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ORIGINAL ARTICLE

TREATMENT NEEDS AND ORAL HEALTH STATUS OF INSTITUTIONALIZED DEAF AND NON-SPEAKING CHILDREN COMPARED TO TYPICALLY DEVELOPING CHILDREN IN AHMEDABAD CITY

Necesidades de tratamiento y estado de salud bucal de niños sordos y no verbales institucionalizados y niños con desarrollo típico en la ciudad de Ahmedabad

Jina Jani,[1,3] Anup Panda,[2] Balraj Shukla,[1,3] Amee Alwani,[4] Jayati Dave.[4]

1. Gujarat University, Gujarat, India.
2. Department of Pediatric and Preventive Dentistry. College of Dental Sciences and Research center, Ahmedabad, Gujarat, India.
3. Departamento de Odontología Pediátrica y Preventiva antes de la Universidad de Gujarat , India.
4. Private Practice, Ahmedabad, Gujarat, India.

ABSTRACT

Aim and Objective: To assess and compare the oral health status and treatment needs in institutionalized deaf and non speaking children to typically developing children in Ahmedabad city, Gujarat, India.

Material and Methods: A total 2200 children aged between 5-15 years were included in the study, Group I: 1100 typically developing, and Group II: 1100 deaf and non-speaking children. A customized proforma was used to evaluate oral health status and treatment needs.

Results: There was an overall higher caries experience as well as preventive, restorative and orthodontic treatment needs in deaf and non-speaking children compared to typically developing children.

Conclusions: This study showed the need for restorative and orthodontic treatment in the deaf non-speaking pediatric population with increased lack of dental care access for sensory-impaired children.

Keywords: *Pediatric dentistry; Deafness; Oral health; Oral hygiene index; Child, institutionalized; Needs assessment*

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Corresponding Author: Jina Jani. College of dental sciences and research center, Ghuma, Ahmedabad, India.
Phone: (+91) 9924 8574 57. **Email:** drjinajani@gmail.com

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RESUMEN

Objetivo: Evaluar y comparar el estado de salud bucal y las necesidades de tratamiento en niños sordos y no verbales institucionalizados con respecto a niños con desarrollo típico en la ciudad de Ahmedabad, Gujarat, India.

Material y métodos: Se incluyeron en el estudio un total de 2200 niños de entre 5 y 15 años, divididos en dos grupos: el Grupo I, compuesto por 1100 niños con desarrollo típico, y el Grupo II, compuesto por 1100 niños sordos y no verbales. Se utilizó un formulario adaptado para evaluar el estado de salud bucal y las necesidades de tratamiento.

Resultados: Los resultados del estudio mostraron una mayor prevalencia de caries, así como mayores necesidades de tratamiento preventivo, restaurativo y ortodóncico, en los niños sordos y no verbales en comparación con los niños con desarrollo típico.

Conclusiones: Este estudio evidenció la necesidad de tratamiento restaurativo y ortodóncico en la población pediátrica sorda y no verbal, junto con la creciente falta de acceso a la atención odontológica para los niños con discapacidad sensorial.

Palabras clave: *Odontología pediátrica; Sordera; Salud bucal; Índice de higiene oral; Niño institucionalizado; Evaluación de necesidades*

INTRODUCTION

Oral health is a fundamental right and an essential human need for general health and well-being. The American Academy of Pediatric Dentistry (AAPD) emphasizes this, advocating for primary and comprehensive preventive and therapeutic oral health care for children through adolescence. At the tail-end of its definition of pediatric dentistry, the AAPD inculcates children with special healthcare needs.[1]

Children with special healthcare needs face barriers to oral health due to functional comorbidities, poor access to dental care, parental attitudes, compromised diet, and inadequate oral hygiene.[2] Frank *et al.*,[3] categorized children with special healthcare needs into eight categories, two of which interest the present study – deaf or partially deaf children, and children with defective speech.

In the Indian context, the need to satisfy the oral health-related treatment needs of deaf-nonspeaking (DNS) children has been emphasized.[4] Yet, there is a paucity of literature regarding the dentition status and treatment needs of these patients in Western India.

This study compared the oral health status of DNS children to typically developing children. The objective was to provide baseline data to facilitate the planning and evaluating of appropriate preventive and curative programs in Western India.

MATERIALS AND METHODS

This present cross-sectional study was conducted in Ahmedabad city, in alliance with institutions specialized for hearing impaired children and in schools for normal children. Ethical clearance to carry out the study was obtained from the institutional ethical board of the College of Dental Sciences and Research Centre (CDSRC/IEC/2023/16).

The necessary permissions for conducting dental camps were obtained from the schools

and written consent was taken from the caregivers/parents.

The study included participants between 5-15 years of age. The inclusion criteria for deafness were based on the World Health Organization's definition of profound hearing impairment (more than 90dB in one or both ears) or total hearing loss.[5] Non-speaking participants who exhibited complete muteness, with no previous lack of sound production, or failure to voluntarily elicit a sound were included in the study. Children with any handicap (except the sensory impairment of concern), systemic diseases, and under medication were excluded from the study.[6]

The Type III examination procedure recommended by the American Dental Association was performed with the help of a plane mouth mirror, explorer, and CPI probe. Two investigators performed the oral examinations in the institute's medical room or classroom. Caretakers and teachers assisted them in communicating with children with sensory impairments.

A customized proforma was used to record the observations. This proforma combined two validated and standardized forms – the WHO Oral Health Assessment for Children (WHOOHAC) (2013)[7] and the Oral Hygiene Index-Simplified (OHI-S) recording sheet.

The WHOOHAC was used to record decayed, missing, and filled components (DMF), dentition, periodontal status, dental erosion, dental trauma, oral mucosal lesions, enamel fluorosis, and intervention urgency.

A total of 2200 children were screened [Group I: 1100 typically developing (TD) and Group; II: 1100 deaf-nonspeaking (DNS)]. After the examinations, children who required dental treatments were referred to a dental institute for rendering specialty care.

Table 1.

Descriptive Statistics for oral hygiene status and dental caries with treatment needs and prevalence rates

Variable	Group I (n=1100)	Group II (n=1100)	p-value
Demography	Male: 614	Male: 733	---
	Female: 486	Female: 367	---
Mean OHI-S	1.315 ± 0.51	1.497 ± 0.78	0.040
deft	0.727 ± 1.04	0.791 ± 1.36	0.697
DMFT	0.182 ± 0.64	1.436 ± 2.01	0.091
Treatment Needs and Prevalence Rates at 95% Confidence Interval			
Variable	**Group I (n=1100) (%)**	**Group II (n=1100) (%)**	**p-value**
One-surface filling	22.72 (20.35 - 25.30)	44.54 (41.63 - 47.5)	<0.001
Two-surface filling	13.63 (11.73 - 15.79)	20 (17.74 - 22.47)	<0.001
Crown coverage	13.63 (11.73 - 15.79)	18.18 (16.01 - 20.57)	<0.001
Veneers/Laminates	3.63 (2.68 - 4.91)	5.45 (4.26 - 6.96)	0.051
Pulp Therapy	16.73 (14.64 -19.05)	19.06 (16.88 - 21.52)	0.17
Extraction	4.54 (3.46 - 5.94)	16.36 (14.30 - 18.67)	<0.001
Fluoride application	60 (57 - 62.86)	88.18 (86.14 - 89.96)	<0.001
Fissure Sealants	29.09 (26.48 - 31.84)	34.54 (31.79 - 37.4)	0.07
Orthodontic Treatment	20.91 (18.61 - 23.41)	25.45 (22.97 - 28.11)	0.01

The resulting data were entered into statistical software (Statistical Package for the Social Sciences version 20; SPSS Chicago, USA) for significance testing between the categorical variables using the Pearson chi-square test and the independent sample t-test.
The former was to understand the prevalence of various dental defects based on treatment needs whereas the latter compared the OHI-S, def, and DMFT scores.

RESULTS

The interpretation of both groups' OHI-S, def, and DMFT scores reveals that oral hygiene, caries status, and caries experience are comparable with neither having a significant advantage (Table 1).

Based on the treatment needs scores, participants in Group II required a significantly higher restorative treatment.

The treatment needs also indicate a higher prevalence of simple, compound, and complex caries in Group II. The Group II prevalence rates also hint that dental status is largely overlooked in DNS children.
This is because of the highly significant (<0.001) need for both radical (extraction) and preventive (fluoride application) treatments in Group II.
Though the prevalence rate and the need for veneers/laminates, pulp therapy, fissure sealants, and orthodontic treatment were higher for Group II, the results were not statistically significant (Table 1).

Table 2.
Caries Prevalence Rate of deaf non-speaking children in India

Reference	Year	Age (Years)	Region	Caries Prevalence (%)
Aruna *et al.*[14]	2005	6-18	Davangere	93.90
Rao *et al.*[15]	2005	7-18	South Canara	35.32
Avasthi *et al.*[16]	2011	5-16	Delhi & Gurgaon	72.43
Jain *et al.*[17]	2013	9-17	Udaipur	90.36
Chand *et al.*[18]	2014	3-22	Indore	45.80
Bhardwaj *et al.*[19]	2014	5-22	Shimla	90.10
Kar *et al.*[20]	2016	6-12	Malda	30.51
Samal A *et al.*[21]	2024	13-16	Cuttack	76.90

Table 3.
OHI-S scores of deaf non-speaking children in Indian studies

Reference	Year	Age (Years)	Region	Mean Ohi-S Scores
Rao *et al.*[15]	2005	7-18	South Canara	1.49 ± 0.88
Jain *et al.*[26]	2008	5-14	Udaipur	1.73 ± 0.70
Rawlani *et al.*[27]	2010	7-18	Warora	1.49 ± 0.76
Reddy *et al.*[28]	2013	7-17	Bhopal	1.15 ± 0.72

DISCUSSION

Oral health may be a low priority in the context of other social and medical challenges in DNS children.[8] Lack of awareness, transportation, financial constraints, poor compliance with dental procedures, communication barriers, and lack of awareness regarding dental diseases among parents or caretakers are common reasons cited for the high incidence of dental defects in sensory-impaired children.[9-11]
A 2020 scoping review[12] and a 2023 systematic review and meta analysis[13] revealed that India led the list of publications that reported on the oral hygiene status and dental caries of deaf or hard-of-hearing and non-speaking children.

However, there is a dearth of such data in the western part of the country. Prevalence studies to identify caries rates in deaf and hard-of-hearing children have been carried out in various Indian cities (Table 2).[14-21]
The present study adds to the literature on comparative studies showing a higher prevalence of dental caries in DNS children than in typically developing children.[20,22,23] The variations in prevalence rates can be attributed to where the prevalence study was conducted. Children living in a constant controlled environment usually have a more supervised dietary control, significantly reducing their caries risk. Yet, dental caries continue to be the highest unmet treatment need in the Indian context. The reason for higher caries prevalence can be due to middle ear inflammation in DNS, which lead to the higher rate of pathogens, specifically *Streptococcus mutans*.[24,25]

OHI-S has been consistently used as a reliable assessment tool to report the oral hygiene status of sensory-impaired patients. The OHI-S score for DNS children in our study was 1.497 ± 0.78, which is eerily similar to and shares high agreement with previous studies (Table 3).[15,26-28]

The orthodontic treatment needs were also significantly higher in Group II. Restriction in tongue mobility is a pertinent etiological factor to explain this. The reduced mobility of the tongue triggers a cascade that leads to muscular dysfunction of the cheek and lips, narrowing of the maxillary arch, and development of parafunctional oral habits. Additionally, the inability to exert pressure on the incisor segment and the ultimate failure to maintain the neutral zone paves the way for deep bites and crossbites.[29-31]

DNS children as exhibiting poor oral health, high levels of dental caries, and requiring higher treatment need leads to negative impact on their overall Quality of life, requiring specialized and comprehensive oral health education and dental care programs.[24]

In a developing country like India, lack of awareness regarding oral hygiene and barriers to dental care are at the forefront among all factors that explain the high prevalence rate of dental defects. The strength of this prevalence study is that it contributes to the literature by explaining prevalence rates through treatment needs. To our best knowledge, this is also the first prevalence study regarding oral hygiene status and treatment needs for the DNS population from Gujarat state.

This study has three notable limitations. Firstly, oral hygiene behaviors, dietary intake, and fluoride consumption for the participants was not taken into consideration. Secondly, the type of traumatic dental injury most prevalent between the two populations

was not assessed. Finally, this study could have been improved if the prevalence rates were better explained based on sexual dimorphism and stratified presentation of results for different age groups.

Given its limitations, this study puts forth preliminary data that future prevalence studies can consider. It also allows researchers to build on this study and extend it to large-scale epidemiological studies.

CONCLUSIONS

This prevalence study reveals the need for restorative and orthodontic treatment in the deaf non-speaking pediatric population.

The oral hygiene status and prevalence rates of dental caries in sensory-impaired children indicate a glaring lack of dental care access for this population.

CONFLICT OF INTERESTS

The authors have no conflicts of interest.

ETHICS APPROVAL

Ethical clearance to carry out the study was obtained from the institutional ethical board of the College of Dental Sciences and Research Centre, Ahmedabad, Gujarat, India (CDSRC/IEC/2023/16).

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AUTHORS' CONTRIBUTIONS

Jina Jani: Conceptualization, Methodology, Formal Analysis, Investigation, Resources, Data Curation, Writing – Original Draft, and Project Administration.

Anup Panda: Conceptualization, Methodology, Formal Analysis, and Writing – Original Draft, and Supervision.

Balraj Shukla: Validation, Formal Analysis, and Writing – Review, Editing.

Amee Alwani: Writing – Review & Editing and Supervision.

Jayati Dave: Visualization and Supervision.

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ORCID

Jina Jani
0000-0002-3386-5348
Anup Panda
0000-0002-9229-0097
Balraj Shukla
0000-0002-0923-5135
Amee Alwani
0009-0006-47459814
Jayati Dave
009-0001-2355-9072

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REFERENCES

1. American Academy of Pediatric Dentistry. Overview. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2024:7-9.
2. Sanjay V, Shetty SM, Shetty RG, Managoli NA, Gugawad SC, Hitesh D. Dental health status among sensory impaired and blind institutionalized children aged 6 to 20 years. J Int Oral Health. 2014 Feb;6(1):55-8. Epub 2014 Feb 26. PMID: 24653604; PMCID: PMC3959138.
3. Franks AS, Winter GB. Management of the handicapped and chronic sick patient in the dental practice. Br Dent J. 1974;136(3):107-10. https://doi.org/10.1038/sj.bdj.4803131. PMID: 4274250.
4. Shivakumar KM, Raje V, Kadashetti V. Dental caries experience and oral hygiene status among hearing and speech impaired children of Karad city, Maharashtra, India. J Int Oral Health 2018;10:283-6. https://doi.org/10.4103/jioh.jioh_181_18
5. World Health Organization. Deafness and hearing impairment – Fact sheet. 2010. http://www.who.int/mediacentre/factsheets/fs300/en/index.html.
6. Shames, George H., and Noma B. Anderson. Human Communication Disorders : An Introduction. 7th ed. Boston: Pearson/Allyn and Bacon, 2006.
7. World Health Organization (2013). Oral Health Survey, Basic//methods, 5th edition.
8. The Faculty of Dental Surgery of the Royal College of Surgeons of England and The British Society for Disability and Oral Health. Clinical guidelines and integrated care pathways for the oral health of people with learning disabilities. London: Royal College of Surgeons of England, 2001.
9. 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. https://doi.org/10.2147/CCIDE.S348730. PMID:35095283; PMCID: PMC8791292.
10. Alkadhi OH, Abdulrahman BI, Alhawas SA, Almanie LA, Alsalmi HE, Aljumah AA. The need for a Smart Phone Application to Facilitate Communication Between Deaf-Mute and Hearing-Impaired Patients and Dentists. J Family Med Prim Care. 2021;10(8):2928-2932. https://doi.org/10.4103/jfmpc.jfmpc_2308_20
11. Kim YR, Kim SR. Differences in Oral Health According to the Presence of Hearing Loss: Data from the 2021 Korea National Health and Nutrition Examination Survey. Noise Health. 2024;26(121):88-96. https://doi.org/10.4103/nah.nah_114_23
12. Cannobbio VC, Cartes-Velásquez R, McKee M. Oral Health and Dental Care in Deaf and Hard of Hearing Population: A Scoping Review. Oral Health Prev Dent. 2020;18(3):417-425. https://doi.org/10.3290/j.ohpd.a44687. PMID: 32515411; PMCID: PMC11654634.
13. Bhadauria US, Purohit B, Agarwal D, Priya H. Dental caries status in individuals with hearing difficulties: A systematic review and meta-analysis. Spec Care Dentist. 2023;43(1):9-16. https://doi.org/10.1111/scd.12745
14. Aruna CN, Chandu GN, Shafiulla MD. Dental caries experience among deaf and dumb children in Davengere, Karnataka. J Indian Assoc Pub Health Dent 2005;6:1-4. https://doi.org/10.4103/2319-5932.184840
15. Rao D, Hegde A, Munshi AK. Oral hygiene status of disabled children and adolescents attending special schools of South Canara, India. Hong Kong Dent J. 2005;2:107-13.
16. Avasthi K, Bansal K, Mittal M, Marwaha M. Oral health status of sensory impaired children in Delhi and Gurgaon. International Journal of Dental Clinics. 2011 Aug 2;3(2).
17. Jain M, Bharadwaj SP, Kaira LS, Bharadwaj SP, Chopra D, Prabu D, Kulkarni S. 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):41-9. PMID: 23474580.
18. Chand BR, Kulkarni S, Swamy NK, Bafna Y. Dentition Status, Treatment Needs and Risk Predictors for Dental Caries among Institutionalised Disabled Individuals in Central India. J Clin Diagn Res. 2014; 8(9): ZC56-9. https://doi.org/10.7860/JCDR/2014/9940.4861. PMID: 25386524; PMCID: PMC4225976.
19. Bhardwaj VK, Fotedar S, Sharma KR, Luthra RP, Jhingta P, Sharma D. Dentition status and treatment needs among institutionalized hearing and speech impaired children in Himachal Pradesh in India: A cross-sectional study. SRM J Res Dent Sci 2014;5:78-81. https://doi.org/10.4103/0976-433X.132075

20. Kar S, Kundu G, Maiti SK, Ghosh C, Bazmi BA, Mukhopadhyay S. A comparative evaluation of dental caries status among hearing-impaired and normal children of Malda, West Bengal, evaluated with the Caries Assessment Spectrum and Treatment. J Indian Soc Pedod Prev Dent 2016;34:306-9. https://doi.org/10.4103/0970-4388.191407
21. Samal A, Menon I, Jha K, Singh A, Saxsena A. Oral Health Status Among Deaf Children in Cuttack City: A Cross-Sectional Study. Cureus. 2024;16(10):e72236. https://doi.org/10.7759/cureus.72236
22. Wei H, Wang YL, Cong XN, Tang WQ, Wei PM. Survey and analysis of dental caries in students at a deaf-mute high school. Res Dev Disabil. 2012;33(4):1279-86. https://doi.org/10.1016/j.ridd.2012.02.025. Epub 2012 Mar 22. PMID: 22502855.
23. Doichinova L. Peneva M. Prevalence of dental caries in hearing impaired children than 5 to 12 years old in Sofia. IJSR 2015 January; 4(1): 1088-1091.
24. Ghannam AN, Nahas L, Dashash M. Exploring the Link Between Oral Health Factors and Hearing Impairments in Children: A Cross-Sectional Study. Cureus. 2024;16(7):e63650. Published 2024. https://doi.org/10.7759/cureus.63650
25. Kashyap N, Katlam T, Avinash A, Kumar B, Kulshrestha R, Das P. Middle ear infection in children and its association with dental caries. Med Pharm Rep. 2019;92(3):271-276. https://doi.org/10.15386/cjmed-1043
26. Jain M, Mathur A, Kumar S, Dagli RJ, Duraiswamy P, Kulkarni S. Dentition status and treatment needs among children with impaired hearing attending a special school for the deaf and mute in Udaipur, India. J Oral Sci. 2008;50(2):161-5. https://doi.org/10.2334/josnusd.50.161. PMID: 18587205.
27. Rawlani S, Rawlani S, Motwani M, Bhowte R, Baheti1 R, Shivkumar. Oral health status of deaf and nonspeaking children attending special school in Anand-Wan, Warore. India J Kor Dent Sci 2010; 3(2): 20-5.
28. Reddy VK, Chaurasia K, Bhambal A, Moon N, Reddy EK. A comparison of oral hygiene status and dental caries experience among institutionalized visually impaired and hearing impaired children of age between 7 and 17 years in central India. J Indian Soc Pedod Prev Dent. 2013;31(3):141-5. https://doi.org/10.4103/0970-4388.117963. PMID: 24021322.
29. Tye-Murray, N. (1991). Repair strategy usage by hearing-impaired adults and changes following communication therapy. Journal of Speech & Hearing Research, 34(4), 921–928. https://doi.org/10.1044/jshr.3404.921
30. Aznar T, Galán AF, Marín I, Domínguez A. Dental arch diameters and relationships to oral habits. Angle Orthod. 2006;76(3):441-5. https://doi.org/10.1043/0003-3219(2006)076[0441:DADART]2.0.CO;2. PMID: 16637724.
31. Graber, TM. The “three M's”: Muscles, malformation, and malocclusion. American J Orthod. 1963;49(6):418-450. https://doi.org/10.1016/002-9416(63)90167-2