Central Sensitivity Disorders Are Associated with Increased Risk of Hearing Loss: A Real-World Evidence Study

Yalda Yazdani, MD[1]; Yueqi Ren, PhD[1]; Charlotte Chan, BS[1]; Khushi Bhatt, BS[1]; Hamid R. Djalilian, MD[1-3]; Mehdi Abouzari, MD, PhD[1]

Department of Otolaryngology[1], Biomedical Engineering[2], and Neurosurgery[3], University of California, Irvine

Introduction

- Central sensitivity disorders (CSD) including fibromyalgia, chronic fatigue syndrome, IBS, temporomandibular disorder, and migraine, share a mechanism of central sensitization – CNS neurons amplify normal or subthreshold input.
- This amplification is not confined to pain. Auditory complaints are common in CSD, with tinnitus in 27–78% of fibromyalgia cohorts. Yet prior evidence is limited to fibromyalgia alone in small or single-country cohorts, leaving it unestablished whether CSD as a group raises the risk of incident hearing loss.
- Objective: To assess whether CSD increases the risk of incident hearing loss.

Methods

- Design: Retrospective cohort study using the TriNetX global research network; adults aged 18–60 followed over 10 years. CSD identified by ICD-10 codes; index date at first CSD diagnosis or first clinical encounter; 1:1 propensity score matching.
- Outcome and analysis: Incident hearing loss, excluding conductive hearing loss and hearing loss before index date; absolute risk difference with 95% CI, risk and odds ratios, and Kaplan–Meier time-to-event analysis.

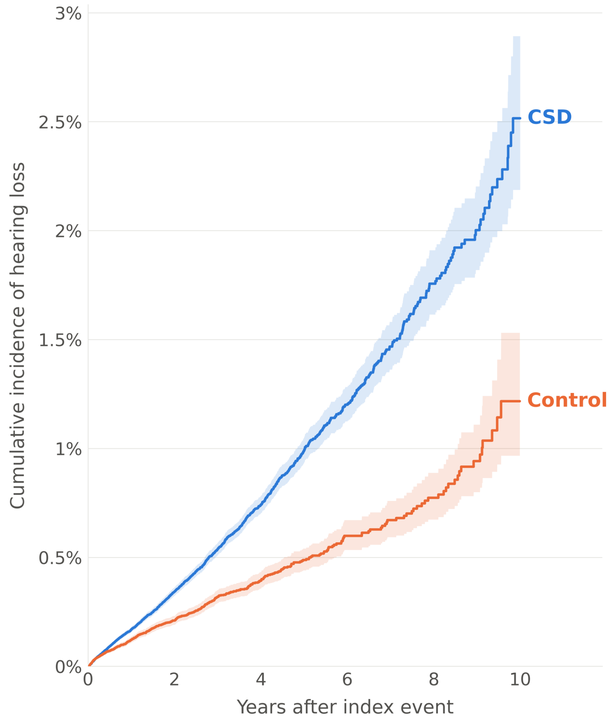
Results

- Cohorts: After propensity matching, 805,430 patients per group with similar age and sex distributions.
- Incidence: Hearing loss developed in 2,164 CSD patients (0.27%) *vs.* 687 controls (0.085%); absolute risk difference 0.184% (95% CI, 0.171%–0.197%; $p < 0.0001$).
- Association: Risk ratio 3.15, odds ratio 3.16, hazard ratio 1.75; Kaplan–Meier showed significantly higher cumulative incidence in the CSD cohort across follow-up (log-rank $p < 0.0001$).

Table 1. Incident hearing loss, CSD vs matched controls.

	CSD (n = 805,430)	Control (n = 805,430)
Incident hearing loss	2,164	687
Cumulative risk	0.27%	0.085%
Measures of association — CSD *vs.* control		
Risk difference	0.184% (0.171–0.197)	
Risk ratio	3.15 (2.90–3.44)	
Odds ratio	3.16 (2.90–3.45)	
Hazard ratio	1.75 (1.60–1.90)	
Log-rank test	$\chi^2 = 165.4$, $p < 0.0001$	

Figure 1. Kaplan–Meier cumulative incidence of hearing loss in the CSD and matched control cohorts. Shaded bands are 95% confidence intervals.



Conclusions

- Adults with CSD had a three-fold higher risk of developing hearing loss than propensity-matched controls. The association was consistent across measures
- These findings support a potential relationship between central sensitization and auditory dysfunction, consistent with the sensory amplification already described in these patients.
- Clinical implication in patients with CSD may warrant formal evaluation rather than attribution to the underlying syndrome.

Additional Comments

- Hearing loss was identified by diagnosis codes rather than audiometry, so severity, laterality and frequency pattern are unknown, and undiagnosed loss is missed in both cohorts.
- Patients with CSD have more frequent healthcare contact than controls, giving hearing loss more opportunity to be coded; matching on demographics does not account for differences in encounter frequency.
- Prospective audiometry and analysis by individual CSD condition could distinguish shared mechanism from differential detection.

Contact

Mehdi Abouzari, MD, PhD
Division of Neurotology and Skull Base Surgery
Department of Otolaryngology–Head & Neck Surgery
University of California, Irvine
Email: mabouzar@hs.uci.edu
Phone: (714) 509-6096

References

1. Yunus MB. Fibromyalgia and overlapping disorders: the unifying concept of central sensitivity syndromes. Semin Arthritis Rheum. 2007;36(6). doi:10.1016/j.semarthrit.2006.12.009
2. Skare TL, de Carvalho JF. Ear complaints in fibromyalgia: a narrative review. Rheumatol Ther. 2024;11(5). doi:10.1007/s40744-024-00701-1
3. Le TP, Tzeng YL, Muo CH, Ting H, Sung FC, Lee SD, Teng YK. Risk of hearing loss in patients with fibromyalgia: a nationwide population-based retrospective cohort study. PLoS One. 2020;15(9). doi:10.1371/journal.pone.0238502
4. Auerbach BD, Rodrigues PV, Salvi RJ. Central gain control in tinnitus and hyperacusis. Front Neurol. 2014;5(206). doi:10.3389/fneur.2014.00206
5. Lee A, Abouzari M, Akbarpour M, Risbud A, Lin HW, Djalilian HR. A proposed association between subjective nonpulsatile tinnitus and migraine. World J Otorhinolaryngol Head Neck Surg. 2023;9(2):107-114. doi:10.1002/wjo2.81