

# Prevalence of Eustachian Tube Dysfunction and Its Associated Factors among the General Public in Aseer Region, Saudi Arabia

Ali Alshehri <sup>1</sup>, Lujain K. Bukhari <sup>2</sup>, Shatha A. Almasswary <sup>2</sup>, Sahar M. Alotaibi <sup>2</sup>, Raghad Y. AlQahatani <sup>3</sup>, Hasnaa A. Althumairy <sup>2</sup>, Enas A. Al Mudawi <sup>2</sup>

(1) Consultant Otolaryngology, Head and Neck Surgery, College of Medicine, King Khalid University, Abha, Saudi Arabia

(2) Medical intern, College of Medicine, King Khalid University, Abha, Saudi Arabia

(3) Medical student, College of Medicine, King Khalid University, Abha, Saudi Arabia

## Correspondence:

Shehata Farag

Email: shehatafarag@yahoo.com

Received: December 2023. Accepted: December 2023; Published: January 1, 2024.

Citation: Ali Alshehri et al. Prevalence of Eustachian Tube Dysfunction and Its Associated Factors among the General Public in Assir Region, Saudi Arabia. World Family Medicine. December 2024; 22(1): 31-36. DOI: 10.5742/MEWFM.2024.95257003

## Abstract

**Introduction:** The Eustachian tube connects the middle ear to the back of the nose. When it doesn't function properly, it's called Eustachian Tube Dysfunction (ETD). This can lead to symptoms like muffled hearing, popping sounds, and discomfort. Recent studies in Saudi Arabia found high ETD prevalence rates (around 42.49%). ETD can cause ear issues and impact daily life. This study aims to evaluate the prevalence and associated factors of ETD in the Aseer region, Saudi Arabia.

**Methodology:** A descriptive cross-sectional questionnaire-based study was conducted among the population of Aseer region in Saudi Arabia. Data was collected through an online self-administered questionnaire (ETDQ-7). Data was analyzed using SPSS.

**Results:** Only 4% of participants had a history of Eustachian tube dysfunction. Hearing loss was reported by 27.3%, with 23.3% having a family history of it. Gender-wise, 31.86% of females and 17.71% of males had a history of hearing loss, the difference being statistically significant ( $p=0.007$ ). Smoking exhibited a strong correlation, with 60.98% of smokers and 22.01% of non-smokers reporting hearing loss, the difference being highly significant ( $p=0.0001$ ). Ear-related issues were prevalent, such as severe pain (41%), underwater sensation (36%), and cold-related problems (23%). Additionally, symptoms like cracking sounds (12%), ringing (16%), and muffled hearing (22%) were noted, sometimes affecting both ears (29%).

**Conclusion:** A significant association was found between smoking and hearing loss. Gender and smoking habits showed significant correlations with hearing loss. The low prevalence of ETD warrants further investigation. These findings contribute to the existing body of knowledge on auditory health and could inform targeted interventions for hearing-related issues in the region.

## Keywords

Eustachian Tube, Dysfunction, Prevalence, Risk factors, population, Saudi Arabia

## Introduction

The Eustachian tube is a tubular structure that connects the middle ear to the back of the nose. It facilitates mucociliary clearance, middle ear ventilation, pressure equalization, and preventing sound and fluid reflux from the nasopharynx. Eustachian tube dysfunction, a common diagnosis in some conditions where the eustachian tube is unable to perform its functions adequately, will result from any kind of deficiency on this tube and cause negative pressure, muffled hearing “popping” sounds, tinnitus, aural fullness, and otalgia (1, 2).

ETD is one of the most prevalent complaints in general otolaryngology practice. ETD is well-studied in children but is not well-defined in the older age group (3). According to Vila et al, we need to understand the incidence, prevalence, and associated risk factors of adult ETD to be able to provide optimal regimens for these patients (4). ETD can lead to a number of middle ear disorders for example, cholesteatoma, otitis media with effusion (OME), and tympanic membrane atelectasis, which can cause long-term impacts, like communication difficulties and decreased productivity, that might lead to low quality of life (5). Environmental factors and cigarette smoking have been linked to ETD, due to a disruption in the eustachian tube's mucociliary clearance mechanism (6).

ETD and associated problems are linked to 2.6 million visits from patients under the age of 20 and 2 million from patients above the age of 20, per year, to clinics (4). Additionally, ETD may result in several middle ear conditions, including cholesteatoma, tympanic membrane atelectasis, and otitis media with effusion (OME).

Adults with ETD can suffer from it alone or in conjunction with a range of inflammatory diseases of the aerodigestive tract (3). A disruption in the eustachian tube's mucociliary clearance system, environmental factors, and smoking have been proposed as potential causes of ETD.

Children who live in homes where at least one parent smoked were more likely to need surgical management of OME, according to preliminary research examining the risk factors for ETD in children and the requirement for tympanostomy tube installation for the treatment of RAOME (7).

Treatments for ETD include advice, early observation, prescription medications such as steroids, and in certain situations, a referral for surgery (6).

ET dysfunction is identified using a combination of clinical history, physical examination, tympanometry, audiometry, and other procedures (8). It has never been easy to define appropriate diagnostic protocols and tests, as well as criteria for identifying those suffering from ETD.

There have been reports of several tools to evaluate eustachian tube function. However, the use of eustachian tube function testing is restricted due to the requirement

for costly equipment and trained personnel, both of which are typically found at specialized medical facilities (9).

It has recently been confirmed that the seven-item Eustachian Tube Dysfunction Questionnaire (ETDQ-7) significantly discriminates against patients with ETD. It consists of a total of seven questions with answers ranging from 1 (no problem) to 7 (severe problem) on a Likert scale. It has been noted that a score of 14.5 offers 100% sensitivity and 100% specificity for ETD, even though the maximum overall score is 49 (10).

Relevant studies have been conducted in three regions of Saudi Arabia. According to Alshamrani et al, the prevalence of ETD among the study population of Almadinah, Saudi Arabia with 380 participants was 41.3%. Female gender was significantly associated with the prevalence of ETD (11). A study by Altalhi et al in Taif, Saudi Arabia revealed a prevalence of 21.1% in a total of 693 participants, participants with a family history of hearing loss and smoking showed approximately doubled risk for having ETD (5). Another recent study was conducted in Jeddah, Saudi Arabia by Alshehri et al with 2,372 participants and showed the prevalence of ETD at approximately 42.49%; the risk of ETD was higher in females (9).

Understanding the prevalence of disease in the general population is helpful in determining whether community services are required now or in the future. To the best of our knowledge, research on the prevalence of ETD in the community has not yet been conducted in Aseer, Saudi Arabia. The purpose of this study is to assess the prevalence of ETD in the Aseer region, and its contributing factors.

## Methods

In this cross-sectional study data was collected by the purposely constructed questionnaire. The questionnaire was composed of demographic items and items related to hearing loss and risks. The questionnaire was constructed after a series of discussions between the panel of experts. The panel was composed of a subject specialist, a researcher, and language expert. Cronbach alpha of the questionnaire was calculated. The study was conducted in the Aseer region of Saudi Arabia.

After the collection of data, data was coded and entered in the SPSS ver.20 software for analyses of descriptive statistics (mean standard deviation, frequencies, and percentages were computed), to measure the significant differences chi-square test was used at a 5% level of significance. Data were collected from patients who visited the primary health care, after giving their consent, through an electronic version of the questionnaire, or paper version.

## Results

**Table 1: Demographic factors**

Demographic factors	N	%
Female	204	68%
Male	96	32%
Underweight	85	28%
Normal weight	120	40%
Overweight	95	32%
Smoker	41	14%
Non-smoker	259	86%

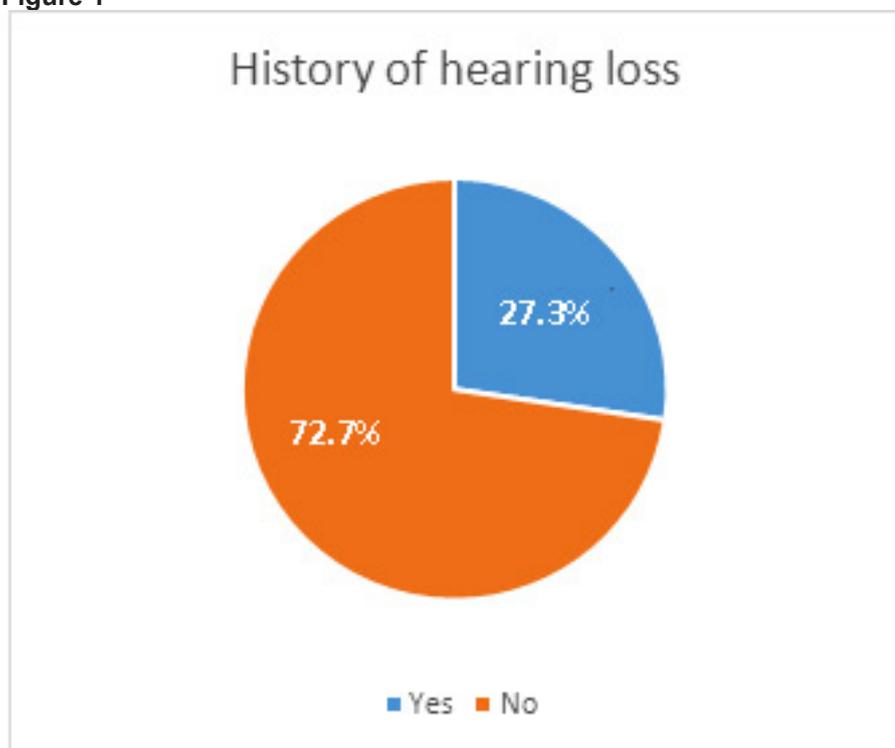
The Cronbach alpha of the questionnaire was 0.84. Out of 300 total respondents, 68% were females while 32% were males, with mean (SD) of age 48.9 (14.2). As per BMI analysis 28% were underweight, 40% had normal weight while 32% were overweight. 14% were smoking.

**Table 2**

History of Eustachian tube dysfunction	N	%
Yes	12	4.0%
No	288	96.0%

As per table 2 only 4% had a history of Eustachian tube dysfunction.

**Figure 1**



As per Figure 1, 27.3% had a hearing loss history; the rest had no history.

Table 3

Family History of hearing loss	N	%
Yes	70	23.3%
No	230	76.7%

As per table 3, 23.3% had a family history of hearing loss.

Table 4

Variables		History of Hearing loss				Total	p
		Yes		No			
		Freq.	%	Freq.	%		
Gender	Female	65	31.86%	139	68.14%	204	0.007
	Male	17	17.71%	79	82.29%	96	
BMI	Underweight	45	52.94%	40	47.06%	85	0.189
	Normal weight	15	12.50%	105	87.50%	120	
	Overweight	22	23.16%	73	76.84%	95	
Smoking	Smoker	25	60.98%	16	39.02%	41	0.0001
	Non-smokers	57	22.01%	202	77.99%	259	

Table 4 presents a comparison between demographic factors and smoking habits with a history of hearing loss. Gender distribution among participants reveals that 65 females (31.86%) and 17 males (17.71%) had a history of hearing loss, while 139 females (68.14%) and 79 males (82.29%) did not. This gender discrepancy yielded a statistically significant p-value of 0.007. Regarding Body Mass Index (BMI), 45 individuals were classified as underweight (52.94%), 15 with normal weight (12.50%), and 22 categorized as overweight while (23.16%) reported a history of hearing loss. In contrast, 40 underweight individuals (47.06%), 105 with normal weight (87.50%), and 73 overweight individuals (76.84%) did not report such a history. However, the BMI factor did not yield a statistically significant difference in terms of hearing loss ( $p = 0.189$ ). The most notable distinction emerged from the smoking habits. Among smokers, 25 participants (60.98%) reported a history of hearing loss, whereas 16 (39.02%) did not. In contrast, among non-smokers, 57 (22.01%) reported hearing loss history, while a larger proportion of 202 (77.99%) did not. The smoking factor exhibited a highly significant p-value of 0.0001.

Table 5

Factors	No problem		Moderate problem		Severe problem	
During the past 1 month, did you feel pressure in the ears?	105	35%	135	45%	60	20%
During the past month, did you feel pain in the ears?	96	32%	81	27%	123	41%
During the past month, did you feel your ears are clogged or "underwater"?	147	49%	45	15%	108	36%
During the past month, did you have ear problems when you had a cold or sinusitis?	174	58%	57	19%	69	23%
During the past month, did you feel crackling or popping sounds in the ears?	186	62%	78	26%	36	12%
During the past month, did you feel ringing in the ears?	222	74%	30	10%	48	16%
During the past month did you feel your hearing is muffled?	189	63%	45	15%	66	22%
During the past month, did you get these symptoms in one ear only or both ears?	135	45%	78	26%	87	29%

As per table 5, 20% felt severe problems in the ear, 41% felt severe pain in the ear, 36% felt ear 'underwater' in a severe condition, 23% felt severe problems in their ears during cold, 12% felt severe crackling sound in the ear, 16% felt severe ringing in their ears, while severe muffled hearing was felt by 22%, and 29% felt these symptoms in both ears severely.

## Discussion

Our study investigated the prevalence of Eustachian Tube Dysfunction (ETD) and its associated factors among the general public in the Aseer region, Saudi Arabia. The study population consisted of 300 respondents. The study population was predominantly female (68%), indicating that women were more likely to participate in the study. The mean age of 48.9 years suggests that the study sample is relatively older. This age distribution could be important in assessing how age influences ETD prevalence and its associated factors.

The BMI analysis provides insight into the weight distribution within our study population. The prevalence of underweight individuals (28%) might raise questions about potential associations between ETD and lower BMI. The prevalence of overweight individuals (32%) might also indicate a need to explore any potential correlation between excess weight and ETD. The finding that 14% of participants were smokers could be an interesting aspect to explore further. Smoking is often associated with various health issues, including respiratory problems, which might potentially contribute to ETD (1).

The observed prevalence of Eustachian tube dysfunction (ETD) among respondents in the Aseer region, which stands at 4%, appears to be notably lower than the figures reported in earlier studies. For instance, Alshehri et al. (2020) found a prevalence rate of 42.5% in a similar population (2). Additionally, the work of Altalhai et al. (2022) reported a higher prevalence of 21.1% in a neighboring region. This discrepancy suggests that ETD might indeed be less common in the general population of the Aseer region, as indicated by the relatively low prevalence in the current study.

Our study illustrates that 27.3% of participants had a history of hearing loss, whereas the majority did not report any such history. This observation underscores the significance of investigating potential factors linked to hearing loss within the studied population. In parallel studies, similar proportions have been reported, highlighting the consistency of this trend across different research contexts (4).

Regarding family history of hearing loss, 23.3% of the participants had a family history of hearing loss. This finding supports the notion of a potential genetic component influencing hearing issues within the population, which is consistent with prior research (9). These previous studies have also suggested a hereditary basis for certain hearing problems, further emphasizing the relevance of genetics in understanding hearing loss (5).

Regarding the comparison of demographic factors and smoking habits with a history of hearing loss, provided interesting insights. A statistically significant gender discrepancy was observed, where a higher percentage of females (31.86%) had a history of hearing loss. This observation warrants further investigation into potential gender-related susceptibility to hearing issues (3). While BMI did not yield a statistically significant difference in terms of hearing loss, the smoking factor exhibited a highly significant p-value. Smokers had a higher prevalence of hearing loss (60.98%) compared to non-smokers (22.01%). This correlation could be attributed to the detrimental effects of smoking on auditory health, which is consistent with prior studies (7).

Regarding the symptoms associated with ETD. A notable 20% of participants reported experiencing severe problems in their ears. This could suggest a significant incidence of underlying ear conditions or issues requiring medical attention. The high percentage (41%) of respondents reporting severe ear pain indicates that ear pain is a common and significant issue within this population (6). This may be linked to various factors such as infections, inflammation, or other medical conditions affecting the ears (8). The prevalence of 36% experiencing the sensation of their ears being underwater severely suggests a potential imbalance or pressure-related discomfort. This could relate to issues with the Eustachian tubes or sinus congestion. 23% of participants reporting severe ear problems during cold conditions points to a vulnerability of the ears to environmental changes, possibly indicating sensitivity to temperature fluctuations.

The presence of severe cracking sounds (12%) in the ears may be linked to issues with the middle ear or auditory system, warranting further investigation into potential causes. 16% of participants reported severe ringing sensations in their ears could indicate a higher prevalence of tinnitus within this population (10). This condition might have various causes, including exposure to loud noise or underlying health conditions. A significant 22% of participants reported severe muffled hearing suggesting that auditory clarity is a concern for a sizable portion of the participants. This could be due to factors such as earwax buildup, middle ear issues, or other auditory problems (11). The relatively high percentage (29%) of participants who experienced severe symptoms in both ears highlights the bilateral nature of these ear-related issues. This could indicate systemic or recurring problems affecting both ears.

## Limitations

Limitations of this study include the reliance on self-reported data, which might introduce recall bias and subjective interpretation of symptoms. Additionally, the study's cross-sectional design prevents establishing causal relationships between factors and Eustachian Tube Dysfunction (ETD) prevalence. The relatively small sample size and the single-region focus might limit the generalizability of findings to other populations. Despite these limitations, the study provides valuable insights into ETD prevalence and its associations.

## Conclusion

The significant association between smoking and hearing loss highlights the importance of public health interventions aimed at reducing smoking to protect auditory health. Gender and smoking habits showed significant correlations with hearing loss. The low prevalence of ETD warrants further investigation. These findings contribute to the existing body of knowledge on auditory health and could inform targeted interventions for hearing-related issues in the region. Further research is warranted to enhance our understanding of ETD's multifaceted nature and its implications for the studied region and beyond.

## References

1. Patel MA, Mener DJ, Garcia-Esquinas E, Navas-Acien A, Agrawal Y, Lin SY. Tobacco Smoke Exposure and Eustachian Tube Disorders in US Children and Adolescents. *PLoS One*. 2016;11(10):e0163926.10.1371/journal.pone.0163926.
2. Alshehri KA, Saggaf OM, Alshamrani HM, Alnefaie AM, Alghamdi KB. Prevalence of and Factors Associated With Eustachian Tube Dysfunction Among the Public in Jeddah, Saudi Arabia: Cross-Sectional Survey-Based Study. *Interact J Med Res*. 2020;9(4):e14640.10.2196/14640.
3. Corazzi V, Ciorba A, Skarżyński PH, Skarżyńska MB, Bianchini C, Stomeo F, et al. Gender differences in audio-vestibular disorders. *Int J Immunopathol Pharmacol*. 2020;34:2058738420929174.10.1177/2058738420929174.
4. Hamrang-Yousefi S, Ng J, Andaloro C. Eustachian Tube Dysfunction. *StatPearls*. Treasure Island (FL): StatPearls Publishing Copyright © 2023, StatPearls Publishing LLC.; 2023.
5. Martini A, Sorrentino F, Sorrentino U, Cassina M. Genetics & Epigenetics of Hereditary Deafness: An Historical Overview. *Audiol Res*. 2021;11(4):629-35.10.3390/audiolres11040057.
6. Shan A, Ward BK, Goman AM, Betz JF, Reed NS, Poe DS, et al. Prevalence of Eustachian Tube Dysfunction in Adults in the United States. *JAMA Otolaryngology–Head & Neck Surgery*.
7. Kumar A, Gulati R, Singhal S, Hasan A, Khan A. The effect of smoking on the hearing status-a hospital based study. *J Clin Diagn Res*. 2013;7(2):210-4.10.7860/jcdr/2013/4968.2730. 2019;145(10):974-5.10.1001/jamaoto.2019.1917.
8. Fireman P. Otitis media and eustachian tube dysfunction: connection to allergic rhinitis. *J Allergy Clin Immunol*. 1997;99(2):S787-97.10.1016/s0091-6749(97)70130-1.
9. Carpena NT, Lee MY. Genetic Hearing Loss and Gene Therapy. *Genomics Inform*. 2018;16(4):e20.10.5808/GI.2018.16.4.e20.
10. Alshamani MR, Alandijani HA, Alhussaini OM, Alharbi RA, Almeshaly SS, Alraddadi AF, et al. Prevalence of Eustachian Tube Dysfunction and Its Associated Factors Among the General Public in Al-Madinah, Saudi Arabia. *Cureus*. 2023;15(1):e33748.10.7759/cureus.33748.
11. Wright T. Ear wax. *BMJ Clin Evid*. 2015;2015