



EFFECTS OF CIGARETTE SMOKING ON SENSORINEURAL HEARING IMPAIRMENT IN AGED PATIENTS

Otorhinolaryngology

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ABSTRACT

Aim: This study was designed with the aim to analyse the hearing and smoking status in elderly patients who were smokers related to sensorineural hearing loss with age-matched control subjects, non-smokers. **Methodology:** In this analytic study, 40 subjects were included among which 20 patients were elderly patients who were smokers and 20 were age-matched control subjects, non-smokers. In all aged subjects, all participants were examined with PTA. **Results:** A significant correlation was found between smoking status hearing impairment ($p < 0.05$). Smoking was found to be highly correlated with sensorineural hearing impairment. The hearing loss was of sensorineural type, with the mild type (26-40 dB) of hearing loss being the most common among the aged patients with smokers. **Conclusion:** Smoking damage anti-oxidative systems and tissue metabolism. We have underlined a clear correlation between the risk of sensorineural hearing impairment & smoking. Our findings may result in future screening of smokers to identify any hearing impairment for improving smoking cessation interventions.

KEYWORDS

INTRODUCTION

Cigarette smoke is an intricate mixture of chemical substances that are attached to aerosols or are free in gaseous phase. The cigarette smoke includes more than 4000 chemical compounds^{1,2}. Numerous classes of chemicals present in cigarette smoke are triggers for various diseases¹⁻³. The tobacco leaves are rich in alkaloids, but nicotine is the most abundant. The alkaloid content includes: nicotine N(1')-oxide, myosmine, β -nicotyrine, cotinine, 2,3'-bipyridyl, anabasine, nor nicotine, N-methylanabasine, anatabine, anabaseine and nicotine^{2,3}.

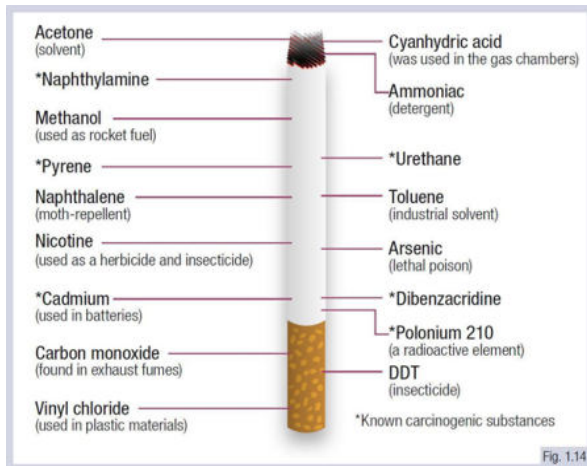


Fig-1 1.

Nicotine has numerous harmful effects and is well known to be very addictive². Nicotine is a dibasic substance and its absorption is related to the pH of the solution². There are three forms of nicotine and all have great solubility in water and dissolve easily in blood². Nicotine has the ability to increase the quantity of free radicals and reactive oxygen species (ROS) that trigger oxidative damage and cause tissue suffering. Also, nicotine stimulates the nuclear factor kappa B (NF- κ B), an ancient protein transcription factor, which is implicated in inflammatory processes and cell damage²⁻⁵.

Thorough search, literature & internet doesn't show enough data for the present topic. So, the present study has been conducted. The cochlea is a structure of the inner ear which has in competence the

organ of Corti and striavascularis. Melanocytes are abundant in the inner ear and striavascularis includes most of the melanin¹⁰⁻¹⁴. Melanin defends the structures of the inner ear against oxidative damage¹⁴⁻¹⁶. One side effect of cigarette smoking is decreased oxygen supply to the cochlea. This may result in constant hardship of the cochlea and moderate to severe hearing damage¹⁷.

MATERIALS AND METHODS:

The present study was conducted in the Department of Otorhinolaryngology, Tertiary care hospital To analyze the smoking and hearing status in elderly smokers' in relation to sensorineural hearing loss with age-matched control subjects. Study was done in the department of ENT & HNS of tertiary care centre over 6 months between march 2024 to august 2024.

In the present analytic study, hearing and smoking status of 40 patients, all the patients were evaluated during the period of march 2024 to august 2024 for 6 months. Informed consent was obtained from all individual participants included in the study. The study population was represented by patients aged 61-70 years.

Smoking History:

Smoking data were assembled in the same way for both cases and controls. Smoking status was assessed as non-smoker and current smoker. The smoking group included patients that had a history of more than 10 cigarettes/day.

To acquire pack-years of smoking, the number of years of smoking was multiplied by the number of packs of cigarettes smoked per day².

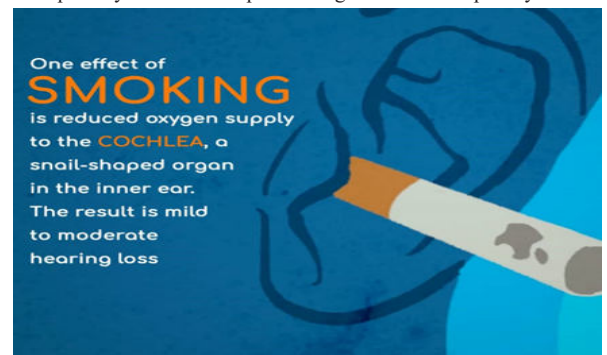


FIG :2

Audiometry:

All patients were inspected with pure tone audiometry. Audiometric trials comprised pure tone audiometry at frequencies ranging from 500–8000 Hz. Pure tones were used to analyze air and bone conduction. Audiometry was performed by using an AMPLIVOX LTD series 240 Portable Audiometer by an experienced audiologist.

The audiometric investigation was done to establish the type and the degree of the hearing impairment. The severity of the hearing loss was classified as normal (≤ 20 dB), mild (>25 dB and ≤ 40 dB), moderate (>40 dB and ≤ 60 dB), and severe (>60 dB), based on the pure tone average.

PURE TONE AUDOMETRY TEST:

The allotment into normal hearing, conductive, mixed and sensorineural hearing loss was done on the basis of audiometric results.

Statistical Analysis:

The statistical analysis was performed by using SPSS, version 16.0. The p-value $p \leq 0.05$ was taken as significant.

RESULTS:

The study included 40 subjects among which 20 were elderly patients who were smokers and 20 were age-matched control subjects, that is non-smokers. The age wise distribution of the subjects into smokers and non-smokers has been depicted in (Table 1), shows that as the age increased, the percentage of subjects with hearing loss also increased, both among smokers & non-smokers. So, it was seen that smoking was a contributing factor in the accelerating age related hearing loss.

On analyzing the audiometric results, it was noticed that cigarette smoking was found to be statistically associated with hearing impairment ($p < 0.05$) (Table 2), especially sensorineural hearing impairment (SNHL), thus 80% of smokers were identified with sensorineural hearing loss (Chart 1). No statistically significant difference was found among other types of hearing loss. 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 (58%), while the severe type was the least common (4%) in the smokers.

Smoking was found to be statistically associated with the hearing impairment, with 80% of the smokers and 10% 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 [Table & Chart-2].

Table 1:

Smoking status	Conductive (Nos)	%	Sensorineural (Nos)	%	Mixed (Nos)	%	Total (Nos)	%
Smokers	1	5	16	80	3	15	20	100
Non-smokers	5	25	2	10	13	65	20	100
Total	6	15	18	45	16	40	40	100

Table 2

Age Group (years)	Smoker (Nos)	%	Non-smoker (Nos)	%	Total (Nos)	%
51-60	12	75	04	25	16	100
61-70	05	46	06	54	11	100
71-80	03	23	10	77	13	100
Total	20	100	20	100	40	100

Type of hearing loss

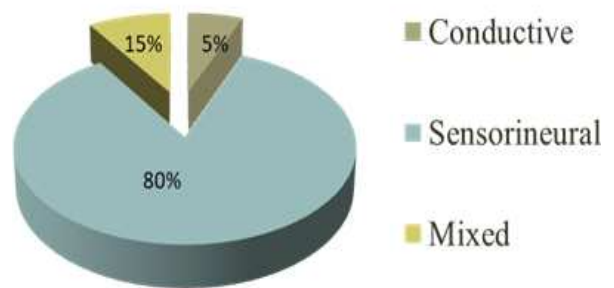


Chart 1:

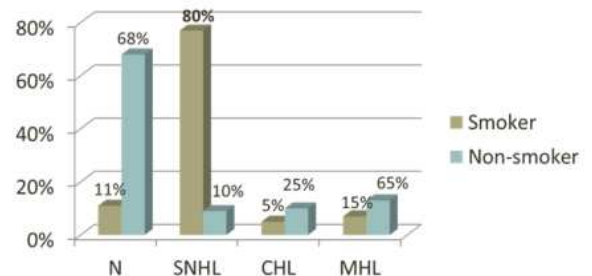


Chart 2:

Chart 1 & 2: The effect of smoking on hearing status (N-Normal, SNHL- Sensorineural, CHL- Conductive, MHL- Mixed hearing loss)

DISCUSSION:

In the current study, cigarette smoking was found to be statistically correlated with sensorineural hearing impairment. Sensorineural hearing impairment (SNHL) is caused by distress of the cochlear sensory epithelium or the peripheral auditory neurons. The sensory component is due to damage of organ of Corti or to an insufficiency of hair cells to stimulate the auditory nerve. The neural element refers to when damage is proximal to the cochlea and auditory nerve (retrocochlear damage)¹¹⁻¹⁵.

The present study revealed that smoking shows a significant association with hearing impairment. Consistent with our study findings, other studies have reported a highly significant association between current smoking and sensorineural hearing loss^{4,17,18,28}. Cigarette has pernicious effects on the inner ear. This provides powerful support for a causal relation between smoking and the prevalence of sensorineural hearing loss.

Therefore, melanin alteration caused by oxidative stress might account for important concomitant hearing impairment²¹⁻²⁵. Cigarette is known to be rich in chemical compounds, the two most toxic constituents are nicotine and carbon monoxide⁵. Cigarette smoking decreases the blood supply due to the vasospasms induced, favors the atherosclerotic narrowing of the blood vessels and accelerates ischemic damage due to increased blood viscosity and by thrombotic occlusions with endothelial changes of the vessels^{24,25}, cigarette may have an effect on cochlea is by causing vasculopathy.

CONCLUSION:

Smoking causes anti-oxidative system damage inducing vasculopathy and tissue metabolism. We have underlined a clear correlation between the risk of sensorineural hearing impairment at higher frequencies & smoking.

This study findings may result in future screening of smokers to identify any hearing impairment and for improving smoking cessation interventions.

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