RESEARCH PAPER

Knowledge, Attitude And Practice Of Salivary MicroRNA as Biomarkers In Oral Cancer Detection Among Dental Professionals: A Cross- Sectional Survey

Dr.M.Parasakthi[1*], Dr. Kavitha Sanjeev[2]

[1]PhD Scholar, Department of Oral Pathology, SRM Dental College, Bharathi Salai, Ramapuram, Chennai- 600089. Tamil Nadu, India*
(Corresponding Author) Email: dr.parasakthi2006@gmail.com

[2]Professor, Department of Conservative Dentistry and Endodontics, SRM Dental College , Bharathi Salai, Ramapuram, Chennai- 600089. Tamil Nadu, India*
Email: kavithasanjeev02@gmail.com

ABSTRACT

Background: Oral cancer is a major public health problem in India, and its late-stage diagnosis results in a poor survival rate. Salivary microRNAs have emerged as promising non-invasive biomarkers for detecting it early. As frontline professionals, dentists should recognise and use these diagnostic tools with due care.

Objective: The present study was conducted to evaluate Dental professionals' knowledge of salivary microRNA biomarkers for oral cancer detection.

Materials and Methods: A descriptive cross-sectional survey was conducted among 100 registered Dental practitioners in Tamil Nadu through a 20-item online questionnaire. Demographics, sources of knowledge, and perceived clinical utility of salivary microRNAs were surveyed, and their awareness was also evaluated.

Results: Awareness of salivary microRNAs was high in 35%, moderate in 40% and low in 25% of respondents. Awareness was significantly higher in Postgraduates than BDS practitioners (ANOVA, F= 5.62, p= 0.019). Younger Dentists with less than 10 years of practice were more aware than senior practitioners (Chi-square, x^2 = 8.21, p = 0.016).

Conclusion: Salivary microRNA biomarkers are known to a moderate extent, but a gap still exists in integrating them into routine dental practice. Therefore, it is necessary to improve early detection strategies through structured continuing education and inclusion in the curriculum.

Keywords: Oral cancer; Salivary biomarkers; microRNA; Dentists'Awareness; Questionnaire survey

How to cite this article: M.Parasakthi, Kavitha Sanjeev, "Knowledge, Attitude And Practice Of Salivary MicroRNA As Biomarkers In Oral Cancer Detection Among Dental Professionals: A Cross- Sectional Survey" Int J Drug Deliv Technol. 2026;16(88s): 1607-1612; DOI: 10.25258/ijddt.16.88s.159

INTRODUCTION

Oral cancer is a major global health concern and ranks fourteenth in terms of incidence and fifteenth in terms of mortality among all cancers [1]. In India, it contributes significantly to a high mortality rate [2]. The main aetiological factors are tobacco, betel quid chewing and alcohol consumption [3]. Despite significant progress in Oncology, the survival rate remains poor due to late-stage diagnosis, underscoring the importance of early detection.

Biomarkers are molecules that indicate the underlying pathogenesis inside the human body. There are three types of biomarkers, viz., diagnostic, prognostic and predictive in Oral Oncology. MicroRNAs can play all these roles.

MicroRNAs (miRNAs) are small non-coding RNAs that regulate gene expression [4]. Dysregulation of these molecules has been implicated in carcinogenesis, including tumour initiation, progression, invasion, and metastasis [5]. Among them, microRNAs such as miR-21, miR-31 and miR-200c have been repeatedly identified as biomarkers in oral squamous cell carcinoma [6].

MicroRNAs can be either tumour-suppressive or oncogenic, and their expression can be upregulated or downregulated [7]. Circulating, cell-free microRNAs in saliva, serum, and plasma could

serve as non-invasive biomarkers for the diagnosis and prognosis of several cancers [8].

Saliva is such a promising diagnostic tool for its non-invasive collection, ease of storage and molecular richness [9]. Salivary microRNAs are stable and reproducible [10]. In several studies, salivary microRNA profiles have been demonstrated to distinguish patients with OSCC from healthy controls.

Dentists, as primary oral health care providers, are frequently the first to detect suspicious lesions. Their knowledge of salivary biomarkers is very much essential for early detection. However, dental practitioners have limited knowledge of molecular diagnostics. Hence, this study aimed to assess their awareness of salivary microRNA biomarkers in Tamil Nadu.

MATERIALS & METHODS

Study Design: A descriptive cross-sectional survey was conducted from April to July 2026. Ethical approval was obtained from the Institutional Ethics Committee of SRM Dental College, Ramapuram.

Sample size calculation: G*Power software version 3.1 was used to estimate the sample size. Assuming a medium to large effect size (f=0.30), α=0.05, and power=80%, the minimum sample size was estimated to be 90 individuals. While 120 dentists were invited to take part in this study, only 100 came forward to respond.

Inclusion criteria: Only registered BDS/MDS practitioners of Tamil Nadu practising in academic institutions, hospitals, or private clinics.

The exclusion criteria include incomplete responses and non-practising Dentists.

Questionnaire: A 20-point questionnaire was prepared and peer-reviewed by oral pathology experts as given in Table 1. It included demographics, awareness of salivary microRNAs, sources of knowledge, perceived clinical utility and barriers to adoption into routine practice.

Table 1: A 20-point questionnaire

Question No.	Questions
1	Have you heard of salivary microRNAs (miRNAs) as biomarkers for oral cancer detection?
2	Are you aware that miRNAs play a role in oral carcinogenesis?
3	Are you familiar with miR-21 as a biomarker associated with oral cancer?
4	Are you familiar with miR-31 as a biomarker associated with oral cancer?
5	Are you familiar with miR-486-3p as a biomarker associated with oral cancer?
6	Are you aware that saliva can be used as a diagnostic fluid for molecular testing?
7	Are you aware that salivary miRNAs are stable and reproducible biomarkers?
8	Do you believe salivary diagnostics are advantageous because they are non-invasive?
9	Have you received any formal training regarding salivary biomarkers?
10	Were salivary biomarkers covered in your undergraduate (BDS) course?
11	Were salivary biomarkers covered in your postgraduate syllabus or Continuing Dental Education (CDE) programs?
12	How confident are you in interpreting biomarker-based diagnostic reports?
13	Do you believe salivary microRNA testing can aid in early detection of oral cancer?
14	Would you consider incorporating salivary miRNA testing into your clinical practice if available?
15	Do you consider salivary biomarker testing a cost-effective diagnostic approach?
16	Do you have access to laboratories capable of performing salivary biomarker analysis?
17	Can your institution or clinic support the use of molecular diagnostic techniques?
18	Do you feel additional training is necessary before using salivary biomarker tests in practice?
19	Would you be interested in attending workshops or CDE programs on salivary biomarkers?
20	Should salivary biomarker diagnostics be incorporated into the Dental curriculum?

RESULTS

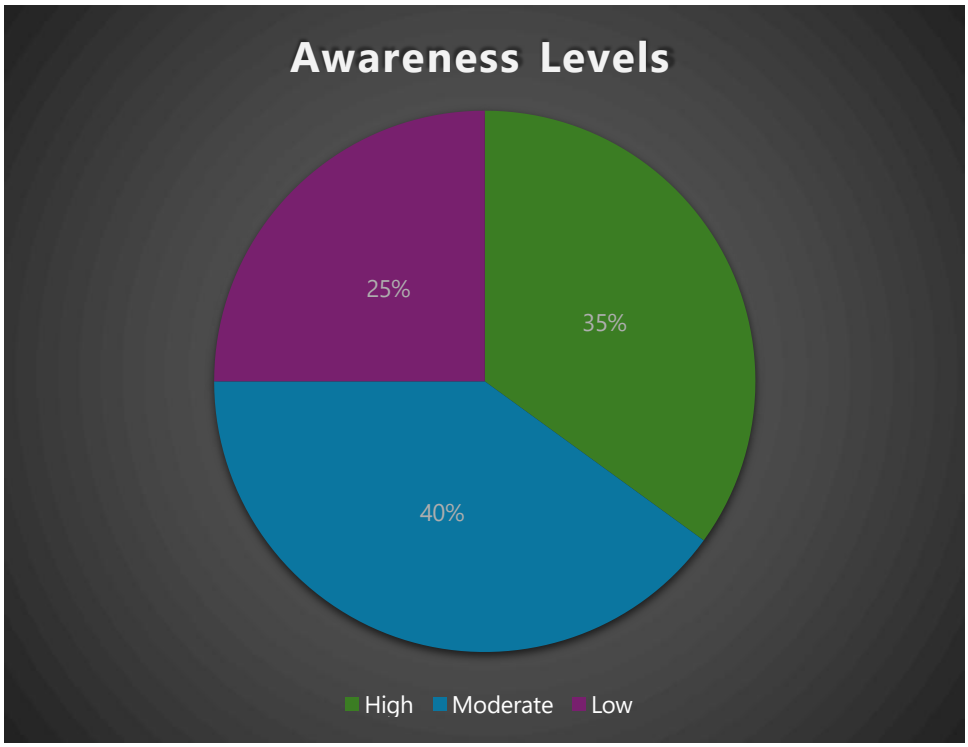
Demographics:

Of the 100 respondents, 40 were women, and 60 were men. Also, 58% of them were below 35 years of age. Oral pathology and oral medicine were the most common specialities among the 62% of postgraduates (MDS). Figure 1 depicts the levels of awareness of salivary microRNAs as biomarkers for detecting oral cancer among Dentists.

Levels of awareness:

- 35% (n= 35) had **high** awareness.
- 40% (n= 40) had **moderate** awareness.
- 25% (n= 25) had **low** awareness.

Figure 1: Awareness levels of salivary miRNA biomarker for oral cancer



Analysis from statistics:

The values obtained using one-way ANOVA are provided in Table 2.

Table 2: One- way ANOVA values:

Source of Variation	Sum of Squares (SS)	df	Mean Square (MS)	F value	p-value
Between Groups	8.92	1	8.92	5.62	0.019*
Within Groups	155.60	98	1.59		
Total	164.52	99			

Interpretation:

A statistically significant difference was observed in awareness scores between qualification groups (**F = 5.62, p = 0.019**). MDS practitioners demonstrated significantly higher awareness regarding salivary microRNA biomarkers than BDS practitioners. Based on years of experience, Chi-square test was used and values are tabulated in Table 3.

Table 3: Chi-square test values

Experience	High	Moderate	Low	Total
<10 Years	28	27	10	65
>10 Years	7	13	15	35
Total	35	40	25	100

χ^2 Value	8.21
Degrees of Freedom	2
p-value	0.016*

Dentists with less than ten years of experience demonstrated higher awareness than those with more than ten years ($\chi^2 = 8.21$, $p = 0.016$). Table 4 shows awareness scores by qualification and experience.

Table 4: Awareness Scores by Qualification and Experience (n=100)

Group	Count	Mean Awareness Score	SD	SE	95% CI (Mean)
BDS (<5 yrs practice)	35	2.1	0.8	0.14	1.82- 2.38
MDS (<5 yrs practice)	30	3.4	0.7	0.13	3.14- 3.66
BDS (>10 yrs practice)	20	1.9	0.6	0.13	1.64- 2.16
MDS (>10 yrs practice)	15	3.1	0.5	0.13	2.85- 3.35

DISCUSSION:

Awareness of salivary microRNA indicators was found to be modest among dental professionals in this investigation, with postgraduates, particularly from Oral Pathology and Oral Medicine, showing noticeably greater knowledge than BDS practitioners. Additionally, younger practitioners had a greater understanding, indicating that recent graduates might be more aware of new diagnostic technology.

Comparisons across borders reveal comparable difficulties. Salivary diagnostics are becoming more popular across the world, but clinical acceptance is still low. In China, dentists' awareness was estimated to be around 40%. These similarities imply that the disconnect between clinical practice and research advancements is a global problem.

Limited integration of molecular diagnostics into the dental curriculum, insufficient continuing education programmes, and dependence on traditional diagnostic techniques like biopsy and histopathology were some of the obstacles to adoption. Shortage of time was the main barrier limiting dentists from participating in the CDE programs [11,12,13]. The integration of biomarker-based diagnostics is hampered by dentists, patient demand, and limited laboratory access.

Salivary miRNAs have a well-established clinical utility [14]. Liquid biopsy indicates the expression of microRNA in healthy and oral cancer cells, thereby making it a reliable biomarker for oral cancer [15]. Tumour invasion and proliferation have been associated with miRNA 21 [16], poor prognosis is correlated with miRNA 31 and 375 [17], and OSCC is

distinguished from normal individuals by microRNA 486-3p [18]. Despite this evidence, structured training, distribution of guidelines, and cooperation between academics and clinicians are necessary for translation into ordinary dental practice.

Dentists were amenable to Continuing Dental Education programs, as evidenced by their encouraging interest in learning more about salivary biomarkers. Adoption might be further increased by creating chairside diagnostic kits and incorporating biomarker knowledge into the curriculum. Improving early identification of oral cancer requires bridging the **knowledge-practice gap** [19, 20].

CONCLUSION

Tamil Nadu dentists have a mediocre understanding of salivary miRNA indicators for oral cancer detection. There are still gaps among general practitioners, but postgraduates and younger practitioners are better versed. To close these gaps, biomarker information should be included in Dental education programs. Programs for Continuing Dental Education should be organised as an interprofessional event. Co-operation between researchers and clinicians should be encouraged. Salivary diagnostic kits should be created at the chairside for regular use. Improving early detection and lowering the incidence of oral cancer are dependent on increasing awareness and practice integration.

References

1. Ervik M, Laversanne M, Lam F, Colombet M, Ferlay J, Filho AM, Bray F (2026). Global Cancer Observatory: International Agency for Research on Cancer. Available from: https://gco.iarc.who.int/today, accessed on 20th July 2026.
2. Borse V, Konwar AN, Buragohain P. Oral cancer diagnosis and perspectives in India. Sens Int. 2020;1:100046. doi: 10.1016/j.sintl.2020.100046.
3. Pramod R, Patil S, Gawande M, et al. Analysis of various risk factors affecting potentially malignant disorders and oral cancer patients of Central India. Journal of Cancer Research and Therapeutics. 2015;11(2):280-286. doi:10.4103/0973-1482.151417
4. O'Brien J, Hayder H, Zayed Y, Peng C. Overview of MicroRNA Biogenesis, Mechanisms of Action, and Circulation. Front Endocrinol (Lausanne). 2018;3(9):402. doi: 10.3389/fendo.2018.00402.
5. Chen PS, Su JL, Hung MC. Dysregulation of microRNAs in cancer. J Biomed Sci. 2012;19(1):90. doi: 10.1186/1423-0127-19-90.
6. MM Muzeal. Salivary Exosomal MicroRNAs as Non-Invasive Biomarkers for Early Detection of Oral Squamous Cell Carcinoma: A Prospective Diagnostic Study. IJIRMS. 2025;10(8):294-301. https://doi.org/10.23958/ijirms/vol10-i08/2114.
7. Rapado Ó, Majem B, Romay L, Castro A, Santamaría A, Gil A. Human Salivary microRNAs in Cancer. Journal of Cancer. 2018; 9 (4), 638-49. https://doi.org/10.7150/jca.21180
8. Peng, Y., Croce, C. The role of MicroRNAs in human cancer. Sig Transduct Target Ther 2016;1:15004. https://doi.org/10.1038/sigtrans.2015.4
9. Cortez MA, Bueso-Ramos C, Ferdin J, Lopez-Berestein G, Sood AK, Calin GA. MicroRNAs in body fluids--the mix of hormones and biomarkers. Nat Rev Clin Oncol. 2011;8:467-77. doi: 10.1038/nrclinonc.2011.76
10. Kumar P, Gupta S, Das B. C. Saliva as a Potential Non-Invasive Liquid Biopsy for Early and Easy Diagnosis/Prognosis of Head and Neck Cancer. Translational Oncology. 2024; 40: 101827. https://doi.org/10.1016/j.tranon.2023.101827.
11. Zamanifar A, Asgari I. Continuing professional development programs for general dentists in Isfahan province, Iran: Interests, priorities, and obstacles. Dent Res J (Isfahan) 2022;19:69.
12. Nayak PP, Prasad KV, Jyothi C, Roopa GS, Sanga R. Preferences and barriers for continuing professional development among dental practitioners in the twin cities of Hubli-Dharwad, India. J Indian Assoc Public Health Dent. 2015;13:429-33.
13. Gambhir RS, Jagga U, Singh R, Kaur R, Kumar G, Gupta A. Continuing dental education (CDE) programs: Are dentists keeping themselves updated? J Educ Health Promot. 2025;14:14. doi: 10.4103/jehp.jehp_1845_23.
14. Park NJ, Zhou H, Elashoff D et al. Salivary microRNA: Discovery, characterisation, and clinical utility. Clin Cancer Res. 2009;15(17):5473-77. https://doi.org/10.1158/1078-0432.CCR-09-0736

15. Baby, N.T.; Abdullah, A.; Kannan, S. The scope of liquid biopsy in the clinical management of oral cancer. Int. J. Oral Maxillofac. Surg. 2022;51:591-60

16. Prasad M, Hamsa D, Fareed M, Karobari MI. An update on the molecular mechanisms underlying the progression of miR-21 in oral cancer. World J Surg Oncol. 2025;23(1):73. doi: 10.1186/s12957-025-03732-2.

17. Siow, M., Karen Ng, L., Vincent Chong, V., Jamaludin, M., Abraham, M., Abdul Rahman, Z. et al. Dysregulation of miR- 31 and miR-375 expression is associated with clinical outcomes in oral carcinoma. Oral Dis. 2013;*20*(4), 345-51. https://doi.org/10.1111/odi.12118

18. Balakittnen, J., Ekanayake Weeramange, C., Wallace, D.F. et al. A novel saliva-based miRNA profile to diagnose and predict oral cancer. Int J Oral Sci. 2024;16:14. https://doi.org/10.1038/s41368-023-00273-w

19. González-Moles MA, Aguilar-Ruiz M, Ramos-Garcia P. Challenges in the Early Diagnosis of Oral Cancer, Evidence Gaps and Strategies for Improvement: A Scoping Review of Systematic Reviews. Cancers. 2022; 14(19):4967. https://doi.org/10.3390/cancers14194967

20. Kujan, O.; Glenny, A.M.; Duxbury, A.J.; Thakker, N.; Sloan, P. Screening programmes for the early detection and prevention of oral cancer. Cochrane Database Syst. Rev. 2003;4, CD004150.