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The role of General Dental Practitioners in the early detection of oral cancer and oral potentially malignant disorders: A global synthesis of barriers and health system strategies

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ABSTRACT

Background: Oral cancer represents a significant global health threat with high morbidity and mortality, largely driven by advanced-stage diagnoses. While the oral cavity is highly accessible for physical examination, approximately 60% to 75% of oral squamous cell carcinomas (OSCC) are diagnosed at advanced clinical stages (III/IV). General dental practitioners (GDPs) are frontline oral health providers uniquely positioned to detect oral potentially malignant disorders (OPMDs) and early stage malignancies during routine clinical encounters, offering an invaluable opportunity for secondary prevention.

Objective: To review and synthesize recent international scientific evidence regarding the clinical knowledge, diagnostic screening practices, structural barriers, and public health opportunities associated with GDPs in the early detection of oral cancer.

Methodology: A comprehensive review of current observational, cross-sectional, and meta-analytic research was conducted. The synthesis focused on general dental practitioner's clinical competencies, knowledge of modifiable risk behaviors, patient counseling adherence, structural barriers in dental practice, and the comparative efficacy of primary care dental referrals versus medical practitioner referrals.

Results: The literature demonstrates a profound 'knowledge-practice gap.' While over 90% of general dental practitioners acknowledge their critical role in oral cancer early detection, routine clinical screening remains highly inconsistent, with comprehensive soft tissue examinations routinely performed in only 17.5% to 46% of cases. Specific components, such as extra oral cervical lymph node palpation (31%–47.7%) and patient education on modifiable risk behaviors (e.g., tobacco and alcohol cessation), are vastly underutilized. Key structural barriers include clinical time constraints, inadequate undergraduate training, low diagnostic confidence, and a lack of formalized guidelines. However, meta analytic data reveals that general dental practitioners exhibit shorter primary care referral intervals (27.6 days' vs 30.5 days) and refer patients at significantly earlier clinical stages (TNM I/II) than general medical practitioners (Odds Ratio: 0.58; 95% CI: 0.34–0.98).

Conclusions: GDPs are highly effective first responders in oral cancer secondary prevention, but their public health potential is severely constrained by educational and practice-level barriers. Transforming these challenges into opportunities requires targeted undergraduate curriculum reform, mandatory structured continuing professional development (CPD), widespread implementation of written screening guidelines, and standardized inter-professional referral pathways.

Keywords: General Dental Practitioners; Oral Cancer; Oral Potentially Malignant Disorders; Early Detection; Screening Barriers; Primary Care Referrals; Public Health Dentistry.

I. INTRODUCTION

Oral and oropharyngeal malignancies remain a major global public health concern, ranked as the sixth most common cancer worldwide **[1]**. In 2022, approximately 389,846 new cases of oral cavity cancer were diagnosed, with an escalating trajectory projected to exceed 460,000 annual deaths by 2030, representing a staggering 67% increase from 2008 levels **[1, 2]**. Oral squamous cell carcinoma (OSCC) accounts for approximately 90% to 95% of all oral malignancies. While high-income regions have witnessed some stabilization in trends, low- and middle-income transitioning countries bear a disproportionate share of the global burden. For instance, in South Asian countries, oral cancer is the second most common cancer and the primary cause of cancer-related deaths in Pakistan **[3]**, while in Sri Lanka, it is the most common cancer among males, contributing to nearly 25% of all new cancer diagnoses each year **[2]**.

The primary etiology of oral cancer is multifactorial, strongly associated with lifestyle and environmental exposures **[1]**. Smoking and

smokeless tobacco use, heavy alcohol consumption, and betel quid (areca nut) chewing represent the classic high-risk factors **[1, 2, 3, 4]**. Emerging risk indicators under active investigation include human papillomavirus (HPV) infections (particularly for oropharyngeal tumors), chronic oral mucosal trauma from sharp teeth or ill-fitting dentures, poor oral hygiene, immunocompromised states, and nutritional deficiencies (such as a low consumption of fresh fruits and vegetables) **[1, 2, 5, 6]**. Despite decades of public health campaigns and education, primary prevention efforts targeting behavior modification have been largely ineffectual on their own, as evidenced by the unremitting high prevalence of tobacco, alcohol, and substance abuse across vulnerable populations **[1]**.

Consequently, secondary prevention: specifically, early detection and timely intervention remains the most effective tool to reduce oral cancer mortality and morbidity **[1, 7]**. When oral cavity cancer is diagnosed in its early, localized clinical stages (TNM Stages I and II), patients enjoy a highly favorable prognosis, with five-year relative survival rates ranging from 66% to 88% **[1, 7, 8]**. Early stage treatment is less invasive, cost effective, and associated with a significantly better quality of life, preserving critical physiological functions such as speech, deglutition, and mastication **[7, 8]**. Conversely, when diagnosed at advanced clinical stages (TNM Stages III and IV), five-year relative survival rates drop precipitously to 41% and 9% respectively, and the cost of managing advanced disease imposes a crippling financial burden on patients and healthcare systems alike (estimated at a staggering USD 3.2 billion annually in late-stage management) **[1, 8]**.

The oral cavity is exceptionally accessible for clinical examination, allowing for direct, non-invasive visualization and manual palpation **[9, 10]**. Unlike internal malignancies, oral cancer is frequently preceded by a clinically detectable, asymptomatic phase manifesting as oral potentially malignant disorders **[1, 8]**. These precursor lesions include leukoplakia, erythroplakia, erythroleukoplakia (speckled lesions), oral submucous fibrosis, and oral lichen planus **[1, 4, 6]**. General dental practitioners,as frontline primary care providers who routinely access the oral cavity and examine both symptomatic and healthy, asymptomatic populations, are uniquely positioned to serve as clinical first responders **[1, 7, 10]**. However, evidence suggests that the clinical potential of General dental practitioners remains heavily constrained by a prominent gap between theoretical knowledge and clinical practice **[3, 4, 11, 12]**. This review article examines the critical role of GDPs in oral cancer early detection, detailing the prominent diagnostic challenges on the ground and identifying concrete structural and educational opportunities to optimize screening and referral pathways.

II. REVIEW

The efficacy of General dental practitioners as frontline first responders

In the patient diagnostic pathway, a major component of delay occurs within the primary care setting. The Primary Care Interval (PCI) is defined as the duration between a patient's first clinical presentation with a suspicious symptom and their subsequent referral to specialized secondary care. A rigorous meta-analysis of 17 international studies involving 2,530 patients demonstrated that the PCI accounts for approximately 31% (95% CI: 23% to 40%) of the entire pre-hospital diagnostic timeline **[13]**. This considerable delay highlights the profound diagnostic difficulties faced by primary care clinicians in identifying occult mucosal changes and navigating complex clinical referral networks **[13, 14]**.

Importantly, the meta-analysis revealed that the average PCI was shorter when patients presented to general dental practitioners (GDPs) than to general medical practitioners (GPs) (27.6 days vs. 30.5 days, respectively). More crucially, GDPs refer patients for definitive specialized treatment at significantly earlier clinical stages (TNM Stages I and II) than their medical physician colleagues (pooled Odds Ratio: 0.58; 95% CI: 0.34–0.98). This diagnostic advantage is further supported by regional studies confirming that dentists are significantly more accurate than general medical practitioners in diagnosing oral mucosal lesions and suspecting malignant potential (Odds Ratio: 2.68; 95% CI: 1.6–4.4) **[13]**. GDPs are trained to evaluate the unique microenvironment of the oral cavity and are highly capable of detecting subtle architectural changes in the oral mucosa **[1, 7, 13]**. This structural efficacy establishes GDPs as indispensable first responders in secondary prevention, capable of intercepting potentially malignant progression before regional metastasis occurs **[1, 13]**.

The Knowledge-Practice discrepancy on the ground

Despite a universal, high theoretical consensus among dentists regarding their professional responsibilitywith over 78% to 92% of dentists in multiple global studies agreeing that their clinical role is vital in reducing oral cancer mortality, there is a stark, disappointing

discrepancy when evaluating their actual clinical behavior **[11, 12, 15]**. On-the-ground survey data reveals a profound 'knowledge-practice gap' across various global health systems **[3, 4, 11, 12]**. For instance, in a large study of 700 dentists in Egypt, 92% acknowledged their clinical responsibility, yet only 37% carried out routine clinical screening for oral mucosal lesions, and only 31% routinely performed extra-oral cervical lymph node examinations **[15]**. Similarly, in India, out of 150 general dental practitioners surveyed, 78% expressed awareness of screening methods, but only 46% routinely performed thorough oral mucosal examinations on all patients **[11]**. In Palestine, while the majority revealed highly positive opinions toward oral mucosal screening, only 29.9% routinely examined their patients at every clinical visit **[12]**.

This discrepancy is characterized by a tendency to bypass essential elements of a comprehensive head and neck examination **[3, 4]**. A cross-sectional study of 235 dentists in Islamabad, Pakistan, revealed that only 47.7% of dentists routinely performed palpation of cervical lymph nodes, and only 45.5% examined the tonsils or oropharynx **[3]**. This selective clinical behavior indicates that many GDPs continue to focus their examinations narrowly on teeth, gums, and immediate procedure-related sites, completely overlooking high-risk soft tissue anatomical regions **[3, 4, 16]**. In an observational study conducted in Turkish dental practices comprising 263 practitioners, only 27.7% of the participants routinely examined high-risk anatomical areas such as the lateral borders of the tongue and the floor of the mouth during routine examinations **[17]**. This selective screening practice is highly concerning, as asymptomatic OPMDs and early stage OSCCs are often located in these specific anatomical niches, where they remain undetected until they progress to symptomatic, advanced stages **[1, 4, 17]**.

Clinical competence and the challenge of OPMD recognition

Early stage oral cancer and OPMDs are frequently asymptomatic and can mimic common, benign oral inflammatory conditions, presenting as subtle white, red, or mixed mucosal patches, induration, or superficial erosions **[1, 8]**. This clinical heterogeneity poses a severe diagnostic challenge for primary care practitioners **[14, 18]**. An objective clinical competency study conducted among 363 dental professionals and students in Australia utilized a 26 case online diagnostic simulator of mucosal lesions. The overall diagnostic accuracy was a modest 65.9%, and notably, there were no statistically significant differences in diagnostic performance between dental specialists, general dental practitioners, and final year dental students ($p > 0.05$). Crucially, the lowest diagnostic accuracies were directly associated with identifying OPMDs and distinguishing them from normal mucosal variations . This empirical evidence proves that dentists frequently struggle to correctly identify and triage early premalignant changes **[18]**.

This clinical deficit is closely tied to a lack of professional confidence and perceived incompetence **[4, 15]**. In the Egyptian cohort, 66% of general dentists self-reported that they felt clinically incompetent to detect oral cancer or OPMDs **[15]**. In Indonesia, a multi province survey of 177 GDPs revealed that an overwhelming 92.66% felt they had received insufficient training during dental school to confidently diagnose oral cancer **[4]**. This lack of competence leads to passive, unsafe clinical decisions **[4, 17]**. For example, rather than executing an immediate referral to specialized care, a significant proportion of dentists (36.9% in the Turkish study) reportedly preferred to clinically 'monitor' suspicious mucosal lesions over extended periods **[17]**. This passive delay can be catastrophic, as it permits the silent, rapid transformation of an OPMD into an invasive carcinoma **[1, 17]**.

Risk behavior assessment and patient education: a neglected duty

Primary prevention of oral cancer relies heavily on health promotion, risk behavior identification, and lifestyle counseling **[1, 5]**. Because GDPs routinely consult with 'healthy' individuals who may not otherwise seek medical care, they are uniquely positioned to deliver brief, impactful counseling on tobacco, alcohol, and betel quid cessation **[1, 2, 5]**. However, patient education is the most neglected dimension of general dental practice **[2, 4, 19]**. In the Toronto study of 91 dentists, while 91% reported performing opportunistic mucosal examinations, only 9.9% routinely discussed oral cancer risk factors with their patients, and 33% admitted to being completely unfamiliar with local smoking cessation and alcohol abuse support resources **[19]**. In Indonesia, 81.4% of general dentists reported that they never educated their patients regarding preventable lifestyle habits and behaviors that constitute risk factors for oral carcinoma **[4]**, while in Australia, over one-third of surveyed GDPs discussed these risk factors with fewer than 25% of their patient base **[6]**.

Several factors contribute to this counseling gap **[2, 19]**. First, dentists frequently report feeling uncomfortable discussing lifestyle habits that are perceived as private or socially sensitive **[2, 19]**. This is particularly relevant regarding alcohol use in conservative populations (such as Pakistan or Egypt), where religious and cultural norms may prevent patients from disclosing substance use honestly **[3, 15]**. Second, a significant proportion of dentists (up to 60%) are completely unsure of whether they are legally or professionally permitted to bill insurance systems for risk behavior counseling **[19]**. This lack of clear financial reimbursement, combined with a lack of structured chairside patient education materials (brochures, visual aids), leads to a clinical environment where preventive education is deprioritized in favor of direct, remunerative restorative procedures **[2, 19]**.

Structural barriers in everyday dental practice

A successful dental public health framework must recognize and address the practical, real world barriers that GDPs encounter in private and public clinical settings **[14]**. Across multiple international cohorts, the most prevalent barriers to routine oral cancer screening are highly consistent:

- **Severe Clinical Time Constraints:** Dentists operating in high-volume public clinics or busy private practices are under intense pressure to complete dental procedures within restricted appointment slots **[11, 12, 19]**. Performing a comprehensive, systematic head and neck soft tissue examination and documenting findings is often perceived as an unrealistic addition to their workload, despite evidence showing that a complete visual tactile screen takes less than two minutes to perform **[1, 9]**.
- **Inadequate Undergraduate training and clinical exposure:** Up to 66.2% of dentists express dissatisfaction with their dental school education, stating that the undergraduate curriculum is heavily focused on hard tissue restorative dentistry (operative, endodontics, prosthodontics) with very limited clinical exposure to oral medicine, soft-tissue biopsy techniques, and systematic head and neck oncology palpation protocols **[4, 15, 17]**.
- **Fear of misdiagnosis and legal repercussions:** The fear of making a false positive or false-negative diagnosis, coupled with a lack of confidence in their diagnostic skills, causes many general dentists to avoid screening entirely, choosing a passive approach of watchful waiting rather than initiating active diagnostic pathways **[4, 17]**.
- **Inadequate material resources and infrastructure:** In transitioning and low-income health settings, dental clinics frequently lack basic diagnostic resources, such as appropriate high intensity white light sources, dental mirrors, sterile gauze squares for tongue traction, and biopsy kits, preventing the execution of definitive diagnostic procedures **[14, 16]**.
- **Lack of financial compensation:** In many healthcare systems, oral cancer screening is entirely un-remunerated under standard public health insurance models, leaving dentists with no financial incentives to dedicate clinical time to thorough soft tissue screening and patient counseling **[19]**.

Strategic opportunities for public health intervention

To bridge the knowledge-practice gap and optimize the screening capacity of GDPs, several actionable, system wide strategic opportunities must be pursued:

- **Undergraduate curricular reform:** Dental schools must transition toward a competency based curriculum that integrates comprehensive soft tissue oncology and systematic head and neck examination protocols into standard clinical requirements **[4, 15, 18]**. Undergraduate training must incorporate hands-on clinical rotations in oral medicine and oral surgery, and competency in providing smoking, smokeless tobacco, and alcohol cessation advice should be established as a mandatory graduation standard **[2, 4, 15]**.
- **Mandatory, structured continuing professional development (CPD):** Observational research demonstrates that recent participation in a CPD course is a powerful predictor of higher early detection practice scores **[3]**. However, early detection practices decrease significantly as the duration since the last CPD course increases, highlighting a rapid decline in diagnostic knowledge over time **[3]**. Therefore, licensing bodies should consider implementing mandatory, regular continuing dental education credits specifically focused on oral cancer screening and risk-behavior counseling to ensure GDP skills remain updated **[3, 12, 16]**.
- **Widespread implementation of written guidelines and chairside protocols:** The presence of written, standardized screening guidelines within dental health facilities is

significantly associated with higher screening practice scores (mean score of 6.1 vs. 4.7, $p < 0.001$) **[3]**. National dental associations and ministries of health must develop and distribute simple, visual chairside diagnostic algorithms, such as the UK NICE 2-week fast-track referral guidelines, to provide dentists with a clear, objective decision-making framework following lesion discovery **[3, 10]**.

- **Scalable digital and e-Learning platforms:** To overcome geographic and scheduling barriers to professional education, digital platforms offer a highly scalable solution. A successful model is the Victorian Department of Health's 'Oral Cancer: Prevention, early detection and referral' e-learning module, launched on the RACGP training website in November 2023. This inter-professional program successfully trains primary care medical and dental clinicians in standardized risk assessment and early referral protocols **[5]**.
- **Evidence based integration of adjunctive diagnostic aids:** While visual-tactile examination and scalpel biopsy remain the absolute gold standards, adjunctive diagnostic techniques can serve as valuable supplementary tools for GDPs. These aids can help distinguish benign mucosal abnormalities from dysplastic or malignant changes, identify occult areas of dysplasia that are invisible to the naked eye, and help delineate surgical margins. GDPs should receive training on the clinical sensitivity and specificity of vital tissue staining (e.g., Toluidine Blue, with sensitivity of 38%–98% and specificity of 9%–93%), oral exfoliative cytology, brush biopsy (OralCDx, with sensitivity of 92% and specificity of 94%) , and light-based systems including chemiluminescence (ViziLite, with sensitivity of 100% and specificity of 14%) and autofluorescence (VELscope, with sensitivity of 98% and specificity of 100%). Understanding the high false-positive rates and clinical limitations of these adjunctive techniques is critical to avoid unnecessary biopsies and patient anxiety **[8]**.
- **Optimization of inter-professional referral and fast-track networks:** Reducing the Primary Care Interval requires streamlined communication between primary care GDPs and specialized secondary care (oral medicine specialists, oral and maxillofacial surgeons, and oral pathologists) **[13]**. Joint curricula should be established in medical and dental schools to train students on inter-professional referral letters, standardized clinical photography documentation, and the utilization of rapid fast-track diagnostic pathways, which ensure that patients with high-risk lesions are evaluated microscopically within two weeks of clinical presentation **[13, 14]**.

Table 1 summarizes the key clinical parameters, knowledge levels, and perceived barriers identified among general dental practitioners across representative global health systems, illustrating the universal nature of these challenges and the urgent need for systemic interventions.

Country / Region	Sample Size	Knowledge Status	Screening Practice Rate	Primary Perceived Barriers
Pakistan (Talha et al., 2026) **[3]**	n = 235	Low clinical presentation knowledge (81.7%); high risk factor knowledge (55.3%)	Mean practice score 5.4/8. Only 47.7% perform lymph node palpation.	Lack of clinical time (47.7%), lack of training (51.9%).
India (Dutt et al., 2026) **[11]**	n = 150	62% moderate knowledge, 24% good knowledge, 14% poor knowledge	46% routinely perform oral mucosal examinations on all patients.	Inadequate training (48%), severe clinical time constraints (41.3%).

Country / Region	Sample Size	Knowledge Status	Screening Practice Rate	Primary Perceived Barriers
Egypt (Ghalwash &Zahran, 2025) **[15]**	n = 700	97.1% recognize tobacco, 80.1% alcohol. 66% feel clinically incompetent.	37% perform proper clinical screening; 31% routine lymph node exams.	Inadequate training, lack of clinical confidence, lack of curricular exposure.
Palestine (Healthcare, 2023) **[12]**	n = 254	70.1% poor overall knowledge; only 29.9% have good knowledge	29.9% perform routine soft-tissue screening at every visit.	Inadequate training (55.1%), lack of clinical time (29.3%).
Indonesia (Sari et al., 2024) **[4]**	n = 177	Inadequate knowledge & awareness. Only 7.3% report sufficient training.	51.41% fail to screen high-risk patients. Very low biopsy rate (2.84%).	92.66% report insufficient dental school training, lack of clinical confidence.

III. CONCLUSIONS

General dental practitioners represent a highly effective yet severely underutilized clinical resource in the global fight against oral cancer. Rigorous clinical and meta-analytic evidence proves that when GDPs are integrated into primary care pathways, they achieve shorter referral intervals and refer suspected lesions at significantly earlier clinical stages than general medical practitioners, directly improving patient survival and minimizing treatment-associated morbidity. However, a profound, universal knowledge-practice gap exists: routine oral soft-tissue screening, comprehensive cervical lymph node palpation, and active risk behavior cessation counseling remain highly inconsistent in everyday dental practice.

To transform these challenges into a major public health opportunity, a paradigm shift is required. Dental educators must reform undergraduate dental curricula to establish hands-on clinical competence in soft-tissue oncology and preventive health promotion as core graduation requirements.Professional dental bodies and licensing boards must mandate structured, regular continuing professional development in early detection. At the health system level, policymakers must distribute standardized, visual chairside screening guidelines, integrate evidence-based adjunctive diagnostic technologies, and streamline rapid, inter-professional fast-track referral networks. By systematically upskilling general dental practitioners and embedding oral mucosal screening as an obligatory component of routine dental hygiene, the global healthcare community can successfully reduce the diagnostic delay of oral cancer, achieve early therapeutic interventions, and save countless patient lives.

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