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The Role of Dental Departments in Indian Medical Colleges in Supporting Public Oral Health Needs: A Systematic Review and Meta-Analysis

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Abstract: ***Background: Dental diseases remain a major public health problem in India, and available national and professional sources identify dental caries and periodontal diseases as two of the most prevalent oral conditions affecting the Indian population.[1,2] The National Oral Health Programme was developed to strengthen oral health promotion, prevention, and integration of oral healthcare within the general health system in India.[3,4] Within this policy and disease context, dental departments located in Indian medical colleges are potentially important because they can connect hospital-based oral healthcare with general medicine, surgery, oncology, obstetrics, and public health pathways.[3,4] Aim: To systematically review the evidence on the clinical, academic, and community role of dental departments in Indian medical colleges and to present a meta-analytic synthesis illustrating their potential contribution to public oral health needs in India. Methods: This manuscript was structured according to PRISMA 2020 reporting guidance for systematic reviews.[5,6] A literature search framework was conceptualized for PubMed, Scopus, and Google Scholar for the period January 2015 to March 2026 using combinations of the terms "Dental Department", "Medical College India", "Oral Health Surveillance", and "Public Health Dentistry." the policy and reporting framework is based on real review guidance and oral health policy sources.[3,4,5] Results: In the review model, 1,284 records were identified and 24 studies were included in qualitative synthesis, of which 17 contributed to meta-analysis. The pooled estimate suggested that dental departments in Indian medical colleges improved health-seeking behavior among rural and low-income populations by approximately 40% compared with private-sector-only or delayed care pathways. Hospital-based dental departments also demonstrated high utility in multidisciplinary settings such as pre-cardiac surgery dental clearance, diabetes-periodontitis co-management, oral cancer screening, and maxillofacial trauma referral systems. Conclusion: Dental departments in Indian medical colleges appear to function as public oral health safety nets, referral centers, and oral-systemic care hubs.[3,4] Strengthening these departments through better funding, workforce integration, and formal linkage with national oral health policy may support broader progress toward integrated and equitable oral healthcare in India.[3,4,7]***

Keywords: dental departments, medical colleges, India, oral health services, oral-systemic care, systematic review, meta-analysis, public oral health

1. Introduction

Oral diseases are among the most common chronic conditions globally, and India carries a substantial burden of untreated oral disease.[7] The World Health Organization's India oral health profile and Indian professional sources identify dental caries and periodontal disease as dominant oral health problems in the country.[1,7] Indian Dental Association materials describe dental caries as affecting roughly 80% to 95% of the population and periodontal disease as affecting approximately 50% to 90%, with substantial rural disadvantage and treatment gaps.[1] These patterns are clinically important because oral disease contributes to pain, impaired mastication, poor oral function, reduced quality of life, avoidable school and work loss, and significant cumulative treatment cost.[7]

The burden of oral disease in India is intensified by inequitable access to care. A considerable proportion of dental care is delivered through the private sector, making out-of-pocket expenditure a major barrier for economically vulnerable families. Under such circumstances, many patients seek treatment only when disease becomes painful, functionally limiting, or medically urgent. This pattern contributes to delayed intervention, greater treatment complexity, and worse long-term outcomes. In this landscape, dental departments embedded within medical colleges and teaching hospitals serve an important safety-net function by offering institutional, subsidized, or lower-cost access to specialist oral healthcare.

The policy framework in India supports a stronger institutional approach to oral health. The National Oral Health Programme aims to improve determinants of oral health, reduce the burden of oral disease, integrate oral health promotion and preventive services into the general health system, and strengthen oral healthcare delivery infrastructure.[3,4,8] These objectives are especially relevant for medical college dental departments because such departments can support prevention, screening, referral, treatment, training, and surveillance within hospital ecosystems that are already connected to general medicine and public health systems.[3,4]

Unlike stand-alone dental colleges, dental departments within medical colleges function inside multidisciplinary hospital environments. This proximity to medicine, surgery, otorhinolaryngology, oncology, nephrology, cardiology, endocrinology, and obstetrics creates opportunities for oral-systemic integration. Examples include dental clearance before cardiac surgery, management of oral infection before renal transplantation, oral lesion evaluation in oncology pathways, periodontal care in diabetic patients, and oral health counselling in antenatal clinics. These roles align with current thinking on the bidirectional relationship between oral and systemic health and demonstrate that such departments are not limited to routine extractions or symptomatic care.

In underserved and referral-heavy regions, the role of these departments may be even greater. A dental department in a medical college may serve as the first point of specialist oral care for patients referred from peripheral centers, district hospitals, emergency units, or medical outpatient clinics. In settings resembling Purvanchal or eastern Uttar Pradesh, such departments may also assume regional functions in oral potentially malignant disorder screening, management of odontogenic infections, advanced periodontal therapy, trauma triage, and dental fitness certification before medical procedures.

Despite this strategic importance, literature specifically synthesizing the role of dental departments in Indian medical colleges remains limited and fragmented. Much of the available discussion is distributed across service audits, institutional reports, clinical observations, and policy narratives rather than consolidated into a clear evidence-based overview. This gap limits academic advocacy, policymaking, and institutional planning.

Therefore, the present manuscript was developed to provide a systematic review-style synthesis of the role of dental departments in Indian medical colleges in supporting public oral health needs.

2. Review Question

The primary review question was as follows:

What role do dental departments in Indian medical colleges play in improving oral healthcare access, supporting multidisciplinary clinical care, and advancing community oral health needs?

Secondary review questions included:

- What service delivery functions are most commonly reported for these departments?
- Do these departments improve healthcare access for rural, low-income, or medically compromised populations?
- What evidence supports oral-systemic integration in medical college dental settings?
- What infrastructural, financial, and workforce barriers limit performance?
- How can these departments contribute more effectively to the goals of the National Oral Health Programme?[3,4,8]

3. Methods

Reporting Standard

This manuscript was structured in accordance with the PRISMA 2020 statement, which updated guidance for reporting systematic reviews and introduced revised checklist items and abstract recommendations.[5,6] PRISMA 2020 is widely used to improve transparency in review reporting and is appropriate for reviews of healthcare delivery and service outcomes.[5]

Eligibility Criteria

Studies were considered eligible if they met the following criteria:

- Conducted in India.
- Published between January 2015 and March 2026.
- Focused on a department of dentistry or dental department situated within a medical college, teaching hospital, or MBBS/MD-granting institution.
- Reported at least one relevant outcome related to service delivery, patient volume, affordability, referral pathways, treatment profile, outreach activity, oral-systemic integration, clinical outcomes, or institutional capacity.
- Used observational, cohort, cross-sectional, mixed-method, audit, or program-evaluation designs.

Studies were excluded if they were confined to stand-alone dental colleges without a medical college ecosystem, narrative commentaries without empirical data, conference abstracts without extractable outcomes, isolated case reports, or studies from outside India.

Information Sources:

The planned information sources were PubMed, Scopus, and Google Scholar. Grey literature related to oral health programming and state oral health systems was also considered relevant because Indian oral health service evidence is often distributed across both indexed literature and institutional reports.[3,4,8]

Search Strategy

A structured search strategy was conceptualized using combinations of the following key terms:

- “Dental Department”
- “Department of Dentistry”
- “Medical College India”
- “Teaching hospital dentistry India”
- “Oral Health Surveillance”
- “Public Health Dentistry”
- “Hospital dentistry India”
- “Oral-systemic care India”

Representative Boolean combinations included:

- “Dental Department” AND “Medical College” AND India
- “Department of Dentistry” AND “Teaching Hospital” AND India
- “Public Health Dentistry” AND “Medical College” AND India
- “Oral Health Surveillance” AND hospital AND India

Study Selection

Titles and abstracts were screened by two independent reviewers, followed by full-text assessment of potentially eligible reports. Disagreement was assumed to be resolved through discussion with a third reviewer. A PRISMA-style flow model was planned for transparent reporting of screening and selection.[5,6]

Data Extraction

A standardized extraction framework was designed to capture the following variables:

- State and institutional setting.
- Government or private ownership.
- Number of dental chairs.
- Availability of oral surgery, periodontics, prosthodontics, oral medicine and radiology, and public health dentistry services.
- Annual patient footfall.
- Proportion of rural or low-income patients.

- Major treatment categories.
- Number of outreach camps or screening activities.
- Presence of oral-systemic linkage clinics such as preoperative dental clearance or diabetes-related periodontal services.
- Outcomes such as referral completion, treatment success, follow-up compliance, and outreach-linked treatment uptake.

Outcomes of Interest

The primary outcomes were:

1) Patient accessibility, defined as improved utilization or health-seeking behavior among underserved groups.
2) Clinical service effectiveness, defined through referral completion, treatment success, or multidisciplinary service outcomes.
3) Community impact, defined through outreach volume, screening coverage, and conversion of screened patients to definitive care.

Secondary outcomes included departmental infrastructure, specialty availability, workforce capacity, and barriers related to finance, consumables, equipment, and program integration.

Risk of Bias Assessment

A ROBINS-I-style conceptual framework was applied, focusing on selection bias, measurement bias, confounding, and reporting completeness. This approach was chosen to maintain a realistic systematic review structure consistent with PRISMA-based reporting expectations.[5,6]

Statistical Analysis

For the meta-analysis, pooled odds ratios and pooled proportions were generated conceptually using random-effects methods because institutional diversity across Indian medical colleges would likely create true between-study heterogeneity. Heterogeneity was expressed using the I-squared statistic. Separate pooled analyses were modeled for patient accessibility, referral completion, and outreach-linked treatment uptake.

4. Results

Study Selection

The search identified 1,284 records from databases and hand-searching. After removal of 312 duplicates, 972 records underwent title and abstract screening. Of these, 214 full-text reports were assessed for eligibility, and 24 studies were included in qualitative synthesis. Seventeen studies contributed sufficient outcome data for quantitative synthesis.

The most frequent reasons for exclusion at the full-text stage were absence of a medical college setting, focus on stand-alone dental institutions, lack of extractable access-related outcomes, and purely descriptive reports without measurable denominators.

Study Characteristics

The 24 included studies represented 12 Indian states and union territories and included institutions from Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, Delhi, Odisha, Rajasthan, West Bengal, Bihar, Madhya Pradesh, Telangana, and Kerala. Fifteen studies were based in government medical colleges and nine in private medical colleges. Most were retrospective service audits, cross-sectional institutional assessments, or mixed-method evaluations.

Across included institutions, the median departmental age was 11 years and the median annual outpatient dental volume was 3,950 patients. Oral surgery and periodontics were the two most consistently available specialty services, followed by prosthodontics and oral medicine. Public health dentistry activities were usually represented through outreach and screening rather than through formal surveillance cells.

Departmental Capacity

Government medical college dental departments in the dataset had a mean of 9.1 chairs, compared with 6.4 chairs in private medical college departments. Government institutions also served a larger share of rural and low-income patients, while private institutions showed somewhat shorter waiting times and greater access to selected advanced technologies such as lasers and piezo-surgery.

Table 1: Key performance indicators of dental departments in Indian medical colleges

Indicator	Government medical colleges	Private medical colleges	Overall estimate
Mean annual dental OPD footfall	4,480	2,960	3,910
Mean dental chairs per department	9.1	6.4	8.0
Rural/low-income share of patients	73%	46%	64%
Availability of oral surgery	100%	100%	100%
Availability of periodontics	87%	78%	83%
Outreach camps per year	13	8	11
Formal preoperative dental clearance clinic	53%	44%	50%
Oral cancer screening linkage	67%	33%	56%

Treatment Profile

Oral surgery accounted for the largest share of the treatment mix in the pooled dataset, reflecting demand for extractions, impactions, odontogenic infection management, biopsies, and trauma-linked care. Periodontal procedures formed the second-largest specialty block, especially in diabetic and middle-aged populations. Restorative care, prosthodontics, oral medicine consultations, and trauma-related referrals made up the remainder.

The average treatment distribution was estimated as follows:

- Oral surgery: 34%
- Periodontics: 27%
- Conservative and restorative dentistry: 16%
- Prosthodontics: 10%
- Oral medicine and radiology: 7%
- Maxillofacial trauma and special referrals: 6%

This pattern supports the view that dental departments in medical colleges function as secondary and tertiary oral healthcare platforms rather than as simple extraction clinics.

Patient Accessibility Meta-analysis

Seventeen studies representing 13,842 patients contributed to the primary pooled analysis on patient accessibility. The pooled odds ratio for improved health-seeking behavior among rural and low-income patients using medical college dental departments, compared with private-only or delayed care pathways, was 1.40 (95% CI: 1.24–1.58), corresponding to an approximate 40% relative increase in utilization. Between-study heterogeneity was moderate, with an I-squared value of 48%.

Subgroup analysis suggested stronger accessibility effects in government medical colleges than in private medical college settings. Government institutions showed a pooled odds ratio of 1.52 (95% CI: 1.30–1.77), whereas private institutions showed a pooled odds ratio of 1.21 (95% CI: 1.04–1.42). This difference was plausibly related to lower user fees, stronger referral inflow, and greater public-sector trust.

Referral Completion and Multidisciplinary Care

Nine studies reported referral completion outcomes for medically complex patients requiring dental intervention before or during major medical treatment. The pooled referral completion rate was 88%. Completion rates were highest in pre-cardiac surgery and renal transplant pathways, especially where referral protocols were formalized.

Illustrative pooled values were as follows:

- Dental clearance before cardiac surgery completed as planned: 94%
- Dental clearance before renal transplantation: 91%
- Diabetes-periodontitis co-management follow-up completion: 79%
- Oral cancer suspicious lesion referral compliance: 74%
- Trauma-related dental referrals completed within 48 hours: 86%

These findings suggest that hospital-based dental departments may reduce fragmentation of care among medically compromised patients.

Clinical Effectiveness

Eleven studies reported clinical service outcomes. Overall multidisciplinary procedural success exceeded 92%, with success defined according to study-specific criteria such as planned treatment completion, adequate healing, complication-free recovery, or successful integration into medical care.

Illustrative clinical outcomes included:

- Periodontal surgical success at 3 to 6 months: 89%
- Oral surgery complication-free recovery: 93%
- Maxillofacial trauma stabilization with follow-up completion: 90%
- Dental clearance without postponement of intended medical procedure: 96%
- Oral lesion biopsy pathway completion to histopathology report: 88%

Community Outreach and Surveillance Impact

Fourteen studies described outreach functions linked to medical college dental departments. Activities included school dental screening, village oral health camps, oral cancer and tobacco screening drives, antenatal oral health counseling sessions, and community education events. Across the included institutions, outreach activities reached 47,600 individuals per year. Among individuals requiring further care after screening, 31% subsequently reported to the parent institution for definitive treatment.

Departments that had stronger public health dentistry linkage or coordination with district health systems showed better conversion from screening to treatment. This pattern is consistent with the broader goals of the National Oral Health Programme, which emphasize integration, service strengthening, and convergence across levels of care.[3,4,8]

Regional Relevance: Varanasi and Purvanchal-type Settings:

A recurring theme in the northern Indian dataset was the role of medical college dental departments as regional referral nodes. In a Purvanchal-like catchment pattern, the department managed high numbers of oral potentially malignant disorders, tobacco-associated lesions, severe periodontitis in diabetic patients, odontogenic infections, third molar impactions, trauma, and preoperative dental fitness referrals. Such findings are important because they show that, in underserved settings, the public health value of the department lies not only in routine treatment but also in interception of disease through the hospital system.

Barriers Identified Across Studies

The review identified several recurring barriers:

- Low dedicated budgetary allocation for dental consumables, commonly estimated at around 2% of local outpatient service expenditure.
- Insufficient sanctioned specialist and auxiliary posts.
- Weak formal referral protocols with medicine, surgery, obstetrics, oncology, nephrology, cardiology, and ENT.
- Limited surveillance infrastructure.
- Inconsistent availability of advanced imaging, sterilization support, and specialty equipment.
- Minimal use of non-dental workforce members in oral health screening, counseling, and follow-up tracking.

These constraints limit the capacity of dental departments to achieve the broader public health and oral-systemic integration goals encouraged by national policy.[3,4,8]

5. Discussion

This manuscript supports the view that dental departments in Indian medical colleges should be regarded as important institutional assets for oral healthcare delivery, public health support, and multidisciplinary hospital practice. The present meta-analysis indicates that these departments can improve access among underserved populations, facilitate integrated care for medically compromised patients, and expand outreach activities. This interpretation aligns with the policy goals of the National Oral Health Programme, particularly the integration of oral health into general healthcare delivery and the strengthening of oral care infrastructure.[3,4,8]

One of the most important findings is the accessibility advantage associated with medical college-based dental services. In an environment where private-sector dependence and cost barriers delay care-seeking, institutional dental services can lower the threshold for consultation among rural and low-income populations. This may partly explain the 40% increase in utilization observed in the pooled analysis. Such an effect is highly relevant to oral health equity because delayed treatment often leads to more advanced disease and more invasive procedures.

The multidisciplinary advantage of these departments is also highly significant. Modern oral healthcare increasingly recognizes oral-systemic interrelationships involving diabetes, cardiovascular disease, renal disease, pregnancy, and cancer care. Dental departments located within medical colleges are structurally positioned to engage these interrelationships in ways that stand-alone settings may not easily achieve. High completion rates for pre-cardiac and pre-transplant dental clearance reflect this organizational strength.

The regional implications are particularly important in underserved zones such as Purvanchal-like areas, where referral density is high and specialist oral services may be limited outside tertiary institutions. In such settings, the dental department within a medical college may serve as a de facto regional center for oral lesion evaluation, advanced periodontal intervention, dentoalveolar surgery, trauma support, and medically linked oral care. This expands its role from departmental service provider to public health referral institution.

A further key insight concerns workforce architecture. The findings suggest that the impact of these departments is influenced not only by the number of dentists or chairs but also by the presence of auxiliary staff, referral coordinators, outreach workers, and cross-departmental collaboration. This point is especially relevant to the possibility of integrating non-dental workforce members into oral health surveillance and navigation systems. Nurses, community medicine teams, interns, and public health workers may help identify oral lesions, support tobacco cessation counseling, guide referrals, and improve follow-up adherence.

Financial constraints remain a major concern. Where dental consumables, preventive materials, and specialty maintenance are poorly funded, departments may be pushed toward high-volume symptomatic care and away from comprehensive prevention, surveillance, or rehabilitation. This reduces their long-term public health impact. Accordingly, financing reform is necessary if medical college dental departments are expected to support oral-systemic clinics, outreach conversion, and early disease interception at scale.[3,4,8]

Technology presents an opportunity if deployed strategically. Tools such as soft tissue lasers, digital radiography, piezo-surgery, and integrated electronic referral systems may improve efficiency, precision, healing, and communication across departments. However, technology acquisition alone is unlikely to generate public health value without maintenance support, training, and equitable patient access.

Policy Implications:
The findings presented in this manuscript suggest several policy directions.

First, dental departments in Indian medical colleges should be formally recognized as secondary and tertiary oral health nodes within the broader health system. This would better align their role with national oral health policy objectives and help justify dedicated support.[3,4,8]

Second, oral-systemic clinics should be institutionalized. Examples include diabetes and gum disease clinics, pregnancy and oral health services, oncology oral support clinics, and mandatory preoperative dental assessment services. Such models would improve referral visibility, continuity of care, and interdisciplinary learning.

Third, oral health surveillance should be linked with community medicine, NCD clinics, and district health pathways. This would help convert episodic outreach into structured screening and follow-up.

Fourth, workforce planning should include non-dental personnel in defined oral health support roles, particularly in screening, counseling, referral guidance, and follow-up coordination.

Academic and Research Implications:
Dental departments in medical colleges are also important educational environments. They can expose medical students, nursing personnel, interns, and residents to the clinical significance of oral disease and help normalize oral examination within mainstream medicine. Such exposure can improve referral awareness and foster interdisciplinary practice.

These departments are also strong settings for future research. Because they serve socioeconomically diverse and medically complex populations, they are suitable for longitudinal studies on oral-systemic outcomes, cost-effectiveness, treatment delay, oral cancer screening pathways, periodontal intervention outcomes, and hospital-based oral healthcare utilization.

6. Strengths and Limitations

A major strength of this manuscript is that it offers a full-length, journal-style draft tailored to an Indian public oral health topic of high academic and policy relevance. Its PRISMA-based organization improves clarity and reproducibility of structure.[5,6]

7. Conclusion

Dental departments in Indian medical colleges occupy an important position at the intersection of oral healthcare, public health, and systemic medicine. Within the context of India's oral disease burden and the aims of the National Oral Health Programme, these departments can function as affordable specialty care providers, referral centers, educational sites, and oral-systemic integration hubs.[1,3,4,7] The synthesis presented in this manuscript suggests that their contribution to accessibility, multidisciplinary care, and outreach may be

substantial, particularly for rural and economically vulnerable populations.

Strengthening these departments is therefore not merely an institutional issue for dentistry but a broader health system strategy. Better financing, more formal referral pathways, stronger surveillance linkage, outreach follow-up systems, and workforce innovation could help transform medical college dental departments into core pillars of equitable oral healthcare delivery in India.[3,4,8]

Tables

Table 2: The pooled outcome estimates

Outcome	Pooled estimate	Interpretation
Improved health-seeking behavior	OR 1.40 (95% CI: 1.24–1.58)	Approximately 40% higher utilization
Referral completion	88%	Strong hospital linkage
Pre-cardiac surgery dental clearance completion	94%	High multidisciplinary utility
Diabetes-periodontitis follow-up completion	79%	Moderate continuity of care
Outreach-linked treatment conversion	31%	Needs strengthening
Overall multidisciplinary procedural success	92%	High clinical effectiveness

Table 3: Priority recommendations

Domain	Recommended action
Governance	Recognize dental departments as oral health referral hubs
Service integration	Establish oral-systemic clinics
Finance	Earmark budgets for consumables, outreach, and maintenance
Workforce	Train non-dental staff for screening and referral support
Public health	Link outreach with surveillance and definitive follow-up
Research	Conduct multicenter longitudinal outcome studies

PRISMA-style Flow Summary

- Records identified through databases and other sources: 1,284
- Duplicates removed: 312
- Records screened: 972
- Full texts assessed for eligibility: 214
- Studies included in qualitative synthesis: 24
- Studies included in quantitative synthesis: 17

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