

DENTAL CARE IN PATIENTS WITH PERIODONTAL DISEASE AND HEARING IMPAIRMENT: A SCOPING REVIEW

Atención odontológica en pacientes con enfermedad periodontal y deficiencia auditiva: Scoping Review

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ABSTRACT

Introduction: Literature shows that individuals with disabilities, including hearing impairment, often suffer from untreated dental caries, poor oral hygiene, and compromised periodontal health, leading to adverse effects on oral health.

Objective: This study aims to analyze current evidence concerning dental care strategies for controlling, managing, and preventing biofilm accumulation in patients with hearing impairment.

Materials and Methods: A systematic search was conducted in the databases *Scopus*, *Web of Science*, *SciELO* and *PubMed* between April and May 2022 to identify articles establishing a relationship between periodontal disease and hearing disability. Full-text articles published in English or Spanish between 2012 and 2022 were included.

Results: Seventeen articles met the inclusion criteria and were analyzed. These included cross-sectional studies, cohort studies, clinical trials, case reports, and case-control studies. Most studies reported fair to poor oral health status among individuals. Nine different interventions or management approaches for treating periodontal disease in patients with hearing impairment were identified.

Conclusions: The current global evidence on the association between periodontal disease and hearing impairment is very limited. Dentists may need to employ various strategies to address communication barriers, as outlined in this study.

Keywords: Periodontal diseases; Hearing loss; Oral health; Clinical protocols; sign language.

RESUMEN

Introducción: Según la literatura, las personas en situación de discapacidad presentan caries dentales no tratadas, higiene bucal y estado periodontal deficiente, lo cual puede resultar en efectos negativos para su salud bucal.

Objetivo: Analizar la evidencia existente con relación a la atención odontológica enfocada en el control, manejo y prevención de acumulación de biofilm en pacientes con deficiencia auditiva.

Materiales y Métodos: Se realizó la búsqueda de artículos en las bases de datos y motor de búsqueda (*Scopus*, *Web of Science*, *SciELO* y *PubMed*) entre abril y mayo 2022, de acuerdo con la evidencia existente que relacione la enfermedad periodontal y la discapacidad auditiva en la atención odontológica. Se incluyeron artículos de texto completo en idioma inglés o español, con fecha de publicación entre 2012 a 2022

Resultado: Se seleccionó un total de 17 artículos para su análisis. Se encontró estudios transversales, estudios de cohorte, ensayos clínicos, reporte de caso y estudios de casos y controles. La salud oral fue catalogada en estado regular y deficiente en la mayoría de los estudios. Se encontró 9 tipos de intervenciones o manejos para el tratamiento de la enfermedad periodontal en pacientes con hipoacusia.

Conclusión: La evidencia existente respecto a la enfermedad periodontal y la deficiencia auditiva es insuficiente a nivel global. Debido a lo anterior, el odontólogo puede abordar los obstáculos comunicativos de diferentes maneras de acuerdo a los métodos descritos en esta publicación.

Palabras Clave: Enfermedades periodontales; Pérdida auditiva; Salud bucal; Protocolos clínicos; Lengua de signos.

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INTRODUCTION

About 5% of the world's population suffers from some type of hearing loss or hypoacusis that can be disabling for the person.¹ In Chile, according to the National Health Survey (ENS, for its acronym in Spanish) conducted between 2009 and 2010, the prevalence of hearing loss was 32.7%.²

Hypoacusis is defined as a hearing loss or impairment that can result in total or partial inability to hear sounds. It is considered the loss of hearing threshold that is equal to or greater than 20 decibels (dB), affecting both ears or only one of them. When hearing loss is complete, it is called cophosis.¹

On the other hand, periodontal disease is defined as a chronic immunoinflammatory disease of infectious origin that undermines the supporting and protective tissues of the teeth.³ It currently affects more than 90% of the Chilean adult population to varying degrees of severity. Epidemiological studies carried out by the Chilean Ministry of Health between 2007 and 2009 reported 55.1% prevalence of gingivitis at the age of 6 and 66.9% in 12-year-old adolescents nationwide.

Regarding periodontitis in the adult population in 2010, the figures were 39% and 69% for the groups of 35-44 years and 65-74 years, respectively.⁴ The etiology of periodontal disease is attributed to the accumulation of bacterial plaque. Treatment focuses on its elimination and adequate control, as well as on the modification of risk factors.⁵

Many patients may experience fear and anxiety when receiving dental care and people with hearing loss are particularly vulnerable. Those who are most fearful and anxious delay, interrupt, and even avoid dental care altogether. It has been demonstrated that anxiety or fear has a negative impact and unfavorable effects on oral health.⁶

Additionally, it has been documented that individuals with disabilities, including hearing loss, often exhibit poor oral hygiene and compromised periodontal health, alongside untreated dental caries.⁷

Moreover, disabilities build communication barriers between the health personnel (dentists and dental students) and patients, as healthcare providers may struggle to communicate effectively with their patients.⁸ Therefore, the aim of the following scoping review is to analyze the current evidence regarding dental care in patients with both periodontal disease and hearing impairment, following the PRISMA-ScR flowchart.⁹

General objective

To analyze current evidence in relation to dental care concerning the control, management, and prevention of biofilm accumulation in patients with hearing impairment.

MATERIALS AND METHODS

The present systematic exploratory review, or scoping review, was conducted following the PRISMA-ScR flowchart.⁹ The bibliographic search was carried out manually and independently by two researchers, M.A.L.V and C.I.M.A, using the databases and search engines: *Scopus*, *Web of Science*, *SciELO* and *PubMed*, the research question guiding the search was: *What type of scientific evidence exists and relates dental care to patients with hearing impairment and periodontal disease?*

The search was carried out between April 18 and May 20, 2022, utilizing the following MeSH terms (Medical Subject Headings) on the aforementioned platforms: (“*Periodontal diseases*”, “*Hearing loss*”, “*Oral health*”, “*Clinical protocols*” and “*Sign language*”). In addition, different combinations, and conjugations between them

were included using Boolean operators “AND” and “OR”.

The search strategies were: ((“Periodontal disease” AND “hearing loss”)); ((“Hearing loss” AND “Oral health”)); ((“Hearing loss” AND “Clinical protocols”)); ((“Oral health” AND “Sign language”)); ((“Periodontal disease” OR “Oral health” AND “Hearing loss”)). In this way, all studies that were potentially useful were included in the review.

The selected articles were analyzed based on the assessment of oral health among patients with hearing impairment. Additionally, the present study focused on the dental management or

intervention for the treatment of periodontal disease during dental care.

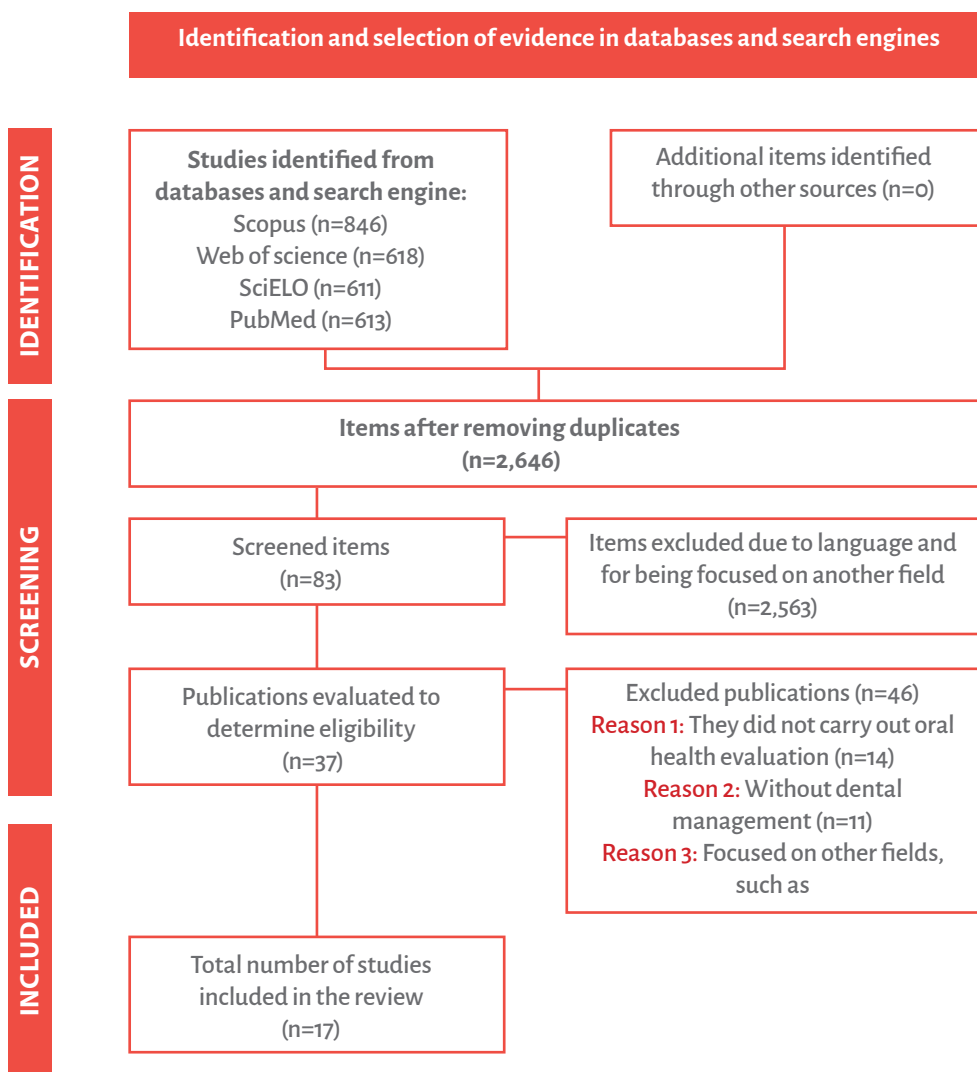
Inclusion criteria

- Articles available as full text in the selected databases and/or search engines, such as *Scopus*, *Web of Science*, *SciELO* and *PubMed*.
- Cross-sectional studies, cohort studies, clinical trials, case reports, case-control studies.
- Studies published between 2012 and 2022.
- Studies published in English or Spanish.

Exclusion criteria

- Articles consisting of news, opinion, reviews, columns, and editorials were excluded.
- Duplicate articles were also excluded.

Figure 1. PRISMA-ScR type flowchart.⁹



RESULTS

Article selection

The applied search methodology yielded a total of 2,688 items published between 2012 to 2022, providing access to full text in the various databases and search engines (*Scopus*, *Web of Science*, *SciELO* and *PubMed*). Duplicate articles were removed, accounting for a total of 2,646 items.

The first stage involved screening the selected articles by reading titles and abstracts; leading to the exclusion of 2,563 articles due to being outside the scope of the review and not in the chosen languages (English or Spanish). A total of 83 articles remained; each of which required

the approval of both reviewers. In case of disagreement, reviewers discussed the relevance of the articles until consensus was reached. All articles deemed relevant after screening underwent full-text reading by the two reviewers. In case of disagreement, the results of each article were discussed.

Forty-six articles were excluded for reasons such as lack of inclusion of oral health evaluation or description of dental management, or focusing on other areas of interest (pedagogy, other health concerns, etc.). Thirty-seven articles were considered eligible. A full text re-reading of each article was conducted, with each reviewer indicating whether it should be included, applying the same previous parameters to ensure

Table 1. Bibliometric variables of this scoping review: Information about the selected articles, analyzed according to their database or search engine, name of the journal, year of publication, geographical location, language, and age group.

Databases and search engine	Name of the journal	Articles	Year of publication	Location	Language	Age group (year)
PubMed	Journal of Indian Society of Pedodontics and Preventive Dentistry	3 (11,18,20)	2017 2020	India	English	6-15
	BioMed Research International	1 (19)	2021	Pakistan	English	12-16
	Special Care Dentistry Association	2 (21,23)	2019	India	English	12-20
	European Journal of Paediatric Dentistry	1 (22)	2022	India	English	5-15
	The Journal of Contemporary Dental Practice	1 (7)	2019	Saudi Arabia	English	Over 18
	Cureus	1 (12)	2022	Saudi Arabia	English	5-16
	The Southeast Asian Journal of Tropical Medicine and Public Health	1 (13)	2014	Thailand	English	18-22
	International Journal of clinical pediatric dentistry	1 (24)	2019	Mexico	English	6-11
	Clinical, Cosmetic and Investigational Dentistry	1 (14)	2022	Ethiopia	English	18-30
	Journal of Clinical Pediatric Dentistry	1 (15)	2015	Yemen	English	6-14
	Oral Health and Dental Management	1(16)	2013	India	English	4-23
	SciELO	Revista cubana de Estomatología	1 (25)	2017	Mexico	Spanish
CES Odontología		1 (26)	2021	Colombia	Spanish	No data
Scopus	Polish Journal of Paediatrics	1 (17)	2018	India	English	5-16

Table 2. Analysis of selected articles, where oral health is examined, through DMFT, dmft, and caries prevalence.

Author and year of publication	Type of study	Sample	Age	DMFT	dmft (%)	Caries Prevalence (%)
Assery <i>et al.</i> , ⁷ 2019	Descriptive Cross-sectional	146	> 18	Age 18–21: 9.29 (AS) Age 22–25: 10.59 (AS) Age > de 25: 10.98 (AS)	Not Applicable	82.2
Jnaneswar <i>et al.</i> , ¹¹ 2017	Cross-sectional Descriptive	540	5-15	0.52±1.10 (SD)	0.28±0.69 (SD)	19.3
Alyami <i>et al.</i> , ¹² 2022	Cross-sectional and Observational	116	5-16	Not Reported	Decayed tooth 25 (21.5) Affected individuals Filled tooth 30 (25.8) (AI) Affected individuals Missing tooth due to cavities 12 (10.3) Affected individuals	Not Reported
Vichayanra <i>et al.</i> , ¹³ 2014	Cases and Controls	180 97 (HI)	18-22	Normal listener 4.83±4.39 (AS) Hearing impairment 3.90±3.22 (AS)	Not Applicable Not Applicable	Normal listener 85.5 Hearing impairment 82.5
Tefera <i>et al.</i> , ¹⁴ 2022	Cross-sectional	149	7-30	1.15±1.654 Average Score	0.11±0.564 Average Score	38.9
Al-Maweri <i>et al.</i> , ¹⁵ 2015	Cross-sectional	401 92 (HI)	6-14	1.91±2.07 (AS + SD)	4.37±3.11) (AS + SD)	Not Reported
Jain <i>et al.</i> , ¹⁶ 2018	Cross-sectional Descriptive	498 297 (HI)	4-23	1.97±1.93 (AS + SD)	Not Reported	Not Reported
Swain <i>et al.</i> , ¹⁷ 2018	Cross-sectional Descriptive	152	5-16	Decayed tooth 3.2±2.1 Average Score Filled tooth 0.4±1.2 Average Score Missing tooth due to cavities 0.9±1.2 Average Score	Not Reported	45.39

DMFT: Decayed, missing, and filled tooth due to dental caries in permanent dentition. dmft: Decayed, missing, and filled tooth due to dental caries in primary dentition.

Table 3. Analysis of selected articles, in which oral health is examined through periodontal indices and oral hygiene.

Author and year of publication	Type of study	Sample	Age	Index	Results (%)
Assery <i>et al.</i> , ⁷ 2019	Cross-sectional descriptive	146	> 18	OHI-S PI GI	Good hygiene: 50 (35.0) Fair hygiene: 79 (55.2) Poor hygiene: 14 (9.8) Good: 40 (27.8) Fair: 78 (54.2) Poor: 26 (18.1) Good: 46 (32.2) Fair: 86 (60.1) Severe: 11 (7.7)
Jnaneswar <i>et al.</i> , ¹¹ 2017	Cross-sectional descriptive	540	5-15	CPI	CPI 0: 156 (28.9) CPI 1: 129 (23.9) CPI 2: 255 (47.2)
Alyami <i>et al.</i> , ¹² 2022	Cross-sectional and observational	116	5-16	BOP	BOP: 74 (63.79%) AI
Vichayanra <i>et al.</i> , ¹³ 2014	Cases and controls	180	18-22	PI NL HI	Good: 4 (4.8) Poor: 43 (51.8) Fair: 36 (43.4) Good: 6 (6.2) Fair: 51 (52.6) Poor: 40 (42.2)
Tefera <i>et al.</i> , ¹⁴ 2022	Cross-sectional	149	7-30	OHI-S BOP OHI-S	PD Prevalence: 22.8 BOP: 43.6 Good hygiene: 36.2 Fair hygiene: 32.2 Poor hygiene: 31.5
Al-Maweri <i>et al.</i> , ¹⁵ 2015	Cross-sectional	401 92 (HI)	6-14	PI GI	PI: 1.19 ± 0.54 GI: 1.13 ± 0.60
Jain <i>et al.</i> , ¹⁶ 2013	Cross-sectional descriptive	498 297 (HI)	4-23	CPI	CPI 0: 72 (24.2) CPI 1: 63 (21.2) CPI 2: 33 (11.1) CPI 3: 105 (35.4) CPI 4: 24 (8.1)
Swain <i>et al.</i> , ¹⁷ 2018	Cross-sectional descriptive	152	5-16	OHI-S	Good hygiene: 26 Fair hygiene: 31 Poor hygiene: 42 Prevalence of gingivitis: 15.78 Plaque prevalence: 23.68

DOHI-S: Greene and Vermillion Simplified Oral Hygiene Index. PI: Silness and Loe plaque index. GI: Loe gingival index. CPI: Community periodontal index. CPI 0: Healthy periodontal tissues. CPI 1: Bleeding on probing. CPI 2: Presence of dental calculus and/or defective restorations. CPI 3: Periodontal pocket of 3.5 to 5 mm or more. CPI 4: Periodontal pocket 5.5 mm or more. BOP: Bleeding on probing AI: Affected individuals. NL: Normal listeners. HI: Hearing impairment. PD: Periodontal disease.

Table 4. Dental management or intervention, focused on the treatment of periodontal disease: Synthesis of articles related to dental management or intervention. In each one of them, the type of study, sample and grouping, intervention or management carried out and its results are analyzed.

Author and year of publication	Type of study	Sample grouping	Sample	Age	Dental intervention or management	Exam and/or survey (Prev/Post)	Results
Sujana <i>et al.</i> , ¹⁸ 2017	Prospective cohort	N: 40, patients with HI and NL	Group 1: 20 patients with HI Group 2: 20 NL patients	6-14	Visual teaching, explaining Fones technique through video and macromodels with the help of trained HI teachers for patients with Instruction in the use of mouthwash	Caries GI PI pH	Non-significant reduction in periodontal parameters for both groups. The use of mouthwash results in a significant decrease in the amount of plaque accumulation and gingival inflammation in both groups.
Moin <i>et al.</i> , ¹⁹ 2021	Randomized controlled clinical trial	N:59 patients with HI	Group 1: 20 patients, pictorial method Group 2: 20 patients, video. Group 3: 19 patients, no intervention	12-16	Group 1: pictorial method, with images about oral hygiene, brushing techniques (horizontal sweep), use of mouthwash and dental floss. Group 2: oral hygiene video playback (horizontal sweep). Group 3: Without intervention. Each group was given a standard toothbrush.	PI GI	Decrease in periodontal indices in all groups. Oral hygiene was classified as fair in group 3 and excellent in groups 1 and 2 post intervention.
Baliga <i>et al.</i> , ²⁰ 2020	Transversal interventionist	N: 68 patients with HI	Group A: 34 patients, video of a play. Group B: 34 patients, sign language	6-13	Group A: video of a play about oral health and oral hygiene technique (Modified Bass). Group B: sign language through caregivers teaching the same oral hygiene instructions. Done daily for 1 month.	PI GI OHI-S Pre- and post-intervention questionnaire	Improvement in oral hygiene habits: time, technique, and materials used for brushing. Periodontal index scores in both groups decreased after the intervention.

Prev: Previous. Post: Post. N: Total number of individuals. HI: Hearing impairment. NL: Normal listener. GI: Löe gingival index. PI: Silness and Löe plaque index. pH: Hydrogen Potential. OHI-S: Greene and Vermillion Simplified Oral Hygiene Index. DMFT: extracted, missing, and filled tooth in permanent dentition. dmft: extracted, missing, and filled tooth in primary dentition. BOP: Bleeding on probing. NA: Not Applicable. NR: Not reported. CSL: Colombian Sign Language. App: Application.

Author and year of publication	Type of study	Sample grouping	Sample	Age	Dental intervention or management	Exam and/or survey (Prev/Post)	Results
Saikiran <i>et al.</i> , ²¹ 2019	Randomized controlled clinical trial	N: 93 patients with HI	Group 1: 47 patients, sign language. Group 2: 46 patients, video. A randomized subgroup of each group received mouthwash	5-15	Group 1: Indian sign language and macro-model, with educational intervention on brushing and hygiene techniques. Group 2: video using modeling, explaining etiology of caries and periodontal disease along with brushing technique. Interventions carried out weekly for 1 month. The subgroups received therapeutic intervention with mouthwash.	PI GI OHI-S	Significant reduction in periodontal index scores in all groups. The therapeutic intervention with mouthwash resulted in an even greater reduction in all oral health parameters.
Sneha <i>et al.</i> , ²² 2022	Randomized controlled clinical trial	N: 56 patients with HI and normal-listening caregivers	Group 1: 28 patients, training of caregivers. Group 2: 28 patients, no intervention	5-15	Group 1: teaching using visual instruction through a power point presentation, delivery of a video and oral health brochure/leaflet to caregivers, so that they can use the knowledge to train their children for 1, 3, 6, and 12 months. Group 2: no type of information is provided to caregivers.	DMFT dmft BOP OHI-S	DMFT and dmft did not vary in both groups. Group 1 showed a reduction in BOP scores from baseline to 12 months. However, Group 2 did not show any significant difference. The groups showed a reduction in OHI-S scores.
Fageeh <i>et al.</i> , ²³ 2019	Randomized controlled clinical trial	N:50 patients with HI	Group 1: 30 patients, brochure. Group 2: 20 patients, video in Arabic sign language	5-20	Group 1: leaflet/brochure containing oral hygiene information (hygiene elements, diet, brushing frequency and technique, visit to the dentist). Group 2: video containing the same instructions in Arabic sign language.	Pre- and post-intervention knowledge survey	Prior to the intervention, the results revealed little knowledge about oral hygiene. After the study was carried out, the average number of patients who demonstrated knowledge of oral health increased.

Prev: Previous. Post: Post. N: Total number of individuals. HI: Hearing impairment. NL: Normal listener. GI: Löe gingival index. PI: Silness and Löe plaque index. pH: Hydrogen Potential. OHI-S: Greene and Vermillion Simplified Oral Hygiene Index. DMFT: extracted, missing, and filled tooth in permanent dentition. dmft: extracted, missing, and filled tooth in primary dentition. BOP: Bleeding on probing. NA: Not Applicable. NR: Not reported. CSL: Colombian Sign Language. App: Application.

Author and year of publication	Type of study	Sample grouping	Sample	Age	Dental intervention or management	Exam and/or survey (Prev/Post)	Results
Ávila-Curiel <i>et al.</i> , ²⁴ 2019	Randomized controlled clinical trial	N: 25 patients with HI	Group 1: 25 patients, "Loti-denti" game application.	6-11	"Loti-denti" game presenting dental images about oral health creating a lottery game, composed of 45 images about dental health. It consisted of 3 sessions where hygiene technique was taught, through playful interactions.	OHI-S dmft	Previous (%): Good: 12 Fair: 44 Poor: 44 Post (%): Good: 64 Fair: 36 Poor: 0 In this way, it is evident that the use of games improved the OHI-S
Hernández <i>et al.</i> , ²⁵ 2017	Case report	N: 1 patient with HI	Not Applicable	7	Initially, the mother cooperated in communication between the child and the dentist. Afterwards, communication was direct between the patient and the dentist, through sign language. For behavior management, the "say, show and do" technique was modified to "show/smell, touch and do."	Not reported	In the first session the girl did not cooperate. In subsequent sessions, the dentist worked on behavior management, avoiding the use of distractors so that, in this way, they could achieve effective communication with the patient. Comprehensive oral rehabilitation was achieved.
Pérez-Baquero <i>et al.</i> , ²⁶ 2020	Experimental	Design in 2 components and 6 phases	Component 1: 23 patients, NL and with HI Component 2: division into 6 phases.	N/R	Phase 1: semi-structured interview with NL people and people with HI about oral care. Phase 2: videos using sign language. Phase 3: adaptation of 20 sentences using CSL and tests were carried out for the final design. Phase 4: recording videos. Phase 5: Prototype development of App Phase 6: prototype evaluation	Not reported	The theoretical support related to the App is presented to promote assertive communication between dentists and people with HI, based on 6 categories: empathy, communication process, communication tools, care ethics, interculturality, and access barriers.

Prev: Previous. Post: Post. N: Total number of individuals. HI: Hearing impairment. NL: Normal listener. GI: Løe gingival index. PI: Silness and Løe plaque index. pH: Hydrogen Potential. OHI-S: Greene and Vermillion Simplified Oral Hygiene Index. DMFT: extracted, missing, and filled tooth in permanent dentition. dmft: extracted, missing, and filled tooth in primary dentition. BOP: Bleeding on probing. NA: Not Applicable. NR: Not reported. CSL: Colombian Sign Language. App: Application.

specificity. Subsequently, 17 articles were included for analysis in the present scoping review. Figure 1.

Bibliometric variables

The bibliometric variables considered included the name of the journal, year of publication, language (English or Spanish), geographic location, and age group. The data collected are presented in Table 1.

Analysis of results

A descriptive analysis was deemed appropriate based on the evidence found.

Of the 17 articles selected, eight corresponded to oral health evaluations, while nine articles addressed dental management or intervention. The countries of origin included India, Pakistan, Saudi Arabia, Thailand, Mexico, Ethiopia, Yemen, and Colombia. The selected articles encompassed various study designs, including cross-sectional studies, cohort studies, clinical trials, case reports, experimental, and case-control studies.

Oral health evaluation in patients with hearing impairment

Eight articles focusing on oral health evaluation in patients with hearing impairment were selected. Among these, four articles specifically studied individuals with hearing impairment. Only one of the selected articles included a comparison with normal-hearing individuals, while three articles made a comparison with subjects who presented other disabilities (physical, sensory, intellectual, and mental) according to the WHO classification¹⁰ (Table 2).

The reported prevalence of dental caries in patients with hearing loss ranged from 19.3 to 82.5% across age groups from 5 to 30 years. Similarly, variations were observed among the studies regarding the Index of Decayed, Missing, and Filled teeth due to dental caries in permanent

dentition (DMFT) and the Index of decayed, missing, and filled teeth due to dental caries in primary dentition (dmft), among the age groups from 5 to 30 years (Table 2).

Periodontal status and oral hygiene were evaluated by analyzing the prevalence of periodontal disease, using the following periodontal indices individually or in combination: Community periodontal index (CPI); Silness and Loe Plaque Index (PI), Loe Gingival Index (GI), Greene and Vermilion Simplified Oral Hygiene Index (IHO-S), and Presence of Bleeding on Probing (BOP) (Table 3).

Regarding CPI in patients with hearing impairment, one of the articles reported the highest percentage as CPI2, while in the other study, it was CPI3. The plaque index was predominantly classified as fair. The gingival index reported in the studies was mainly assessed as fair. In relation to the IHO-S, most studies indicated a fair status, with only one article reporting a poor status. On the other hand, BOP ranged from 43.6% to 63.79%.

Dental management or intervention, focused on the treatment of periodontal disease

Within the nine selected articles, various methods for managing and controlling periodontal disease were identified, comprising eight methods and different combinations between them, facilitating communication between patients with hearing impairment and their caregivers.

The main methods included the use of video playback, supplementary mouthwash, explanation using macro-models, the use of printed material such as brochures, leaflets or cards, the performance of a play, the use of sign language or interpreter according to the country, engagement in a game, and lastly, the planning and development of an application (Table 4).

Among the methods used, the reproduction of

video and/or the use of printed material was one of the most common in four studies. On the other hand, the least used methods were performing a play, recreational games, and developing an application. It should be noted that most studies, when using different methods together, reported an even greater decrease in periodontal indices.

DISCUSSION

According to the present results, the existing scientific evidence is limited, insufficient, and non-specific regarding the reviewed subject. Cross-sectional, case report, case-control and cohort studies were identified in the search.

In relation to the oral health of patients with hearing impairment, much of the evidence suggests that the different DMFT and dmft indices correspond to fair and poor status.^{8,11,17} The prevalence of caries ranged between 38.9% and 82.5%, indicating a poor status.^{8,14,17}

According to Jnaneswar *et al.*,¹¹ these indices are within acceptable limits for caries prevalence. On the other hand, in the study conducted by Vichayanra *et al.*,¹³ in which they administered a questionnaire and performed routine oral examinations, it was observed that patients with hearing impairment, when compared to those with normal hearing, exhibited a slightly lower prevalence of caries and, furthermore, achieved better results in the plaque index, being classified as “good” and “fair”. This study also evaluated other factors such as parental education level and socioeconomic status, which were found to be directly related to the oral health condition of their patients.

In contrast to the classification proposed by the WHO,¹⁰ in studies where comparisons were made with individuals having other disabilities

(physical, sensory, mental, or combined),¹⁵ it was found that individuals with hearing loss and/or cophosis exhibited better oral health. On the other hand, as indicated by Jain *et al.*,¹⁶ although they stated that they had better oral health, they demonstrated that individuals with visual impairment had even better periodontal indices. Regarding periodontal health, based on the questionnaires and surveys carried out by Baliga *et al.*,²⁰ and Fageeh *et al.*,²³ it is observed that patients typically exhibit poor oral hygiene, as reflected in their limited prior knowledge of oral health care. However, after the intervention, knowledge increased, leading to improvements in periodontal indices.

Within the selected publications, various dental interventions and/or management approaches were identified, including the use of visual material, games, sign language, mouthwashes, and even the incorporation of a mobile application featuring sign language to facilitate communication during treatment. The most used method was visual materials, comprising images and videos. These could effectively contribute to the treatment of periodontal disease when used collectively and/or in a more personalized way.

In the studies conducted by Sujlana *et al.*,¹⁸ and Saikiran *et al.*,²¹ in addition to oral health interventions, mouthwashes were implemented as adjuvants in periodontal therapy, leading to an improvement in periodontal indices, which was even more significant than dental intervention alone. However, current studies indicate that the use of mouthwashes may not be effective without adequate mechanical control of the biofilm,²⁷ which could contradict what was previously suggested.

Controlling biofilm is essential for periodontal treatment, which is why various techniques were taught during the interventions, such as the modified Bass technique, horizontal sweep

technique, and Fones technique. However, personalized techniques, addressing specifically the oral condition of each patient, were not practiced during the interventions.¹⁸⁻²⁰ Therefore, it is important to assess the clinical situation of each patient to accurately and optimally recommend an oral hygiene technique that can effectively maintain a good biofilm control and remove plaque. It is also relevant to suggest the frequency of the supportive periodontal therapy. There are various behavioral management methods during dental care.

Even in the case of hearing-impaired patients, communication continues to be a significant challenge. Hernández *et al.*,¹⁵ describe an initial session where their patient did not cooperate; however, in subsequent sessions, they achieved comprehensive oral rehabilitation through effective communication. They modified the “say, show and do” technique to “show/smell, touch and do.” Consequently, it was demonstrated that modifying the usual behavioral methods in the management of patients, with or without disabilities, is beneficial and necessary.

Hygiene instruction, patient education and motivation, control of modifiable and non-modifiable factors are integral parts of the initial phase of periodontal treatment, crucial for long-term success.⁴ Despite the availability of various dental interventions and management approaches, it has been shown that there is no single completely effective method.²¹

However, communication is essential, whether it is through pictograms, videos, sign language, sign language interpreters, or other methods. For this reason, it is necessary to consider that the dentist must possess the ability and tools to overcome these communication barriers to provide adequate care.

One of the limitations of this study is the

scarcity and limited methodology of publications that relate periodontal disease to hearing impairment, as well as the absence of protocols for adequate clinical management. Regarding the evaluation of oral health in the studies, geographical distribution was mainly in Asia, suggesting that it may not necessarily be representative for the population of other continents.

Likewise, relevant information regarding Chile is non-existent, as no study was found on the oral health evaluation or dental management of patients with hearing impairment in the country. Nevertheless, it should be noted that there is a clinical guide issued by the Chilean Ministry of Health (MINSAL), titled “*Comprehensive oral health for children under 20 years of age with disabilities that require special care in dentistry*”, which encompasses disabilities involving movement disorders and/or difficulty to follow simple commands. However, the guide does not specify the management of patients with hearing disabilities.²⁸

Another limitation is that there is a lack of consensus regarding the periodontal indices to be used. These indices vary in each study, making comparison between them difficult. Studies also employ different methods for evaluating DMFT, dmft, and caries prevalence. Furthermore, in the authors’ opinion, studies comparing the normal-hearing population and people with disabilities are scarce.

CONCLUSION

Existing global evidence regarding periodontal disease and hearing impairment is insufficient and, particularly in Chile, it is scarce and widespread. Therefore, further research is needed in this respect.

Regarding the relationship and influence of hearing disability on periodontal disease, there is no detailed evidence of a link between them, beyond the communication barrier that can affect periodontal care and treatment. Despite the above, the ability to find different ways to properly address these communication problems has been highlighted. Depending on the age of the patient, communication can be improved using pictograms, videos, sign language, and sign language interpreters. Current

evidence does not indicate which method is better and fully effective in the long term.

According to the evidence found, there are no established procedures or protocols within the dental community to provide treatment to this type of patients, which gives the possibility of proposing new approaches to their treatment.

CONFLICT OF INTERESTS

Authors declare no conflict of interest.

ETHICS APPROVAL

Not applicable.

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AUTHORS' CONTRIBUTIONS

Mejías-Ampuero C: Conceptualization, data curation, formal analysis, research, methodology, project administration, writing original draft, writing: review and editing.

León-Vicencio M: Conceptualization, data curation, formal analysis, research, methodology, project administration, writing: original draft, writing: review and editing

Melo-Mendieta P: Charge of supervision, writing validation: review and editing.


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REFERENCES.

1. Sociedad Chilena de Otorrinolaringología. Hipoacusia, una patología en aumento. 2019.
2. Ministerio de Salud. Encuesta Nacional de Salud ENS Chile 2009 -2010. 2010.
3. Ministerio de Salud. Salud Oral en Adolescentes de 10-19 años: Prevención, diagnóstico y tratamiento de la enfermedad periodontal. 2017.
4. Liccardo D, Cannavo A, Spagnuolo G, Ferrara N, Cittadini A, Rengo C, Rengo G. Periodontal Disease: A Risk Factor for Diabetes and Cardiovascular Disease. *Int J Mol Sci.* 2019;20(6):1414. doi: 10.3390/ijms20061414. PMID: 30897827; PMCID: PMC6470716.
5. Suhani RD, Suhani MF, Badea ME. Dental anxiety and fear among a young population with hearing impairment. *Med Pharm Rep.* 2016;89(1):143–9.
6. Alkahtani FH, Baseer MA, Ingle NA, Assery MK, Al Sanea JA, AlSaffan AD, Al-Shammery A. Oral Health Status, Treatment Needs and Oral Health Related Quality of Life among Hearing Impaired Adults in Riyadh City, Saudi Arabia. *J Contemp Dent Pract.* 2019;20(6):743-749. PMID: 31358720.
7. Cardona V, Fasanella M, Escorihuela Z, Fernández A. Atención odontológica de discapacitados auditivos por estudiantes de la Facultad de Odontología de la Universidad de Carabobo. *Odous Científica.* 2017;18 (2): 28-36.
8. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, Moher D, Peters MDJ, Horsley T, Weeks L, Hempel S, Akl EA, Chang C, McGowan J, Stewart L, Hartling L, Aldcroft A, Wilson MG, Garrity C, Lewin S, Godfrey CM, Macdonald MT, Langlois EV, Soares-Weiser K, Moriarty J, Clifford T, Tunçalp Ö, Straus SE. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med.* 2018;169(7):467-473. doi: 10.7326/M18-0850. Epub 2018 Sep 4. PMID: 30178033.
9. Liccardo D, Cannavo A, Spagnuolo G, Ferrara N, Cittadini A, Rengo C, Rengo G. Periodontal Disease: A Risk Factor for Diabetes and Cardiovascular Disease. *Int J Mol Sci.* 2019;20(6):1414. doi: 10.3390/ijms20061414. PMID: 30897827; PMCID: PMC6470716.
10. Jnaneswar A, Subramaniya G, Pathi J, Jha K, Suresan V, Kumar G. Assessment of dental caries and periodontal status in institutionalized hearing impaired children in Khordha District of Odisha. *J Indian Soc Pedod Prev Dent.* 2017;35(3):203.
11. Alyami Y, Alamri RN, Abdulsamad MA, Alsharabi OH, Hakami MM, Alsheekh MA, Zamka HO, Alhijaili MA, Alharbi KA, Abulaban RM. Assessment of Oral Health Status and Communication Barriers in Hearing- and Speech-Impaired Children in Jeddah City. *Cureus.* 2022;14(3):e23277. doi: 10.7759/cureus.23277. PMID: 35449645; PMCID: PMC9013403.
12. Vichayanrat T, Kositpumivate W. Oral health conditions and behaviors among hearing impaired and normal hearing college students at Ratchasuda College, Nakhon Pathom, Thailand. *Southeast Asian J Trop Med Public Health.* 2014;45(5):1228-35. PMID: 25417527.
13. Tefera AT, Girma B, Adane A, Muche A, Awoke Ayele T, Getahun KA, Aniley Z, Ali S, Handebo S. Oral Health Status of Hearing-Impaired Students Attending Special Need Schools in Amhara Region, Ethiopia: A Cross-Sectional Study. *Clin Cosmet Investig Dent.* 2022;14:19-35. doi: 10.2147/CCIDE.S348730. PMID: 35095283; PMCID: PMC8791292.
14. Al-Maweri S, Zimmer S. Oral Health Survey of 6-14-Year-Old Children with Disabilities Attending Special Schools Yemen. *Journal of Clinical Pediatric Dentistry.* 2015;39(3):272–6.
15. Jain M, Bharadwaj SP, Kaira LS, Bharadwaj SP, Chopra D, Prabu D, et al. Oral health status and treatment need among institutionalised hearing-impaired and blind children and young adults in Udaipur, India. A comparative study. *Oral Health Dent Manag.* 2013;12(1):41–49.
16. Swain SK, Choudhury BK, Sahu MC. Dental problems among hearing-impaired children: Our experiences at a tertiary care teaching hospital in eastern India. *Pediatr Pol.* 2018;93(3):199–202.
17. Sujlana A, Goyal R, Pannu P, Opal S, Bansal P. Visual pedagogy and probiotics for hearing impaired children: A pilot study. *Journal of Indian Society of Pedodontics and Preventive Dentistry.* 2017;35(4):353.
18. Moin M, Saadat S, Rafique S, Maqsood A, Lal A, Vohra F, Alam MK, Ahmed N. Impact of Oral Health Educational Interventions on Oral Hygiene Status of Children with Hearing Loss: A Randomized Controlled Trial. *Biomed Res Int.* 2021;2021:5185613. doi: 10.1155/2021/5185613. PMID: 34950734; PMCID: PMC8692028.
19. Baliga Ms, Deshpande M, Thosar N, Rathi N, Bane S, Deulkar P. Comparison of impact of oral hygiene instructions given via sign language and validated customized oral health education skit video on oral hygiene status of children with hearing impairment. *J Indian Soc Pedod Prev Dent.* 2020;38(1):20.
20. Saikiran KV, Kamatham R, Sahiti PS, Nuvvula S. Impact of educational (sign language/video modeling) and therapeutic (Glycyrrhiza glabra--liquorice mouth wash) interventions on oral health pertaining to children with hearing impairment: A randomized clinical trial. *Spec Care Dentist.* 2019;39(5):505–14.

21. Sneha K, Praveen P, Anantharaj A. An assessment of the effectiveness of oral health education on oral health-related knowledge and attitudes of caregivers of children with hearing impairment. *Eur J Paediatr Dent.* 2022;23(1):10–4.
22. Fageeh HN, Mansoor MA. The effectiveness of oral hygiene instructions in sign language among hearing impaired adults in Saudi Arabia. *Special Care in Dentistry.* 2020;40(1):41–8.
23. Ávila-Curiel BX, Solórzano-Mata CJ, Avendaño-Martínez JA, Luna-Vásquez B, Torres-Rosas R. Playful Educational Intervention for Improvement of Oral Health in Children with Hearing Impairment. *Int J Clin Pediatr Dent.* 2019;12(6):491–3.
24. Hernández C, Robles N, Medina C, Jiménez S, Centeno C. Manejo odontológico del paciente con hipoacusia neurosensorial profunda bilateral. *Rev Cubana Estomatol.* 2017;54(3).
25. Pérez BM, Sánchez LA, Grandas ÁL. Dentiseñas–Colombia, prototipo de una App para facilitar la comunicación Odontólogo– Persona con Discapacidad Auditiva. *CES Odontol.* 2020;33(2):49–61.
26. Anil S, Bhandi SH, Chalisserry EP, Jafer M, Hosmani J. Chemical Plaque Control Strategies in the Prevention of Biofilm-associated Oral Diseases. *J Contemp Dent Pract.* 2016;17(4):337-43.
27. Ministerio de Salud. Salud Oral Integral para Menores de 20 años en Situación de Discapacidad que Requieren Cuidados Especiales en Odontología. 2012.