

A STUDY OF THE EFFECT OF CIGARETTE SMOKING ON HEARING IMPAIRMENT IN NORTH KARNATAKA

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ABSTRACT

Introduction: Cigarette smoking has become a common tendency worldwide. In general, tobacco is consumed by approximately 1.3 billion of the world's population. Smoking is an addiction that has been accepted by the community despite its harmful effects. In general, these have suggested that smokers have a greater risk of hearing loss than non-smokers.

Materials and Methods: The data was randomly collected from age matched smoking and non-smoking male population from residential areas of North Karnataka belonging to age group of 20-60 yr. The age matched study and control groups were selected based on inclusion and exclusion criteria. The group consists of 100 and 50 subjects respectively.

Results: On analyzing the audiometric data for the severity of the hearing impairment, it was observed that the mild form (26-40 db loss) was the most common (57%), while the severe type was the least common (4%) in the smokers. Smoking was found to be statistically associated with the hearing impairment, with 70% of the smokers and 20% of the non-smokers having hearing impairment. Also, as the age increased, the percentage of the affected individuals also increased, with greater percentages of the smokers being affected in comparison to the non-smokers.

Conclusion: In conclusion, this study was unique in the sense that it is conducted in Indian population. Our results showed that smoking might affect the degree of hearing loss within the overall range of a frequency in workers who are exposed to noise. It was also shown that heavy smoking had a greater effect on the degree of hearing loss at lower frequencies. At lower frequencies, there was a dose-response relationship based on the smoking amount.

Keywords: Cigarette smoking, risk, hearing impairment

INTRODUCTION

Cigarette smoking has become a common tendency worldwide. In general, tobacco is consumed by approximately 1.3 billion of the world's population.¹ Smoking is an addiction that has been accepted by the community despite its harmful effects. It is extensively practiced from time immemorial. As per World Health Statistics-2006 42.3% of males and 8.3% of females of age group of 15yr are smokers in India (2003).² According to a nationwide survey, 184 million used tobacco, of which 112 million smoked tobacco. It kills 8 lakh people every year according to Indian Council of Medical Research

(ICMR) which amounts to 2200 people dying every day from tobacco related diseases.³

While tobacco use is rising globally, the epidemic of tobacco related diseases has just begun. Most of tobacco's damage to the human health does not become evident until years or even decades after the onset of its use. While tobacco use is the leading cause of preventable death in the world⁴ but this epidemic can be stopped by proper measures.

Though smoking is well known as a risk factor for various diseases, little is known about its association with hearing loss. Evidence on relation of smoking to hearing loss have been found from health screening programmes,^{5,6} occupational programs of hearing conservation^{7,8} and a few population based surveys.^{9,10} In general, these have suggested that smokers have a greater risk of hearing loss than non-smokers. While hearing loss is common among the elderly, the young also suffer from hearing impairment, which according to the impaired spectrum of frequencies, is not induced by noise. The medical literature describes the relationship between hearing loss and smoking. The causes probably arise from a combination of genetic and environmental factors. An experimental study has concluded that cigarette smoking results in structural modification of cochlea and tuba acoustica, i.e. degenerative lesions and vascular lesions.¹¹

Prevalence of hearing impairment among South Asian population is also known to be quite high. However, the direct relationship between hearing impairment and smoking cigarettes remained mostly unfocused. Only few studies have been shown to cause hearing loss linking with cigarette smoking.¹²⁻¹⁵

Meanwhile, some studies failed to find any direct correlation between them.^{16,17} Most of the earlier studies have investigated the correlation of hearing impairment among subjects who has used MP3 player and have drunk alcohol. This study was therefore attempted to investigate whether cigarette smoking affects hearing among subjects in India who maintain a lifestyle without using MP3 player and drinking alcohol. For this purpose, the study was conducted among 100 subjects of different ages, all of them subjects smoked cigarettes on daily basis. The audiometric measurement was taken at 1, 4, 8 and 12 kHz frequencies. The mean \pm S.D values of auditory thresholds were measured followed by analysis of the correlation between hearing impairment and smoking cigarettes. Furthermore, the study was attempted to find out any association of hearing impairment with frequency and duration of cigarettes smoked.

MATERIALS AND METHODS

The data was randomly collected from age matched smoking and non-smoking male population from residential areas of Koppal, North Karnataka belonging to age group of 20-60 yr. The group consists of 100 and 50 subjects respectively. The subjects selected had good health as evaluated by general physical and systemic examination, and had given written consent. Diabetic or hypertensive patients, alcoholics, residents of noisy areas, occupational exposure to noise and vibration, mobile phone users for more than 3 yrs, subjects with history of recent ear, nose and throat infection, ear surgeries, head injury or consuming ototoxic drugs in the past 3 months were excluded. Subjects were given a prepared questionnaire to answer that reveals Socio- Demographic data, hearing ability and regarding inclusion/exclusion criteria. Detailed ear, nose and throat examination was carried out to rule out sub-clinical infection or other pathology. Random blood sugar test was done using a glucometer (to exclude undetected diabetic patients). Considering the predetermined inclusion and exclusion criteria, study subjects were selected and designated into case and control groups. An assessment of auditory acuity using a pure tone audiometer was done.

The parameter of auditory acuity studied was the hearing threshold for air conduction and bone conduction at different frequencies. Using the puretone audiometer, audiograms were recorded separately for both ears of the selected subjects in a sound proof room. The audiogram chart thus obtained depicted the auditory acuity of the particular ear. Smoking history of each subject of the test group was expressed in terms of pack-years. Pack-years of smoking was defined as the number of packs (one pack is equal to 20 cigarettes) smoked per day multiplied by the duration of smoking (in years). Hearing thresholds for air conduction and bone conduction at different frequencies of the test group was recorded. The method of recording was based on American Society for Speech and Hearing Association [ASHA] 2005 Guidelines for manual pure-tone threshold audiometry (PTA). The recordings were entered in a master chart.¹⁸ Similarly, hearing thresholds for air conduction and bone conduction at different frequencies of the control group was also recorded and entered in a separate master chart.

RESULTS

On analyzing the audiometric data for the severity of the hearing impairment, it was observed that the mild form (26- 40 db loss) was the most common (57%), while the severe type was the least common (4%) in the smokers. Smoking was found to be statistically associated with the hearing impairment, with 70% of the smokers and 20% of the nonsmokers having hearing impairment. Also, as the age increased, the percentage of the affected individuals also increased, with greater percentages of the smokers being affected in comparison to the nonsmokers.

The most common type of hearing loss in the smokers was the sensorineural type (75.71%), followed by the mixed hearing loss (18.58%), while the mixed type was found in the non-smokers.

Table 1: Age composition of study groups

Age Group (Years)	Smoking status				Total	
	Smoker		Non- Smoker			
	No.	%	No.	%	No.	%
20-30	22	22	12	24	34	22.67
31-40	40	40	13	26	53	35.33
41-50	25	25	14	28	39	26
51-60	13	13	11	22	24	16
Total	100	100	50	100	150	100

Table 2: Degree of hearing loss and smoking status

Smoking status	Affected subjects		Degree of hearing loss						No hearing loss		Total
			26-40 db		41-60 db		>60 db				
	No.	%	No.	%	No.	%	No.	%	No.	%	
Smokers	70	70	57	57	9	9	4	4	30	30	100
Non smokers	10	20	10	20	0	0	0	0	40	80	50

Table 3: Hearing loss in relationship with age

Smoking status	Age in years	Affected subjects		Hearing loss (in db)			No hearing loss	Total
		No.	%	26-40	41-60	>60		
Smokers	20-30	8	36.36	7	1	0	14	22
	31-40	29	72.5	25	2	2	11	40
	41-50	20	40	17	2	1	5	25
	51-60	13	100	8	4	1	0	13
	Total	70	65.7	57	9	4	30	100
Non Smokers	20-30	0	0	0	0	0	12	12
	31-40	0	0	0	0	0	13	13
	41-50	2	14.29	2	0	0	12	14
	51-60	8	72.72	8	0	0	3	11
	Total	10	20	10	0	0	40	50

Table 4: Type of hearing loss and smoking status

Age Group (Years)	Type of hearing loss						Total	
	Conductive		Sensorineural		Mixed		No	%
	No	%	No.	%	No	%		
Smoker	4	5.71	53	75.71	13	18.58	70	100
Non-Smoker	0	0	3	30	7	10	10	100
Total	4	5	56	70	20	25	80	100

DISCUSSION

This study was an attempt to study the role of cigarette smoking in hearing loss. Eliminating all confounding factors, the age matched male subjects were selected, the age group being 20-60 yrs to avoid age related physiological alteration in auditory acuity i.e. presbycusis.¹⁹

The age wise distribution of the subjects into smokers and non-smokers has been depicted in the table. This corresponded to the working class in general, that was more likely to be exposed to tobacco smoking. The table shows that as the age increased, the percentage of the subjects with hearing loss also increased, both among the smokers and the non-smokers. Also, with increasing age, the percentage of the smokers who had hearing loss was more than the percentage of the non-smokers who had hearing impairment. Thus, it was seen that smoking was a contributing factor in the accelerating age related hearing loss.

Hearing thresholds of smokers group were higher in smokers with pack-years >1. Pearson correlation

between smoking history and hearing thresholds of smokers was positive suggesting that hearing thresholds raise as the number of pack-years increase. The results are matching with that of study done by Nakanishi et al.²⁰ Age and smoking had a multiplicative effect on the hearing impairment, which was in concordance with the findings of Noor hassim et al.,²¹ For each age-decade, as the frequency increased, the percentage of the ears which were able to respond, decreased.²² Smoking increased the risk of hearing loss and it was a contributory factor in age related hearing loss, which was also shown by other studies.²³⁻²⁶ A multicentre study also reported that smoking was a risk factor for age related hearing loss.²⁷

The debate on the effect of tobacco smoking on the sensorineural loss has been controversial. It has been shown that the hearing loss which was associated with smoking was SNHL, with the damage mainly affecting the higher frequencies.²⁸ In the present study, a close association was found between smoking and the sensorineural hearing loss. Similar findings were also reported by Chung et al.,²⁹ A retrospective analysis of the data which were collected during the 1963 follow up of the NAMRL Thousand Aviator Study also showed a positive correlation between smoking and the chances of the development of the sensorineural hearing loss.³⁰

Our results also showed that the degree of hearing loss was significantly high in the smokers who were exposed to noise. Considering our results and the theoretical background of previous studies, it can be inferred that smoking would have a detrimental effect on the hearing function of workers who are exposed to noise. Previous studies have shown that there is variability in the range of frequencies in which smoking has an effect on hearing function. Specifically, it has previously been shown that smoking caused hearing loss at higher frequencies in the absence of exposure to noise.^{31,32} However, other reports have stated that it caused hearing loss at lower frequencies.^{33,34} Hearing loss within the overall range of a frequency has also been described. Several studies have shown that in workers exposed to noise, smoking may affect hearing loss at higher frequencies.

CONCLUSION

In conclusion, this study was unique in the sense that it is conducted in Indian population. Our results showed that smoking might affect the degree of hearing loss within the overall range of a frequency in workers who are exposed to noise. It was also shown that heavy smoking had a greater effect on the degree of hearing loss at lower frequencies. At lower frequencies, there was a dose-response relationship based on the smoking amount. We could not confirm whether a dose-response relationship existed at higher frequencies. We could not draw conclusions based solely on our results. About which very little data was available regarding the smoking effects on the hearing status. We hope that, this study may pave the way for large scale studies which could be carried out further.

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