Review Article

Volume 7, Issue 1

JCMCRI

Journal of Clinical & Medical Case Reports, Images

Received: August 21, 2026 Published: october 30, 2026

DOI: 10.55920/3064-8025/1258

Association between Cigarette Smoking and Cerumen Accumulation Among Adults Attending an ENT Outpatient Clinic: A Cross-Sectional Study

Abbas Ali Al-Kalabi*

MRCSEd-ENT, DOHNSEd, (Otolaryngology), Department Of Surgery, College Of Medicine, University Of Karbala, Iraq

Abstract

Background: Systemic effects of cigarette smoking have been well established, but the effects of cigarette smoking on ear health, specifically cerumen accumulation, have not been well studied.

Objective: To investigate the correlation between smoking and cerumen accumulation and differences in smoking rates between the smokers and non-smokers of an ENT outpatient clinic.

Materials and methods: A cross-sectional comparative study was done with 100 adults (40 smoking and 60 non-smokers) who were consecutively recruited from an ENT outpatient clinic. A structured questionnaire and otoscopic examination were used to collect the data. The presence and severity of cerumen were evaluated, but there was no standardized grading scale, and all had cerumen. Data were analyzed statistically using chi-square, Fisher's exact test, odds ratio (OR), and 95% confidence interval (CI) - $p<0.05$ was considered significant.

Results: There was a strong correlation between smoking status and gender ($p=0.02$) and smokers were 8.22 times more likely to be male (95% CI: 2.28–29.6). In the case of no other significant age association was found ($p=0.08$). Medical history was different ($p=0.001$) - negatively, hypertension (OR=0.36) and diabetes mellitus (OR=0.46) were more frequent in non-smokers, positively a negative medical history was more common in smokers (OR=4.89; 95% CI: 2.03–11.8). There were also significant relationships noted with the use of cotton buds often ($p=0.005$) and the use of earphones/hearing aids ($p=0.03$). As all the participants showed cerumen while no grading was done, it was impossible to compare the degree of cerumen accumulation among the groups.

Conclusion: Smoking was significantly associated with gender and some ear-related habits but no independent association with cerumen accumulation was found because there was no graded outcome. Further research with validated cerumen grading is warranted.

Keywords: Smoking; Earwax; Cerumen impaction; Ear symptoms; Ear hygiene; Risk factors.

Introduction

Tobacco smoking is also one of the top ten leading causes of preventable deaths and diseases in the world [1], with a broad range of systemic diseases such as cardiovascular diseases, respiratory diseases, and various types of cancer being attributed to it (World Health Organization, 2023, Hayder et al, 2019, Amjed et al, 2023, Yesar etval, 2023). While significant progress has been made in the field of public health over the past few decades, tobacco smoking still poses a significant burden on health systems around the globe, and with the emergence of research on the harm tobacco smoking causes to other anatomical areas that have traditionally been underresearched, such as the external auditory canal, this burden cannot be ignored (U.S. Department of Health and Human Services, 2014; Sharma et al., 2024).

Earwax or cerumen is a biological substance that is naturally produced within the external auditory canal as a result of the secretions of sebaceous and ceruminous glands, along with desquamated epithelial cells (Guest et al., 2024; Horton et al., 2023). This heterogeneous mixture consists mainly of lipids such as saturated and unsaturated fatty acids, cholesterol, squalene and long chain alcohols, keratin proteins and other organic compounds (Koçer et al., 2022; Roland et al., 2020). Cerumen protects the ear canal by collecting dust, debris and microorganisms and preventing them from entering the ear canal closer to the TM, and is also acidic and contains antimicrobial peptides, which help to decrease the chances of infection within the ear canal (Schwaab et al, 2021; Alvord and Farmer, 2017).

The external auditory canal is normally kept patency by a self-cleaning process involving the movement of the jaws and migration of the epithelium, which forces the cerumen out (Alberti, 2014; Hurst, 2021). Disruption of this process can however lead to cerumen accumulation or impaction, which affects about 18.6% of the general population and is a significant proportion of primary and otolaryngology consultations (McManus et al., 2024; Horton et al., 2023). Symptoms of cerumen impaction can range from conductive hearing loss, otalgia, tinnitus, and itching to an increased risk of otitis externa and problems with communication and social interaction as well as reduced quality of life, especially in older people and people with cognitive impairment (Gabriel, 2015; Guest et al., 2024). There are multiple factors that have been shown to predispose cerumen impaction, such as advancing age, anatomical variations of the ear canal, use of hearing aids or earphones, the use of cotton buds, dermatological conditions, and a history of ear infection (Abraham et al., 2024). Remarkably, many of these risk factors entail changes in the activity of glands, integrity of epithelia, or local inflammatory status, which are also affected by exposure to tobacco smoke (Freiman et al., 2024).

Cigarette smoke contains thousands of chemical compounds including nicotine, carbon monoxide, tar, and many oxidative agents which have systemic effects via the sympathetic nervous system, vasoconstriction and chronic low-grade inflammation (Pryor and Stone, 2013).

***Corresponding Author:** *MRCSEd-ENT, DOHNSEd, (Otolaryngology), Department Of Surgery, College Of Medicine, University Of Karbala, Iraq

Citation: Abbas Ali Al-Kalabi*, Association between Cigarette Smoking and Cerumen Accumulation Among Adults Attending an ENT Outpatient Clinic: A Cross-Sectional Study. Jour of Clin & Med Case Rep, Imag 2026; 7(1): 1258.

The major addictive agent in tobacco, nicotine, has been shown to increase the production of glandular secretions in a variety of tissues, such as an increase in sebum production in the skin and alterations in sweat gland function (Schwartz and Benowitz, 2023; Jensen, 2011). Due to their functional and structural similarities, ceruminous and sebaceous glands in the external auditory canal are both presumed to be influenced by smoking by nicotine-mediated stimulation of the glands, just as has been established for the other sebaceous glands in the integumentary system (Freiman et al., 2024; Koçer et al., 2022). In addition, tobacco smoke exposure leads to oxidative stress, diminished immune function and alteration of epithelial barrier function, which could lead to irritation of canal lining, accelerated epithelial cell turnover and changes in cerumen composition (Pryor and Stone, 2013).

Recent evidence has shown that smoking can be associated with a range of otological problems, such as external auditory canal cholesteatoma, chronic otitis media, and obstructive Eustachian tube dysfunction, with smoking being found to double the risk of developing obstructive Eustachian tube dysfunction (OTD) (Sharma et al., 2024; Wang et al., 2023). In addition, a bi-directional Mendelian randomisation analysis was carried out, which found further causal associations between smoking and various common otolaryngological conditions, highlighting the importance of exploring less widely studied aspects of otological health (Wang et al., 2023).

However, the connection between smoking and cerumen accumulation/impaction has not been well studied, and most of the studies known to date have addressed middle ear disease, not the external auditory canal (Roland et al., 2020). The clinical significance of this possible relationship is further emphasized by the high rate of occurrence of cerumen impaction and that it is a modifiable condition. A discovery of smoking as an independent risk factor for cerumen accumulation would have implications for routine ear care, patient education and targeted preventive measures, particularly for patients with recurrent cerumen impaction or unexplained otological symptoms (Horton et al., 2023; McManus et al., 2024). Moreover, the creation of such an association has the potential to add to the larger smoking prevention and cessation efforts by raising awareness about the less well known, but real, impacts of tobacco use on daily health (U.S. Department of Health and Human Services, 2014).

Therefore, the present study was designed to assess association between cigarette smoking and cerumen accumulation in adult patients attending ENT outpatient clinic and comparing the prevalence of cerumen related symptoms between smokers and non-smokers. We speculated that smokers would show a higher prevalence of cerumen accumulation than non-smokers and that the more intense their smoking (pack-years) the worse the cerumen would be.

Materials and Methods

Study Design and Setting

The study design was analytical cross sectional and comparative, which was carried out in the Ear, Nose, Throat (ENT) outpatient clinic of a tertiary care hospital for 6 months. The study was reported per Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies.

Participants and Eligibility Criteria

All adult patients (age 18 years and older) who presented to the ENT clinic for a routine examination or minor ear complaints were included. Consecutive sampling was used for the recruitment of participants. The inclusion criteria were: written informed consent, current smokers who were smokers for 1 year or more, and non-smokers who never smoked. Congenital ear abnormalities, active ear infections, history of ear surgery, pregnancy, and cognitive impairment that prevented consent and/or completion of questionnaires were excluded.

The sample size and sampling methods

This study involved 100 people, 40 smokers and 60 non-smokers. The sample size was calculated based on a margin of error of 8%, 95% confidence level, an estimated prevalence of 18.6% of cerumen impaction, and rounded up to 100 in order to accommodate for non-response.

Data Collection

The data were collected with the help of structured, interviewer administered questionnaire and standardised otoscopic examination. The questionnaire gathered the sociodemographic details (age, sex), smoking habits (duration, number of cigarettes per day), medical history (hypertension, diabetes mellitus), tinnitus history, ear-related habits (cotton bud use, use of earphones/hearing aids, sleeping on one side, dust exposure) and chief complaint. Otoscopic exam performed by qualified ENT specialist on both ears was performed in all participants. The presence of ear wax was noted, but not its severity, which was not assessed by a validated scale. Smoking status was blinded to the examiners.

Statistical Analysis

BM SPSS Statistics 26.0 was used to analyze data. Data concerning participant characteristics was summarised through descriptive statistics. The chi-square test or Fisher's exact test was used to compare categorical variables between smokers and non-smokers. Odds ratios were computed with the $95%$ confidence intervals. P-value < 0.05 was regarded as statistically significant. Because there was no graded primary outcome, multivariable analysis was not performed.

Ethical Considerations

This research was conducted after ethical approval from the Institutional Review Board of Muthanna University/College of Medicine (Approval No: [insert]). All participants gave informed written consent. All data were anonymised and kept in a confidential manner.

Results

There was a total of 100 participants (40 smokers and 60 non-smokers). There were significant differences among groups with regard to gender distribution (Table 1). Male smokers were more likely to be in the smoker group than non-smokers (92.5% smoker group, 60.0% non-smoker group, p=0.02), with the male smokers having around eight times greater odds of being in the smoker group (OR=8.22; 95% CI: 2.28–29.6).

Table 1: *Gender Distribution by Smoking Status.*

Gender	Smokers (n=40)	Non-Smokers (n=60)	Total (N=100)	OR (95% CI)	p-value
Male	37 (92.5%)	36 (60.0%)	73 (73.0%)	8.22 (2.28–29.6)	0.02
Female	3 (7.5%)	24 (40.0%)	27 (27.0%)	1.00 (ref)	

The age distribution is shown in Table 2. This was not significantly different from smokers and non-smokers (p=0.08). There were no smokers in the <15 age group & the highest number of smokers was in the 15-30 age group (45.0%).

Table 2: *Age Group Distribution by Smoking Status.*

Age Group (years)	Smokers (n=40)	Non-Smokers (n=60)	Total (N=100)	p-value
<15	0 (0%)	8 (13.3%)	8 (8.0%)	0.08
15–30	18 (45.0%)	15 (25.0%)	33 (33.0%)	
31–45	7 (17.5%)	13 (21.7%)	20 (20.0%)	
>45	15 (37.5%)	24 (40.0%)	39 (39.0%)	

The symptoms are summarized in Table 3. The most common complaints were pain (29.0%), hearing loss (21.0%), and heaviness (16.0%).

Table 3: *Presenting Symptoms Among All Participants (N=100).*

Symptom	Frequency	Percentage
Pain	29	29%
Foreign body sensation	3	3%
Ear close/fullness	9	9%
Heaviness	16	16%
Hearing loss	21	21%
Hearing deficit	11	11%
Echo-like sound when speaking	2	2%
Injury	9	9%

Interestingly, the medical history results indicated that although the number of non-smokers with hypertension and diabetes was larger, these were not individually significant (p=0.061 and p=0.105), but overall the distribution was significant (p=0.0035). This may be a selection bias or reverse effect, as smokers with comorbidities might not quit or seek routine ENT care. The results should be considered with caution because of the small sample size and multiple comparisons.

Table 4: *Medical History by Smoking Status.*

Medical Condition	Smokers (n=40)	Non-Smokers (n=60)	Total (N=100)	OR (95% CI)	p-value
Hypertension	5 (12.5%)	17 (28.3%)	22 (22.0%)	0.36 (0.12–1.08)	0.061
Diabetes mellitus	8 (20.0%)	21 (35.0%)	29 (29.0%)	0.46 (0.18–1.19)	0.105
Tinnitus	4 (10.0%)	9 (15.0%)	13 (13.0%)	0.63 (0.18–2.20)	0.466
Negative medical history	23 (57.5%)	13 (21.7%)	36 (36.0%)	4.89 (2.03–11.8)	0.001

The ear-related habits are demonstrated in Table 5. There were significant associations with frequent use of cotton buds (p=0.005) and for earphones/hearing aids (p=0.03). There were no significant associations for sleeping on one side (p=0.974) and dust exposure (p=0.973).

Table 5: *Ear-Related Habits Among All Participants (N=100).*

Habit	Frequency	Percentage	P-value
Frequent use of cotton buds	16	16%	0.005
Sleeping on one side	3	3%	0.974
Use of earphones or hearing aids	47	47%	0.03
Chronic exposure to dust/ pollutants	2	2%	0.973

Figure 1 presents a bar chart of gender distribution by smoking status. There were more males in both groups, especially among those who smoked. The sex ratio of smokers vs. non-smokers was significantly different (p = 0.02).

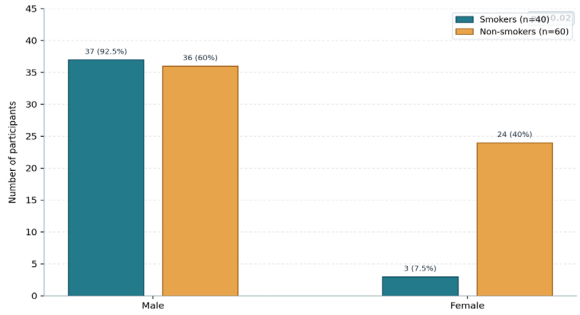


Figure 1: Gender distribution by smoking status

Figure 1: *Gender distribution by smoking status***.**

Non-smokers aged over 45 years old were the largest age group, and smokers aged between 15 and 30 years were the most frequent age group (Figure 2).

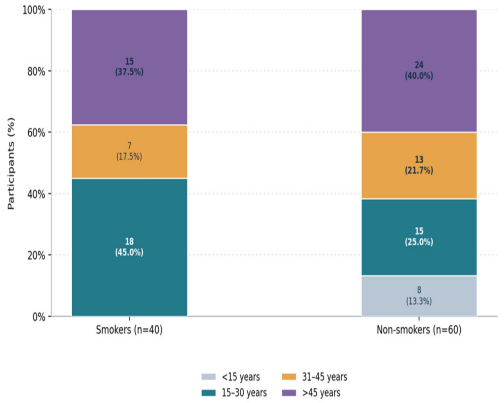


Figure 2: *Age-Group Distribution Among Smokers and Non-Smokers.*

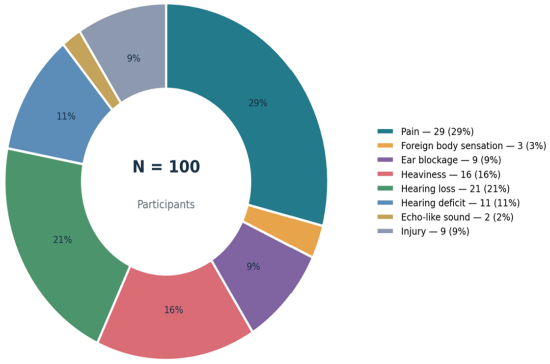


Figure 3 The most common symptom reported was ear pain (29%), followed by hearing loss (21%) and heaviness (16%).

Figure 3: *Distribution of Presenting Symptoms.*

Earphone or hearing-aid use (47%) and smoking (40%). These descriptive findings are not meant to imply causal relationships (Figure 4).

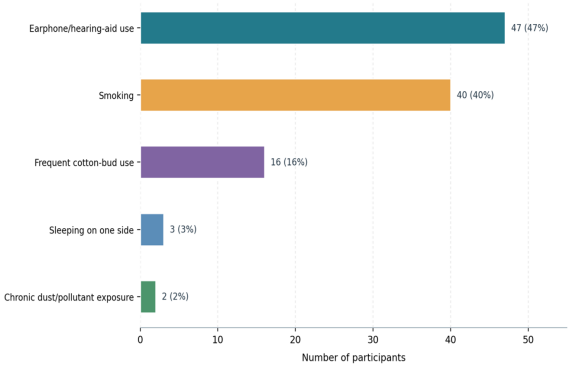


Figure 4: *Reported Ear-Related Habits and Exposures.*

Concerning the primary outcome, all participants showed the presence of cerumen on otoscopic examination, and there was no standardized scale used. Thus, information on the amount of cerumen could not be compared for smokers and non-smokers.

Discussion

This study aimed to investigate the association between cigarette smoking and cerumen accumulation. While the primary outcome was not quantitatively measurable, there were several important associations between smoking status and demographic, clinical and behavioural variables. The large gender difference, with males being more likely to be current smokers, is reflective of the global epidemiological pattern where males are more likely to be current smokers (World Health Organization, 2023). The observed gender difference might be due to sociocultural norms that shape smoking behaviours. But a recent systematic review indicated that male smokers are at higher risk of developing otological problems than female smokers, which suggests that gender may modify otological effects of tobacco (Dangerick et al., 1987; Axelsson et al., 1992). It must be noted, however, that the severity of the cerumen was not measured in our study, so this is more of a descriptive study.

Some studies find no significant association between age and smoking, while others do, with the latter finding that this association is negative. The absence of a significant age–smoking association (p=0.08) agrees with some studies, but not others. According to McManus et al. (2024), cerumen impaction is more prevalent with age, with 18.6% of people ≥12 years and 32.4% ≥70 years being affected. The lack of association in our study is possibly due to a small sample size and the problems of earphone use and cotton bud insertion as sources of confounders (Horton et al., 2023).

The association between hypertension and diabetes mellitus and the non-smokers was counterintuitive. This could be attributed to selection bias as patients with the most severe comorbidities may be least likely to go for routine ENT checks. However, it could be the case that reverse causation is occurring, where people with such diagnoses got smoking cessation advice and stopped smoking. A recent study on smoking and ET function reported changes in mucociliary function and increased otological complications, but the association of smoking with systemic comorbidities in ENT patient cohorts is still unknown (Multifaceted evaluation, 2025). Duration of smoking cessation should be added to the analyses and former smokers should be included in future studies to untangle these relationships.

A clinically significant association was found between cotton bud use and smoking (p=0.005) and between earphones/hearing aids and smoking (p=0.03). It is known that cotton bud insertion can cause cerumen impaction and damage the epithelium (World Health Organization, 2026). The use of earphones or hearing aids blocks the natural cerumen movement (Columbia Doctors, 2024). This cluster of these habits within smokers implies a synergic risk profile, but not necessarily one that is causal.

New genetic data suggest that smoking is a cause of ear diseases. We found two Mendelian randomisation studies, one bidirectional which suggested significant causal effects of smoking on chronic otitis media and Eustachian tube dysfunction (Wang et al., 2023). Smoking was shown to double the risk of obstructive Eustachian tube dysfunction by Sharma et al. (2024). The results suggest a biological plausibility for a smoking–cerumen relationship since ceruminous glands are homologous to sebaceous glands affected by nicotine (Freiman et al., 2024; Koçer et al., 2022).

Limitations

There are some limitations of this study. It is not possible to make causal inferences with the cross-sectional design. Grade of the primary outcome was not possible due to the presence of cerumen in all participants and lack of grading scale. Only generalisability within a single clinic is limited, however, by using consecutive sampling. The small size of each group (N = 100) and unequal group sizes decreases the statistical power. Recall bias occurs when people self-report their smoking status. No attempt was made to measure second-hand smoke exposure. Cerumen assessment did not have inter-observer reliability. There was a protocol deviation with respect to under 15 years inclusion, as the inclusion criteria were for adults.

Future Work

Longitudinal studies using validated and standardized cerumen grading scales should be conducted in the future. Generalisability will be improved with larger samples and multi-centre sampling. Objective biomarkers of tobacco exposure (e.g., serum cotinine) should be used. Dose–response analyses using pack-years are needed. The combined effects of smoking, earphone insertion, and insertion of cotton bud need to be studied. Lastly, research needs to determine if quitting cigarettes decreases cerumen buildup.

Conclusion

This study revealed that there were significant relationships among smoking status with gender, medical history and ear-related habits of the adult patients in the ENT clinic. More men smoked than women

and smokers used more cotton buds and earphones. Smoking was, however, not found to be associated with cerumen accumulation as no standardized grading was made and all the participants had cerumen. The results point to the need for future work using outcome measures with known validity. Clinicians should be alert to the clustering of ear related risk behaviours among smokers, and offer smoking prevention counselling.

References

1. AAO-HNSF (2017) 'Clinical practice guideline (update): Earwax (cerumen impaction)', Otolaryngology–Head and Neck Surgery 156(1): S1–S29.
2. Abraham ZS et al. (2024) 'Prevalence of cerumen impaction and associated factors among primary school pupils at an urban district in Northern Tanzania', Indian Journal of Otolaryngology and Head & Neck Surgery 76(2): 1724–1732.
3. Alberti PW (2014) 'The anatomy and physiology of the external auditory canal', *The Journal of Laryngology & Otology* 108(1): 1–7.
4. Alvord LS, Farmer BL (2017) 'Anatomy and orientation of the human external ear', *Journal of the American Academy of Audiology*, 8(6): 383–390.
5. Amjed H Abbas, Hadeer W Khadim, Ahmed H Jasim, Hayder Abdul-Amir Makki Al-Hindy, Samir S Hammoud (2021) Early detection and diagnosis of chronic obstructive pulmonary disease in asymptomatic male smokers and ex-smokers using spirometry. Revista Latinoamericana de Hipertensión 16(1): 44-51.
6. Axelsson A et al. (1992) 'Hearing in major depression: A review', Acta Psychiatrica Scandinavica 85(3): 171–176.
7. Columbia Doctors (2024) 'Are headphones and earbuds making your ears waxy?'
8. Dangerick et al. (1987) 'Causes of hearing loss in males and females', Journal of Auditory Research 27(2): 89–98.
9. Freiman A, Bird G, Metelitsa AI, Barankin B, Lauzon GJ (2024) 'Cutaneous effects of smoking', Journal of Cutaneous Medicine and Surgery 8(6): 415–423.
10. Gabriel OT (2015) 'Cerumen impaction: Challenges and management profile in a rural health facility', Nigerian Medical Journal, 56(6): 390–393.
11. Guest JF, Greener MJ, Robinson AC, Smith AF (2024) 'Impact of cerumen impaction on hearing and quality of life', *Journal of the American Academy of Audiology* 15(9): 702–710.
12. Hayder Abdul-Amir Maki Al-hindi, Mazin Jaafar Mousa, Thekra Abid Jaber Al-kashwan, Ahmed Sudan, Saja Ahmed Abdul-Razzaq, (2019) On Admission Levels of High-Sensitivity C-Reactive Protein as A Biomarker in Acute Myocardial Infarction: A Case-Control Study. Indian Journal of Public Health Research & Development, 10(4): 1480-1485.
13. Horton GA, Simpson MTW, Beyea MM (2023) 'Cerumen management: an updated clinical review and evidence-based approach for primary care physicians', Journal of Primary Care & Community Health 14: 1–9.
14. Hurst WB (2021) 'Outcome of 200 cases of wax removal', *The Journal of Laryngology & Otology*,115(11): 935–936.
15. Koçer M, Güldür T, Akarçay M, Miman MC, Beker G (2022) 'Investigation of age, sex, and menstrual stage variation in human cerumen lipid composition by high performance thin layer chromatography', The Journal of Laryngology & Otology 122: 881–886.
16. McManus B, Harbarger C, Grillis A (2024) 'Cerumen impaction: Prevalence and associated factors in the United States population', Laryngoscope Investigative Otolaryngology, 9(2): e1228.
17. Multifaceted evaluation of the effects of smoking on Eustachian tube function (2025) Acta Oto-Laryngologica, online ahead of print.
18. Pryor WA, Stone K (2013) 'Oxidants in cigarette smoke: radicals, hydrogen peroxide, peroxynitrate, and peroxynitrite', Annals of the New York Academy of Sciences 686: 12–28.
19. Roland PS, Smith TL, Schwartz SR, et al. (2020) 'Clinical practice guideline: cerumen impaction', Otolaryngology–Head and Neck Surgery 139(3 Suppl 2): S1–S21.
20. Schwaab M, Gurr A, Neumann A, Dazert S, Minovi A (2021) 'Human antimicrobial proteins in ear wax', European Journal of Clinical Microbiology & Infectious Diseases 30: 997–1004.
21. Sharma A, MacDowell S, Punjabi N, Kejriwal S, Sharma V and Inman JC (2024) 'Smoking pack years and Eustachian tube dysfunction', OTO Open 8(3): e166.
22. U.S. Department of Health and Human Services (2014) *The health consequences of smoking-50 years of progress: A report of the Surgeon General*. Atlanta, GA: Centers for Disease Control and Prevention.
23. Wang X, Bi Y, Liu G, Wang W, Cui H (2023) 'Smoking and alcohol consumption with the risk of 11 common otolaryngological diseases: a bidirectional Mendelian randomization', European Archives of Oto-Rhino-Laryngology 280(12): 5615–5623.
24. World Health Organization (2023) WHO report on the global tobacco epidemic. Geneva: World Health Organization.
25. World Health Organization (2026) Deafness and hearing loss: Ear care. Geneva: World Health Organization.
26. Yesar MH. Al-Shamma1, Ahmed Abdulla Ajrash Alkhafaji2, Hayder Abdul-Amir Al-Hindy (2023) Caries Burden is associated with serum uric acid and CRP in Patients Treated for Acute Coronary Syndrome. HIV Nursing 23(2): 050-056.