

Original article:

Assessment of impact of smoking and tobacco addiction on sensorineural hearing loss among normal healthy subjects

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Abstract:

Aim: To assess impact of smoking and tobacco addiction on sensorineural hearing loss among normal healthy subjects.

Methodology: One hundred forty- four subjects with history of smoking of both genders were selected. We made two groups. Group I were smokers and group II had non- smokers (control). All underwent ENT examination followed by tuning fork test and pure tone audiometry. Sensorineural hearing loss was recorded as mild, moderate and severe.

Results: There were 100 males and 40 females in group I and 60 males and 50 females in group II. On assessment of sensorineural hearing loss, it was found that group I comprised of 50 normal, 60 mild, 20 moderate and 10 severe subjects and group II had 80 normal and 30 mild. The difference was significant ($P < 0.05$).

Conclusion: Tobacco addiction is associated with increased risk of developing sensorineural hearing loss.

Key words: Sensorineural hearing loss, Tobacco addiction, Smoking, Nicotine

Introduction

Cigarette and tobacco addiction is a common health problem. In general, 1.3 billion people are addicted to tobacco products worldwide.¹ It is one of the major causes of health issue in many countries, especially in India. Smoking is a serious public health problem. Several studies have shown its many harmful effects.² Smokers, when compared to non-smokers, are at a greater risk of having bacterial respiratory infections and both acute and chronic viral diseases; oral, laryngeal, esophageal, pancreatic, renal, and bladder cancer; circulatory diseases such as arteriosclerosis, aortic aneurism, stroke, and multiple organ disorders.³ Tobacco toxicity is directly related to the number of cigarettes smoked and inversely related to the age at which the habit was initiated.⁴ Tobacco products contain nicotine, toxins, and tar products which are deleterious to health in many ways. Tobacco addiction is well linked to diseases such as lung cancers, oral malignancy, chronic obstructive pulmonary disease, and atherosclerosis.⁵ However, in recent times, we also found that it is linked with sensorineural hearing loss (SNHL). Hearing is one of the most important tools of social communication.⁶ Besides aging, a variety of environmental factors may also cause hearing impairment. Smoking is also considered as one of the risk factors for hearing loss.⁷ Considering this, we selected present study to assess impact of smoking and tobacco addiction on sensorineural hearing loss among normal healthy subjects.

Materials & Methods

One hundred forty- four subjects with history of smoking of both genders were selected for this prospective, observational study. All gave their written consent for the participation of the study. Ethical clearance was taken from institutional higher committee.

Demographic profile of each participant was recorded. We made two groups. Group I were smokers and group II had non- smokers (control). History was recorded in case history proforma. All underwent ENT examination followed by tuning fork test and pure tone audiometry. Sensorineural hearing loss was recorded as mild, moderate and severe. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table I Distribution of subjects

| Groups | Group I | Group II |
|--------|---------|--------------|
| Status | Smokers | Non- smokers |
| M:F | 100:40 | 60:50 |

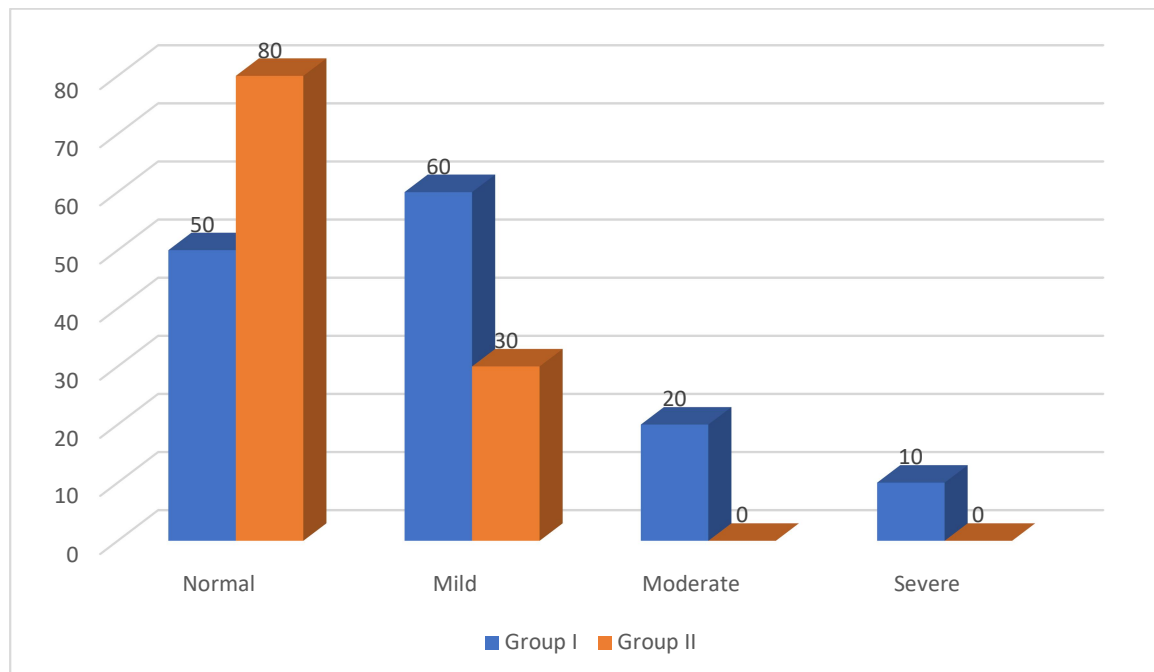
There were 100 males and 40 females in group I and 60 males and 50 females in group II (Table I).

Table II Assessment of sensorineural hearing loss in both groups

| Sensorineural hearing loss | Group I | Group II | P value |
|----------------------------|---------|----------|---------|
| Normal | 50 | 80 | <0.05 |
| Mild | 60 | 30 | |
| Moderate | 20 | 0 | |
| Severe | 10 | 0 | |

On assessment of sensorineural hearing loss, it was found that group I comprised of 50 normal, 60 mild, 20 moderate and 10 severe subjects and group II had 80 normal and 30 mild. The difference was significant (P< 0.05) (Table II, graph I).

Graph I Assessment of sensorineural hearing loss in both groups



Discussion

Smoking is associated with lower blood oxygen levels, vascular obstruction, altered blood viscosity, and possibly ototoxicity.⁸ But it is not known how much of it impacts the auditory system.⁹ There is controversy as to whether cigarettes can really be deemed as a risk factor for the development of hearing loss. Some smokers complain of tinnitus, an indication of peripheral or central disorders.¹⁰ Tinnitus has been associated with smoking, but only indirectly as it is a manifestation seen in smokers with hearing loss. All forms of smoking and tobacco use are harmful and there are significant data on relationship of smoking and middle-ear diseases in children (by passive smoking) and in adults.^{11,12} Among adults the risks of internal ear diseases especially hearing loss also increases with smoking. The risk of becoming hearing-impaired often increases with the number of cigarettes smoked, as well as with the intensity and the duration of exposure to smoke and tobacco.^{13,14} We selected present study to assess impact of smoking and tobacco addiction on sensorineural hearing loss among normal healthy subjects.

Our results showed that there were 100 males and 40 females in group I and 60 males and 50 females in group II. Itoh et al¹⁵ determined the risk factors for hearing loss in the elderly, a total of 496 subjects with bilateral hearing loss and 2807 age-matched persons without hearing disturbance were recruited from the participants in an automated multiphasic health screening examination, and their lifestyle and medical data were analysed. Current smokers showed a significantly increased risk of hearing loss compared with non-smokers, while heavy drinkers did not show an increased risk compared to non-drinkers.

Our results showed that on assessment of sensorineural hearing loss, it was found that group I comprised of 50 normal, 60 mild, 20 moderate and 10 severe subjects and group II had 80 normal and 30 mild. Paschoal et al¹⁶ evaluated the effects of cigarette smoking in auditory thresholds, in otoacoustic emissions and in their inhibition by the efferent olivocochlear medial system. 144 adults from both genders, between 20 and 31 years of age, smoking and non-smoking individuals were submitted to conventional and high-frequency audiometry, transient stimuli otoacoustic emissions and suppression effect investigation. Smokers presented worse auditory thresholds in the frequencies of 12,500Hz in the right ear and 14,000 kHz in both ears. Regarding the otoacoustic emissions, smokers group presented a lower response level in the frequencies of 1,000Hz in both ears and 4,000Hz in the left ear. Among smokers there were more cases of cochlear dysfunction and tinnitus. Results suggested that cigarette smoking has an adverse effect on the auditory system.

Wild et al¹⁷ analysed the influence of long-term smoking on the hearing threshold of individuals subjected to occupational noise exposure. A study group of long-term smokers (n = 30) and a control group of non-smokers (n = 58) were identified from a population of 227 male noise-exposed employees. Both groups had similar mean age and total duration of occupational noise exposure. The median age-corrected hearing thresholds at 3 and 4 kHz in the smokers group were significantly higher (approximately 7dB) than those in the non-smokers group. No statistical difference in the hearing thresholds between both groups was found in any other tested frequency (0.5, 1, 2, 6 and 8 kHz).

Nakanishi et al¹⁸ assessed the association of cigarette smoking with development of hearing impairment (loss of 30 dB at 1000 Hz and 40 dB at 4000 Hz) in 1554 non-hearing-impaired Japanese male office workers who ranged in age from 30 to 59 years. After controlling for potential predictors of hearing impairment, the relative risk for low-frequency hearing impairment compared with never smokers was 1.12 for ever-smokers, 1.21 for current smokers of 1 to 20 cigarettes/day, 1.35 for current smokers of 21 to 30 cigarettes/day, and 1.82 for

current smokers of 31 or more cigarettes/day. The respective multivariate-adjusted relative risks for high-frequency hearing impairment compared with never smokers were 1.70, 1.82, 2.00 and 2.20. As the number of pack-years of exposure increased, the risk for high-frequency hearing impairment increased in a dose-dependent manner but the risk for low-frequency hearing impairment did not. Results indicated that cigarette smoking is highly associated with development of high-frequency hearing impairment.

Conclusion

Tobacco addiction is associated with increased risk of developing sensorineural hearing loss.

References

1. Siegelaub AB, Friedman GD, Kedar A, Seltzer CC: Hearing loss in adults. Relation to age, sex, exposure to loud noise, and cigarette smoking. *Arch Environ Health* 1974, 29:107-109.
2. Friedman GD, Siegelaub AB, Seltzer CC: Cigarette smoking and exposure to occupational hazards. *Am J Epidemiol* 1969, 98:175-183.
3. Virokannas H, Anttonen H: Dose-response relationship between smoking and impairment of hearing acuity in workers exposed to noise. *Scand Audiol* 1995, 24:211-216.
4. Barone JA, Peters JM, Garabrant DH, Bernstein L, Krebsbach R: Smoking as a risk factor in noise-induced hearing loss. *J Occup Med* 1987, 29:741-745.
5. Brant LJ, Gordon-Salant S, Pearson JD, Klein LL, Morrell CH, Metter EJ, Fozard JL: Risk factors related to age-associated hearing loss in the speech frequencies. *J Am Acad Audiol* 1996, 7:152-160.
6. Karlsmose B, Lauritzen T, Engberg M, Parving A: A five-year longitudinal study of hearing in a Danish rural population aged 31-50 years. *Br J Audiol* 2000, 24:47-55.
7. Boffetta P, Hecht S, Gray N, Gupta P, Straif K: Smokeless tobacco and cancer. *Lancet Oncol* 2008, 9:667-675.
8. Reddy KS, Gupta PC: Tobacco control in India New Delhi: Government of India, Ministry of Health; 2004.
9. Gaur K, Kasliwal N, Bhandari A, Amisha B, Gupta VP, Gupta R: Changing trends in otorhinolaryngological diseases at a non-government clinic at Jaipur. *Ind J Otolaryngol Head Neck Surg* 2009, 61:173-178.
10. Adair-Bischoff CE, Sauve RS: Environmental tobacco smoke and middle ear disease in preschool-age children. *Arch Pediatr Adolesc Med* 1998, 152:127-133.
11. Beaglehole R, Ebrahim S, Reddy S, Voute J, Leeder S: Chronic disease action group. Prevention of chronic diseases: a call to action. *Lancet* 2007, 370:2152-2157.
12. Shafey O, Eriksen M, Ross H, Mackay J: The Tobacco Atlas. 3 edition. Atlanta: American Cancer Society; 2009.
13. Bartecchi CE, MacKenzie TD, Schrier RW: The human costs of tobacco use. *N Engl J Med* 1994, 330:907-912.
14. Adair-Bischoff CE, Sauve RS, Kimberley B, Brant R: Smoking and middle ear disease. *Otolaryngol Head Neck Surg* 1996, 114:837-840. 4. Aligne CA, Stoddard JJ: Tobacco and children. *Arch Paediatr Adolesc Med* 1997, 151:648-653.
15. Itoh A, Nakashima T, Arai H, Wakai K, Tamakoshi A, Kawamura T, Ohno Y. Smoking and drinking habits as risk factors for hearing loss in the elderly: epidemiological study of subjects undergoing routine health checks in Aichi, Japan. *Public health*. 2001 May 1;115(3):192-6.
16. Paschoal CP, Azevedo MF. Cigarette smoking as a risk factor for auditory problems. *Brazilian journal of otorhinolaryngology*. 2009 Dec;75(6):893-902.
17. Wild DC, Brewster MJ, Banerjee AR. Noise-induced hearing loss is exacerbated by long-term smoking. *Clin Otolaryngol*. 2005; 30(6):517-20.

18. Nakanishi N, Okamoto M, Nakamura K, Suzuki K, Tatara K: Cigarette smoking and risk for hearing impairment: a longitudinal study in Japanese male office workers. *J Occup Environ Med* 2000, 42:1045-1049.