smoking was  $6.53 \pm 3.21$  (mean  $\pm$  SD) on a visual analogue scale of 0 to 10. Patients placed blindness as the second most important motivating factor to quit smoking immediately, within 1 year and 5 years, after lung cancer.

**Conclusion** The awareness of the risk of blindness from smoking was lowest compared with five other smoking-related diseases among eye patients who smoke. However, blindness remains a key motivational factor in smoking cessation and hence should be

**emphasised as an important negative health consequence of smoking in public health education and anti-smoking campaigns.**

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**Keywords:** awareness; blindness; smoking cessation; tobacco

## Introduction

Cigarette smoking is a major preventable cause of morbidity and mortality worldwide. Epidemiological evidence has established smoking as a key risk factor of many cardiovascular, pulmonary, and malignant diseases. Although most smokers are aware of the increased risk of premature death from smoking, they are less likely to acknowledge its harmful effects in causing disability and a reduction in quality of life.<sup>1</sup>

In recent years, blindness has emerged as an important cause of smoking-related disability. Notably, smoking has been linked to age-related eye diseases such as cataract and age-related macular degeneration, two leading causes of visual impairment and blindness globally.<sup>2,3</sup> Other conditions such as Graves' ophthalmopathy, and ischaemic and thromboembolic diseases of the eye are in the growing list of smoking-related ocular morbidities.<sup>2</sup> However, relative to other better known smoking-related conditions, the association between smoking and eye diseases is less widely recognised. The awareness of the risk of blindness from smoking is low. A hospital-based cross-sectional survey of patients in the United Kingdom revealed that only 9.5%

of patients believed that smoking was definitely or probably a cause of blindness, compared with 70.6 to 92.2% for stroke, heart disease and lung cancer.<sup>4</sup> A survey of teenagers aged from 16 to 18 years in the United Kingdom yielded similar results.<sup>5</sup> However, despite the low level of awareness of smoking-related blindness found in these studies, the fear of blindness was as compelling a motivation for smoking cessation, if not more, as the fear of lung cancer, heart disease, and stroke.<sup>4,5</sup>

As such, data on the level of awareness of smoking-related blindness and its value as a motivational factor for smoking cessation is of significant public health importance. Current smokers who also have ocular diseases are a particularly vulnerable group. These patients may be at a higher risk of smoking-related visual morbidity, especially in view of their pre-existing eye conditions at baseline.<sup>2,6</sup> However, to the best of our knowledge, no previous study has elucidated the level of awareness of smoking-related blindness in this subgroup of patients.

## Patients and methods

### Patients and setting

Eligible patients who attended the ophthalmology outpatient clinic from January 2004 to June 2005 in Alexandra Hospital, Singapore, were invited to participate in the study. Only current smokers, defined as individuals who smoked one or more cigarette daily at the time of the study, were included. Patients who were ex-smokers, defined as individuals who previously smoked but were no longer smoking at the time of the study, and non-smokers were excluded. In addition, we also excluded patients who were unable to give written informed consent or complete the questionnaire.

### Data collection

Data were collected through a structured interview in a dedicated room in the eye clinic. A uniform and standardised questionnaire was administered in English by specially trained nursing staff and doctors. For subjects who did not possess an adequate understanding of the English language, the interview was conducted in either Mandarin or Malay, with the questionnaire translated into the respective language. The questionnaire collected information such as demographic data and smoking status. In addition, we also assessed the awareness and fear of smoking-related conditions and their relative impact on smoking cessation in detail. The awareness of the association between smoking and six smoking-related conditions, namely heart attack, lung cancer, stroke, blindness, other lung diseases, and other cancers, was assessed by the ability of each subject

to attribute the specific condition to smoking. The subject's perception of harm resulting from smoking was measured using a visual analogue scale (VAS). Responses were scored from 0 (not harmful) to 10 (very harmful). To assess the fear of each smoking-related condition, each subject was asked to choose the condition they would like to prevent and treat first if it were possible to do so for only one. The motivation score to quit smoking immediately, within 1 year, and within 5 years for six smoking-related conditions was similarly assessed using the VAS. Subjects were also asked the likelihood that they would stop smoking on developing these conditions. Responses were scored from 0 (extremely unlikely to quit smoking) to 10 (extremely likely to quit smoking).

### Statistical analysis

Data analysis was carried out using SPSS version 15 (SPSS Inc., Chicago, IL, USA). Data were combined and checked for outliers and errors. A univariate analysis was performed to identify statistically significant differences between the groups. Categorical variables were analysed using a  $\chi^2$ -test, and continuous variables were analysed using a two-tailed Student's *t*-test and non-parametric tests such as Mann-Whitney *U*-test and Kruskal-Wallis (KW) test for non-normal data. The Wilcoxon signed-rank test for paired data was used for group comparisons at each point. Statistical significance was set at *P*-value < 0.05. Continuous variables were expressed as mean  $\pm$  SE, whereas categorical variables were expressed as percentages.

The study was approved by and has complied with the policies of the Local Ethics Review Board.

## Results

### Demographic profile

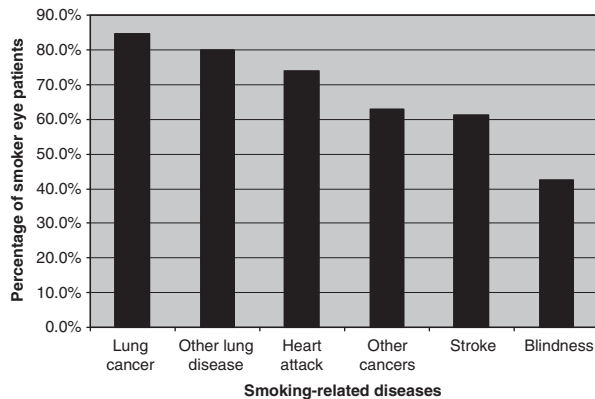
A total of 200 randomly selected subjects participated in the study. The subjects' demographic details and visual status are listed in Table 1.

### Awareness of association between smoking and smoking-related diseases

Subjects were most aware of the association between smoking and lung cancer (85.0%, 170 patients), followed by other lung diseases (80.0%, 160 patients), heart attack (74.0%, 148 patients), other cancers (63.0%, 126 patients), and stroke (61.5%, 123 patients). The smallest proportion of subjects was aware of the link between smoking and irreversible central blindness (42.5%, 85 patients) (Figure 1). Subjects who were aware of the association between smoking and heart attack, stroke, other lung diseases, and other cancers, were more likely to be aware of smoking-related blindness ( $\chi^2$ -test, *P* < 0.001); however,

**Table 1** Demographics and visual status of patients

Patient characteristics	No. (%) of patients (n = 200)
<b>Gender</b>	
Male	186 (93)
Female	14 (7)
<b>Age (years)</b>	
30 or less	27 (13.5)
31 to 50	43 (21.5)
51 to 70	100 (50)
71 or more	30 (15)
<b>Race</b>	
Chinese	147 (73.5)
Malay	25 (12.5)
Indian	19 (9.5)
Others	9 (4.5)
<b>Working status</b>	
Working	106 (53)
Non-working	94 (47)
<b>Education</b>	
Primary education or less	89 (44.5)
Secondary education or more	111 (55.5)
<b>Best-corrected Snellen visual acuity (Better eye)</b>	
6/6 to 6/12	190 (95)
6/15 to 6/36	10 (5)
6/60 and worse	0 (0)



**Figure 1** Knowledge of association between smoking and smoking-related diseases.

this result was not statistically significant for lung cancer ( $P = 0.057$ ). Subjects who reported an awareness of the link between smoking and lung cancer ( $\chi^2$ -test,  $P = 0.001$ ) other lung diseases ( $P = 0.030$ ), and other cancers ( $P = 0.003$ ) were significantly younger, but there was no such statistical difference seen in subjects who reported awareness of heart attack ( $P = 0.142$ ), stroke ( $P = 0.184$ ), and irreversible central blindness ( $P = 0.768$ ). There was no difference in the awareness of the heart attack ( $\chi^2$ -test,  $P = 0.766$ ,  $P = 0.130$ ), stroke ( $P = 0.160$ ,  $P = 0.052$ ), blindness ( $P = 1.000$ ,  $P = 0.105$ ), lung cancer ( $P = 0.699$ ,  $P = 0.585$ ), other lung diseases ( $P = 0.486$ ,  $P = 0.676$ ), and other cancers ( $P = 0.775$ ,  $P = 0.114$ ) between different genders and races, respectively.

**Smoking history**

The subjects smoked an average of  $13 \pm 8$  cigarettes per day (range, 1–40) and the average duration of smoking was  $33 \pm 18$  years (median, 35 years). There was no difference in the smoking pattern among males and females in terms of the average number of cigarettes smoked ( $P = 0.99$ ) and duration of smoking. Males smoked a greater number of pack year (mean, 22.79 years; SD 19.56) compared with females (mean, 18.61 years; SD 17.57), but the results were not statistically significant ( $P = 0.438$ ). Subjects who were not aware of heart attack (median, 27; range, 1–65 pack years, Mann–Whitney  $U$ -test,  $P = 0.006$ ), stroke (median, 24; range, 1–100 pack years,  $P = 0.033$ ), lung cancer (median, 27; range, 3–65 pack years,  $P = 0.002$ ), other lung diseases (median, 25; range, 1–65 pack years,  $P = 0.024$ ), and other cancers (median, 27; range, 1–100 pack years,  $P < 0.0001$ ) smoked significantly more pack years than those who were aware of the link between these diseases and smoking. However, this trend was not observed for irreversible central blindness (median, 20; range, 1–100 pack years,  $P = 0.736$ ).

**Coexisting medical illnesses**

In total, 101 (51%) subjects had one or more coexisting medical conditions. Among patients with coexisting medical conditions, diabetes mellitus, hypertension, ischaemic heart disease, asthma, and stroke alone were present in 25 (25%), 13 (13%), 6 (6%), 3(3%), 1(1%), respectively, and 53 (52%) subjects had more than one of the above coexisting medical conditions. Among those who were aware of lung cancer and irreversible central blindness there was no statistically significant difference in motivation scores to stop smoking immediately (Mann–Whitney  $U$ -test  $P = 0.970$ ,  $P = 0.459$ , respectively), within 1 year ( $P = 0.145$ ,  $P = 0.353$ ), or within 5 years ( $P = 0.090$ ,  $P = 0.386$ ) between those who had coexisting medical illnesses and those who did not. A similar trend was seen for other smoking-related diseases.

**Awareness of harm resulting from smoking**

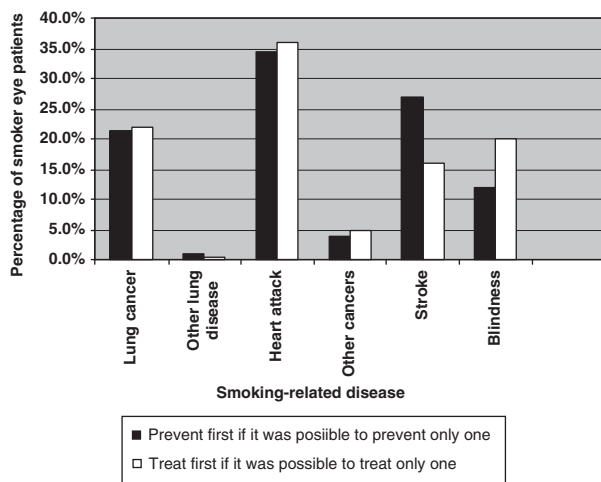
The mean score of the subjects' perception of harm caused by smoking was  $6.53 \pm 3.21$  (mean  $\pm$  SD) on a VAS of 0 to 10. Scores at the 25th, 50th, and 75th percentile were 5, 6.75, and 10, respectively. There was no statistically significant gender difference in the perception of harm caused by smoking (Mann–Whitney  $U$ -test;  $P = 0.57$ ). However, younger subjects were more aware of the harmful effects of smoking when compared with older subjects (KW test;  $P < 0.0001$ ).

### Fear of smoking-related diseases

In the assessment of fear of smoking-related diseases, most subjects preferred to treat heart attack (36%, 72 patients) first among the six conditions, if it were possible to treat only one. This was followed by lung cancer (22%, 44 patients), irreversible central blindness (20%, 40 patients), stroke (16.5%, 33 patients), other cancers (5%, 10 patients), and other lung diseases (0.5%, 1 patient). Heart attack (34.5%, 69 patients) was also the smoking-related disease that most subjects would like to prevent first, followed by stroke (27%, 54 patients), lung cancer (21.5%, 43 patients), irreversible central blindness (12%, 24 patients), other cancers (4%, 8 patients), and other lung diseases (1%, 2 patients) (Figure 2). The priority in the treatment ( $\chi^2$ -test,  $P = 0.238$ ) or prevention ( $\chi^2$ -test,  $P = 0.934$ ) of the smoking-related diseases was not affected by the educational level of the subject.

### Motivation to quit smoking

Both the mean and median motivation scores significantly increased with a longer deadline, that is, patients reported they were more likely to quit smoking if they developed one of the smoking-related conditions within 5 years than within 1 year or immediately. The motivation score for quitting smoking within 5 years was consistently higher for all smoking-related diseases than for quitting within 1 year and immediately (KW test;  $P < 0.001$ ). The motivation score to quit smoking due to lung cancer was the highest among all the smoking related diseases, followed by irreversible central blindness. The likelihood of developing lung cancer had in general significantly higher motivation scores to quit smoking immediately, within 1 year and within 5 years compared with heart attack (Wilcoxon

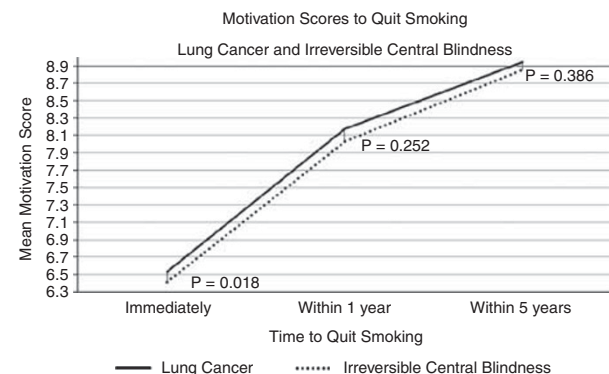


**Figure 2** Fear of smoking-related diseases amongst current smokers.

signed-rank test,  $P < 0.001$ ,  $P < 0.001$ ,  $P = 0.001$ , respectively), stroke ( $P = 0.032$ ,  $P = 0.052$ ,  $P = 0.023$ ), other lung diseases ( $P < 0.001$ ,  $P = 0.002$ ,  $P = 0.001$ ), and other cancers ( $P = 0.005$ ,  $P = 0.002$ ,  $P = 0.005$ ). Though the likelihood of developing lung cancer also had higher motivation scores compared with irreversible central blindness, the difference was significant only for motivation to quit smoking immediately (mean score 6.52, 6.40, respectively,  $P = 0.018$ ) and not for quitting smoking within 1 year (8.17, 8.03,  $P = 0.252$ ), or within 5 years (8.94, 8.85,  $P = 0.386$ ) (Figure 3). There was no statistically significant difference in the likelihood of stopping smoking immediately, within 1 year, or within 5 years between those who were aware of irreversible central blindness (Mann-Whitney  $U$ -test;  $P = 0.221$ ,  $P = 0.082$ ,  $P = 0.323$ , respectively) and lung cancer ( $P = 0.894$ ,  $P = 0.938$ ,  $P = 0.542$ ) as a smoking-related disease and those who were not. Among those who were aware of irreversible central blindness as a smoking-related disease, there was no statistically significant difference noted in motivation scores to quit smoking immediately, within 1 year, and within 5 years (KW test;  $P = 0.176$ ,  $P = 0.301$ ,  $P = 0.075$ , respectively) among Chinese, Malay, and Indians, though there was a trend for Indians to have higher motivation scores compared with the Chinese and Malays.

### Discussion

The results of the current study suggest that the awareness of blindness as a smoking-related condition was low among current smokers with ocular conditions attending an ophthalmology clinic. Only 42.5% of subjects were aware of the association between blindness and smoking, the lowest among the six conditions included in the survey. Our finding was similar to that in another study on adult outpatients in ophthalmic, general medical, and general surgical clinics in Singapore



**Figure 3** Mean motivation scores to quit smoking immediately, within 1 year and within 5 years for lung cancer compared with irreversible central blindness.

and Scotland, in which the awareness of blindness as a smoking-related condition was 36.5% and 30.5%, respectively, the lowest amongst a list of conditions including lung cancer, mouth and throat cancer, heart disease, and stroke.<sup>7</sup> Furthermore, although the awareness of other smoking-related conditions was associated to the number of pack-years smoked such that those who were not aware of these smoking-related diseases smoked significantly more pack years, this trend was not observed in subjects who were not aware of irreversible central blindness as a smoking-related condition. This may be due to the fact that blindness has yet to be established as a well-known smoking-related condition. Awareness of a smoking-related disease may help in reducing the number of pack years smoked, but this may also be dependent on the perceptions of vulnerability by the smokers and the extent to which they consider the condition to be life threatening.

Health concerns remain the primary motive for smoking cessation.<sup>8</sup> Smokers who believe that they have a smoking-related disease<sup>9</sup> and attribute their symptoms to smoking<sup>10</sup> are more motivated to quit. In addition, smokers who have experienced and attributed an acute sentinel health event to smoking were more likely to stop smoking compared with community-based estimates.<sup>11</sup> About 93% of South-Korean men hospitalised with cardiovascular disease reported their intention to quit smoking.<sup>12</sup> It was also found that smokers who attributed respiratory symptoms to smoking were more likely to quit smoking than others.<sup>10</sup> The current study showed that heart attack was the greatest source of concern among smokers. Our subjects were less fearful of irreversible central blindness from smoking than potentially life-threatening systemic diseases such as heart attack, lung cancer, and stroke, when they were asked to prioritise treatment and prevention among the six conditions included in the survey. The majority of smokers in our study had normal or near-normal vision and, therefore, may be less fearful of developing blindness from smoking. This might be suggestive of a possible barrier towards smoking cessation in those who are poorly motivated. As such, it may be more appropriate to offer further education on effects of smoking before encouraging a cessation attempt.

Our study in an Asian population yielded results similar to that of Bidwell *et al*<sup>4</sup> and Moradi *et al*;<sup>5</sup> in that the motivation score to quit smoking due to irreversible central blindness was the second highest among all the conditions examined, following only lung cancer. Hence, despite a low level of awareness, blindness is still a significant motivational factor for smoking cessation. Interestingly, previous knowledge of the association between smoking and blindness had no effect on the mean motivation score for stopping smoking due to the

increased likelihood of irreversible central blindness. In addition, motivation scores for quitting smoking within 5 years had consistently higher scores for all smoking-related diseases than those for quitting immediately and within 1 year. As such, it may be suggested that subjects may be more motivated to quit smoking if they were allowed to do so gradually over a period of time rather than immediately.

Our study and others<sup>4,5,7,13</sup> suggest that attempts should be made to highlight blindness as a smoking-related disease as part of anti-smoking public health education. The use of graphic health warning labels on cigarette packets is one potential way to increase the awareness of the association between blindness and smoking. A global survey found that Australia had the highest level of awareness (77%) of blindness as a smoking-related disease among 14 countries.<sup>14</sup> This could be due in part to its aggressive anti-smoking campaigns including a 'Smoking causes blindness' graphic warning on cigarette packs. A twofold increase in the calls to the Australian Quitline was noted after the introduction of graphic pictorial warnings with the Quitline number printed on cigarette packs.<sup>15</sup> A survey among adult patients in Singapore revealed that 58% of respondents indicated that graphic health warning labels on cigarette packs would be effective in discouraging them from smoking.<sup>7</sup> Additionally, public education on smoking through mass media campaigns and outreach activities in the community and workplaces have an equally crucial role. It has been shown that an increased level of awareness through tobacco control mass media campaigns is associated with a reduction in the prevalence of smoking.<sup>16</sup> Hence, there is an urgent need to increase the awareness of modifiable risk factors like smoking to reduce the risk of blindness. The low level of awareness of smoking-related blindness even among current smokers with eye diseases found in the current study may underline the inadequacy of smoking cessation advice and support in the eyecare setting. A previous survey of ophthalmologists and optometrists in the United States found that although these eyecare professionals feel it is appropriate to help smoking patients with cessation, few do so regularly. Several barriers, such as a lack of time, patient materials, and training, have also been identified.<sup>17</sup> In addition, a cross-sectional postal survey of consultant ophthalmologists in the United Kingdom noted that only 35% of responders asked about smoking status every time or most times for new patients and 5% for follow-up patients. Likewise, only a small proportion of responders assessed for motivation to quit smoking and provided advice and assistance to those who were keen to do so.<sup>18</sup> Similar findings were observed among community optometrists in the United Kingdom.<sup>19</sup> Hence, eyecare professionals

can potentially have a greater role in the provision of targeted smoking cessation support for eye patients in routine ophthalmic and optometric practice.<sup>20</sup> This can be achieved through reducing perceived barriers by training eyecare professionals in providing an effective, brief intervention that is readily received by patients, as well as providing resources and materials to practitioners.<sup>17</sup>

The strength of this study is its uniqueness in exploring the relative impact of awareness of blindness and other smoking-related diseases and the motivation to quit smoking in a relatively large sample of potentially vulnerable cohort of current smokers attending an eye clinic for ocular problems. The current study was limited by the convenience sampling of a select group from an ophthalmology outpatient clinic in the hospital, the results of which may not be representative of smokers in the general population.

In conclusion, although most smoker eye patients recognise many health hazards of smoking, their awareness of the association between smoking and irreversible central blindness is low compared with other smoking-related conditions. Despite this relatively low awareness and fear of blindness from the smoking, our study suggests that blindness is an important motivational factor in smoking cessation, as evidenced by the higher motivation scores to quit smoking than most other smoking-related conditions. The message of 'smoking causes blindness' should therefore be reinforced and could be incorporated as part of the overall strategy in anti-smoking campaigns and health education.<sup>13</sup> The reach of such interventions can be further extended through the involvement of eyecare professionals in the assessment, counselling, and motivation of smokers in the ophthalmic setting.

## Summary

### What was known before

- The awareness of the risk of blindness from smoking is low amongst smokers and non-smokers. The fear of blindness may be as powerful a motivational factor to quit smoking as fear of non-ophthalmic smoking-related diseases.

### What this study adds

- This study assesses the awareness of blindness and other smoking-related conditions on a potentially at risk population of current smokers attending an ophthalmology outpatient clinic. Currently, no data exists on such a large sample of current smokers with eye diseases. This vulnerable group was found to be less fearful of irreversible central blindness from smoking than potentially life-threatening systemic diseases such as heart attack, lung cancer, and stroke. Of the smoking-related diseases studied, the motivation to quit smoking due to irreversible central blindness was the second highest after lung cancer.

## Conflict of interest

The authors declare no conflict of interest.

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