
**"Frequency of Level V Lymph Node Positivity in Clinically
and Pathologically Node-Positive Neck in Oral Cavity
Squamous Cell Carcinoma: A Hospital-Based Prospective
Observational Study."**

BY



ABSTRACT

Background: Oral cavity squamous cell carcinoma (OSCC) is one of the most common head and neck malignancies and frequently metastasizes to the cervical lymph nodes. The presence of cervical nodal metastasis significantly influences prognosis, treatment planning, recurrence rates, and survival outcomes. Therapeutic neck dissection remains the standard treatment for clinically node-positive disease; however, the necessity of routinely including Level V during neck dissection remains controversial because Level V metastasis has been reported to occur infrequently. Identification of the actual incidence of Level V involvement is essential to optimize the extent of neck dissection while minimizing surgical morbidity.

Aim and Objective:

[REDACTED]

Materials and Methods:

[REDACTED]

Results:

[REDACTED]

[REDACTED]

[REDACTED]

Discussion: [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Conclusion: [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Keywords: Oral cavity squamous cell carcinoma; Cervical lymph node metastasis; Node-positive neck; Neck dissection; Level V lymph node.

LIST OF ABBREVIATIONS

Abbreviation	Full Form
AJCC	American Joint Committee on Cancer
CI	Confidence Interval
CT	Computed Tomography
DOI	Depth of Invasion
ECS	Extracapsular Spread
LVI	Lymphovascular Invasion
MDSCC	Moderately Differentiated Squamous Cell Carcinoma
MRI	Magnetic Resonance Imaging
N	Nodal Stage
N+ve	Node Positive
OSCC	Oral Cavity Squamous Cell Carcinoma
PDSCC	Poorly Differentiated Squamous Cell Carcinoma
PNI	Perineural Invasion
T	Tumour Stage

Additional TNM Staging Abbreviations (if used in tables/results)

Abbreviation	Full Form
T1	Tumour Stage 1
T2	Tumour Stage 2
T3	Tumour Stage 3
T4	Tumour Stage 4
N1	Nodal Stage 1
N2	Nodal Stage 2

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INTRODUCTION

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

The rationale for this

The rationale for this

shift is based on two critical factors: (1) minimizing surgical morbidity and improving post-operative quality of life; and (2) the potential oncological redundancy of dissecting level V in the absence of radiological or intraoperative evidence of involvement.

[REDACTED]

[REDACTED] These findings support a more tailored approach, where the decision to dissect level V is made based on tumor site, burden of disease, and radiological evidence, rather than uniformly applied to all N+ve cases.

[REDACTED]

[REDACTED]

[REDACTED] This information will not only help refine the surgical extent of neck dissections but also potentially reduce operative morbidity and improve quality of life without compromising oncological outcomes.

Global Epidemiology

[REDACTED]

[REDACTED] Delayed diagnosis remains a critical issue, with the majority of cases presenting in Stage III or IV, leading to poor outcomes and higher mortality in resource-constrained settings (20).

Indian Epidemiology

India bears the highest burden of oral cancer globally, contributing to approximately one-third of all cases worldwide. [REDACTED]

Karnataka Epidemiology

In the state of Karnataka, OSCC constitutes a major oncological challenge and ranks among the top three cancers in males according to the Population-Based Cancer Registry

(PBCR) data from Bengaluru and Kidwai Memorial Institute of Oncology (4). [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] However, state-level cancer screening programs remain underdeveloped, and most cases present at advanced stages, necessitating aggressive surgical management including neck dissection.

AIMS AND OBJECTIVES

AIMS AND OBJECTIVES

OBJECTIVES:

[REDACTED]

[REDACTED]

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Oral Cavity Squamous Cell Carcinoma (OSCC)



Figure 1: Oral Cavity Squamous Cell Carcinoma (OSCC) (25,26)

Oral cancer refers to malignant neoplasms arising in the oral cavity, and the most common histological subtype is squamous cell carcinoma (SCC), accounting for more than 90% of cases (26).

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Given the aggressive potential of even early-stage tumors, appropriate nodal clearance remains a key part of curative management (30).

Anatomical Subsites of the Oral Cavity

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Each subsite has distinct lymphatic drainage patterns and proximity to critical neurovascular structures, influencing the pattern of disease spread and choice of surgical procedure (32).

The oral cavity is divided into the following surgical subsites:

- Lips (upper and lower)
- Buccal mucosa (inner cheek lining)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Each of these subsites has specific surgical considerations. For example:

- Lesions of the anterior tongue often metastasize to level I and II nodes

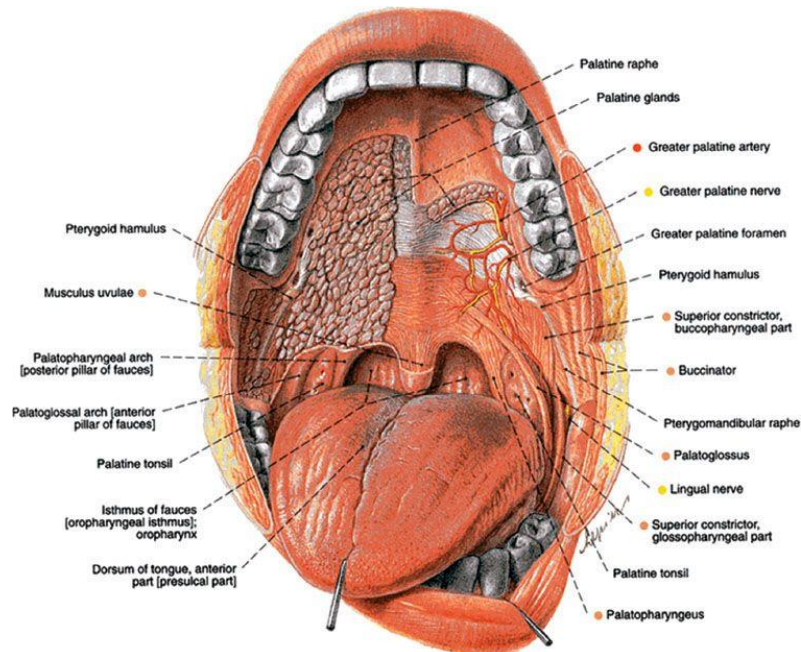


Figure 2: Anatomical Subsites of the Oral Cavity

Histological and Pathological Classification of OSCC

Histologically, over 90% of malignant tumors of the oral cavity are squamous cell carcinomas (SCCs), originating from the stratified squamous epithelium.

The classification system helps guide treatment decisions, particularly regarding adjuvant therapy and surgical margins (33).

OSCC is histologically categorized into the following types:

- Well-differentiated SCC: Resembles normal epithelium with keratin pearls and minimal pleomorphism

- Basaloid SCC: A high-grade subtype with aggressive behavior and poor prognosis

Histopathological examination further evaluates:

- Depth of invasion (DOI), now included in TNM staging

Type of SCC	Characteristics	Clinical Behavior

Natural History and Local Aggressiveness of OSCC

Oral squamous cell carcinoma follows a predictable natural history characterized by local progression, regional nodal metastasis, and in later stages, distant spread.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Feature	Clinical Significance (36-37)
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]

Etiopathogenesis and Carcinogenic Factors

Role of Tobacco, Areca Nut, and Alcohol in Tumor Biology

Tobacco, areca nut, and alcohol are the most significant carcinogenic agents responsible for the initiation and progression of oral squamous cell carcinoma (OSCC), particularly in the Indian subcontinent. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Agent	Mechanism of Carcinogenesis	Clinical Relevance
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

Molecular Pathways Driving Tumorigenesis

Oral squamous cell carcinoma develops through a multi-step process involving accumulation of genetic and epigenetic alterations in key molecular pathways regulating cell growth, apoptosis, angiogenesis, and immune evasion. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

These molecular changes correlate with clinical behavior, resistance to therapy, and recurrence risk.

Molecular Target	Alteration	Clinical Impact

Lymphatic Spread and Nodal Architecture in OSCC

Lymphatic Drainage Pathways of Oral Subsites

The lymphatic drainage of the oral cavity is highly organized and plays a crucial role in the regional spread of oral squamous cell carcinoma (OSCC).

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Oral Subsite	Primary Drainage	Secondary Drainage	Bilateral Drainage Risk
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Surgical Anatomy of Cervical Lymph Node Levels (I–V)

[REDACTED]

[REDACTED]

[REDACTED]

In the context of OSCC, each level corresponds to predictable patterns of metastatic spread, and thus determines the extent of neck dissection elective or therapeutic (47).

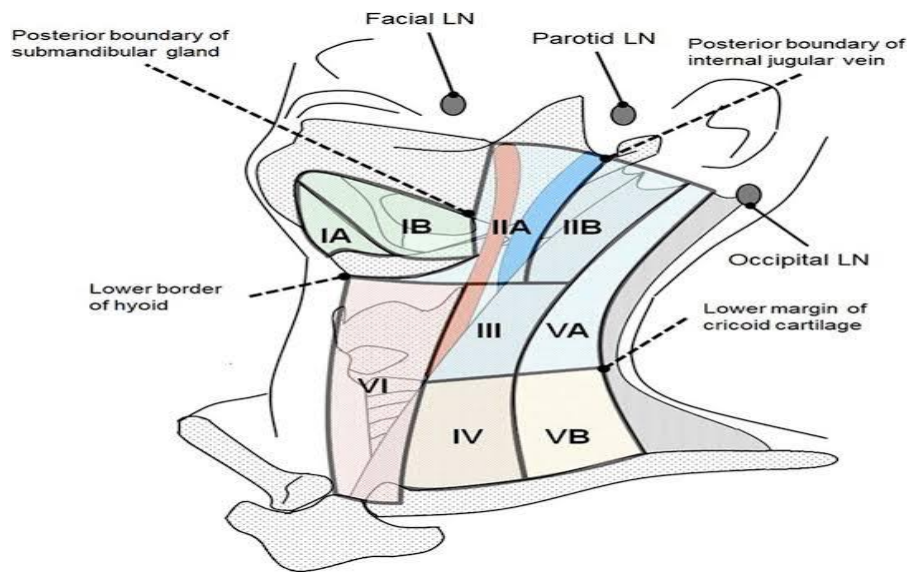


Figure 3: Anatomy of Cervical Lymph Node Levels (I–V) (53,54)

Each level is defined as follows:

- Level I: [REDACTED]
[REDACTED]
[REDACTED]
- Level II: [REDACTED]
[REDACTED]
[REDACTED]
- Level III: [REDACTED]
[REDACTED]
- Level IV: [REDACTED]
[REDACTED]
- Level V: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Level	Anatomical Boundaries	Common Primary Draining Sites	Surgical Notes
I	[REDACTED]	[REDACTED]	[REDACTED]
II	[REDACTED]	[REDACTED]	[REDACTED]
III	[REDACTED]	[REDACTED]	[REDACTED]
IV	[REDACTED]	[REDACTED]	[REDACTED]
V	[REDACTED]	[REDACTED]	[REDACTED]

Stepwise Metastatic Pattern in OSCC: Predictability and Variability

Oral squamous cell carcinoma typically exhibits a stepwise pattern of cervical lymph node metastasis, starting from the first-echelon nodes (levels I–III) and progressing to second-echelon nodes (levels IV–V) in more advanced disease. [REDACTED]

[REDACTED]
[REDACTED]

- Initial involvement of level I nodes for anterior oral cavity primaries (e.g., lips, anterior tongue)

-
- A series of horizontal black bars of varying lengths, representing redacted text. The bars are arranged in a list-like fashion, with some bars being longer than others, suggesting different levels of redaction or different types of information being withheld.

--	--	--	--

[illegible]

[REDACTED]

Prognostic Implications of Cervical Node Involvement

Impact on Disease-Free and Overall Survival

Cervical lymph node metastasis is the most significant prognostic factor in oral squamous cell carcinoma (OSCC). [REDACTED]

[REDACTED] Even in early-stage OSCC, occult nodal metastasis is common, necessitating elective neck management to improve long-term outcomes (6,55).

The prognostic implications of nodal metastases can be summarized as:

- Presence of even a single metastatic lymph node lowers the 5-year OS by 50% compared to node-negative patients (6,55)

Nodal Status	5-Year DFS (%)	5-Year OS (%)	Clinical Implication
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Number, Size, and Laterality of Metastatic Nodes

The burden of metastatic disease in cervical lymph nodes quantified by the number of involved nodes, their size, and their laterality has a direct impact on prognosis in OSCC. [REDACTED]

The prognostic roles of nodal characteristics are as follows:

- A higher number of positive lymph nodes is associated with increased risk of local recurrence and poor overall survival

Feature	Risk Category	Prognostic Impact	Surgical Implication
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Significance of Extracapsular Extension (ECS)

Extracapsular spread (ECS) refers to the extension of metastatic tumor cells beyond the capsule of a lymph node into the surrounding soft tissue. [REDACTED]

Clinical significance of ECS includes:

- ECS is linked with a 2–3-fold increase in risk of locoregional recurrence, even in completely resected cases

Even if neck dissection clears all gross disease, the presence of ECS indicates the tumor’s invasive potential, requiring adjuvant systemic therapy to prevent recurrence (59).

AJCC 8th Edition T and N Staging for Oral Squamous Cell Carcinoma

The AJCC (American Joint Committee on Cancer) 8th Edition provides a refined framework for nodal staging in oral cavity squamous cell carcinoma.

Nodal Stage	Description	Prognostic Category	Treatment Implication
I		I	
II		II	
III		III	
IV		IV	

Principles of Neck Dissection in Surgical Oncology

Evolution of Neck Dissection Techniques

The surgical management of cervical lymph nodes in head and neck cancers, particularly oral squamous cell carcinoma (OSCC), has undergone significant evolution over the past century. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Technique	Features	Morbidity Level	Current Use
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Radical, Modified Radical, and Selective Neck Dissections: Indications and Scope

Neck dissection in OSCC is classified based on the extent of nodal clearance and preservation of non-lymphatic structures. [REDACTED]

[REDACTED]

Neck dissection types and their indications:

- **Radical Neck Dissection (RND)**

[REDACTED]

- **Modified Radical Neck Dissection (MRND)/ Comprehensive neck dissection(CND)**

[REDACTED]

- **Selective Neck Dissection (SND)**

[REDACTED]

Type	Structures Removed	Indications	Morbidity

Criteria for Elective vs Therapeutic Neck Dissection

The decision to perform elective or therapeutic neck dissection in OSCC hinges on the clinical nodal status.

Criteria for elective neck dissection include:

- Tumor thickness or depth of invasion >4 mm
- High-risk subsites (e.g., tongue, floor of mouth) with rich lymphatic drainage

Criteria for therapeutic neck dissection:

- Palpable, clinically mobile lymph node(s) >1 cm

[REDACTED]

[REDACTED] Their proper use reduces the likelihood of nodal recurrence and guides the need for postoperative therapy (67).

Surgical Rationale for Addressing Level V in cN+ Necks

Rationale for level V dissection in cN+ OSCC includes:

- Contiguous spread: Tumors involving level II and III nodes with extracapsular extension may spread posteriorly into level V

[REDACTED]

[REDACTED] The decision must be individualized based on clinical, radiological, and intraoperative findings (70).

NCCN and AHNS Guidelines for Neck Dissection in OSCC

[REDACTED]

[REDACTED] The overarching goal is to balance oncological adequacy with functional preservation, using selective neck dissection patterns that reflect predictable lymphatic drainage of oral subsites (73).

- **Preoperative assessment:**

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

- **Elective management of cN0 neck (early oral cavity primaries):**

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

- **Therapeutic management of cN+ neck:**

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

- **Role of sentinel lymph node biopsy:**

[REDACTED]

[REDACTED]

[REDACTED]

- **Pathology reporting and risk stratification:**

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

This synthesis keeps the surgical oncologist's priorities at the forefront: anatomically faithful clearance of nodal basins at risk, avoidance of unnecessary posterior triangle morbidity, and seamless transition to adjuvant therapy when pathology declares high risk.

Boundaries and Contents of Level V (Posterior Triangle)

[illegible]

- [illegible]

[REDACTED]

[REDACTED]

[REDACTED]

Parameter	Description	Surgical relevance
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

Relationship to Spinal Accessory Nerve and Clinical Implications

The spinal accessory nerve traverses level VA superficially, making it highly vulnerable to traction, thermal, compression, and ischemic injury during level V dissection (86). [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Postoperative Morbidity: Shoulder Dysfunction and Neuropathic Pain

Shoulder morbidity after posterior triangle dissection ranges from transient stiffness to chronic disability due to spinal accessory nerve injury, trapezius denervation, and scapulothoracic dysfunction (11). [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Strategies for Nerve Preservation and Rehabilitation

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] This approach improves quality of life and supports timely completion of adjuvant therapy (94).

Balancing Oncological Clearance and Morbidity

Risk–Benefit Analysis of Level V Dissection in OSCC

[REDACTED]

[REDACTED] The optimal strategy remains selective: clear level V when the pretest probability of disease is meaningfully high or when intraoperative findings compel extension (15).

Dimension	Low-risk signal	High-risk signal	Action
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Functional Outcomes vs Survival Outcomes

Neck surgery in oral cancer is judged not only by disease control but also by the quality of life it preserves. [REDACTED]

- Survival drivers: pathologic nodal count, extranodal extension, margin status, adherence to adjuvant RT/CRT schedules
- Functional drivers: nerve traction time, extent of soft-tissue stripping around the accessory nerve, inclusion of IIB and V, early physiotherapy access

Priority	What improves it	What harms it	Surgical implication

Multimodality Approach: Role of Postoperative RT/CRT

Postoperative radiotherapy, with or without chemotherapy, is the main adjunct to surgery in node-positive oral cavity cancer, improving locoregional control and allowing selective neck dissection without compromising oncologic outcomes (101).

[REDACTED]

Domain	Best-practice approach	Advantages	Constraints/mitigation
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

These emerging strategies move neck management from one-size-fits-all toward individualized precision surgery. By combining accurate mapping, selective clearance, and risk-adapted adjuvant therapy, surgical oncology can deliver durable regional control while preserving shoulder function and overall quality of life (90).

Role of Diagnostic and Preoperative Workup

Clinical Examination and Tumor Mapping

Clinical examination remains the cornerstone of initial assessment in oral cavity squamous cell carcinoma (OSCC), especially in resource-limited settings where advanced imaging may be delayed or unavailable. [REDACTED]

Step	Purpose	Surgical relevance
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

Imaging Tools: CECT, MRI, PET-CT in Nodal Detection

Comparison of imaging modalities in nodal evaluation:

- CECT: Most widely used; high spatial resolution; assesses nodal size, central necrosis, extracapsular spread (ECS), and vascular/osseous involvement. Best for high-volume centers with access to contrast protocols (93).
- MRI: Superior soft tissue contrast; excellent for tongue, floor of mouth, and skull base extension. Less accurate for nodal ECS detection but helpful in tongue tumors with deep invasion (94).

Radiologic signs of nodal metastasis include:

- Short axis >10 mm (except jugulodigastric and submandibular nodes with higher cut-offs)
- Central necrosis, loss of fatty hilum, irregular margins, round shape

Modality	Strengths	Limitations	Ideal use case

FNAC and Core Needle Biopsy for Nodal Confirmation

Fine-needle aspiration cytology (FNAC) and core needle biopsy (CNB) are essential tools in the diagnostic workup of suspected cervical lymph node metastasis (97).

- FNAC: Preferred first-line test for accessible, radiologically suspicious nodes; yields cytological material quickly

Importance of Accurate Clinical Staging Before Neck Dissection

[REDACTED]

[REDACTED]

[REDACTED]

Rationale for robust preoperative staging:

- Identifies patients who benefit from selective neck dissection (SND) versus modified radical neck dissection (MRND)
 - Detects extranodal extension, matted nodes, and deep node involvement
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

Research Studies

[REDACTED] (2025) evaluated survival in OSCC according to nodal distribution, extranodal extension (ENE), and lymph-node ratio (LNR). [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Their conclusion underscored that the metastatic probability to level V is low but prognostically grave, advocating selective, data-driven neck dissection to preserve spinal accessory nerve function without compromising oncologic control (56).

[REDACTED] (2025) discussed current applications of sentinel-lymph-node (SLN) mapping across solid tumors, dedicating a detailed section to head-and-neck malignancies. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED] Clinically, the paper validates selective surgery as oncologically safe when posterior drainage risk remains minimal, aligning with modern function-preserving strategies (101).

[REDACTED] (2024) addressed the incidence and implications of level V metastases in node-positive OSCC. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED] Overall, the paper contributes regional evidence supporting selective inclusion of level V based on multilevel nodal burden and ENE, guiding pragmatic neck-management protocols in Indian surgical practice (10).

[REDACTED] (2024) examined sentinel-lymph-node biopsy (SLNB) in early-stage tongue SCC. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED] The paper thus provides a reference map validating the safety of functional, level-restricted surgery when guided by accurate preoperative imaging (65).

[REDACTED] (2024) investigated the relationship between depth of invasion (DOI) and cervical-node spread in early OSCC. [REDACTED]
[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] By linking pathological depth to posterior-triangle metastasis risk, the study provides a quantitative framework for tailoring surgical extent and minimizing functional morbidity (74).

[REDACTED] (2022) established lymph-node ratio (LNR) as a robust, independent prognosticator after neck dissection for OSCC. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] The meta-analysis thus complements topographic mapping with a quantitative burden metric, encouraging integrated algorithms (LNR + ENE + involved levels) to individualize extent of dissection and adjuvant planning, particularly in institutions aiming to balance oncologic safety with postoperative shoulder function and quality-of-life outcomes (102).

[REDACTED] (2022) synthesizes contemporary evidence for the neck in head-and-neck cancers. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] The guideline formalizes a shift from one-size-fits-all to individualized templates, anchoring our study's premise that the incidence of level V positivity is low but clinically consequential, warranting selective inclusion (72).

[REDACTED]
 [REDACTED]
 [REDACTED]
 [REDACTED] The study

A series of horizontal black bars of varying lengths, creating a striped pattern. The bars are stacked vertically, with some being longer than others, creating a rhythmic, abstract visual effect. The bars are solid black and set against a white background.

██████████ (2019) the ASCO Clinical Practice Guideline for management of the neck in oral cavity and oropharyngeal SCC consolidated global evidence into risk-adapted recommendations. ██████████
██████████

A series of horizontal black bars of varying lengths, creating a striped pattern. The bars are stacked vertically, with some being longer than others, creating a rhythmic, abstract design. The bars are solid black and set against a white background.

██████████ (2017) analyzed lymphatic drainage patterns of maxillary oral tumors using sentinel lymph node (SLN) mapping and regional dissection to define level-specific involvement. ██████████

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██████████ Clinically, their results validate a selective, function-preserving surgical template that minimizes accessory nerve morbidity without compromising oncologic safety, reinforcing the modern principle that extent of neck dissection should reflect individual drainage patterns rather than uniform anatomic boundaries (32).

██████████ (2015) comprehensively mapped cervical lymphatic drainage in oral squamous cell carcinoma (OSCC) using sentinel-node biopsy. Involving a large cohort with standardized radiotracer methodology and central quality control, the study identified sentinel nodes almost exclusively within levels I–III; level V was involved in less than 1% of cases.

██████████

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██ The study thereby provides a physiologic foundation for risk-based tailoring of neck surgery, balancing oncologic control against functional preservation (45).

██████████ (2014) evolving surgical philosophies regarding neck management in head-and-neck squamous cell carcinoma (HNSCC), tracing the evolution from radical to functional and selective dissections. ██████████

██████████

██████████

██████████

██████████ (2006) challenged the long-standing paradigm of routine level V clearance in clinically node-positive oral and oropharyngeal SCC. ██████████

██
██
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██

██ Level V dissection, once routine, is now recognized as selectively indicated, ensuring optimal quality of life and oncologic precision (84).

MATERIALS AND METHODS

MATERIALS AND METHODS

Source of Data:

[REDACTED]

Study Design:

[REDACTED]

Study Period:

[REDACTED]

Sample Size:

[REDACTED]

Sampling Technique:

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Inclusion Criteria

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Exclusion Criteria

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

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Study Protocol: [REDACTED]

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Data Collection Procedure

Patient Recruitment and Enrolment

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[REDACTED]

Collection of Demographic and Clinical Data

[REDACTED]

[REDACTED]

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[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

Preoperative Diagnostic Evaluation

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[REDACTED]

Perioperative and Surgical Data Collection

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[REDACTED]

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[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]



Figure 4: Container with Cervical Lymph Node Levels (I–V)

Histopathological Data Collection

Data Compilation and Quality Assurance

Outcome Assessment and Data Utilization

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Statistical Analysis

[REDACTED]

[REDACTED]

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RESULTS

RESULTS

Statistical Methods

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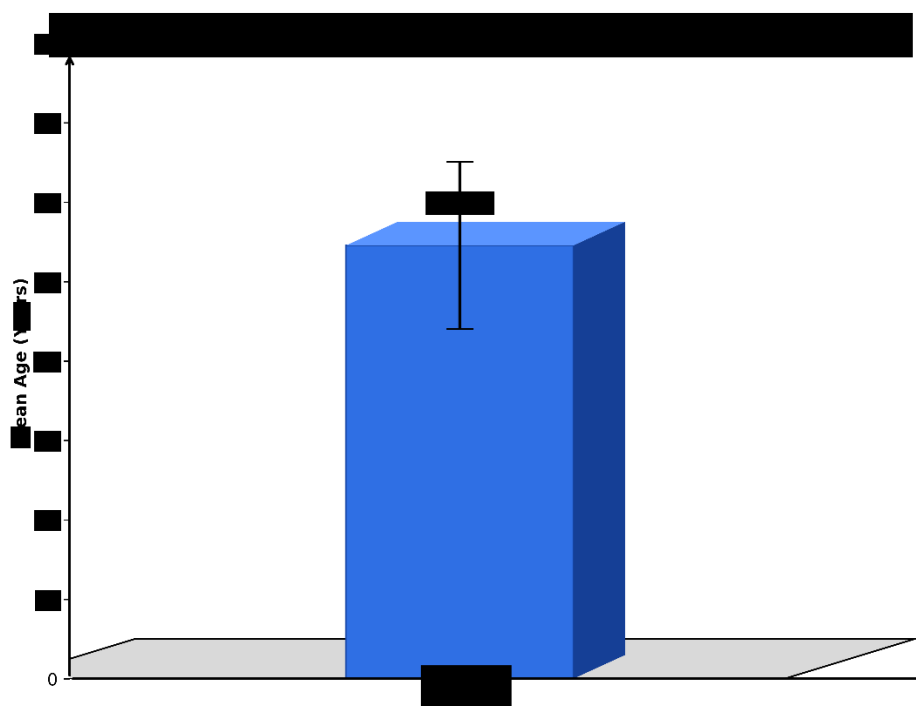
[REDACTED]

[REDACTED]

[REDACTED]

Table 1: Descriptive Analysis of Age (Years) in the Study Population (N = 49)

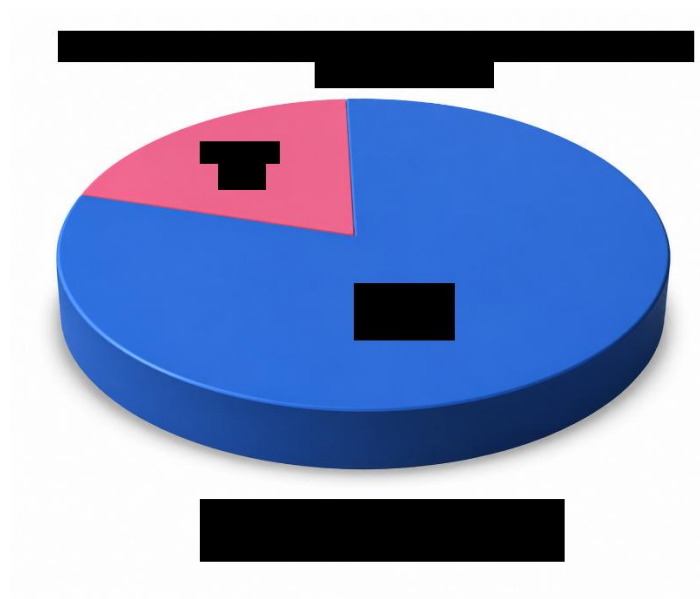
Parameter	Mean $\pm$ SD	Median	Minimum	Maximum	95% C. I	
					Lower	Upper
Age	██████████	████	████	████	████	████

Graph 1: Descriptive Analysis of Age (Years) in the Study Population (N = 49)

In the present study, the mean age of the study population was ██████████

Table 2: Descriptive Analysis of Gender in the Study Population (N = 49)

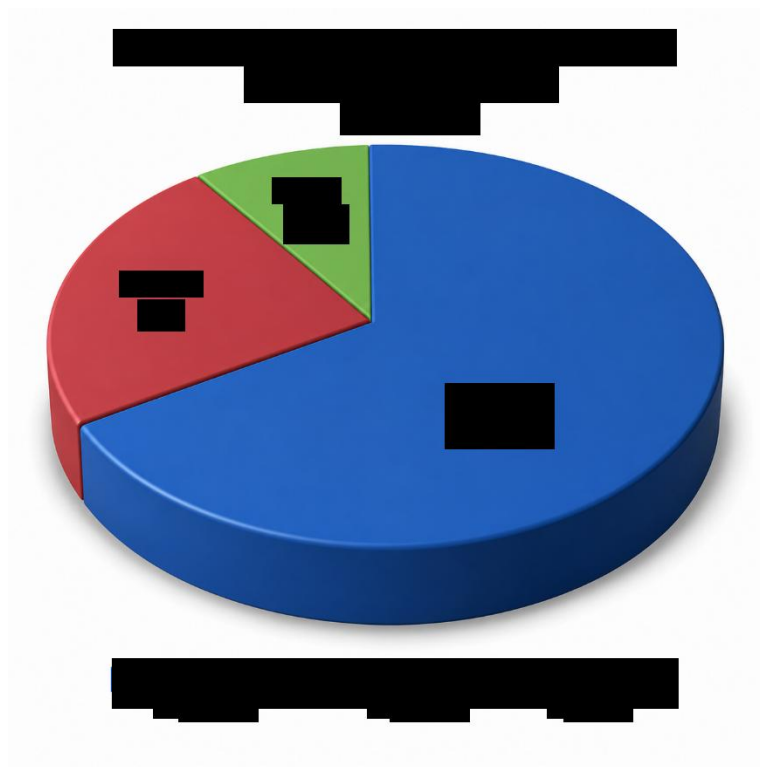
Gender	Frequency	Percentages
Male	■	■
Female	■	■

Graph 2: Descriptive Analysis of Gender in the Study Population (N = 49)

In the present study, out of ■ participants, ■
 ■
 while females comprised ■ of the study population.

Table 3: Descriptive Analysis of Primary Tumour Site in the Study Population (N = 49)

Primary Tumour Site	Frequency	Percentages
Buccal Mucosa	■	■
Tongue	■	■
Lower Alveolus	■	■

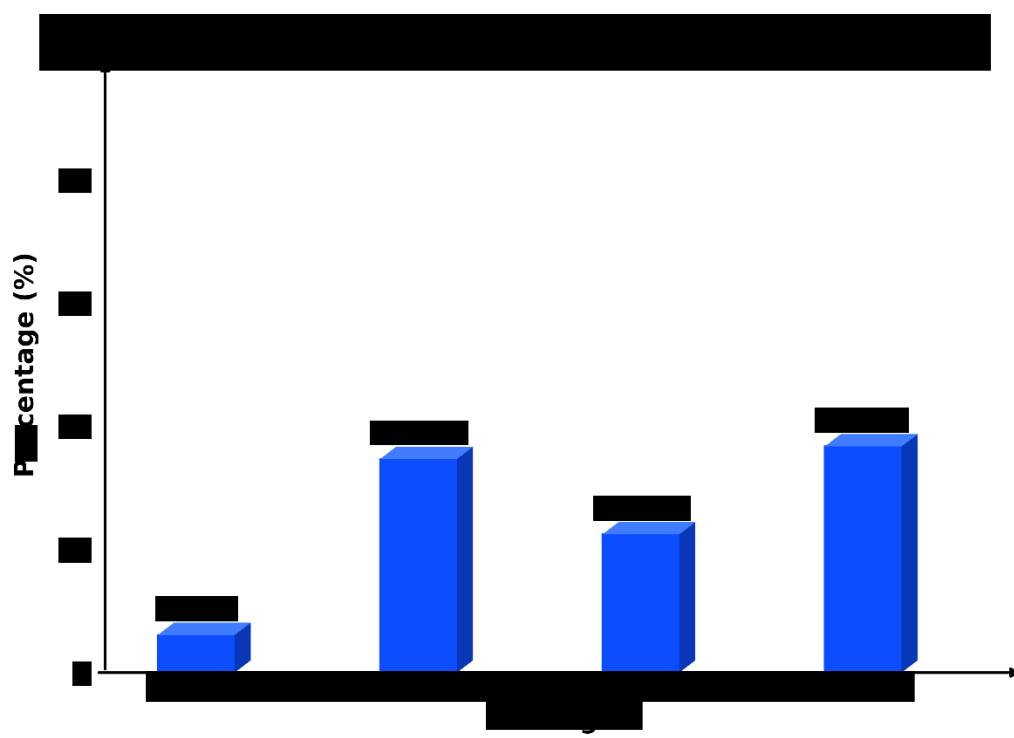
Graph 3: Descriptive Analysis of Primary Tumour Site in the Study Population (N = 49)

In the present study, Buccal Mucosa was the most common primary tumour site, observed in ■ patients. ■

■ Thus, the majority of patients had primary tumours arising from the buccal mucosa, followed by the tongue and lower alveolus.

Table 4: Descriptive Analysis of T Stage in the Study Population (N = 49)

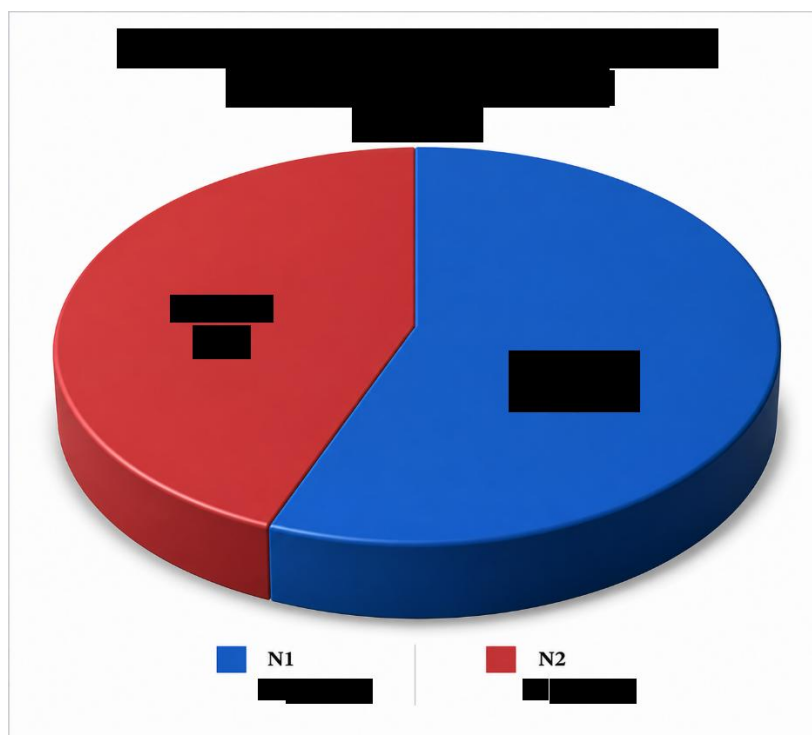
T Stage	Frequency	Percentages
T1	1	2.04
T2	10	20.41
T3	10	20.41
T4	18	36.74

Graph 4: Descriptive Analysis of T Stage in the Study Population (N = 49)

In the present study, [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Table 5: Descriptive Analysis of N Stage Data in the Study Population (N = 49)

N Stage	Frequency	Percentages
N1	■	■
N2	■	■

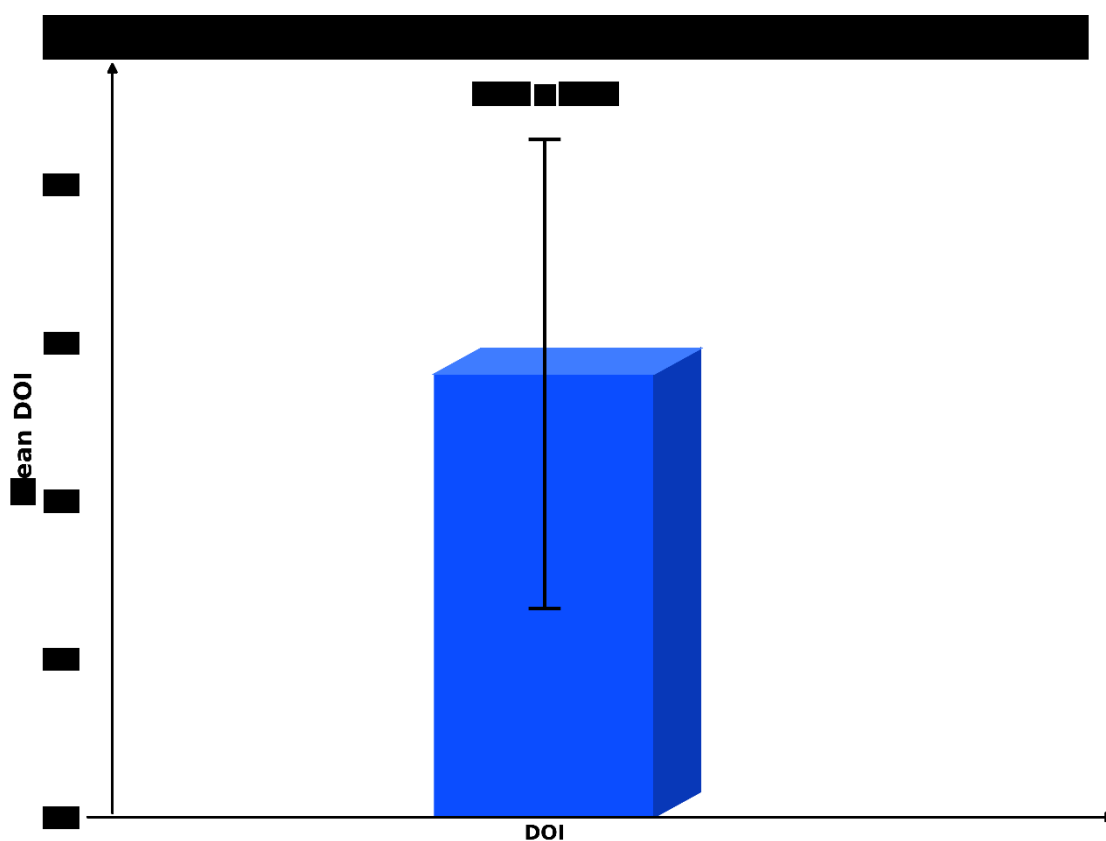
Graph 5: Descriptive Analysis of N Stage Data in the Study Population (N = 49)

In the present study

Table 6: Descriptive Analysis of Depth of Invasion (DOI) in the Study Population (N = 49)

Parameter	Mean $\pm$ SD	Median	Minimum	Maximum	95% C.I	
					Lower	Upper
DOI						

Graph 6: Descriptive Analysis of Depth of Invasion (DOI) in the Study Population (N = 49)

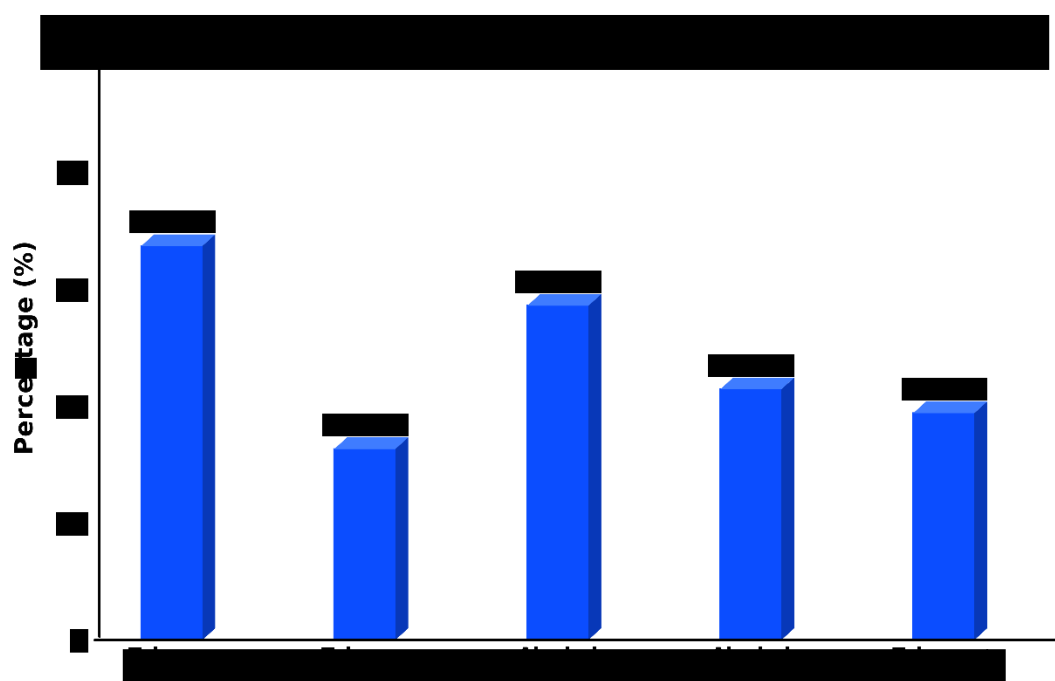


In the present study, the mean Depth

Table 7: Descriptive Analysis of Tobacco and Alcohol Use in the Study Population (N = 49)

Parameter	Frequency	Percentages
Tobacco		
Yes	1	2.04%
No	48	97.96%
Alcohol		
Yes	1	2.04%
No	48	97.96%
Tobacco + Alcohol (Both)	1	2.04%

Graph 7: Descriptive Analysis of Tobacco and Alcohol Use in the Study Population (N = 49)

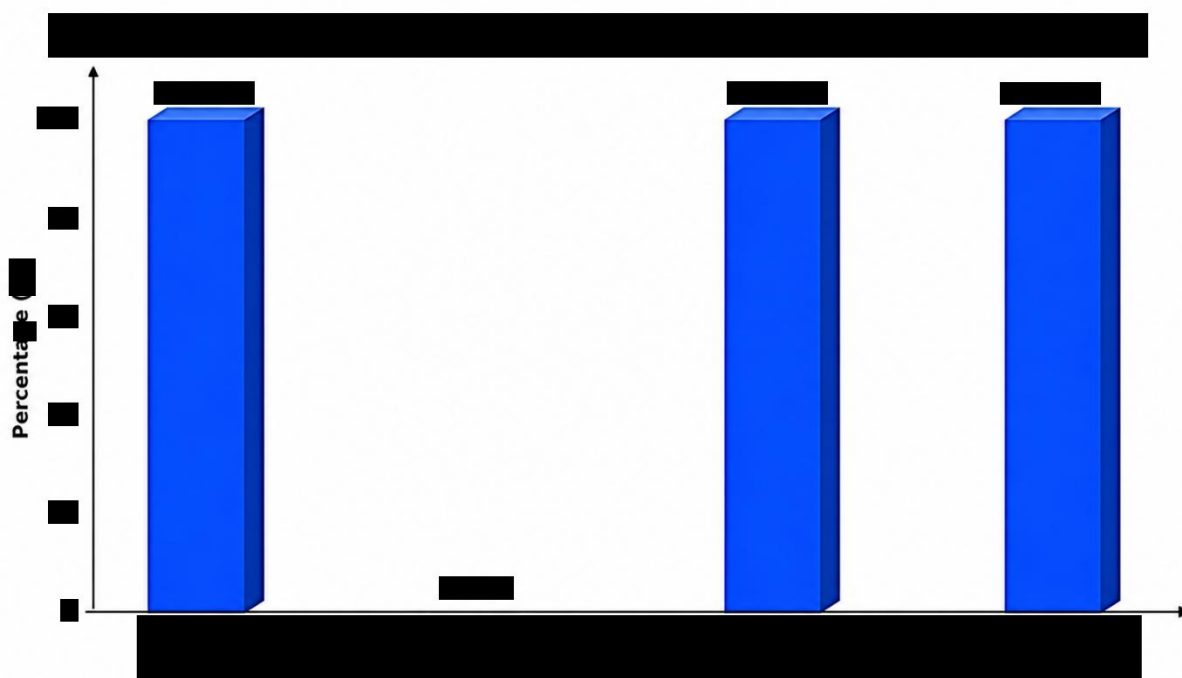


In the present study, [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED] tobacco and alcohol use in 38.78%
of the study population.

Table 8: Descriptive Analysis of Level V Dissection and Histopathological Findings in the Study Population (N = 49)

Surgery Type	Frequency	Percentages
Level V Dissected	49	100%
Level V Positive	0	0%
Lymph vascular Invasion	49	100%
Perineural Invasion	49	100%

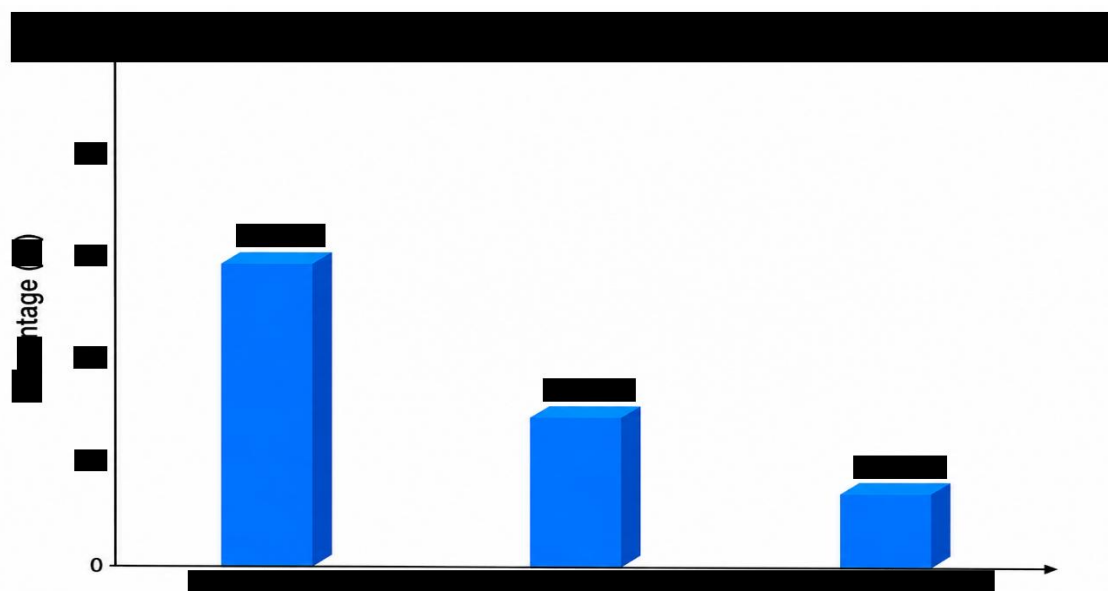
Graph 8: Descriptive Analysis of Level V Dissection and Histopathological Findings in the Study Population (N = 49)



In the present study, Level V was [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED], all patients underwent Level V dissection, no patients demonstrated Level V positivity, all patients showed lymphovascular invasion and perineural invasion.

Table 9: Descriptive Analysis of Levels I–II Positive in the Study Population (N = 49)

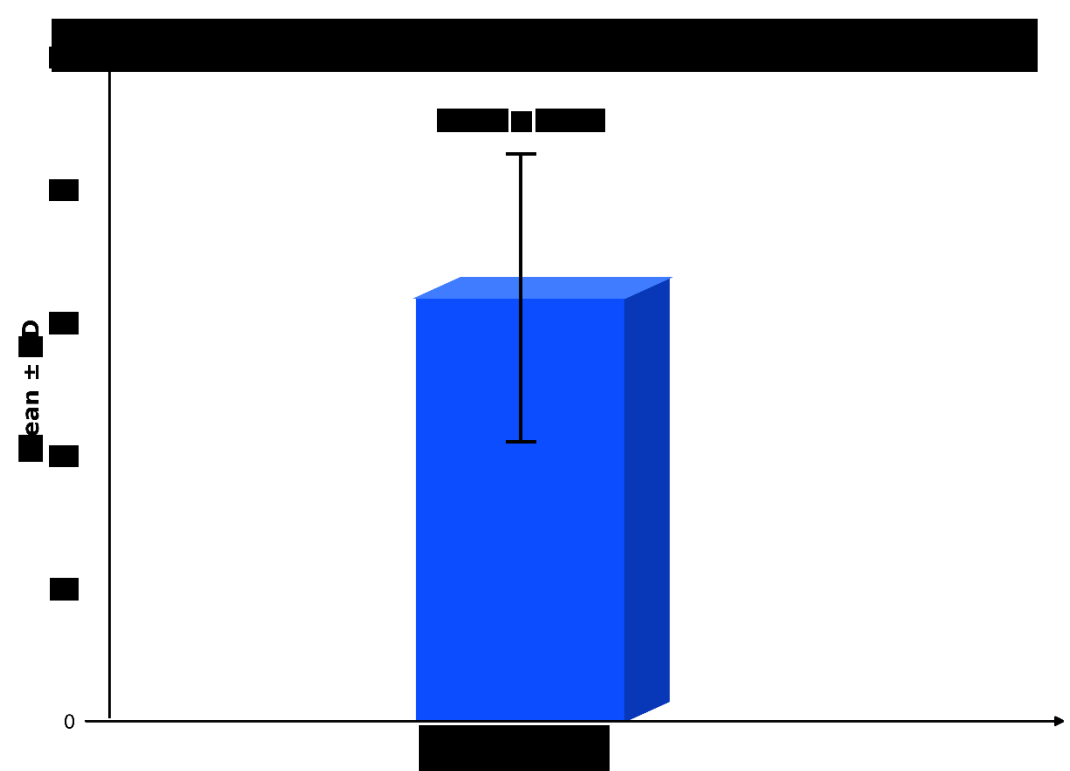
Nodal Level Involvement	n	%
Level I Only	14	28.57
Level II Only	10	20.41
Level I + II	5	10.20

Graph 9: Descriptive Analysis of Levels I–II Positive in the Study Population (N = 49)

Level I nodal positivity was the predominant pattern of cervical metastasis, observed in 14 (28.57%) of patients, followed by isolated Level II involvement in 10 (20.41%). Concurrent involvement of Levels I and II was identified in 5 (10.20%) of cases, highlighting the predominance of Level I lymph node metastasis in oral cavity squamous cell carcinoma.

Table 10: Descriptive Analysis of Total Nodes Retrieved in the Study Population (N = 49)

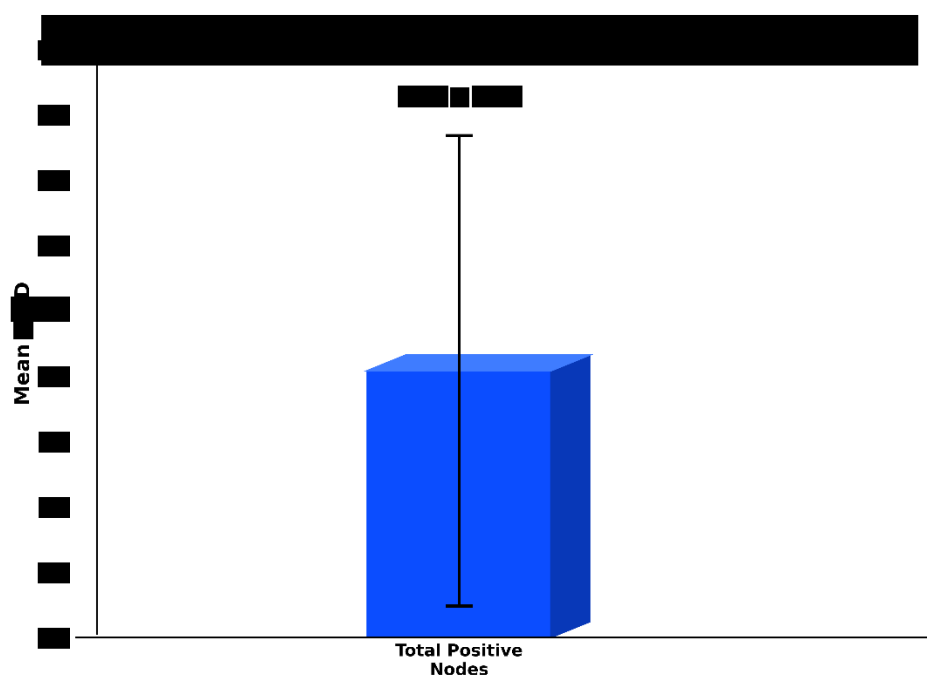
Parameter	Mean $\pm$ SD	Median	Minimum	Maximum	95% C.I	
					Lower	Upper
Total Nodes Retrieved	██████████	████	████	████	████	████

Graph 10: Descriptive Analysis of Total Nodes Retrieved in the Study Population (N = 49)

In the present study, the mean total number of nodes retrieved was ██████████
 ██████████
 ██████████ confidence interval for the mean total
 nodes retrieved ranged ██████████

Table 11: Descriptive Analysis of Total Positive Nodes in the Study Population (N = 49)

Parameter	Mean $\pm$ SD	Median	Minimum	Maximum	95% C.I	
					Lower	Upper
Total Positive Nodes	██████████	█	█	█	█	█

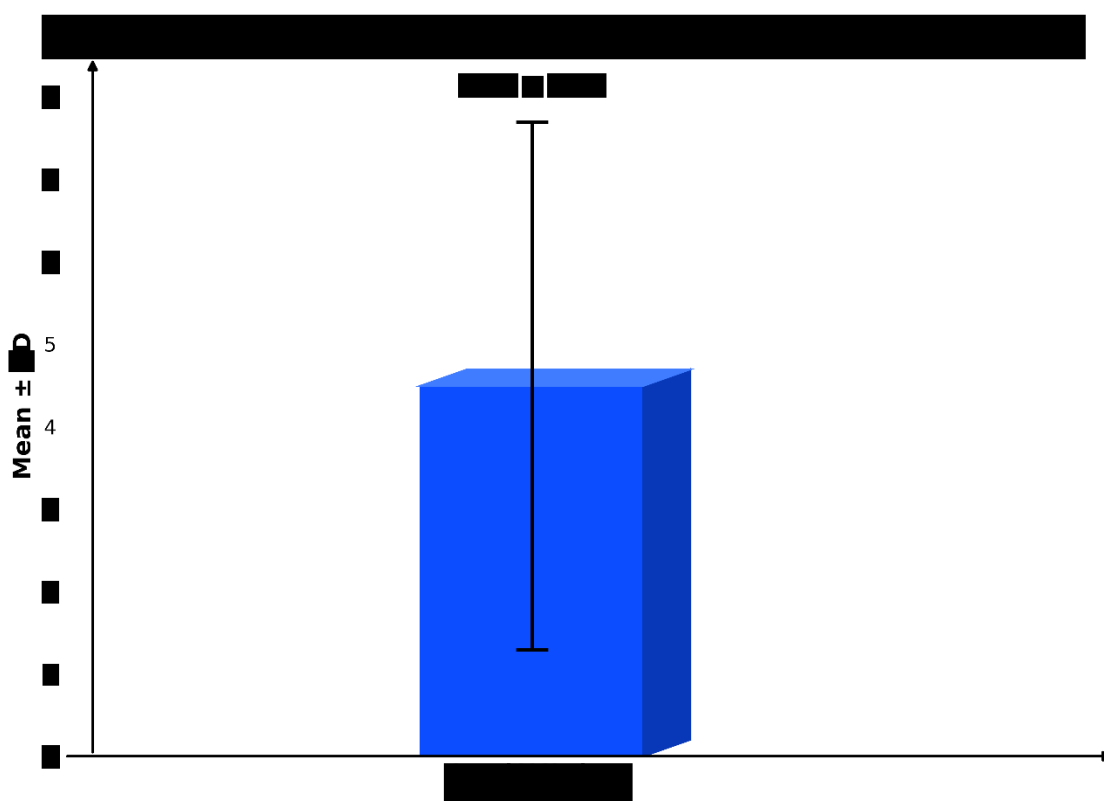
Graph 11: Descriptive Analysis of Total Positive Nodes in the Study Population (N = 49)

In the present study, the mean total number of positive nodes ██████████
 ██████████
 ██████████ confidence interval for the mean total
 positive nodes ranged from ██████████

Table 12: Descriptive Analysis of Level V Nodes Dissected in the Study Population (N = 49)

Parameter	Mean $\pm$ SD	Median	Minimum	Maximum	95% C.I	
					Lower	Upper
Level V Nodes Dissected						

Graph 12: Descriptive Analysis of Level V Nodes Dissected in the Study Population (N = 49)

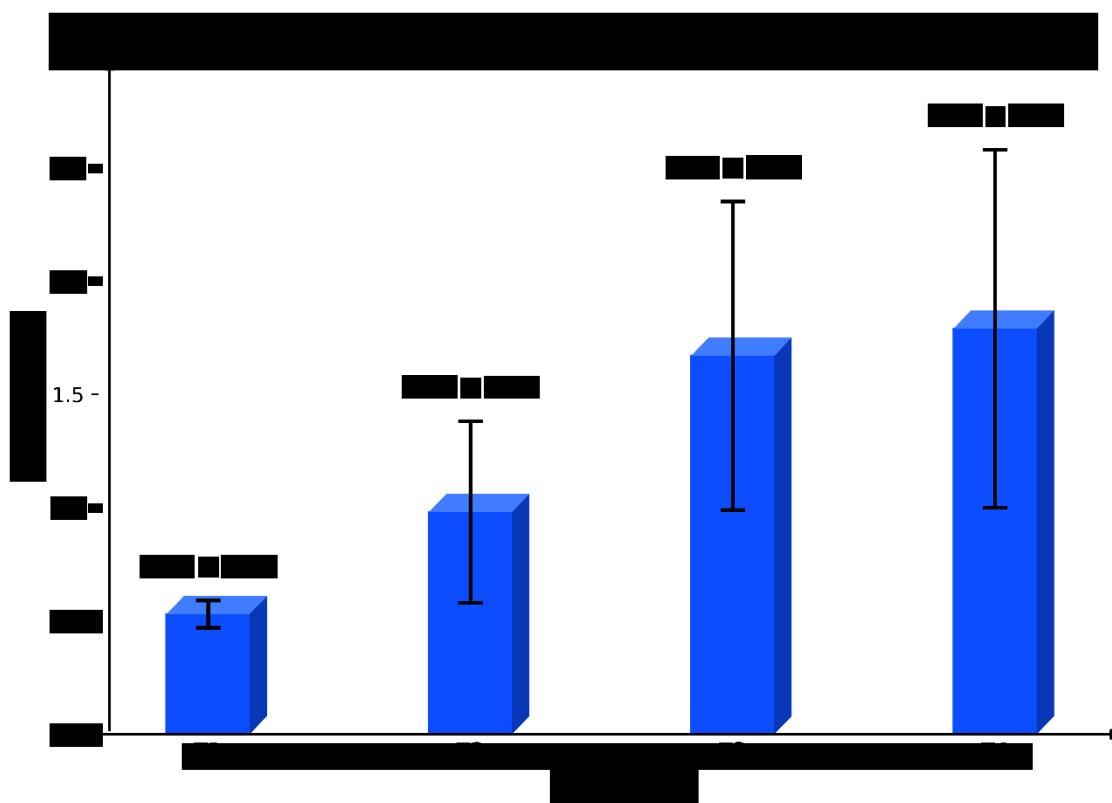


In the present study, the mean number of Level V nodes dissected was [redacted] [redacted]. The 95% confidence interval for the mean number of Level V nodes dissected ranged [redacted].

Table 13: Comparison of Depth of Invasion (DOI) According to T Stage in the Study Population (N = 49)

Parameter	T Stage (Mean $\pm$ SD)				P-value
	T1 (n=3)	T2 (n=17)	T3 (n=11)	T4 (n=18)	
DOI					

Graph 13: Comparison of Depth of Invasion (DOI) According to T Stage in the Study Population (N = 49)

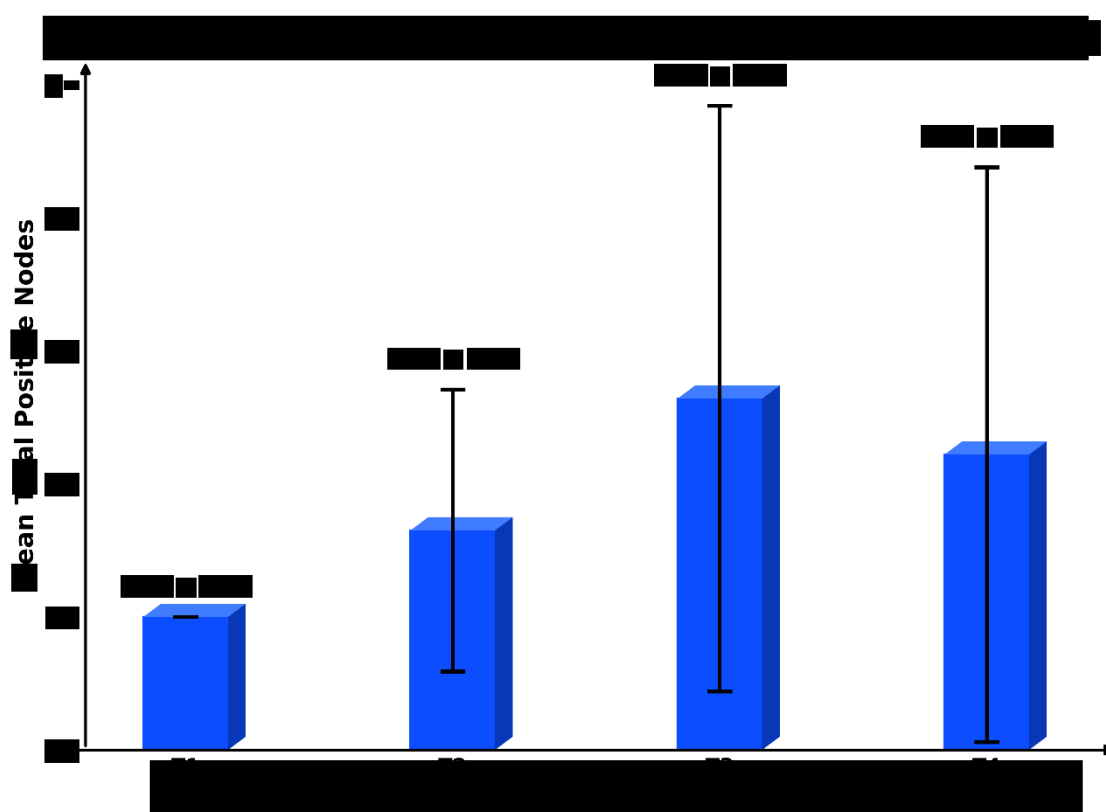


In the present study, the mean Depth of Invasion [redacted]
[redacted]
[redacted]
[redacted] was statistically
[redacted]

Table 14: Comparison of Total Positive Nodes According to T Stage in the Study Population (N = 49)

Parameter	T Stage (Mean $\pm$ SD)				P-value
	T1 (n=3)	T2 (n=17)	T3 (n=11)	T4 (n=18)	
Total Positive Nodes					

Graph 14: Comparison of Total Positive Nodes According to T Stage in the Study Population (N = 49)



The difference in total positive nodes across the T stages was not statistically significant (p = 0.12).

DISCUSSION

DISCUSSION

Oral cavity squamous cell carcinoma (OSCC) is one of the most common malignancies of the head and neck region and is characterized by a predictable pattern of cervical lymphatic spread. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Particular emphasis has been placed on evaluating whether routine Level V dissection is justified in clinically node-positive oral cavity cancer patients based on the observed incidence of Level V metastasis.

Descriptive Analysis of Age (Years) in the Study Population

In the present study, the mean age of the study population was [REDACTED] years, with a median age of [REDACTED] years. [REDACTED]

[REDACTED]

[REDACTED]

Descriptive Analysis of Gender in the Study Population

In the present study, out [REDACTED] patients with clinically and pathologically node-positive oral cavity squamous cell carcinoma, [REDACTED] were females, demonstrating a marked male predominance with a male-to-female ratio of approximately

[REDACTED]

[REDACTED] The male predominance observed in their study is consistent with the present finding of [REDACTED] male patients.

Descriptive Analysis of Primary Tumour Site in the Study Population

In the [REDACTED]

[REDACTED]

[REDACTED] In the present study, tongue lesions accounted [REDACTED] of cases, making it the second most common tumour site.

Descriptive Analysis of T Stage in the Study Population

In the present study [REDACTED]

[REDACTED] who reported [REDACTED] occult level V metastasis in node-positive patients (84).

Descriptive Analysis of N Stage in the Study Population

In the present study [REDACTED]

[REDACTED]

[REDACTED] In the present study, despite [REDACTED] of patients having N2 disease, no level V positivity was identified, supporting their conclusion that routine level V dissection may not be necessary in all node-positive patients.

Descriptive Analysis of Depth of Invasion (DOI) in the Study Population

In the present study, the mean depth of invasion (DOI) [REDACTED]

[REDACTED]

[REDACTED] the growing importance of DOI in the modern staging era and discussed its role in determining postoperative management in oral cavity squamous cell carcinoma (105).

Descriptive Analysis of Tobacco and Alcohol Use in the Study Population

In the present study, tobacco use was present in [REDACTED] while 16 patients [REDACTED] had no history of tobacco use. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] that tobacco and alcohol are among the most recognized risk factors for oral squamous cell carcinoma and further emphasized that these exposures may influence tumour location within the oral cavity (42).

Descriptive Analysis of Level V Dissection, Level V Positivity, Extracapsular Spread, Lymphovascular Invasion and Perineural Invasion in the Study Population

In the present study, [REDACTED] Level V neck dissection as part of the surgical procedure. [REDACTED]

[REDACTED]

[REDACTED] specifically investigated Level V metastases in node-positive oral squamous cell carcinoma and reported that Level V

involvement was uncommon and was predominantly associated with advanced nodal disease, multiple metastatic lymph nodes, and extensive cervical nodal burden (10).

Descriptive Analysis of Other Level Positive (I–II) in the Study Population

In the present study, all 49 patients demonstrated metastatic involvement of cervical lymph node levels I–II, while none of the patients showed Level V lymph node positivity. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] evaluated

Level V lymph node dissection in oral and oropharyngeal carcinoma patients with clinically positive neck disease and reported that metastatic deposits were predominantly distributed within the upper cervical nodal levels (84).

Descriptive Analysis of Total Nodes Retrieved in the Study Population

In the present study, the mean total number of lymph nodes retrieved during neck dissection was [REDACTED], with a median of [REDACTED] nodes. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Their findings support the present study, where a mean retrieval of [REDACTED] lymph nodes allowed reliable assessment of cervical nodal distribution.

Descriptive Analysis of Total Positive Nodes in the Study Population

In the present study, the mean number of positive lymph nodes [REDACTED], with a median of 1 positive node. [REDACTED]

[REDACTED]

[REDACTED] analyzed cervical lymph node

Descriptive Analysis of Level V Nodes Dissected in the Study Population

██████ The present study supports these findings, as a mean ████████ Level V lymph nodes was examined per patient without identification of metastatic disease.

In the present study, a statistically significant increase in depth of invasion (DOI) was observed with increasing T stage [redacted]

[REDACTED]

[REDACTED]

[REDACTED] reported that pathological features associated with tumour aggressiveness significantly influence nodal metastasis and prognosis in oral squamous cell carcinoma (6).

Comparison of Total Positive Nodes According to T Stage in the Study Population

In the present study, the mean number of positive lymph nodes increased [REDACTED]

[REDACTED]

[REDACTED] that lymph node involvement is one of the most important prognostic indicators in oral squamous cell carcinoma and that increasing nodal burden adversely affects survival outcomes (6).

- [illegible]

Limitations of the Study

1. The study was conducted at a single tertiary care centre, which may limit the generalizability of the findings to other populations.

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

12. Because Level V metastasis is an uncommon event, larger multicentric studies with longer follow-up are required to validate the findings and establish definitive recommendations regarding routine Level V dissection in node-positive oral cavity squamous cell carcinoma.

CONCLUSION

CONCLUSION

The present hospital-based prospective observational study was conducted among 49 patients with clinically and pathologically node-positive oral cavity squamous cell carcinoma to determine the incidence of Level V lymph node positivity. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED] Larger multicentric studies with longer follow-up are required to further validate these findings and define specific indications for Level V dissection in oral cavity squamous cell carcinoma.

SUMMARY

SUMMARY

Oral cavity squamous cell carcinoma (OCSCC) is among the most prevalent malignancies of the head and neck region, with cervical lymph node metastasis representing the single most important prognostic determinant influencing locoregional control, disease recurrence, and overall survival. [REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED] Larger multicentric prospective studies with longer follow-up are warranted to validate these observations and to further refine evidence-based surgical guidelines for the management of cervical lymph nodes in oral cavity squamous cell carcinoma.

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BIBLIOGRAPHY

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2. Tandon P, Dadhich A, Saluja H, Bawane S, Sachdeva S. The prevalence of squamous cell carcinoma in different sites of oral cavity at our Rural Health Care Centre in Loni, Maharashtra – a retrospective 10-year study. Contemp Oncol. 2017;21(2):178. doi:10.5114/WO.2017.68628 PubMed PMID: 28947890.

[REDACTED]

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[REDACTED]

106. Sahu PK, Kumar S. Epidemiological Aspects of Oral Cancer in North Indian Population. Indian Journal of Otolaryngology and Head & Neck Surgery. 2019 Oct 1;71(Suppl 1):944. doi:10.1007/S12070-019-01629-7 PubMed PMID: 31742099.

INFORMED CONSENT FORM

[REDACTED]

[REDACTED]

Name of Student/Principal Investigator: [REDACTED]

Name of Guide/Co Investigators: [REDACTED]

Introduction: [REDACTED]
[REDACTED]
[REDACTED]

Explanation of procedure: [REDACTED]
[REDACTED]
[REDACTED]

Withdrawal from participation in the study: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Possible benefits from participating in the study: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Privacy and confidentiality: [REDACTED]
[REDACTED]
[REDACTED]

Financial incentives: [REDACTED]
[REDACTED]

Authorization for publication of aggregated data: [REDACTED]
[REDACTED]

[REDACTED]

Questions: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Legal rights: [REDACTED]

CONSENT STATEMENT

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Name of the participant:

Signature or left thumb impression of the participant:

Name of the witness:

Signature or left thumb impression of the witness:

Name of the investigator:

Signature of the investigator:

Date:

Place:

INFORMED CONSENT FORM

[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]

Name of Student/Principal Investigator: [REDACTED]

Name of Guide/Co Investigators [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

INFORMED CONSENT FORM

[REDACTED]

[REDACTED]

Name of Student/Principal Investigator: [REDACTED]

Name of Guide/Co Investigators: [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

सहमति वक्तव्य

[Redacted Signature Area]

प्रतिभागी का नाम:

प्रतिभागी के हस्ताक्षर या बाएं अंगूठे का निशान:

गवाह का नाम:

गवाह के हस्ताक्षर या बाएं अंगूठे का निशान:

अन्वेषक का नाम:

अन्वेषक के हस्ताक्षर:

तारीख: _____

जगह: _____

INFORMED CONSENT FORM

[REDACTED]

[REDACTED]

Name of Student/Principal Investigator: [REDACTED]

Name of Guide/Co Investigators: [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

प्रश्नावली:

[REDACTED]

[REDACTED]

संमती विधान

[Redacted Signature Area]

सहभागीचे नाव:

सहभागीची सही किंवा डाव्या अंगठ्याचा ठसा:

साक्षीदाराचे नाव:

साक्षीदाराची सही किंवा डाव्या अंगठ्याचा ठसा:

तपासकर्त्याचे नाव:

अन्वेषकाची स्वाक्षरी:

तारीख: _____

जागा: _____

