Indian J Med Res 163, May 2026, pp 640-648
DOI: 10.25259/IJMR_2452_2025

Systematic Review

Inflammation-driven carcinogenesis in oral cancer: A systematic review of cellular mechanisms and clinical perspectives

Munish Rastogi,[1] Alka Katiyar[1] and Dheeraj Kumar[1]

[1]*School of Health Sciences, Chhatrapati Shahu Ji Maharaj University, Kanpur, Uttar Pradesh, India*

Received September 7, 2025; Accepted December 21, 2025; Published May 16, 2026

Background and objectives: Oral squamous cell carcinoma (OSCC) represents the predominant form of oral cancer and remains a major cause of morbidity and mortality worldwide. Beyond traditional risk factors such as tobacco, alcohol, and betel quid consumption, mounting evidence implicates chronic inflammation as a driving force in oral carcinogenesis. This review synthesises current literature exploring how inflammatory mediators contribute to tumour initiation, progression, and clinical outcomes in OSCC.

Methods: A systematic search of PubMed, Scopus, Web of Science, Embase, and Cochrane Library databases was conducted according to PRISMA 2020 guidelines. Studies from 2020–2025 examining molecular and clinical interactions between inflammation and OSCC were analysed. Extracted data included inflammatory biomarkers, activated signalling pathways, and prognostic or therapeutic implications. The risk of bias was assessed using the Newcastle–Ottawa Scale and Cochrane RoB-2 tool. The review protocol was registered with PROSPERO (CRD420251141942).

Results: Forty-three eligible studies revealed that inflammatory cytokines such as TNF-α, IL-6, and IL-1β, together with chemokines like CXCL8, trigger oncogenic cascades involving NF-κB and STAT3, leading to enhanced proliferation, angiogenesis, and epithelial–mesenchymal transition. Oxidative DNA damage and immune suppression mediated by M2 macrophages and PD-1/PD-L1 signalling further facilitate tumour aggressiveness. Elevated COX-2, STAT3, and systemic inflammatory ratios were strongly associated with poor prognosis.

Interpretation and conclusions: Persistent inflammation acts as a critical determinant in OSCC pathogenesis. Integrating inflammation-related biomarkers and anti-inflammatory therapeutic strategies may improve early detection, prognostication, and patient survival outcomes.

Keywords Carcinogenesis; Chronic inflammation; Cytokines; Oral cancer; Oral squamous cell carcinoma (OSCC); Therapeutic targets