

Influence of smoking and other factors in development of cataracts in urban and rural areas. A cross-sectional study from Pakistan

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A B S T R A C T

Introduction: A cataract is characterized by the clouding of the crystalline lens fibers in the eyes. Smoking has been identified as a risk factor for several common and serious eye diseases, including age-related macular degeneration, glaucoma, and cataracts, all of which can lead to irreversible blindness. This study aimed to examine the relationship between tobacco smoking and non-smoking with the prevalence of cataracts in both urban and rural populations in Pakistan.

Methodology: This epidemiological study was conducted in Okara, involving approximately 2000 patients. Some participants did not provide information, resulting in a total of 1992 confirmed cases from both genders. Data was collected using a questionnaire-based form after obtaining informed consent from patients.

Results: Of the 1992 subjects, 46.13% were male and 53.87% were female. The age distribution of both groups showed a significant difference. A total of 24.60% of patients were from urban areas, while 75.40% were from rural areas, showing no significant difference. The marital status of age groups 20 to 60 and 61 to 100 showed no significant differences. For cigarette smokers aged 20 to 60, the OR / 95% CI was 10.41 / 2.34, while for the age group 61 to 100, it was 6.63 / 1.89, indicating a significant difference. Huqa smokers aged 20 to 60 also showed a significant difference, as did the age group 61 to 100.

Conclusion: Smoking, whether cigarettes or huqa, is strongly associated with the development of cataracts. Other factors, such as the use of pan, niswar, and marital status, also play a role.

Keywords: Smoking, Huqa, Cataract, World, Urban, Rural

Introduction

Cataracts are a leading cause of preventable blindness and vision loss worldwide. The challenge lies in preventing the development of cataracts and treating those that do occur.¹ Although current treatments can restore normal vision for many who suffer from vision loss, the problem of cataracts continues to grow annually. This is due to the high number of patients needing surgery and the increasing number of cataract cases driven by longer life expectancies. While surgery remains the only effective

treatment for cataracts, identifying risk factors can aid in developing preventive measures at an early stage. The World Health Report, published in 1998, estimated that 19.34 million people were bilaterally blind due to age-related cataracts.²

Cigarette smoking is a well-known risk factor for nuclear cataracts, and growing epidemiological evidence indicates that smoking is also a risk factor for posterior subcapsular

cataracts. Smoking has been identified as a risk factor for several common and serious eye diseases, including age-related macular degeneration, glaucoma, and cataracts, all of which can lead to irreversible blindness.³

Furthermore, previous research indicates that cigarette smoking poses a higher risk for cataract development compared to non-smoking. Tobacco use is a major global public health issue and the leading preventable cause of disease, disability, and premature death. It has been reported to account for a significant proportion of mortality and morbidity among middle-aged individuals. In India, it is estimated that about one-third of women and two-thirds of men use tobacco in various forms, including cigarettes, bidis, cheroots, and smokeless tobacco such as snuff or chewing tobacco. Tobacco is also used in powdered form, inhaled through the nose.⁵

Low socioeconomic status (SES) has been associated with many age-related diseases, including senile cataracts. Previous studies indicate that lifestyle factors such as smoking and alcohol use, along with indicators of SES like education, household income, and housing conditions, are linked to a higher prevalence and progression of cataracts. However, most of this data has been derived from studies conducted on white populations in the United States, Europe, and Australia.⁶⁻⁸

While data has been collected from India⁹ and China,¹⁰ some studies have been conducted in urban areas that are representative of a large portion of the population in Asia.¹¹ Moreover, no research has been conducted on the Malay people, the third largest ethnic group in Asia, comprising about 5% of the world's population.¹² No survey-based study has been conducted to examine the effects of smokeless tobacco on eye health. This study aimed to investigate the association between tobacco smoking and non-smoking with the development of cataracts in urban and rural populations in Pakistan.

Methodology

This population-based study aimed to assess the frequency of cataracts in urban and rural areas of Pakistan. Conducted at the Pakistan Ali Trust Eye Hospital in Okara, it was a cross-sectional retrospective epidemiological study involving 1992 individuals aged 20 to 100 years living

in Pakistan. The study was carried out from June 2021 to December 2021. Patients at the Pakistan Ali Trust Eye Hospital in Okara provided informed consent forms. The study adhered to the principles of the Declaration of Helsinki, and ethical approval was obtained from the ethics committee, represented by Dr. Muhammad Ejaz Anjum, affiliated with the Ali Trust Eye Hospital in Okara, Pakistan, under the reference ATFEH-HR-1199.

The study involved 1992 subjects who were unidentified individuals attending the hospital. Only patients diagnosed with cataracts by ophthalmologists were included, while those without cataracts were excluded from further analysis. Individuals aged between 20 and 100 years were considered for inclusion. This was a small-scale study aimed at assessing the association between cataracts and socioeconomic status. The potential for systematic errors or inaccuracies in the study is estimated to be up to 5%.

Comprehensive information was gathered from all participants enrolled in the study. Given that many patients lacked formal education, the questionnaire was administered by the study personnel through verbal interviews. Detailed data on the use of tobacco, including whether they smoked cigarettes or used huqa, pan, or niswar, was collected, regardless of whether they were current users.¹³ Additionally, questions regarding age, gender, education level, marital status, and place of residence were included in the study questionnaire.

Analyses were conducted for all variables, with age, sex, and age-adjusted odds ratios (ORs) along with their corresponding 95% confidence intervals (CIs) calculated. Chi-square tests were utilized where necessary to obtain p-values, with $p < 0.05$ considered significant and $p > 0.05$ considered non-significant. All analyses were performed using Microsoft Excel 2010.¹⁴

Results

Among the 1992 patients included in the study, 46.13% were male and 53.87% were female, ranging in age from 20 to 100 years.

Age distribution: Two age groups were examined in the study: one comprising individuals aged 20 to 60 years and the other aged 61 to 100 years. Within the 20 to 60 age

group, 15.91% were male and 24.70% were female, while within the 61 to 100 age group, 30.22% were male and 29.17% were female. The distribution of age groups showed a significant difference ($p < 0.05$), with an odds ratio of 0.62 and a 95% confidence interval of -0.48.

In this study, it was noted that 24.60% of the total population under investigation resided in urban areas, while 75.40% were from rural areas. This difference was found to be non-significant, with a p-value greater than 0.05 (i.e., $p > 0.05$). The calculated odds ratio was 0.93, with a 95% confidence interval of -0.08 (Table 1).

Table 1: Residence of cataract patient

Residence of cataract patients						
Residence	Gender	No. of people	Percentage	Total	P-value	OR/ 95% CI
Urban	Male	219	10.99	24.60	0.46	0.93/-0.08
	Female	271	13.60			
Rural	Male	700	35.14	75.40		
	Female	802	40.26			
Total		1992	100.00			

In this study involving 1992 patients, the marital status of individuals in different age groups was compared. Among patients aged 20 to 60 years, 40.16% were married (both males and females), while only 0.60% were unmarried (both males and females). The calculated p-value, which was greater than 0.05 (i.e., $p > 0.05$), indicates that the difference was non-significant, with an odds ratio (OR) of 1.29 and a 95% confidence interval (CI) of 0.26. Similarly, among patients aged 61 to 100 years, 59.94% were married (both males and females), and only 0.30% were unmarried (both males and females). Once again, the p-value was greater than 0.05, indicating a non-significant difference, with an OR of 0.52 and a 95% CI of -0.66. These findings are summarized in Table 2.

In different age groups, both smokers and non-smokers were observed, as detailed in Table 3. For individuals aged 20 to 60 years, 5.87% were cigarette smokers (both male and female), while 34.74% were non-smokers, with a p-value greater than 0.05 (i.e., $p > 0.05$), indicating a non-significant difference. The odds ratio (OR) and 95% confidence interval (CI) were 10.41 and 2.34, respectively.

However, among individuals aged 61 to 100 years, 13.70% were cigarette smokers (both male and female), while 45.68% were non-smokers, with a p-value less than 0.05 (i.e., $p < 0.05$), indicating a significant difference, with an OR of 6.63 and a 95% CI of 1.89.

Similarly, for huqa smokers aged 20 to 60 years, 1.86% were smokers (both male and female), while 38.76% were non-smokers, with a p-value less than 0.05 (i.e., $p < 0.05$), indicating a significant difference, with an OR of 2.11 and a 95% CI of 0.75. Among individuals aged 61 to 100 years, 5.82% were huqa smokers (both male and female), while 53.56% were non-smokers, with a p-value less than 0.05 ($p < 0.05$), indicating a significant difference, with an OR of

1.80 and a 95% CI of 0.59. In the study involving 1992 patients, an analysis of pan and niswar usage among different age groups revealed interesting patterns.

Among individuals aged 20 to 60 years, only 0.15% were identified as male and female pan users, with a significant majority, 40.46%, abstaining from pan use. Interestingly, the statistical analysis yielded a non-significant difference, as indicated by a p-value exceeding 0.05, with an odds ratio of 0.00 and a 95% confidence interval of none. Conversely, among the older age group of 61 to 100 years, a higher proportion, 5.82%, were identified as pan users, while 53.56% remained non-users. Despite this disparity, the statistical analysis again failed to show significance, with a p-value greater than 0.05. The odds ratio calculated was 1.61, with a 95% confidence interval ranging from 0.48 to none. Similarly, for niswar usage, among individuals aged 20 to 60 years, 5.82% were identified as users, but statistical analysis showed no significant difference. Likewise, in the older age group of 61 to 100 years, 53.56% were users, with the statistical analysis again failing to demonstrate significance.

Table 2: Marital status of patients

Marital status of cataract patients							
Married	Gender	Age	No. of people	%	Total	P-value	OR/ 95% CI
Yes	Male	20-60	314	15.76	40.16	0.68	1.29/ 0.26
	Female		486	24.40			
No	Male		4	0.20	0.60		
	Female		8	0.40			
Yes	Male	61-100	597	29.97	58.94	0.44	0.52/ -0.66
	Female		577	28.97			
No	Male		4	0.20	0.30		
	Female		2	0.10			
Total			1992	100.00			

Table 3: Cigarette and Huqa smoking status of patients

Cigarette Smokers							
	Gender	Age group	No. of people	%	Total %	P-value	OR/ 95% CI
Smokers	Male	20-60	97	4.87	5.87	0.98	10.41/ 2.34
	Female		20	1.00			
Non-smokers	Male		220	11.04	34.74		
	Female		472	23.69			
Smokers	Male	61-100	225	11.30	13.70	0.00	6.63/ 1.89
	Female		48	2.41			
Non-smokers	Male		377	18.93	45.68		
	Female		533	26.76			
Total			1992	100.00			
Huqa Smokers							
Smokers	Male	20-60	21	1.05	1.86	0.02	2.11/ 0.75
	Female		16	0.80			
Non-smokers	Male		296	14.86	38.76		
	Female		476	23.90			
Smokers	Male	61-100	74	3.71	5.82	0.00	1.80/ 0.59
	Female		42	2.11			
Non-smokers	Male		528	26.51	53.56		
	Female		539	27.06			
Total			1992	100.00			

Discussion

The study was carried out at the Ali Trust Eye Hospital in Okara, aiming to investigate the correlation between smoking and various factors associated with the development of cataracts. A total of 1992 patients participated in the study, each providing informed consent before inclusion. Their observations align with previous findings indicating that smoking increases the risk of nuclear cataracts.¹⁵⁻¹⁷ Recent research has also highlighted a connection between cigarette smoking and cortical cataracts. The study's results corroborated earlier research, revealing that individuals who smoke cigarettes or cigars face a higher risk of developing both nuclear and cortical cataracts. Furthermore, they emphasized the significant role of cumulative cigarette smoking in the development of these types of cataracts.¹⁸

Numerous cross-sectional studies have consistently observed a high prevalence of nuclear and cortical opacities among females.¹⁹⁻²¹ Additionally, research on cataracts has consistently highlighted the relationship between education level and senile cataracts. These studies have consistently suggested that individuals with lower socioeconomic status (SES) face a higher risk of cataracts, a finding supported by other investigators. Moreover, smoking has been identified as a risk factor for nuclear cataracts, and recent research has also linked cigarette smoking to cortical cataracts. These findings are in line with earlier studies indicating that both cigarette and cigar smoking pose significant risks for nuclear and cortical cataracts. However, their study results, particularly regarding the association between cigar smoking and nuclear cataracts, contradict some previous findings but align with others.

Notably, they observed a significantly higher frequency of cortical cataracts among individuals with a history of cigarette smoking, a finding consistent with some studies but not all. Furthermore, their study identified significant differences among patients in various age groups, except for cigarette smokers aged 20 to 60, where the difference was non-significant. However, they found non-significant differences among individuals who use pan and niswar. It's worth mentioning that other studies have also observed a

relationship between cataracts and alcohol usage, particularly in individuals aged 65 to 74 years.¹⁵

Smoking unequivocally stands as a primary contributor to disease and premature death. Over time, the prevalence of smoking has increased significantly in numerous Asian countries, emerging as a major cause of mortality.²² Although efforts towards comprehensive anti-tobacco initiatives have resulted in a decline in smoking rates to less than 30% in developed nations such as England and Australia, the scenario remains starkly different in many Asian countries,²³ In these regions, approximately 50-70% of adults are reported to be current smokers,²⁴ posing substantial risks of cancer, heart diseases, and respiratory infections.³⁵ Furthermore, the impact of smoking on eye diseases such as cataracts, diabetic retinopathy, and age-related macular degeneration has been extensively documented in Asian countries where smoking rates remain high.

Previous studies have revealed a smoking rate of 40% among Singaporean Malay individuals, which was associated with a significantly increased risk of senile macular degeneration,²⁶ retinal arteriolar emboli,²⁷ and thyroid-related ophthalmopathy.²⁸ Previous research has consistently demonstrated a relationship between cataracts and cigarette smoking, with smoking playing a significant role in the development of cataracts across various populations. This association has been observed not only in people from the United States but also in European and Australian populations.²⁹⁻³² India and China also show that cigarette smoking has been a threat for NC,³³ CC,¹³ and any type of cataract.¹⁸ The relationship of other types of tobacco like cigars,³⁴ pipes, smokeless tobacco,¹³ or cooking smoke with cataracts was also observed.

In their research, they observed that cataracts predominantly manifest in older individuals, indicating a strong correlation with age. This explains why the incidence of cataracts was higher among nonsmokers or former smokers, who were on average older (59 years), compared to current tobacco users, who were slightly younger (55.3 years).

However, upon adjusting for age, it became evident that smoking was indeed a significant factor in the development

of senile cataracts.²⁸ In their observations, individuals who smoked Beedis presented a somewhat unclear picture due to the higher prevalence of beedi smokers compared to cigarette smokers (23.9% vs. 13.3%). Surprisingly, the risk for cataract development appeared to be lower among beedi smokers, with the odds ratio indicating a more significant effect of reduced risk (OR 0.81). Similarly, in the current study involving 1992 patients, the prevalence of pan and niswar users was lower compared to cigarette and huqa smokers. Specifically, among male and female pan users aged 20 to 60 years, the prevalence was only 0.15%, with non-users comprising 40.46%.

However, statistical analysis revealed a non-significant difference ($p>0.05$) with an odds ratio (OR) of 0.00 and none for the 95% confidence interval (CI). Conversely, among individuals aged 61 to 100 years, the prevalence of pan users was higher at 5.82%, with non-users accounting for 53.56%. Once again, the difference was non-significant ($p>0.05$), with an OR of 1.61 and a 95% CI ranging from 0.48 to none. Similarly, for niswar users among males and females aged 20 to 60 years, the prevalence was 5.82%, with a non-significant difference observed ($p>0.05$) and an OR of 0.77, but with a wide 95% CI ranging from -0.26 to none. Among individuals aged 61 to 100 years, niswar users accounted for 53.56%, with a non-significant difference observed ($p>0.05$) and an OR of 1.61, with a 95% CI ranging from 0.15 to none.

Low socioeconomic status has emerged as a documented risk factor for various chronic eye conditions, including age-related macular degeneration, glaucoma, diabetic retinopathy, and cataracts. A plethora of studies consistently highlight the association between lower economic status and an increased likelihood of developing cataracts. In their research, consistent with earlier findings, a significant relationship was identified between nuclear cataracts and indicators such as lower education levels and reduced income, as well as between posterior subcapsular cataracts and poor living conditions.

It can be inferred that individuals with lower socioeconomic status may have limited access to cataract surgery, leading to a higher prevalence of cataracts among this demographic. In earlier investigations among Malay individuals, there was no observed correlation between socioeconomic status and cataract operation,³¹ However,

numerous survey-based studies consistently indicate a higher incidence of cataracts among females.²⁸ In this study, I also noted a higher prevalence of cataracts in females compared to males. They observed that in rural populations, a majority were uneducated and engaged in farming, while also using cigarettes and bidis.¹³

In this study, I examined populations from both rural and urban areas, with 24% residing in urban settings and 76% in rural areas. Additionally, they reported the regular use of cigarettes, pan, and niswar among the participants. Interestingly, the difference between urban and rural areas was found to be non-significant. Furthermore, marital status was described among the patients, revealing a non-significant difference across different age groups.

Conclusion

The study concludes that smoking, whether cigarettes or hookah, is strongly associated with the development of cataracts. Additionally, factors such as the use of pan, niswar, and marital status also play a minor role in cataract development. It emphasizes the importance of raising awareness, particularly in rural areas, to reduce smoking habits and thereby mitigate the risk of cataract disease

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