

Introduction

Oral squamous cell carcinoma (OSCC) represents approximately 90% of all oral malignancies and remains a significant global health burden. Despite advances in therapy, the five-year survival rate has remained stagnant at 50–60% for decades, a statistic primarily driven by diagnostic delays and the asymptomatic nature of early tumorigenesis. Survival rates can reach 80–90% when detected at Stage I, but plummet to less than 30% in advanced stages. While tissue biopsy is the gold-standard confirmatory test, its invasive nature and cost create barriers to routine screening. Consequently, saliva has emerged as an ideal "liquid biopsy medium; it is non-invasive, easy to collect, and in direct contact with the tumor site, allowing for the capture of locally derived molecular signatures

Objectives

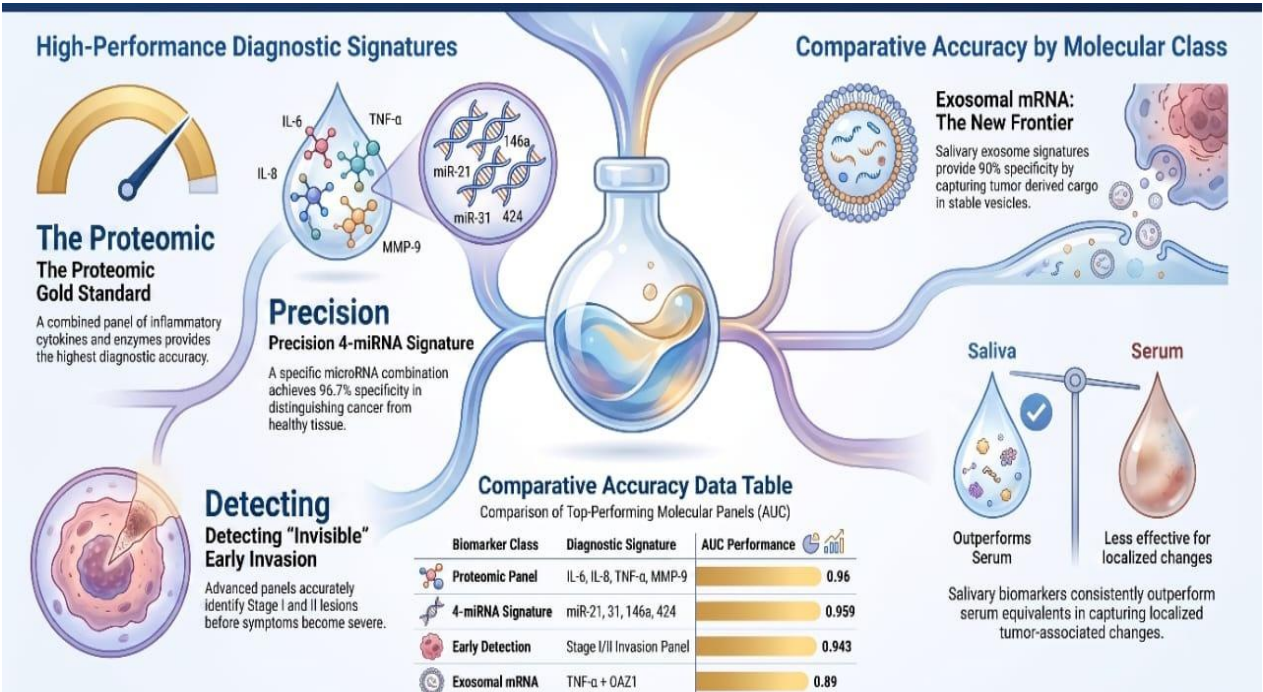
The primary aim of this study is to evaluate the diagnostic accuracy and potential clinical applicability of diverse salivary molecular classes, including microRNAs (miRNAs), proteomic cytokines, and exosomal mRNAs, for the early detection and risk stratification of Oral Squamous Cell Carcinoma (OSCC).

Methodology

Following PRISMA guidelines, a systematic search was conducted across databases including PubMed, Scopus, and Web of Science for clinical studies published up to 2026. Twelve clinical studies met the inclusion criteria, which required histological confirmation of OSCC and the reporting of diagnostic performance metrics, primarily Area Under the Curve (AUC), sensitivity, and specificity.

Results

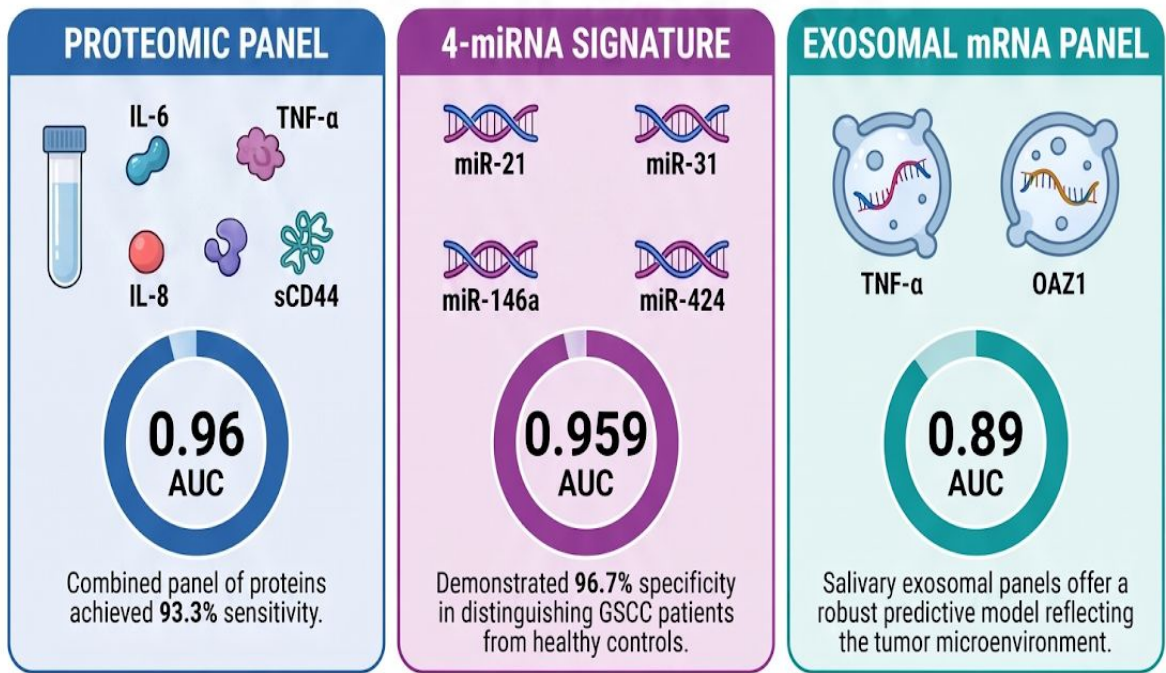
Despite methodological heterogeneity across detection platforms (including ELISA, qRT-PCR, and electrochemical biosensors), combinatorial biomarker panels consistently demonstrated superior diagnostic performance compared to individual markers. A novel four-miRNA signature (miR-21, miR-31, miR-146a, and miR-424) achieved an AUC of 0.959, with 96.7% specificity. A disease-specific panel targeting early invasion (miR-20b-5p, miR-484, miR-185-5p, and miR-181d-5p) demonstrated an AUC of 0.954, maintaining a high discriminatory power (AUC: 0.943) specifically for early-stage (Stage I/II) lesions. Proteomic analysis of a combined inflammatory cytokine and enzyme panel (including IL-6, IL-8, and MMP-9) yielded an AUC of 0.96, while salivary exosomal mRNA signatures (TNF- α + OAZ1) exhibited an AUC of 0.89.



Conclusions

Salivary molecular signatures show considerable promise as non-invasive diagnostic tools for the early detection of OSCC. The high diagnostic performance of combined miRNA and proteomic panels may facilitate earlier diagnosis and more timely treatment. These findings support the potential for future clinical screening, though further multicentre validation is required before routine clinical implementation.

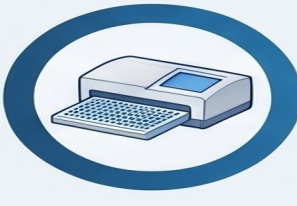
HIGH-PERFORMANCE DIAGNOSTIC PANELS



DETECTION PLATFORM TECHNOLOGIES & CLINICAL OUTLOOK

Multi-Platform Detection Efficacy

High diagnostic precision achievable across multiple platforms



ELISA



qRT-PCR



Electrochemical Biosensors