



ORIGINAL ARTICLE

ORAL HEALTH STATUS AND ITS ASSOCIATED FACTORS AMONG TRIBALS OF SOUTH INDIA - A SYSTEMATIC REVIEW

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ABSTRACT

Background: Oral health is a critical but under-researched aspect of general health among tribal populations in South India. These communities face multiple structural and cultural barriers including poverty, geographical isolation, and reliance on traditional practices, leading to high disease burden and low dental service utilization. This systematic review evaluates the oral health status of South Indian tribal populations and identifies associated behavioral, systemic, and cultural determinants. The aim of the present review was to systematically assess the oral health status and its associated factors among tribal communities in South India using evidence from the past decade

Materials and methods: This review followed PRISMA 2020 guidelines and the Cochrane Handbook. Searches were conducted in PubMed, Scopus, Web of Science, Google Scholar, Cochrane CENTRAL, and LILACS from 2014 to 2025. Studies included were original research focusing on dental caries, oral hygiene, periodontal status, oral health-related quality of life, or nutrition among South Indian tribals. Twenty-one cross-sectional and qualitative studies met the inclusion criteria. The Modified Newcastle Ottawa Scale was used for risk of bias assessment, and Egger's test evaluated publication bias.

Results:The included studies covered diverse tribes across Tamil Nadu, Kerala, Karnataka, Andhra Pradesh, and Telangana. DMFT scores ranged from moderate to alarmingly high (up to 18.32), with dental caries, poor hygiene, and periodontal disease being widespread. Children showed high caries prevalence (up to 89.3%), and elderly populations exhibited poor prosthetic status and compromised oral health-related quality of life. Behavioural determinants such as use of twigs, charcoal, and tobacco were common. Nutritional deficits and systemic health issues were correlated with poor oral outcomes. A few interventional studies demonstrated improved outcomes with culturally sensitive oral health education and access interventions.

Conclusion: South Indian tribal populations experience severe oral health disparities shaped by systemic neglect, cultural practices, and inadequate access to care. There is a pressing need for integrated, community-engaged, and culturally competent public health interventions. The incorporation of oral health into tribal welfare policies, education of local health workers, and targeted research are crucial for addressing this longstanding inequity.

Keywords: Oral health, Oral hygiene practices, Indigenous population, Health behaviour, Oral health related quality of life

INTRODUCTION

Oral health is an integral yet often overlooked component of general health, with wide-reaching implications for systemic well-being, quality of life, and social integration. Among India's diverse population, tribal communities represent a unique subset whose health experiences are shaped by deeply rooted cultural practices, geographical isolation, socioeconomic marginalization, and limited access to healthcare infrastructure¹. The indigenous groups, spread across remote and forested regions, have historically been disconnected from mainstream development narratives, and their oral health needs remain under-researched, under-documented, and under-addressed in public health policies. The intersection of cultural identity, environmental exposure, traditional health beliefs, and systemic barriers creates a complex landscape in which oral diseases are both prevalent and neglected².

In India, tribal communities constitute approximately 8.6% of the total population and represent some of the most socioeconomically disadvantaged groups. South India is home to diverse tribal populations, including but not limited to the Irula, Kurumba, Paniyan, Todas, Kotas, and Chenchus, each with their distinct cultural practices, dietary habits, and health beliefs. These communities are often geographically isolated and face systemic barriers in accessing quality healthcare, including dental services³.

The oral health profile of tribal communities in Tamil Nadu reveals a confluence of factors that not only contribute to poor oral hygiene outcomes but also hinder timely access to preventive and therapeutic dental services. These communities often rely on traditional practices and indigenous remedies for oral care, rooted in ancestral knowledge and ritualistic customs. While these methods reflect cultural richness and resilience, they may not align with evidence-based oral health practices, leading to the persistence of dental caries, periodontal issues, and untreated oral infections⁴.

Socioeconomic deprivation further exacerbates the situation, as most tribal populations grapple with poverty, low literacy levels, and limited employment opportunities. These determinants directly impact health-seeking behavior and the affordability of dental services. In areas where public health infrastructure is scarce or inadequately equipped, oral healthcare becomes a luxury rather than a basic necessity⁵. Distance from urban centers, lack of transportation, and linguistic barriers further alienate these communities from mainstream healthcare systems. Even when government initiatives are in place,

awareness and utilization of these schemes remain significantly low due to poor outreach, mistrust in institutional healthcare, or administrative bottlenecks⁶.

Another layer of complexity arises from the behavioral aspects that influence oral health. Habits such as tobacco chewing, smoking, and the use of areca nut are culturally embedded in many tribal societies.

These practices begin early in life and are socially normalized, often without awareness of their deleterious effects on oral and systemic health⁷. The habitual use of smokeless tobacco, areca nut, and betel quid is notably widespread among many tribal groups and is culturally ingrained, thereby increasing the risk for oral premalignant and malignant lesions. Collective social beliefs, fatalism, and lack of access to cessation support influence attitudes towards quitting such habits. Addressing these behaviors requires culturally sensitive, community-specific approaches beyond conventional awareness campaigns⁸.

Stress and psychosocial determinants also play a critical role in the oral health status of tribal populations. Many indigenous communities face systemic marginalization, social exclusion, and economic instability, all of which contribute to chronic stress. There is a growing body of evidence indicating a direct link between psychological stress and oral health problems, including periodontal diseases and oral pain⁹. However, the mental health needs of tribal populations are rarely addressed in conjunction with oral health, and the bio-psycho-social model is yet to be fully integrated into tribal health frameworks. By examining stress indicators, such as salivary cortisol levels, alongside oral health outcomes, researchers are beginning to unravel the deeper interconnections between psychological well-being and dental health among these communities¹⁰.

Cultural beliefs and community narratives significantly influence oral health perceptions and behaviors. In tribal societies, oral health is not always conceptualized in biomedical terms. Pain, for instance, may be attributed to spiritual or supernatural causes, leading to reliance on rituals or herbal remedies over clinical intervention¹¹. These cultural interpretations, while valuable in understanding community worldviews, can delay treatment and exacerbate oral health problems¹².

Intervention strategies aimed at improving oral health in tribal populations must therefore be rooted in cultural competence, community participation, and intersectoral collaboration. Community-based education programs, tailored interventions in schools, and training of local health workers can bridge the gap between traditional beliefs and modern dental practices¹³. There is also a

pressing need to improve data collection, epidemiological surveillance, and research focusing specifically on tribal oral health to inform policy and program development. This includes qualitative insights that explore community attitudes, barriers to care, and lived experiences of oral health, providing a nuanced understanding beyond mere statistics.

Despite various governmental initiatives aimed at addressing tribal health disparities, oral health continues to be sidelined. Awareness of public welfare schemes related to dental care remains minimal, and where present, the implementation often lacks cultural sensitivity or fails to reach remote areas. Strengthening health systems to accommodate the unique needs of tribal populations involves not only infrastructural development but also the empowerment of communities through education, advocacy, and leadership from within the tribes. Creating platforms where tribal voices are heard and their health narratives recognized is essential for sustainable change¹⁴.

In recent years, there has been a modest but significant shift in research interest toward understanding the oral health of tribal communities. However, the scope of this research must expand further to encompass a multidisciplinary approach that includes anthropology, psychology, sociology, and public health. Addressing the oral health needs of tribal populations is not merely a clinical challenge but a societal responsibility that calls for empathy, equity, and systemic transformation. Through sustained research, culturally rooted interventions, and a deep commitment to inclusive health, the oral health outcomes of tribal populations can be significantly improved. The road ahead requires collective action, multidisciplinary engagement, and a genuine respect for the knowledge, resilience, and dignity of India's tribal communities.

MATERIALS AND METHODS

Protocol

The Preferred Reporting Items for Systematic Reviews and Meta-Analysis 2020 Statement and the Cochrane Handbook were followed in the preparation of the review's protocol^{15,16}. The review did not have any human participation and hence was exempted from the institutional ethical review board.

Original research investigating the oral health status of south Indian tribals as their primary objective, Studies that had included nutrition, caries status, oral hygiene practices and oral health related quality of life of South Indian tribals, Studies published in the last 10

years and of cross sectional, longitudinal, qualitative trials and comparative studies were included. Reviews, editorials, out-of-scope articles, grey literature, studies done in north indian states and studies that required English translation were excluded.

Information Sources and Search Strategy

To find all peer-reviewed studies relevant to the review's question, a comprehensive search of PubMed, Google Scholar, Cochrane CENTRAL, Scopus, Web of Science, and LILACS was conducted for all the articles that were published. When developing thorough search strategies, each database's unique vocabulary and syntactical restrictions were taken into account.

The following MeSH terms were used in the search strategy. The MeSH terms include Oral Health Status OR Dental Caries OR Oral health related quality of life OR Oral hygiene OR Oral hygiene practices, OR Periodontal status. The second set includes South Indian Tribals, OR Indian Tribals, OR Tribes of South India, and the third set of terms includes Adults, OR Children, OR Elderly from 2014 to 2025. A manual search of several journals, including the Journal of Indian Association of Public Health Dentistry, BMC Oral Health, and Journal of Family Medicine and Primary Care, covering Dental Public Health, was also conducted.

Two authors (HK and LRC) independently carried out the study selection process by screening the titles and abstracts based on predefined inclusion and exclusion criteria to identify relevant studies. For those papers that could not be excluded through title and abstract alone, both authors independently reviewed the full texts. The results were then compared between the two, and there were no disagreements regarding which studies to include.

Data extraction

Two reviewers carried out the data extraction. The following information was taken from the studies that satisfied the requirements for inclusion and eligibility and entered into a Microsoft Excel spreadsheet that was predetermined (Microsoft Corp., Redmond, WA, USA): the level of evidence; sample size; year of publication; first author; method of obtaining secondary outcomes such as nutrition status, dental caries, oral hygiene status, oral hygiene practices. Figure 1 shows the stages of article selection schematically as shown in the PRISMA flow diagram¹⁷.

Assessment of Risk of Bias

A total of 21 cross-sectional studies were included in the final analysis. The methodological quality of these studies was evaluated using the Modified Newcastle Ottawa Scale. This scale assesses cross-sectional studies based on seven criteria grouped under three categories: selection,

comparability, and outcome. The maximum possible scores were 5 points for selection, 2 points for comparability, and 3 points for outcome. Higher scores indicated better methodological quality of the studies¹⁸. Egger's test was used to assess the publication bias¹⁹.

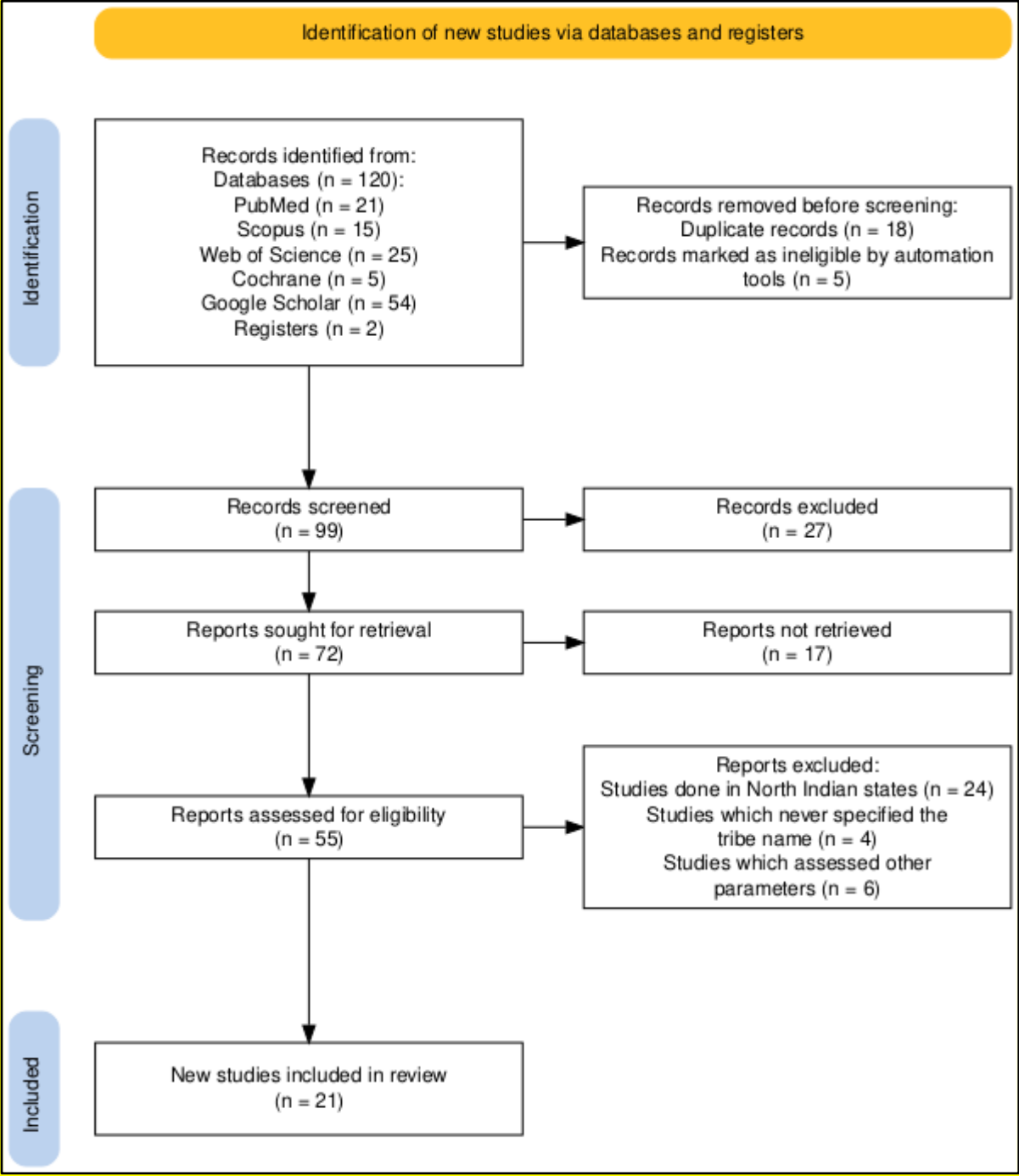


Figure 1. Prisma Flowchart showing the selection process of included studies

RESULTS

A total of 122 studies were initially identified through database and register searches. After removing 18 duplicate entries and 5 articles through automated processes, 99 studies remained for screening. Of these, 27 were excluded based on abstract review due to not meeting the eligibility criteria. Full-text retrieval was attempted for the remaining 72 articles, but 17 could not be accessed. Consequently, 55 studies underwent full-text evaluation. Among them, 24 were excluded as they were conducted in North Indian states, 4 were removed for not specifying the tribal community studied, and 6 were excluded for focusing on unrelated parameters. Ultimately, 21 studies were deemed suitable and included in the final review.

The studies span from 2014 to 2025, reflecting nearly a decade of research focus on tribal oral health. Notably, many of the recent studies (2024–2025) suggest a growing academic interest in this area. The authorship includes researchers affiliated with dental and public health institutions, and most articles are published in reputed journals like the *Journal of Clinical and Diagnostic Research*, *Indian Journal of Public Health Research & Development*, and *Bioinformation*.

Most of the studies are cross-sectional, providing snapshots of oral health status within specific populations at a single time. One qualitative study is included by Margret Beaula Alocious Sukumar et al. 2025, offering deeper insights through focus groups and interviews. The geographical focus is largely on Tamil Nadu, with a few studies from Kerala and Karnataka. There was one study from Andhra Pradesh by Vikram Simha Bommireddy et al 2023.

Sample sizes vary significantly from as small as 56 participants (in qualitative research) to over 900 individuals in a study by Rahmath Meeral et al. The populations studied include schoolchildren, adults, and elderly from various tribes such as Narikurarvars, Kurumbas, Kanikkaran, Paliyan, Pulayan, Irular, and Paniya.

Across studies, the most frequently used tool was the WHO Oral Health Assessment Proforma (1997, 2013), ensuring standardized oral health evaluation. In studies done by Rahmath Meeral P et al, Srisakthi Dorai Kannan et al, Durga Devi Raj et al, IrIS Valsan et al, Shibani Sushmitha Ray et al, Sandhya Neelamana et al, Sophia Thomas et al, and Margret Beaula et al consistently used WHO formats. Studies done by Shaik Mohammed Asif et al and Vikram Simha Bommireddy et al, also incorporated Oral Hygiene Index-Simplified (OHI-S) and Community Periodontal Index (CPI) to assess hygiene and periodontal status. A study done by Lalitha Rani Chellappa et al used the DMFT index with detailed recording of decayed, missing, and filled teeth components.

There were two studies done by Kayal VM et al, G.G. Gopika et al, and Pradeep VR et al supplemented WHO tools with pretested questionnaires, enabling behavioral and attitudinal assessments. One study by Margret Beaula et al used qualitative tools like focus groups and interviews, offering rich cultural insight absent in quantitative-only studies. Other than these parameters, studies done by Vishal Prakasam et al 2025 and Margret et al 2025 included Mini Nutritional Assessment (MNA) and GOHAI (Geriatric Oral Health Assessment Index), showing a shift toward a multi-dimensional evaluation that includes systemic and psychosocial health.

Dental Caries status

A clear trend across all studies is the high prevalence of untreated dental caries, poor oral hygiene, and low awareness in tribal populations. A study done by Vishal Prakasam and GG Gopika reported a mean DMFT of 18.32 and 13.1 respectively, one of the highest, indicating severe untreated dental disease. Another study done by Lalitha Rani Chellappa reported a DMFT breakdown showing decayed component dominating, suggesting lack of access to restorative care. Studies by M.T. Jeseem and Shibani Ray also found high DMFT and poor hygiene scores. Another study by Iris Valan et al, revealed 40% caries prevalence and higher mean DMFT scores. Study by Mahalakshmi et al revealed mean DMFT was 5.6 which was higher than national average. Contrastingly, study by Sophia Thomas et al revealed a 22.3% prevalence of dental caries status.

Prosthetic Needs and Elderly Challenges

A study by Srisakthi Dorai Kannan highlighted 58% ignored oral health with high prosthetic need among 55+ age group. Another study by Sandhya Neelamana found elderly women had a worse oral health-related quality of life than men.

Study by Margret Beaula (BMC) reported 38.5% caries, 60.6% periodontal disease, and 35% oral dryness, linking oral and systemic health in the elderly.

Hygiene and Periodontal status

Studies by Shaik Mohammed Asif and Vikram Simha Bommireddy identified CPI scores indicating moderate to severe periodontal disease, often linked to misbeliefs and illiteracy. Also studies by Kirankumar B. Dhanappa and Durga Devi Raj observed worsening oral health with age, emphasizing the need for early intervention. A study by Durga Devi Raj et al revealed that 72% used toothbrushes and 28% used twigs for oral hygiene. They did not visit dentist regularly. Another study by Margret et al concluded that Older Irula adults use toothbrushes, neem twigs, or charcoal for oral hygiene. A study by Hiranya S et al revealed that 85% used brush and paste, while others used finger-toothpowder, neem sticks, or masheri and about 85.25% brushed once daily, and 14.75% twice daily.

Children's Oral Health

Studies done by Sophia Thomas, Kayal VM, and Hiranya S focused on school-going children, reporting poor brushing habits, high dental trauma (7.8%), and even dental erosion (19.4%). Another study done by Pradeep VR highlighted better potential for treatment compliance in children, a positive window for intervention. A study by Baby John et al revealed caries prevalence of 89.3% for tribal school children. Another study by Jaseem et al revealed that mean DMFT and dmft scores of 0.72 and 1.85 respectively.

Implications of the included studies

All the reviewed studies consistently emphasize the urgent need for culturally sensitive and context-specific interventions to address the oral health disparities among tribal populations. A major recommendation across the board is the promotion of awareness and education. Rahmath Meeral P, Durga Devi Raj, and Shibani Ray advocate for school-based awareness initiatives and active community mobilization to instill preventive oral health habits from a young age. Complementing this, Margret Beaula (Indian Journal of Geriatrics) underscores the importance of customizing health messages to align with traditional cultural beliefs and suggests involving respected community elders to serve as oral health ambassadors, thereby enhancing trust and compliance. Improving access and infrastructure also emerged as a critical theme. IrIS Valsan, J. Baby John, and Vishal Prakasam recommend innovative approaches such as deploying mobile dental units and tele-dentistry services, alongside government-subsidized care, to overcome geographical and financial barriers. Further, Sandhya Neelamana and G.G. Gopika draw attention to glaring infrastructure deficits, particularly affecting women and vulnerable groups like the Narikuravars, reinforcing the need for targeted infrastructural support. Behavioral change and tackling deep-rooted cultural barriers were also prominently discussed. Vikram Simha, Shaik Asif, and Pradeep VR note that illiteracy and superstition often prevent communities from embracing modern dental practices. They call for sustained, community-based behavioral interventions that are culturally contextualized. Additionally, Margret (BMC) suggests employing comprehensive tools like ICDAS and GOHAI not only to track the prevalence of dental disease but also to assess functional limitations and the overall impact on quality of life. At the policy level, multiple studies including those by Lalitha Rani Chellappa, Sophia Thomas, and G.G. Gopika highlight the necessity of integrating oral health services into the primary healthcare framework. They also recommend incorporating oral health into existing national tribal welfare programs to ensure systematic and sustained outreach. Collectively, these studies make a compelling case for a multi-pronged, inclusive strategy to address the oral health needs of India's tribal populations (Table 1). A detailed quality assessment of included articles were done by New Castle Ottawa assessment scale (Table 2).

Table 1. Characteristics of included studies

S.No	Author and year	Study type	State	Sample	Parameters	Results	Implications
1	Rahmath Meeral P et al, Journal of Oral Biology and Craniofacial Research, 2024 [20]	cross sectional	Tamil Nadu	907 Kanikkaran tribes	WHO oral health assessment proforma and dietary habit and adverse habit practices	The study found a significant negative moderate correlation between age and dental caries. Tribes with only primary education and agricultural occupations faced a higher risk of periodontal disease, premalignant lesions, and non-carious lesions. Additionally, males in this group showed significantly higher sugar consumption and tobacco use.	The necessity of raising awareness of the significance of good oral health through education and implementation of necessary dental services in Kanikkaran tribes.
2	Srisakthi Dorai Kannan et al, Bioinformat ion, 2020 [21]	cross sectional	Tamil Nadu	463 - Paliyan tribes and 551 - Pulayan tribes.	WHO oral health assessment proforma, and oral health behaviour and oral hygiene practices	The results revealed that 58% ignored oral health issues, 22.2% used self-medication, 14% consulted a general physician, only 3.5% visited a dentist, and 2.3% relied on over-the-counter medications.	The prosthetic need was highest among the 55 + yrs age group, 48.6% required maxillary prosthesis and 28.4% required mandibular prosthesis.
3	Durga Devi Raj,et al. Journal of Indian Association of Public Health Dentistry, 2025 [22]	cross sectional	Tamil Nadu	6–16-year-old tribal school children at Jawadhu (520)	WHO oral health assessment proforma and oral hygiene behaviour	Among 520 participants, 72.3% were male and 27.7% female. While 71.92% used toothbrushes and toothpaste, 28.07% used twigs for oral hygiene. None visited the dentist regularly or knew sugar impacts oral health. Dental caries affected 55.8%, and only 3.5% had fluorosis.	Students lack awareness about oral health, dental caries, lack of dental care facilities, and limited access to oral health services. Hence, it is recommended to concentrate on improving the oral health status and treatment needs of these tribal students.
4	Margret Beaula Alocious Sukumar et al. Indian Journal of Community Medicine, 2025 [23]	Qualitative study	Tamil Nadu	56 Irulars elderly	Qualitative - Focus groups and indepth interviews	Older Irula adults use toothbrushes, neem twigs, or charcoal for oral hygiene and commonly face gum bleeding and caries. Limited awareness of oral cancer and barriers like cost and poor access to care lead many to self-medicate or silently endure dental issues.	Need for oral health programs to tribal cultural beliefs and socioeconomic constraints, requiring collaboration among public health agencies, tribal governments, and healthcare providers. Incorporating traditional knowledge, enhancing accessibility, and fostering community outreach can achieve long-term oral health improvements and overall well-being in tribal communities

5	IrIS ValSan et al, Journal of Clinical and Diagnostic Research.2016 [4]	cross sectional	Kerala	420 Paniyas	WHO oral health proforma	The study found a 40% caries prevalence, with mean DMFT scores of 1.52 (ages 35–44) and 18.47 (ages 65–74). Periodontal disease affected 76.9%, and 4.52% had oral mucosal lesions. While 55.5% brushed their teeth, 89.3% chewed paan. Older adults (65–74) had the highest treatment need, mainly extractions. CPI scores showed a strong correlation with age.	The lack of basic oral health care access is important for high oral disease burden in these populations. Efforts are to be done for basic oral health care facility to these marginal populations
6	J. Baby John, Journal of Public Health Research, 2015 [5]	cross sectional	Tamil Nadu	1028 Palamalai and Kolli Hills (tribal), Tiruchengode (suburban) and Erode (urban)	(DMFT), decayed and filled teeth (dft) and Significant Caries Index; A questionnaire - oral hygiene practices, socioeconomic background, dental treatment availability, parent's education level	Caries prevalence was highest among tribal school children (89.3%), followed by suburban (77%) and urban (55%) children. Mean DMFT scores differed significantly across these groups (P=0.001) and were also significantly affected by brushing frequency (P=0.001). In the urban group, mothers' education significantly impacted DMFT scores (P=0.018), while television presence and parental income showed no significant effect.	Oral hygiene practices, dietary habits and access to dental care services played an important role in prevalence of dental caries. It was observed that the socioeconomic status, parents' educational status and mass media influenced the oral health of these children but without a significant contribution.
7	Shibani Sushmitha Ray, International Journal of Community Medicine and Public Health, 2021 [24]	cross sectional	Karnataka	256 Santhal tribes	WHO oral health proforma 2013	Most participants were aged 35–44 and belonged to the Soliga sub-caste. The mean DMFT was 5.5±4.14. Gingival bleeding was seen in 44.5%, while 29.7% had 4–5 mm pockets and 5.5% had pockets >6 mm. Attachment loss of 4–5 mm was found in 28.9%, and 6–8 mm in 6.3%. Oral lesions included leukoplakia (1.2%), lichen planus (0.4%), ulcers (4.7%), and abscesses (4.7%).	This study showed that a majority of tribes used toothbrush and toothpaste to routinely clean their teeth. High prevalence of dental caries and periodontal diseases was observed among the participants.

8	Vikram Simha Bommireddy. Journal of Indian Association of Public Health Dentistry, 2023 [25]	cross sectional	Andhra Pradesh.	151	community periodontal index (CPI) A valid questionnaire about social myths and taboos.	A statistically significant difference was observed in CPI scores among males and females, those who brush their teeth once daily and those who brush twice and high significance was seen among those who consume alcohol and those who do not. For loss of attachment scores high significant difference was found among tobacco chewers and nonchewers, those who brush once daily and twice daily.	Most of the misbeliefs were seen among illiterates and rural population. Hence, there is a need to improve the level of education as well as knowledge related to health, among these groups for overall improvement of health related quality of life
9	Sandhya K. Neelamana. Journal of Family Medicine and Primary Care, 2020 [26]	cross sectional	Kerala	280	WHO oral health proforma 2013, GOHAI	The study included 214 females and 66 males, with 70.7% being illiterate and 96.4% earning less than ₹500 daily. Over half (59.3%) were unaware of oral health issues, and 41.4% required emergency treatment. GOHAI scores were higher in males (26.44) than females (19.72), with comparisons also made by age and prosthetic status. Despite poor oral health, the elderly did not view it as a barrier to social interaction.	The oral disease burden is very high in tribes. The prevalence of the tobacco habits is of concern. Education and motivation of these laity is needed to improve their oral health
10	M. T. Jeseem et al. Journal of Indian Society of Pedodontics and Preventive Dentistry, 2025 [27]	cross sectional	Kerala	1158 children aged 5–15 years of Paniya tribe	WHO Oral Health Assessment Form 2013 ; DMFT index, Modified Gingival Index.	The study showed mean DMFT and dmft scores of 0.72 and 1.85, respectively. Gingivitis was prevalent in 81% of children (54.9% mild, 23.3% moderate, 2.8% severe). Enamel hypoplasia affected 9.6%, traumatic injuries 5.4%, oral lesions 5.2%, and 21.1% had oral habits. Tobacco smoking and chewing were reported in 1.5% and 15.7%, respectively, with 82.8% needing dental treatment.	The present study revealed a high treatment need for the tribal community, with a relatively higher prevalence of gingivitis and noticeable number of dental caries, oral lesions, traumatic dental injuries, enamel hypoplasia, sugar consumption, and tobacco smoking/tobacco chewing habits

11	Mahalakshmi Kumaraguru et al Cureus, 2023 [28]	cross sectional	Tamil Nadu	880 Irular and Narikuravar	A World Health Organization (WHO) oral health assessment form, self-oral health assessment form (2013)	Among the study population, 76.4% were Irulars and 23.6% Narikuravars. The mean DMFT score was 5.60, higher in Irulars (6.58) than Narikuravars (5.30). Periodontal status showed significant variation by age, sex, ethnicity, and education ($p<0.05$). Leukoplakia and Tobacco Pouch Keratosis were present in 3.3% and 1.6% of the population, respectively.	The oral health status of Irulars was poorer than that of Narikuravars. This study highlights the requirement of raising awareness about the significance of oral health and strategically implementing necessary dental care in tribal people living in this region of Tamil Nadu
12	Shaik Mohammed Asif et al. BMC Oral Health, 2019 [29]	cross sectional	Telangana	500 Koya and 500 Lambada tribes	Oral Hygiene Index (OHI-S) index and Community Periodontal Index (CPI).	The OHI-S ranged between 2.5–3.0 in both the groups. The CPI index scores showed that sextants with calculus, shallow pockets, deep pockets and loss of attachment of 4–5mm were significantly present in both groups	Though practice of poor oral hygiene and compromised periodontal status was seen among both groups. However, it was more prevalent in Koya. Under these circumstances, implementation of a basic awareness of oral health care programme for these tribes should be a high priority.
13	Margret Beaula Alocious Sukumar et al. BMC Oral Health, 2025 [30]	cross sectional	Tamil Nadu	881 Irula elderly	ICDAS, CPITN, GOHAI	The prevalence of carious lesions was 38.5%, non-carious lesions 70%, periodontitis 70.8%, and tooth loss 53.6%. Only 2.3% of participants had restorative dental treatments. Multivariate analysis reveals that illiteracy, arthritis, carious lesions, periodontal disease, and tooth loss affected OHRQoL significantly.	The study reveals poor oral health among the Irula tribe, especially the elderly, due to high rates of caries, periodontitis, and tooth loss. Factors like low education, poverty, and chronic illness worsen their oral health-related quality of life. It calls for targeted care, improved access, culturally sensitive strategies, and policy-driven research to ensure oral health equity.

14	Kirankumar B. Dhanappa et al. Journal of Evolution of Medical and Dental Sciences, 2014 [31]	cross sectional	Tamil Nadu	710 Malayali tribe from Javdhu hills	WHO Oral health Assessment form 1997	Periodontal health declined with age, with younger individuals having more healthy sextants (mean of 3.36 at age 12). The mean DMFT also increased with age, from 0.65 at 12 years to 9.9 in the 65–74 age group.	The findings study survey highlights the dominance of untreated caries and a high prevalence of calculus in 12 & 15 year old Malayali tribe children.
15	Sophia Thomas et al. European Journal of Public Health, 2020 [32]	cross sectional	Tamil Nadu	655 children 12-15 years in Jawdhi Hills	WHO Oral health Assessment form 2013	The study found a 22.3% prevalence of dental caries and 87.3% of gingivitis, with 57% of children citing dental pain as the main reason for dental visits. Dental fluorosis affected 53.6%, linked to high fluoride levels in water (>1.5 ppm). Gender, diet, dental fluorosis, and maternal education were significantly associated with caries.	Two hundred children needing treatment were referred for free care at a local hospital. Schools were advised to provide regular oral health education and dental camps, with an emphasis on girls' education. Local authorities were informed about excessive fluoride in water and educated on household-level defluoridation methods.
16	G.G. Gopika et al. Journal of Pioneering Medical Sciences, 2025 [33]	cross sectional	Tamil Nadu	460 narikuravars	WHO Oral Health Assessment Proforma (2013), OHI-S index, pretested questionnaire for barriers in dental care	The study of 460 participants (55% male, 45% female) revealed a high mean DMFT score of 13.1, indicating widespread dental caries. While 65.1% had fair oral hygiene, 41.5% needed comprehensive dental care. Key barriers to dental service use included lack of awareness, financial issues, and limited access.	Narikuravar community faces significant barriers in accessing dental care, contributing to poor oral health outcomes. Public health strategies should focus on enhancing awareness, promoting preventive dental care practices and implementing mobile dental clinics to reduce these barriers and improve oral health outcomes in this marginalized population.

17	Pradeep VR et al. Journal of Pioneering Medical Sciences, 2023 [34]	cross sectional	Tamil Nadu	458 narikur avars	WHO Oral Health Assessment Proforma (2013), pretested questionnaire for Oral Health Beliefs & Oral Hygiene Practices	The perceived severity and perceived benefits are high, and the perceived barriers and perceived importance are low, which increases the cues for action and increased participation.	Tribal gypsies might have favorable compliance for oral health promotional programs. Further research is needed to investigate the oral health of the various ethnic tribes of Tamil Nadu.
18	Kayal VM et al. Journal of Pioneering Medical Sciences, 2024 [35]	cross sectional	Tamil Nadu	210 malayalee tribes javadhu hills	WHO Oral health proforma 2013, pretested questionnaire on oral health perceptions, attitudes, beliefs and practices	Dental erosion (19.41%) and dental trauma (7.89%) were the most common conditions. A strong link was found between viewing pain as weakness and avoiding dentists for dignity. Most participants (82.38%) self-treated, with 59.04% preferring home remedies over dental care, a significant association.	The oral health practices of the Indian tribal population are diverse and often influenced by traditional methods and beliefs. There is a need to improve the level of education and knowledge related to oral health among the tribal population for overall improvement of oral health-related quality of life
19	Hiranya S et al. Journal of Pioneering Medical Sciences, 2024 [36]	cross sectional	Tamil Nadu	110 Irular Children from Nilgiris	oral health hygiene practices using a pre validated questionnaire, DMFT, OHIS	Boys made up 68.56% of participants and girls 31.44%. Most students (85.65%) used brush and paste, while others used finger-toothpowder, neem sticks, or masheri. About 85.25% brushed once daily, and 14.75% twice daily. Oral hygiene significantly improved after the health intervention.	Tribal students require improved oral health practices. Toothache emerged as the most common oral health problem among them, emphasizing the necessity of preventive measures and regular dental check-ups.

20	Vishal Prakasam et al. Journal of Pioneering Medical Sciences, 2025 [37]	cross sectional	Tamil Nadu	575 Beta Kurumbas and Mullu Kurumbas	DMFT Index , Mini Nutritional Assessment (MNA) and the Geriatric Oral Health Assessment Index (GOHAI)	The study showed a high mean DMFT score of 18.32, reflecting widespread tooth loss and untreated caries. Nutritional assessment found 62.95% malnourished and 23.3% at risk. GOHAI scores revealed significant psychosocial and functional impacts, with many reporting eating discomfort. Poor oral health, malnutrition, and reduced quality of life were strongly correlated.	There is a urgent need for targeted interventions to improve oral health, enhance nutritional support and provide accessible dental care services for these vulnerable tribal populations. Integrating oral healthcare initiatives within primary healthcare frameworks and implementing culturally appropriate awareness programs is essential to addressing these disparities
21	Lalitha Rani Chellappa et al. International Journal of Research in Pharmaceutical Sciences, 2020 [38]	cross sectional	Tamil Nadu	164 Narikuravars	DMFT Index	Mean DT, MT, FT was found to be 3.38±1.730, 1.01±2.109, 0.01±0.088 respectively. Decayed teeth were most common in the study population. Mean DMFT score among the adult study population was found to be 4.40 ±2.603. The difference between the different age groups to Mean DMFT was found to be statistically significant	The present study concluded that the experience of dental caries was low in the study population. It was more prevalent in males as compared to the female population

		Table 2. New Castle - Ottawa Quality assessment scale							
		Selection				Comparability	Outcome		Summary scores
S.No	Author	Representativeness	Sample size	Ascertainment of exposure	Non responders	The subject in different outcome groups are comparable, based on the study design or analysis. Confounding factors are controlled	Assessment of outcome	Statistical tests	
1	Rahmath Meeral P et al, Journal of Oral Biology and Craniofacial Research, 2024	*	*	**	NR	*	**	*	8
2	Srisakthi Dorai Kannan et al, Bioinformation, 2020	*	*	**	NR	*	**	*	8
3	Durga Devi Raj,et al. Journal of Indian Association of Public Health Dentistry, 2025	*	*	**	NR	*	**	*	8
4	Margret Beaula Alocious Sukumar et al. Indian Journal of Community Medicine, 2025	*	*	**	NR	*	**	*	8
5	IrIS ValSan et al, Journal of Clinical and Diagnostic Research.2016	*	*	**	NR	*	**	*	8
6	J. Baby John, Journal of Public Health Research, 2015	*	*	**	NR	*	**	*	8

7	Shibani Sushmitha Ray, International Journal of Community Medicine and Public Health, 2021		*	**	NR	*	**	*	7
8	Vikram Simha Bommireddy. Journal of Indian Association of Public Health Dentistry, 2023		*	**	NR	*	**	*	7
9	Sandhya K. Neelamana. Journal of Family Medicine and Primary Care, 2020	*	*	**	NR	*	**	*	8
10	M. T. Jeseem et al. Journal of Indian Society of Pedodontics and Preventive Dentistry, 2025	*	*	**	NR	*	**	*	8
11	Mahalakshmi Kumaraguru et al Cureus, 2024	*	*	**	NR	*	**	*	8
12	Shaik Mohammed Asif et al. BMC Oral Health, 2019	*	*	**	NR	*	**	*	8
13	Margret Beaula Alocious Sukumar et al. BMC Oral Health, 2025	*	*	**	NR	*	**	*	8
14	Kirankumar B. Dhanappa et al. Journal of Evolution of Medical and Dental Sciences, 2014	*	*	**	NR	*	**	*	8

15	Sophia Thomas et al. European Journal of Public Health, 2020	*	*	**	NR	*	**	*	8
16	G.G. Gopika et al. Journal of Pioneering Medical Sciences, 2025	*	*	**	NR	*	**	*	8
17	Pradeep VR et al. Journal of Pioneering Medical Sciences, 2023	*	*	**	NR	*	**	*	8
18	Kayal VM et al. Journal of Pioneering Medical Sciences, 2024		*	**	NR	*	**	*	7
19	Hiranya S et al. Journal of Pioneering Medical Sciences, 2024		*	**	NR	*	**	*	7
20	Vishal Prakasam et al. Journal of Pioneering Medical Sciences, 2025	*	*	**	NR	*	**	*	8
21	Lalitha Rani Chellappa et al. International Journal of Research in Pharmaceutical Sciences, 2020	*	*	**	NR	*	**	*	8

DISCUSSION

According to the present research, research on tribal oral health has consistently shown that teeth erosion, trauma, and poor brushing habits are common. Despite these obstacles, some research showed that children had a higher chance of adhering to their treatment plans, pointing to a significant window of opportunity for early intervention. There is an urgent need for preventative education and easily accessible pediatric dental treatment in these communities, as seen by the startling 89.3% caries prevalence among tribal kids in one study and the 1.85 mean DMFT and dmft scores in another.

Lack of access to conventional dental care, established traditional habits, and low knowledge all contribute to the high prevalence of untreated dental cavities and poor periodontal health. Both preventive and curative oral health care are hampered by the fact that the majority of tribal inhabitants live in isolated locations with poor health infrastructure. Studies employing qualitative techniques and behavioral assessments have shown that poverty, low health literacy, and cultural views that frequently favor traditional remedies over professional care further exacerbate this.

Evidence of minimal dental visits, bad brushing practices, and a preponderance of decaying teeth without restorative treatment corroborate studies showing frighteningly high DMFT scores in both youngsters and the elderly. The lack of oral health integration into mainstream primary healthcare in tribal regions and systemic neglect are the causes of these tendencies, which are not coincidental. The recommendations are both necessary and sensible because the results are not just similar across various geographic areas and tribe groups, but they are also backed by contextual behavioral insights, verified instruments, and decades of systematic neglect.

In the present review, one of the included study by Vishal Prakasam et al 2025 revealed malnutrition among the Kurumbas tribe at about 62.95%. Similarly, in a study done in Odisha among Particularly vulnerable tribal groups revealed that prevalence of malnutrition and anemia is high in a study done by Das et al 2024³⁹.

One of the particularly Vulnerable Tribal Groups (PVTG) that was mentioned in the included study was Irular. Studies by Margaret et al, 2025, Hiranya S et al, 2024 revealed that half the Irulars use twigs, tooth powder and charcoal for tooth brushing. Similarly in a study done by Shrivastab et al 2018 among PVTG Bharia in Central India, it was revealed that 56.7% of them used chewing sticks for oral hygiene practice⁴⁰.

In the present review, studies by Durga Devi et al, J Baby John et al, MT Jaseem et al, Sophia Thomas and Hiranya S et al included children in their study population. The studies were done in Malayalee tribe, Paniya tribe, and Irular. It was revealed that prevalence of dental caries was more than 58% among malayalee tribe and 54.9% Paniya tribe had mild gingivitis in the study by MT Jaseem et al. Additionally Sophia Thomas study revealed that dental pain was the most common cause for the children's dental visit. Similarly, in a study done by Biswabandita Mohanty et al among tribal children of Odisha, it was revealed that oral hygiene index of most children was poor who were using twigs and charcoal or any traditional methods of brushing⁴¹. This was supported by a study done by Rishika Agarwal et al, with the results revealing that 90% of tribal children exhibited problem behaviour⁴².

Contrastingly, in an interventional study done by AK Bose et al in an tribal residential school, the OHI scores ranged from 2.11 to 1.77 after an effective health interention. This showed that providing essential dental education and care can change their oral health status^{43,44}.

In the present review, studies by Rahmath Meeral et al, Iris Valsan et al, Shibani Sushmitha Roy et al, Mahalakshmi K et al, Shaik Mohammed Asif et al, Margaret et al, Kirankumar B et al, GG Gopika et al, Kayal et al and Lalitha Rani Chellappa et al assessed the oral health status of tribal adults of South Indian states which included Tamil Nadu, Telangana, Andhra Pradesh, Karnataka and Kerala. The tribes include Kannikaran, Paniyan, Santhal, Irular, Narikuravar, Koya, Lambada, and Malayalee tribes. The studies uniformly stated high prevalence of poor oral health status, high prevalence of caries, periodontitis, lower dental utilisation, erosion, and high oral health treatment needs. Various studies have agreed with the included studies. A study by Hasibur Zaman Haque et al done among Santhal tribes of West Bengal also concluded that poor oral hygiene prevalence among the study participants was alarmingly high⁴⁵. Another study done by Diptajit Das et al done among Juang tribe of Odisha revealed that the tribes had high prevalence of oral diseases with highest treatment needs⁴⁶. Similar findings were observed in almost all studies among many tribes across India⁴⁷⁻⁴⁹.

Interestingly, in studies done by Hiranya S et al and Aritra K. Bose et al concluded with significant improvement in the oral health status of the children. Similarly, in a study done by Minti Kumari et al among Bihar tribes, mixed methods of quantitative and qualitative interventions were done to tribal adults through the use of mobile technology and networking showed improved gingival status and better utilization of oral hygiene practices and services⁵⁰.

The current analysis highlights the urgent need to rethink oral health delivery approaches for indigenous groups

from a multidisciplinary, culturally sensitive perspective. Building the capacity of grassroots health workers, like as ASHAs and anganwadi staff, to integrate basic oral health teaching and screening into their daily routines is one important aspect. Adopting a syndemic approach, where oral health is viewed in relation to nutrition, systemic disorders, and quality of life—especially for vulnerable populations like women and the elderly—is crucial, as evidenced by the success of a few studies that used tools like GOHAI and MNA. Crucially, the findings recommend that in order to raise awareness among aspiring dental practitioners, dental curriculum should incorporate tribal public health dentistry modules.

Furthermore, longitudinal, interventional studies that evaluate the effects of culturally specific therapies across time should be the focus of future research instead of just prevalence studies. Psychosocial factors that influence health-seeking behavior in tribal regions, such as gender roles, stigma, and caregiving styles, should also be investigated in studies.

CONCLUSION

The current assessment of tribal oral health research highlights a pervasive inequality in outcomes, awareness, and access among the indigenous inhabitants of South India. High caries prevalence, untreated periodontal diseases, and low dental service usage across age groups are consistent findings that suggest to a systemic failure to incorporate oral health into the larger public health framework for tribal communities rather than being isolated data points.

The findings from several studies all point to the same conclusion: equity in oral health cannot be attained without methods that are incorporated into policy, backed by infrastructure, and culturally relevant. In order to close this long-standing gap and guarantee that oral health becomes a fundamental right, not a privilege, for India's tribal inhabitants, a coordinated effort including government agencies, dental clinics, and community partners is essential going forward.

DECLARATION

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable.

Competing interests

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- [1] S S, R S. Effectiveness of oral health education and interventions in improving oral health outcomes in type II diabetes mellitus patients: A prospective study. *Cureus* 2024;16:e58227.
- [2] Deshmukh N, Ikhar A, Paul P. Traditional practices of oral health care among tribals of India: A scoping review. *MRIMS Journal of Health Sciences* 2024;12:1–7.
- [3] Rafeeq FN, Rajasekaran R. Extent of utilization of various government tribal development schemes by primitive tribes living in biodiversity zone of Nilgiri district in Tamil Nadu. *Asian J Agric Ext Econ Sociol* 2021:250–8.
- [4] Valsan I, Joseph J, Janakiram C, Mohamed S. Oral health status and treatment needs of Paniya tribes in Kerala. *J Clin Diagn Res* 2016;10:ZC12–5.
- [5] John JB, Asokan S, Aswanth KP, Priya PRG, Shanmugaavel AK. Dental caries and the associated factors influencing it in tribal, suburban and urban school children of Tamil Nadu, India: a cross sectional study. *J Public Health Res* 2015;4:361.
- [6] Mohanty V, Mitra R. Understanding the governments schemes designed for tribal womens financial inclusion in the state of Jharkhand and Odisha. *Int J Adv Res (Indore)* 2024;12:437–43.
- [7] Thakur I, Paul R, Som K, Sarkar R. Prevalence and determinants of tobacco product use among the tribal community of west Bengal: A cross-sectional survey. *J Assoc Physicians India* 2019;67:97–8.
- [8] Hebbar R. Particularly vulnerable tribal groups in south India. *The Working of the Indian Constitution*, London: Routledge India; 2024, p. 261–71.
- [9] Emayavaramban M, Kandasamy RK, Muthusamy S, Manickam M. Barriers in the educational attainment of tribal girl students in Salem district of Tamil Nadu state, India. *Int J Theory Appl Elem Second Sch Educ* 2020;2:121–42.
- [10] Raghavan A, Lakshmi K, Kumar PDM. Prevalence of dental caries among Indian tribal population – A systematic review. *Int J Oral Health Sci* 2021;11:15–22.
- [11] Poitra CM. Policy through practice: How tribal education department leaders view educational policy problems. *Am Indian Cult Res J* 2016;40:83–99.
- [12] Kishor Yadav N, Research Scholar, Department of Tribal Studies, Art, Culture & Folk Literature, Indira Gandhi National Tribal University, Amarkantak 484886, Madhya Pradesh, India, Soni A, Assistant Professor, Department of Tribal Studies, Art, Culture & Folk Literature, Indira Gandhi National Tribal University, Amarkantak 484886, Madhya Pradesh, India. An appraisal of prevailing issues in rural tribal health care system in India. *Ind J Res Anthr* 2022;8:19–26.
- [13] Kumar B, Indira Gandhi National Open University, New Delhi, Baraik VK, Indira Gandhi National

- Open University, New Delhi. Non-inclusive tribal workforce participation in urban spaces: A case study of Jharkhand. *Ngji* 2020;66:208–21.
- [14] Ganesh B, Rajakumar T, Acharya SK, Vasumathy S, Sowmya S, Kaur H. Particularly vulnerable tribal groups of Tamil Nadu, India: A sociocultural anthropological review. *Indian J Public Health* 2021;65:403–9.
 - [15] Higgins JPT, Altman DG, Gøtzsche PC, Jüni P, Moher D, Oxman AD, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ* 2011;343:d5928.
 - [16] Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71.
 - [17] Haddaway NR, Page MJ, Pritchard CC, McGuinness LA. PRISMA2020: An R package and Shiny app for producing PRISMA 2020-compliant flow diagrams, with interactivity for optimised digital transparency and Open Synthesis. *Campbell Syst Rev* 2022;18:e1230.
 - [18] Moskalewicz A, Oremus M. No clear choice between Newcastle-Ottawa Scale and Appraisal Tool for Cross-Sectional Studies to assess methodological quality in cross-sectional studies of health-related quality of life and breast cancer. *J Clin Epidemiol* 2020;120:94–103.
 - [19] Egger M, Davey Smith G, Schneider M, Minder C. Bias in meta-analysis detected by a simple, graphical test. *BMJ* 1997;315:629–34.
 - [20] P RM, Balasubramaniam A, Arumugham Indiran M, M K. Oral health status and behaviour among Kanikkaran tribes of Mundandhurai Hills in Tirunelveli district, Tamil Nadu. *J Oral Biol Craniofac Res* 2024;14:245–51.
 - [21] Kannan SD, Indiran MA, Pradeep Kumar R. Oral health behaviour, practices, status and the dental treatment needs among paliyan and pulayan tribes in India. *Bioinformation* 2020;16:1113–20.
 - [22] Assessment of Oral Health Behavior and Oral Health Status among 6-16-year-old Tribal School Children at Jawadhu and Sitheri Hills, Tamil Nadu - A Cross-sectional Study. n.d.
 - [23] Behind Closed Smiles: Understanding Oral Hygiene Practices and Treatment Seeking Behaviour among Irula Tribal Population. Tamil Nadu -Qualitative Study: n.d.
 - [24] Ray SS, Doddaiiah SK, Chandan, Gopi A, Murthy N, Bilimale AS. Oral health status of the tribal population of Chamarajanagar district, Karnataka. *Int J Community Med Public Health* 2021;8:4902.
 - [25] Bommireddy VS. Oral health-related taboos and oral health status among a south Indian tribal population: A descriptive study. *J Indian Assoc Public Health Dent* 2023;21:82–6.
 - [26] Neelamana SK, Janakiram C, Varma B. Oral health status and related quality of life among elderly tribes in India. *J Family Med Prim Care* 2020;9:5976–81.
 - [27] Jeseem MT, Veetil SMT, Vadakkepurayil K, Manningal MR. Oral health status and treatment needs among 5-15-year-old children of tribal population in Noolpuzha Panchayath of Wayanad: A cross-sectional study. *J Indian Soc Pedod Prev Dent* 2025;43:50–6.
 - [28] Kumaraguru M, Balasubramaniam A, I MA. Oral health status and oral health risks among tribes in Tamil Nadu, India: An epidemiological study. *Cureus* 2023;15:e48721.
 - [29] Asif SM, Naheeda S, Assiri KI, Almubarak HM, Kaleem SM, Zakirulla M, et al. Oral hygiene practice and periodontal status among two tribal population of Telangana state, India- an epidemiological study. *BMC Oral Health* 2019;19:8.
 - [30] Sukumar MBA, Peter RM, Joseph A. Tooth morbidity and its impact on oral related quality of life in elderly tribal population-The Irula experience. *BMC Oral Health* 2025;25:252.
 - [31] Dhanappa KB, Amjad Hussian K, Alzoghaibi I, Azzeghaiby SN, Gowdruviswanathan S, Tamewar SR. Assessment of factors influencing oral health status and treatment needs among malayali tribal population at javadhu hills, India. *J Evol Med Dent Sci* 2014;3:5263–71.
 - [32] Thomas S, Chacko R, Khanapur GD, Kattula D, Rose A. Oral health status and treatment needs of school going children in a tribal area in Southern India. *Eur J Public Health* 2020;30. <https://doi.org/10.1093/eurpub/ckaa165.455>.
 - [33] Gopika GG, Rani Chellappa L, Indiran MA, Roshan A. Oral health challenges and barriers to dental care access among Narikuravar gypsies in Chennai: A cross-sectional study. *J Pioneer Med Sci* 2025;14:140–7.
 - [34] Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Tamil Nadu 600077, India., Vr P, Chellappa LR, epartment of Pedodontic and Preventive Dentistry Saveetha Dental College and Hospitals, Saveetha Institute of Medica and Technical Sciences, Saveetha University, Tamil Nadu 600077, India., Indiran MA, epartment of Pedodontic and Preventive Dentistry Saveetha Dental College and Hospitals, Saveetha Institute of Medica and Technical Sciences, Saveetha University, Tamil Nadu 600077, India., et al. Assessment of oral health beliefs & oral hygiene practices among tribal gypsies in Tamil Nadu. *J Pioneer Med Sci* 2023;12:11–4.
 - [35] Kayal VM, Chellappa LR, Indiran MA. Cultural influences on oral health: Insight from tribes in Jawadhu Hills of Tamil Nadu. *J Pioneer Med Sci* 2024;13:125–30.
 - [36] Hiranya S, Chellappa LR, Indiran MA. Promoting oral health practices among tribal irulas children

- from Nilgiris hills of Tamil Nadu: An interventional approach and its effects. *J Pioneer Med Sci* 2024;13:37–42.
- [37] Prakasam V, Chellappa LR, Arumugham Indiran M. Assessment of geriatric dental caries, nutritional status and oral health-related quality of life among Particularly Vulnerable Tribal Groups in the Nilgiris Biosphere Reserve: A cross-sectional study. *J Pioneer Med Sci* 2025;14:210–7.
- [38] Chellappa LR, Leelavathi L, Rathinavelu PK, Indiran MA. Caries experience among tribal gypsies in Thoothukudi district - A cross-sectional study. *Int J Res Pharm Sci* 2020;11:1372–6.
- [39] Das A, Ghosal J, Khuntia HK, Dixit S, Pati S, Kaur H, et al. Malnutrition and anemia among particularly vulnerable tribal groups of Odisha, India: Needs for context-specific intervention. *Indian J Community Med* 2024;49:519–28.
- [40] Shrivastav A, Maurya R, Shukla C, Sahu T, Chauhan N, Azad A, et al. Oral hygiene and periodontal status in the primitive hidden tribe of Patalkot, a tribal area in Central India. *J Indian Soc Periodontol* 2018;22:55–9.
- [41] Oral hygiene practice and oral health status among tribal children of odisha, India. *Indian J Forensic Med Toxicol* 2020. <https://doi.org/10.37506/ijfmt.v14i4.13180>.
- [42] A Comparative Study of Behaviour Problems in Tribal and Nontribal Children Residing In Urban Areas. n.d.
- [43] Bose AK, Anusha CP, Kadam DD, Neethu LA. Impact of practice modification on oral health status of students: An interventional study from a tribal area of India. *J Family Med Prim Care* 2019;8:2592–6.
- [44] Ojha S, Bhargava A, Bhargava A, Singh S, Yadav S. Oral health assessment and treatment needs of 12- and 15-year-old children residing in tribal welfare and private hostels - A comparative study. *J Family Med Prim Care* 2024;13:1303–10.
- [45] Haque HZ, Pal D, Sadhukhan SK, Das S. A cross-sectional study on oral hygiene among Santhal tribal adults in a rural area of West Bengal. *J Family Med Prim Care* 2021;10:2859–61.
- [46] Das D, Suresan V, Jnaneswar A, Khurana C, Bhadauria US, Saha D. Oral health status and treatment needs among the Juang tribe-a particularly vulnerable tribal group residing in Northern Odisha, India: A cross-sectional study. *Health Soc Care Community* 2019;27:e752–9.
- [47] Kumar G, Dileep CL, Sethi AK, Gupta B. The Birhor tribes of Ramgarh District, Jharkhand - a ferret into their oral health status and treatment needs. *Med Pharm Rep* 2019;92:178–84.
- [48] Thakur J, Mohan S. Periodontal health status, dental caries experience, oral hygiene practices and treatment needs of geriatric tribal population. *Bioinformation* 2024;20:1658–62.
- [49] Understanding oral health beliefs and behavior among Paniyan tribals in Kerala, India. *India J Int Oral Health* 2012.
- [50] Kumari M, Sharma S, Raj A, Jha A, Shivakumar S, Kumar A. Addressing oral health disparities of a tribal population through a combined implementation of focus group discussion, mobile technology networking, and creating a supportive environment: A prospective study. *Cureus* 2023;15:e41266.