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ORIGINAL ARTICLE

Exploring the Etiology of Referred Otalgia: A Comprehensive Study

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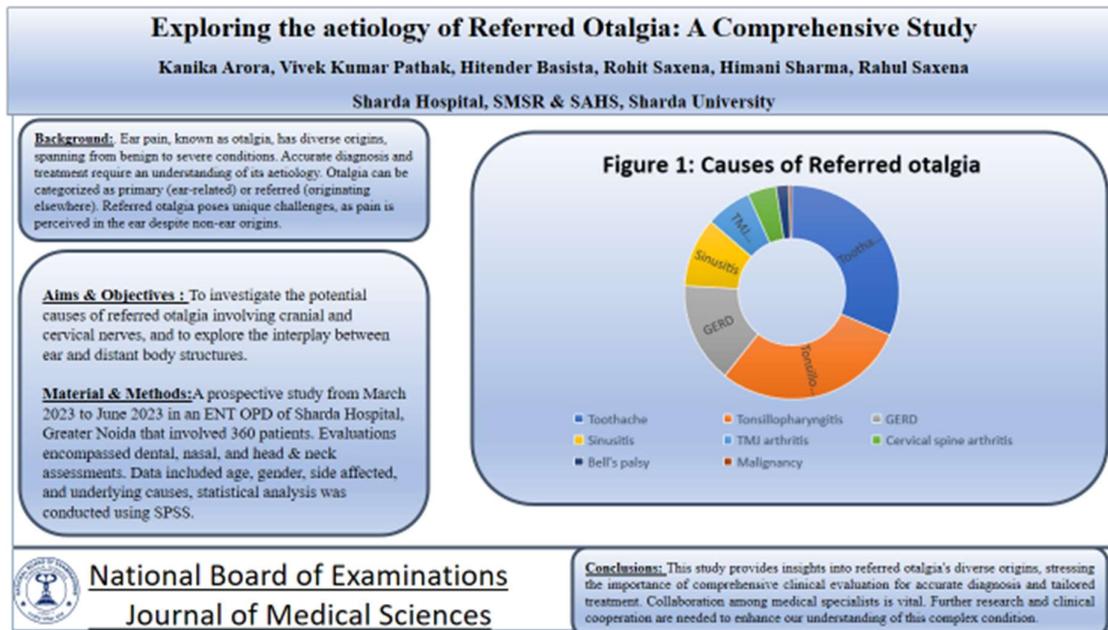
Abstract

Background: Ear pain, known as otalgia, has diverse origins, spanning from benign to severe conditions. Accurate diagnosis and treatment require an understanding of its etiology. Otalgia can be categorized as primary (ear-related) or referred (originating elsewhere). Referred otalgia poses unique challenges, as pain is perceived in the ear despite non-ear origins. **Aim:** The aim of present study is to investigate the potential causes of referred otalgia involving cranial and cervical nerves, and to explore the interplay between ear and distant body structures. **Materials & Methods:** A prospective study from March 2023 to June 2023 in an ENT OPD of Sharda Hospital, Greater Noida involved 360 patients. Evaluations encompassed dental, nasal, and head & neck assessments. Data included age, gender, side affected, and underlying cause statistical analysis was conducted using SPSS version. **Results:** Out of 360 patients, 16.1% had referred otalgia. Most were female (67.2%), and right-sided involvement was predominant (47%). Toothache (31.6%) and pharyngitis (29.1%) were the most common leading causes. Other causes included Gastroesophageal reflux disease, sinusitis, temporomandibular joint disease, cervical spine arthritis, and Bell's palsy. Two cases (0.5%) were associated with supraglottic and base of tongue malignancies. **Conclusion:** This study provides insights into referred otalgia's diverse origins, stressing the importance of comprehensive clinical evaluation for accurate diagnosis and tailored treatment. Collaboration among medical specialists is vital. Further research and clinical cooperation are needed to enhance our understanding of this complex condition.

Keywords: Pharyngitis, sinusitis, cranial nerve, Bell's palsy

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Graphical Abstract



Introduction

Otalgia, or ear pain, stands out as a common complaint that can result from variety of underlying conditions. Its etiology is vast and diverse, spanning from benign, self-limiting causes to severe, fatal illnesses. Understanding the origin of otalgia is imperative for accurate diagnosis & effective treatment, making it a subject of paramount importance in the field of otolaryngology. The cause of otalgia can be categorized as either related to ear issues (Otological) or arising from other sources, depending on the underlying pathology. While primary otalgia is directly related to the ear, referred otalgia presents a unique challenge in clinical practice. Referred otalgia occurs when pain is perceived in the ear despite its origin lying elsewhere in the body, making its diagnosis and management a complex and intriguing subject for medical investigation [1].

The auditory system derives sensory input from six different origins, and various structures in the head & neck also

have shared nerve connections [2]. Consequently, issues arising in the neural network involving cranial nerves V, VII, IX and X that are Trigeminal Nerve, Facial Nerve, Glossopharyngeal Nerve and Vagus Nerve respectively, as well as Cervical spinal nerves C2 & C3, may be potential causes of referred ear pain [3]. It's worth mentioning that children are more frequently affected by direct ear pain, whereas in adults, referred ear pain is more common [4]. The common causes of referred otalgia can be remembered as 5 Ts – Temporomandibular joint (TMJ), Teeth, Tongue, Tonsil and Throat.

The auriculotemporal nerve, which arises from the mandibular branch of the trigeminal nerve (V), conveys sensory information to the tragus, front portion of the ear, the anterior wall of the external ear canal, and the frontal area of the lateral tympanic membrane. Conditions such as temporomandibular joint disease and dental problems can cause referred ear pain via the auriculotemporal nerve [5].

The posterior auricular nerve, which is a division of the facial nerve, supplies sensory information to the rear wall of the external auditory canal, the posterior lateral area of the tympanic membrane, and the skin at the back of the auricle [6]. Referred ear pain originating from the facial nerve (VII) can manifest after an episode of herpes zoster [7].

Jacobson's nerve, a branch of the glossopharyngeal nerve (IX), is responsible for providing sensory input to the middle ear, the eustachian tube, and the inner surface of the tympanic membrane. Inflammatory conditions or lesions affecting the nasopharynx, palatine tonsils, soft palate, or the rear portion of the tongue can lead to referred ear pain through cranial nerve IX [8].

Arnold's nerve, which is a branch of the Vagus nerve (X), transmits sensory information to the lower and rear portions of the external auditory canal, the concha, and the side of the tympanic membrane. Conditions like thyroid abnormalities, laryngeal problems, and gastroesophageal reflux can result in referred ear pain through cranial nerve X [9]. Pathological conditions of the cervical spine (such as osteoarthritis, spondylosis, disc herniation, etc.) can manifest as referred ear pain through the greater auricular & lesser occipital nerves, which originate from C2 & C3 of the cervical plexus [10].

A CT scan of the temporal bone is the primary method used to examine issues related to the ear and temporal bone. When looking into problems concerning the pharynx, larynx, and other parts of the neck, using contrast-enhanced CT of the neck is usually most effective, although MR imaging is also useful and in certain cases might outperform CT for specific conditions [11].

This paper embarks on a comprehensive exploration of the etiology of referred otalgia through the various anatomical and physiological mechanisms that may result in referred otalgia. This paper sheds light on the intricate interplay between the ear and distant body structures. By examining the sources most likely to be implicated in origin of referred otalgia and the underlying neural pathways responsible for transmitting pain signals, we hope to enlighten medical practitioners with the knowledge necessary to differentiate between primary and referred otalgia, thereby facilitating more accurate diagnoses and tailored treatment strategies. Through an in-depth analysis of its etiology, we aim to offer a comprehensive resource that will aid healthcare professionals in the diagnosis, and management of this intriguing and often perplexing condition.

Materials & Methods

This is a prospective study carried out in March, 2023 to June, 2023 on patients visiting the ENT OPD of Sharda Hospital, Greater Noida.

The patients were evaluated thoroughly and those with normal ear examinations were included to be the part of this study. These evaluations encompassed assessments of the dental structures and temporomandibular joints, the nasal passages, the sinuses, and various areas of the head & neck. In cases where needed, the evaluations also involved direct and indirect laryngoscopy as well as biopsy procedures. Individuals with a recent history of tonsillectomy or other head & neck operations who subsequently experienced earaches were not included in the study.

Following the acquisition of written and informed consent from the patients, their data was documented. This data encompassed age, gender, season in which the patient presented, the affected side, and the underlying cause of the ear pain. Due to the diverse range of potential causes for referred ear pain, consultations with other medical specialties were sought when

deemed necessary. Subsequently, the gathered data underwent statistical analysis using SPSS software.

Results

In the duration of the study 360 patients presented with earache, out of which 58 (16.1%) patients had referred otalgia (Figure 1).

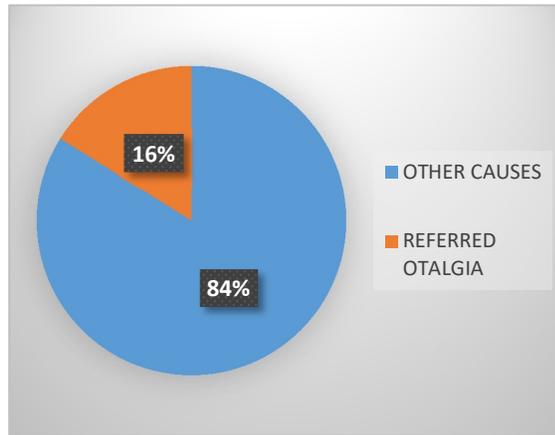


Figure 1. Graphical representation of cases of Referred Otalgia in OPD

Out of the patients experiencing referred otalgia, 39 (67.2%) were female, while 19 (32.7%) were male (Figure 2).

In regard to the side affected, 47% of cases experienced right-side

involvement, while 44% exhibited left-side issues, and 9% had problems on both sides. (Figure 3).

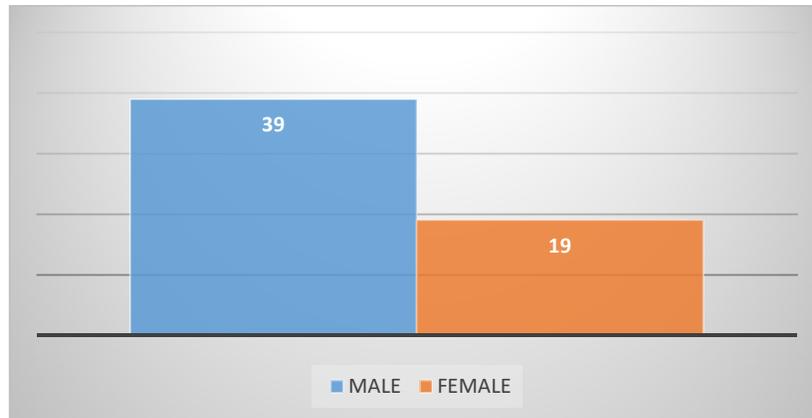


Figure 2. Gender wise distribution of patients of Referred Otalgia

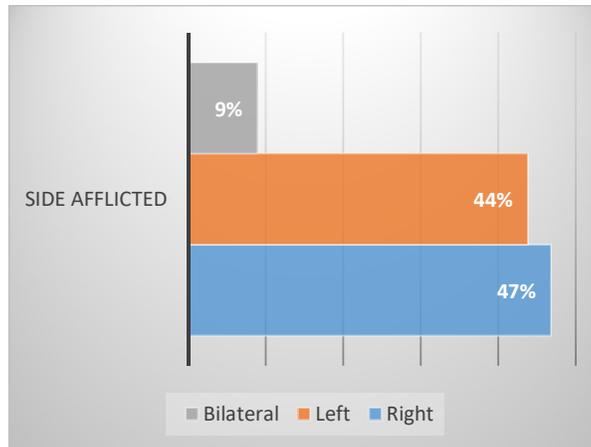


Figure 3. Graphical presentation of afflicted side of Referred Otalgia patients

Patients experiencing referred ear pain fell within the age bracket of 10 to 60 years, with the majority of cases occurring

in the 21-30 age group. The average age among these patients was 26.3 years (Figure 4).

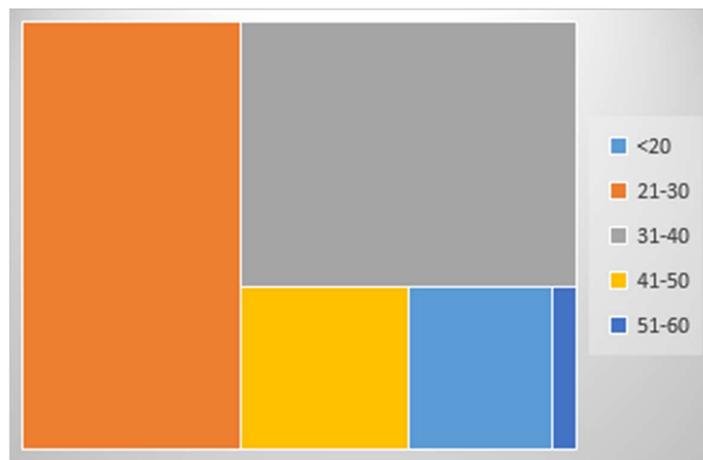


Figure 4. Distribution of patients on the basis of age group

Among the multiple causes of referred otalgia in our study, Toothache (31.6%) was the most common and pharyngitis (29.1 %) was 2nd most common.

GERD (15.2%), Sinusitis (10.5%), Inflammation of the temporomandibular joint, confirmed on clinical examination (6.9%), cervical spine arthritis, diagnosed

by orthopaedic Department by X-Ray Neck (4.3%), Bell's palsy (1.9%) and were the other causes.

Out of 360, 2(0.5%) patients of referred otalgia were found to have supraglottic and base of tongue malignancy respectively, proven on biopsy later (Figure 5).

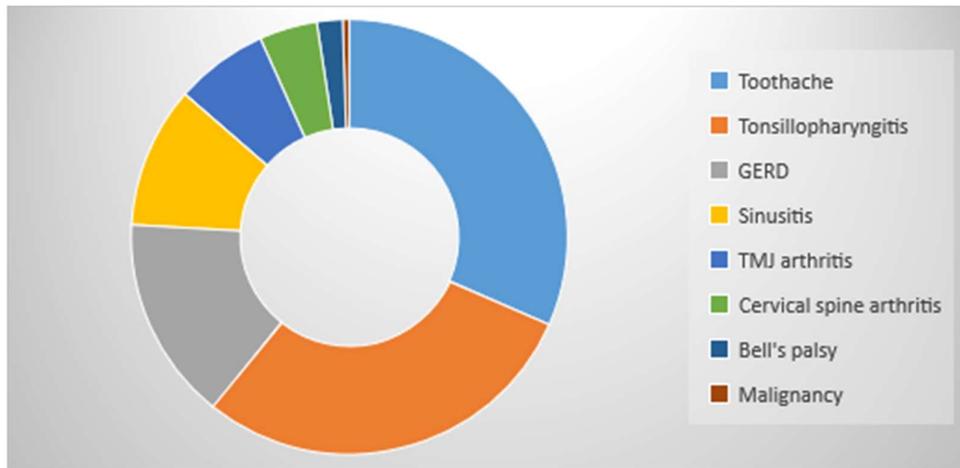


Figure 5. Various causes of Referred Otolgia

Discussion

The current study delves into the multifaceted realm of referred otalgia, shedding light on the diverse array of aetiologies contributing to this intriguing phenomenon. The incidence of referred otalgia in our study was 16.1%, emphasizing the significance of this condition in clinical practice, which was consistent with findings by Taziki M et al that showed 770 patients suffered from otalgia, 12.2% of whom had the referred type [12].

Gender disparity in referred otalgia was observed, with a predominance of female patients (67.2%). This disparity may reflect differences in healthcare-seeking behavior or predispositions to conditions that cause referred otalgia between genders. Kiakojoori et al. reported similar findings, with 40% of men and 60% of women, aligning with the results of our study [13].

Like the study published by Saraf A et al., which revealed right ear was involved in 53.8%, left ear in 35.3% and bilateral otalgia in 10.7%, Our findings also revealed interesting patterns regarding the side affected [14]. Nearly half of the cases

(47%) exhibited right-sided involvement, while a slightly lower percentage (44%) experienced left-sided issues. The presence of bilateral problems in 9% of cases underscores the complexity of referred otalgia and highlights the need for a meticulous clinical evaluation to pinpoint its origin accurately.

Toothache emerged as the leading cause of referred otalgia in our study, accounting for 31.6% of cases. This finding aligns with research by Taziki M et al., according to which the most frequent aetiology of referred otalgia was found to be dental and TMJ pathologies due to their proximity to the ear and shared sensory nerve pathways [12].

Tonsillopharyngitis followed closely as the second most common cause at 29.1%, highlighting the connection between the throat and ear regions, where inflammation in the pharynx can lead to ear pain. Saraf et al. also found that 16.9% of patients had pharyngitis, and 10.7% had tonsillitis, which mirrors our study's findings [14].

Gastroesophageal reflux disease (GERD), sinusitis, temporomandibular

joint inflammation, cervical spine arthritis, and Bell's palsy were also identified as causes of referred otalgia, albeit less frequently. These findings emphasize the importance of a holistic approach to diagnosing ear pain, considering both local and remote etiologies. Notably, two cases of referred otalgia were associated with underlying supraglottic and base of tongue growths (0.5%). These findings underscore the significance of vigilance in assessing patients with otalgia, as they highlight the potential for serious underlying pathologies that may present with seemingly benign symptoms. In Dally's research, a single instance was reported where metastatic liposarcoma from the lower extremity had spread to the pharynx, presenting symptoms such as a sore throat and ear pain [15].

Similarly, in Reiter's study, there was a documented case of nasopharyngeal carcinoma that manifested as referred ear pain [16]. The comprehensive nature of this study, encompassing a wide spectrum of etiologies, reinforces the need for a multidisciplinary approach to the evaluation and management of referred otalgia. Collaboration between otolaryngologists, dentists, gastroenterologists, and other specialists is essential to accurately diagnose and treat this complex condition.

Karmacharya et al. concluded in their study that out of 607 patients with otalgia, 243(40%) had referred otalgia of this 39% were men and 61% were women. Commonest etiology of referred otalgia was dental causes followed by TMJ dysfunction. 3% patient had underlying malignancies. 37% had right earache, 42% had left earache and 21% had bilateral earache, the findings were very consistent with our study (17).

Conclusion

This study provides valuable insights into the aetiology of referred otalgia, emphasizing the importance of a thorough clinical evaluation, including dental and systemic assessments, to identify the underlying cause. Recognizing the diverse origins of referred otalgia is essential for healthcare professionals to formulate tailored treatment strategies and ensure optimal patient care. Further research and clinical collaboration are warranted to continue advancing our understanding of this intriguing and often perplexing condition.

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Conflict of interest

There is no conflict of interests. All authors are equally contributed.

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Ethics: The present study is ethically approved via letter no. SU/SMSR/76-A/2022/76

Authors Contributions

“Conceptualization, V.K.P. and R.S.; methodology, H.B.; validation, H.S., V.K.P. and R.S.; formal analysis, H.S.; investigation, K.A.; resources, H.S.; data curation, K.A.; writing—original draft preparation, K.A.; writing—review and editing, R.S.; visualization, R.S.; supervision, V.K.P.; project administration, R.S.

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