



## **Frequency of Involvement of Different Head and Neck Sites in Referred Otagia**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Authors AH and MFB designed the study, performed the statistical analysis, author SB wrote the protocol and wrote the first draft of the manuscript. Authors NI and ANB managed the analyses of the study. Author MM managed the literature searches. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Aim:** To find out the most frequent head and neck sites of origin of referred otalgia.

**Study Design:** Descriptive cross-sectional.

**Place and Duration of Study:** Study was conducted at the ENT department of Bahawal Victoria hospital Bahawalpur during January 2019 to December 2019.

**Methodology:** About 500 patients with ear ache were examined and after exclusion 150 were finally analyzed. Detailed history of the patient and clinical examination were done along with radio imaging and endoscopic studies wherever needed. Diagnosis of referred otalgia was made after having normal ear examination along with pathology lying at different head and neck region which share common sensory innervation. For analysis SPSS version-20 was used.

**Results:** The mean age of the study participants was 28.23 ±13 years. The majority of participants

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were having otalgia of tonsillar origin followed by dental origin and pharyngitis with 31.3%, 23.3% and 16% respectively. Very few of them having otalgia originating from hypopharyngeal carcinoma and laryngeal carcinoma i.e. 3.3% and 2% respectively. While only 4.7% of otalgia were of unknown origin. Female participants were having higher frequency of otalgia which is originated from diseases of temporomandibular joint, hypopharyngeal carcinoma and otalgia of unknown origin in comparison to male participants but differences were insignificant. Otalgia originated from tonsillar and dental causes and due to pharyngitis were most common among the younger age group but having non-significant p-value.

**Conclusion:** It has been concluded that the patients presenting with ear pain, have sometimes no underlying ear pathology. If the ear examination is normal then it is important to examine all other sites of head and neck which share sensory innervation with the ear including teeth, tonsils, pharynx, larynx, nose and paranasal sinuses to find out the exact cause of referred otalgia.

*Keywords: Ear pain; otalgia; referred pain.*

## 1. INTRODUCTION

Earache, medically termed as otalgia, is the most common symptom among the patients presenting in ENT OPD. Usually the pathology is within ear, called otogenic, but it become mysterious when there is no pathological findings in the ear and the site is other than the ear, referred non-otogenic [1]. The otalgia due to non-otogenic cause is also known as "referred otalgia". There are multiple etiological factors responsible for referred otalgia and the pain originate from multiple sites of head and neck because of the same sensory innervations. So the correct diagnosis required a better understanding of sensory innervation of head and neck region. The cranial nerves including 5<sup>th</sup>, 7<sup>th</sup>, 9<sup>th</sup> 10<sup>th</sup> and spinal nerves including C2 and C3 supplies ear along with other head and neck sites. The underlying mechanism of referred otalgia is unknown, one of the theory named as convergence projection theory, stated as there is a single converging point of multiple nerves which follow a common neural pathway so is difficult to differentiate the origin of stimulation [2,3].

Any lesion affecting head and neck (from the nasal sinuses up to the hypopharynx and larynx) with the common nerve supply to that of the ear leads to otalgia. The temporomandibular joint is in direct contact with ear and also share common nerve supply, leads to severe otalgia. The most common disease leading to referred otalgia include tonsillitis, dental diseases, any pathology involving temporomandibular joint or cervical spine [4]. It is considered as a first symptom soon after the malignancy affecting head and neck region [5]. Computed tomography (CT) and magnetic resonance imaging (MRI) are important diagnostic tests to evaluate the cause of referred

otalgia, if there is no finding on physical examination [6,7].

Almost no attention is given to the patients who are presented in out-patient department with otalgia and having normal otoscopic examination, so it is very important that the physician must know about the non-otogenic causes of otalgia. Very few of the studies have been done in Pakistan to find out the most prevalent causes of referred otalgia. The aim of current study is to find out the most frequent head and neck sites of origin of referred otalgia.

## 2. METHODOLOGY

A descriptive cross-sectional study was conducted at the ENT department of Bahawal Victoria hospital Bahawalpur during January 2019 to December 2019. Non-probability convenient sampling technique was used. Sample size was calculated by using the OpenEpi calculator and was 150. Patients who are presented with complain otalgia having age range of 5-70 years were included in the study. Those patients were excluded who were having either underlying ear pathology or past surgical history of ear or having hemi-fascial pain.

About 500 patients with ear ache were examined and after exclusion 150 were finally analyzed. Detailed history of the patient and clinical examination were done along with radio imaging and endoscopic studies wherever needed. Diagnosis of referred otalgia was made after having normal ear examination along with pathology lying at different head and neck region which share common sensory innervation. Patients who were having normal otoscopic

examination along with normal distant sites on imaging studies, were labelled as otalgia of unknown origin.

For final analysis statistical package for social science (SPSS) version-20 was used. The qualitative data was presented as frequency and percentage while numerical data as mean and standard deviation. Chi-square test was used to find out the association of frequency of different sites of otalgia to that of the different age groups and with gender.

### 3. RESULTS

The mean age of the study participants was 28.23 years with standard deviation of 13 years (age range included in the study was 5-70 years). Majority of study participants were male that was 56% and female were 46%. Looking over the origin of referred otalgia, the majority of participants were having otalgia of tonsillar origin followed by dental origin and pharyngitis with 31.3%, 23.3% and 16% respectively. Very few of them having otalgia originating from hypopharyngeal carcinoma and laryngeal carcinoma i.e. 3.3% and 2% respectively. While only 4.7% of otalgia were of unknown origin as mentioned in Fig. 1.

Female participants were having higher frequency of otalgia which is originated from diseases of temporomandibular joint, hypopharyngeal carcinoma and otalgia of

unknown origin in comparison to male participants. Remaining sites for originating otalgia including tonsillar origin, dental origin, pharyngitis, nose and sinus origin and laryngeal carcinoma were most commonly involving the male participants while otalgia of cervical origin equally involved the both genders as presented in Fig. 2 but chi-square test reported non-significant differences among both gender as p-value was more than 0.05.

Otalgia originated from tonsillar and dental causes and due to pharyngitis were most common among the younger age group while those originated from laryngeal and hypopharyngeal carcinoma and of cervical origin were common among elder age group as mentioned in Table 1. Difference between the different age groups was statistically non-significant as p-value was more than 0.05.

### 4. DISCUSSION

Otalgia due to otogenic cause is simple to diagnose but the cause is not always in the ear. It becomes a puzzle when the ear is normal on examination and physician has to find the cause of referred ear pain. Usually the referred ear pain is due to the sharing of a common nerve supply between ear and other head and neck structures. There are number of conditions starting from inflammation up to cancer can irritate the sensory innervations leading to pain which radiate towards the ear [8-10].

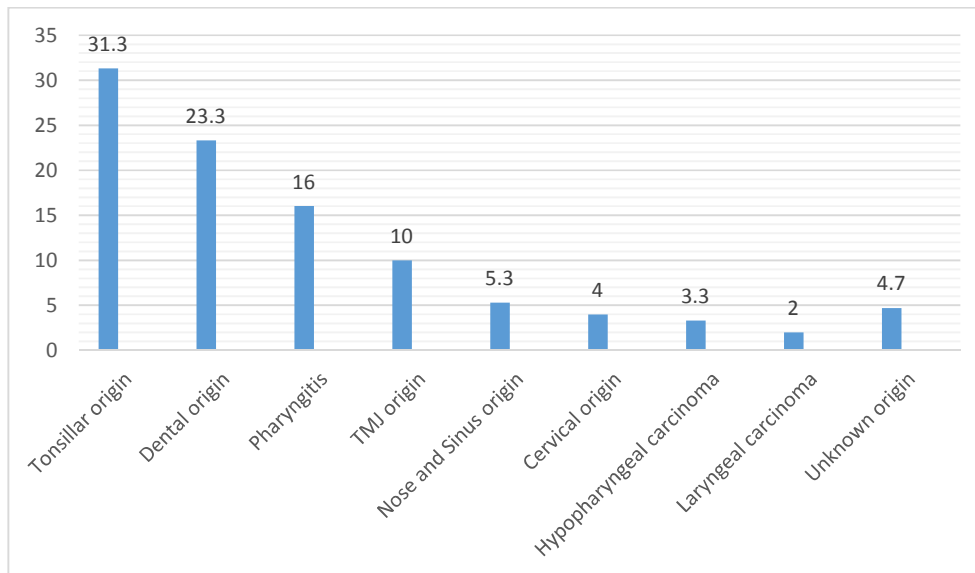
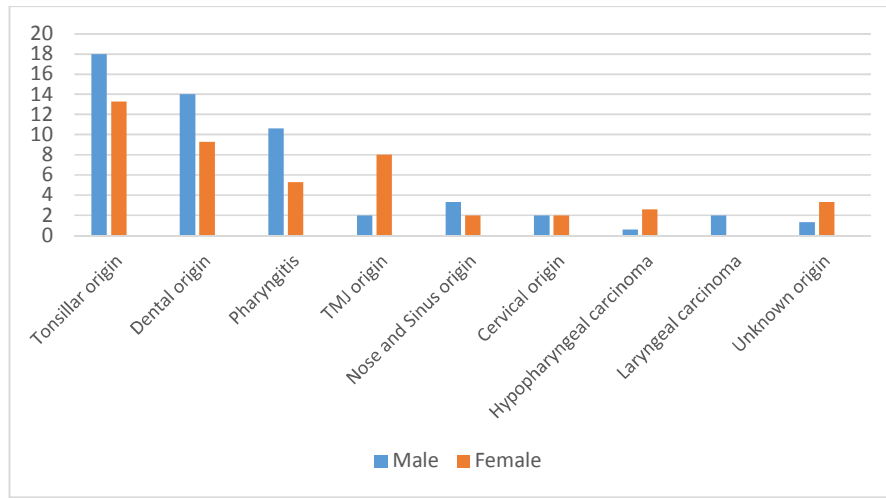


Fig. 1. Percentages of origin of otalgia among study participants



**Fig. 2. Percentages of origin of otalgia in relation to gender**

**Table 1. Frequency of origin of otalgia among different age groups**

| Site of origin of otalgia | Age groups |       |       |       |       | p-value |
|---------------------------|------------|-------|-------|-------|-------|---------|
|                           | 5-10       | 11-20 | 21-35 | 36-55 | 56-70 |         |
| Tonsillar origin          | 10         | 18    | 14    | 3     | 2     | 0.872   |
| Dental origin             | 7          | 4     | 13    | 9     | 3     |         |
| Pharyngitis               | 0          | 5     | 11    | 8     | 0     |         |
| TMJ origin                | 0          | 3     | 3     | 7     | 1     |         |
| Nose & sinus origin       | 0          | 3     | 2     | 2     | 1     |         |
| Cervical origin           | 0          | 0     | 1     | 3     | 2     |         |
| Hypopharyngeal Carcinoma  | 0          | 0     | 1     | 3     | 1     |         |
| Laryngeal carcinoma       | 0          | 0     | 0     | 1     | 2     |         |
| Unknown origin            | 0          | 0     | 3     | 3     | 1     |         |
| Total                     | 17         | 33    | 48    | 39    | 13    |         |

Modern technologies help the physicians to diagnose correctly within no time. As the referred otalgia is the early symptom of tumor involving head and neck sites so the referred otalgia needs proper attention. In Unites States, Kozen et.al conducted a retrospective study, in which he took data from Nationwide Emergency Department Sample (NEDS) and found that about 8611282 of the patients were presented in emergency department with ear problems, out of which majority were having otitis media followed by otitis externa and otalgia with 60.6%, 11.8% and 6.8% respectively [11].

Current study reported that the majority of participants were having otalgia of tonsillar origin (31.3%) followed by dental origin (23.3%) and pharyngitis (16%) while a study conducted in Peshawar favored these findings by reporting the same sequence of causes lead to referred otalgia [12]. Another study conducted in Karachi reported slight variation in the frequency

of involvement of head and neck sites in referred otalgia as the diseases of temporomandibular joints are the most common site of origin of referred otalgia (29.2%) and the second one was due to neck pain (15.7%) [13]. Literature review revealed dental origin of referred otalgia as the most frequent cause [14,15].

There are wide variations in the frequency of involvement of different sites of origin of otalgia, sometimes more than one site may be involved or there may be the bilateral type of otalgia. A study conducted in Turkey by Mazlumoglu et.al found diseases of cervical spine (49.1%) as the most common site of origin of referred otalgia followed by diseases of temporomandibular joint, dental origin and chronic sinusitis as 32.1%, 21.9% and 9.4% respectively, while about 31.3% of the cases were having more than one site of origin of referred otalgia with multiple underlying pathologies [16].

Current study reported that the elder age group was having laryngeal and hypopharyngeal carcinoma and of cervical origin were common causes of referred otalgia. This is favored by a study done in United States by Jaber et.al who found that diseases of the cervical spine were most frequent cause among elder age group because as the degenerative changes in the cervical spine are highly prevalent in this age group [17]. Current study also reported that referred otalgia was highly prevalent among adult age group and more in women. The current finding is supported by a study done in Iraq which reported adult age group was more affected with female predominance [18]. Another study in Korea reported that referred otalgia is more among younger age group than the adults and is more among women [19].

## 5. CONCLUSION

It has been concluded that the patients presenting with ear pain, have sometimes no underlying ear pathology. If the ear examination is normal then it is important to examine all other sites of head and neck which share sensory innervation with the ear including teeth, tonsils, pharynx, larynx, nose and paranasal sinuses to find out the exact cause of referred otalgia.

## CONSENT AND ETHICAL APPROVAL

Study got approval from the Ethical review committee of concerned institute. Informed consent was taken from all participants.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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