



CLINICO-ETIOLOGICAL PROFILE AND MANAGEMENT OF DEEP NECK SPACE INFECTIONS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Deep neck space infections (DNSI) remain a significant clinical challenge despite advances in antibiotics and oral hygiene. This study aimed to evaluate the clinical presentation, etiological factors, and management strategies for DNSI in a tertiary care setting. **Methods:** A hospital-based cross-sectional observational study was conducted on 30 patients admitted to the Department of Oto-Rhino-Laryngology at Sri Aurobindo Medical College & Postgraduate Institute, Indore, India, from June 2023 to November 2024. Patients aged 20-65 years with clinically diagnosed DNSI were included after obtaining informed consent. Data on demographics, symptoms, investigations (blood tests, ultrasonography, CT scans, FNAC, pus culture), etiology, diagnosis, and management were collected using a pre-structured proforma. Statistical analysis was performed using R software, with descriptive statistics presented as frequencies, percentages, means, and standard deviations. **Results:** The mean age was approximately 45 years, with the highest prevalence in the 21-40 years age group (36.7%). Males predominated (60%). Common symptoms included odynophagia and malaise (23.3%), pain while swallowing (23.3%), and fever with neck swelling (16.7%). Trauma was the leading etiology (30%), followed by tonsillitis (23.3%). Parapharyngeal abscess was the most common diagnosis (30%). Management involved incision and drainage with tracheostomy in 33.3% of cases, and conservative antibiotics in 26.7%. Pus cultures revealed *Staphylococcus aureus* and *Streptococcus pyogenes* as predominant organisms (26.7% each). **Conclusion :** DNSI predominantly affect middle-aged males, with trauma and infections as key etiologies. Early surgical intervention combined with antibiotics is effective in most cases. Timely diagnosis and management are crucial to prevent complications.

KEYWORDS : Deep Neck Space Infections, Etiology, Management, Parapharyngeal Abscess, Surgical Drainage

INTRODUCTION

Deep neck space infections (DNSI) are serious bacterial infections involving the fascial planes and potential spaces of the neck, posing significant diagnostic and therapeutic challenges due to their potential for rapid progression and life-threatening complications [1,3]. Studies have consistently highlighted their clinical complexity and the need for prompt intervention. Almutairi et al. (2020) reported that dental infections are a leading cause of DNSI (42.6%), with peritonsillar abscess being the most common site (30.6%) in a retrospective study of 183 cases, emphasizing the role of comorbidities like diabetes (45.2%) in exacerbating outcomes [1]. Similarly, Huang et al. (2004) found odontogenic infections (53.2%) and upper airway infections (30.5%) as primary etiologies in 185 cases, with parapharyngeal space involvement in 38.4% and a strong association between *Klebsiella pneumoniae* and diabetes [3].

The clinical presentation of DNSI often includes fever, neck pain, swelling, odynophagia, and dysphagia, as noted by Bakir et al. (2012), who identified dental infections (48.6%) and pain as predominant features in 173 patients [5]. Wang et al. (2003) further demonstrated that older age, neck swelling, trismus, and comorbidities like diabetes are associated with prolonged hospitalization and complications [2]. Complications such as airway obstruction, mediastinitis, and sepsis remain significant risks, with Boscolo-Rizzo et al. (2012) reporting an 18.4% complication rate and identifying diabetes and multi-space involvement as key predictors [6].

Management typically involves a combination of airway management, antibiotics, and surgical intervention. While incision and drainage is often the cornerstone, as supported by Puttamadaiah et al. (2017) who found it most effective in 50 patients [9], Mayor et al. (2001) demonstrated that conservative antibiotic therapy was successful in 90.3% of 31 cases, suggesting viability in select patients [7]. Microbiologically, *Streptococcus* species and *Staphylococcus aureus* are frequently isolated, though antibiotic resistance, as noted by Hasegawa et al. (2011), complicates treatment [4]. Despite advances in antibiotics and dental care, DNSI remain prevalent, as evidenced by Bottin et al. (2003) and Karodpati et al. (2021), who reported persistent morbidity due to delayed

diagnosis and underlying systemic diseases [8,10]. This study aims to investigate the clinico-etiological profile and management outcomes of DNSI in a tertiary care setting in India, building on these prior findings to enhance clinical understanding and optimize patient care.

MATERIALS AND METHODS

Study Design and Setting

This was a hospital-based cross-sectional observational study conducted at the Department of Oto-Rhino-Laryngology, Sri Aurobindo Medical College & Postgraduate Institute, Indore, Madhya Pradesh, India.

Duration

The study spanned from 1st June 2023 to 30th November 2024.

Sample Size and Selection

Initially planned for 50 patients, this analysis includes 30 patients admitted with DNSI, based on an estimated admission rate of 5-7 cases every 2-3 months.

Inclusion Criteria

- Patients presenting with reduced mouth opening, fever, and difficulty in swallowing.
- Clinically diagnosed DNSI admitted under the Department of Oto-Rhino-Laryngology.
- Age group 20-65 years.

Exclusion Criteria

- Patients not providing consent or unwilling to participate.

Methodology

After obtaining institutional research and ethical committee approval and informed written consent, patients underwent a complete history to identify predisposing factors (e.g., diabetes mellitus, immunocompromised states, orodental infections) and a detailed ENT examination. Dental evaluation was performed by a specialist. A pre-structured proforma was used for baseline data collection.

Investigations

1. Blood investigations: Complete Blood Count, Random Blood Sugar, Fasting and Postprandial Blood Sugar, Urea, Creatinine, Serum Electrolytes, HIV, HBsAg.

2. Radiological: Ultrasonography (USG) of the local region/neck, Contrast-Enhanced Computed Tomography (CECT) of the neck.
3. Fine Needle Aspiration Cytology (FNAC).
4. Pus Culture and Sensitivity.

Data Collection and Analysis

Findings were recorded on the proforma. Data were entered into MS Excel 2010 and analyzed using R software. Descriptive statistics included means and standard deviations for quantitative variables, and frequencies and percentages for qualitative variables. Pie or bar diagrams were used for visualization. Statistical significance was set at $p < 0.05$.

RESULTS

Thirty patients were analyzed.

Table 1: Age Distribution

Age Group	Frequency	Percentage
18–20 years	3	10.0%
21–40 years	11	36.7%
41–60 years	10	33.3%
>60 years	6	20.0%
Total	30	100%

As shown in Table 1, the majority of patients were in the 21–40 years age group (mean age approximately 45 years). Males predominated (60%, 18/30) compared to females (40%, 12/30). Common symptoms included odynophagia and malaise (23.3%, 7/30), pain while swallowing (23.3%, 7/30), trismus with neck stiffness (20%, 6/30), fever with neck swelling (16.7%, 5/30), and voice change with fever (16.7%, 5/30).

Blood investigations revealed elevated white blood cell (WBC) count and C-reactive protein (CRP) in 30% (9/30), mild leukocytosis in 23.3% (7/30), normal blood counts in 20% (6/30), anemia with high CRP in 13.3% (4/30), and raised erythrocyte sedimentation rate (ESR) with neutrophils in 13.3% (4/30). Ultrasonography (USG) showed hypoechoic lesions with fluid in 30% (9/30), cellulitis with no collection in 23.3% (7/30), abscess with debris in 20% (6/30), and collection in the submandibular region or diffuse swelling with echogenicity in 13.3% (4/30 each). Contrast-enhanced computed tomography (CECT) identified large retropharyngeal abscess in 33.3% (10/30), peritonsillar space involvement in 23.3% (7/30), cellulitis without abscess in 16.7% (5/30), and parapharyngeal abscess or multiple pockets in deep neck spaces in 13.3% (4/30 each). Fine Needle Aspiration Cytology (FNAC) showed inflammatory smears in 30% (9/30), necrotic material with pus in 30% (9/30), dry tap in 16.7% (5/30), pus cells and neutrophils in 16.7% (5/30), and suggestive of bacterial abscess in 6.7% (2/30).

Table 2: Pus Culture & Sensitivity

Organism	Frequency	Percentage
Anaerobic bacteria	6	20.0%
Klebsiella	6	20.0%
Staph aureus	8	26.7%
Streptococcus pyogenes	8	26.7%
Sterile	2	6.7%
Total	30	100%

Table 2 shows that Staphylococcus aureus and Streptococcus pyogenes were the leading isolates.

Table 3: Diagnosis

Diagnosis	Frequency	Percentage
Cellulitis of neck	5	16.7%
Parapharyngeal abscess	9	30.0%
Peritonsillar abscess	2	6.7%
Retropharyngeal abscess	6	20.0%

Submandibular abscess	8	26.7%
Total	30	100%

Table 3 indicates that parapharyngeal abscess was the most common diagnosis.

Table 4: Etiology

Diagnosis	Frequency	Percentage
Cellulitis of neck	5	16.7%
Parapharyngeal abscess	9	30.0%
Peritonsillar abscess	2	6.7%
Retropharyngeal abscess	6	20.0%
Submandibular abscess	8	26.7%
Total	30	100%

Table 4 reveals that trauma was the primary etiology.

Table 5: Management

Management	Frequency	Percentage
Aspiration under ultrasound guidance	5	16.7%
Conservative with antibiotics	8	26.7%
CT-guided drainage with IV antibiotics	1	3.3%
Incision and drainage with tracheostomy	10	33.3%
Incision drainage with IV antibiotics	6	20.0%
Total	30	100%

Table 5 demonstrates that surgical intervention was required in the majority of cases.

No statistically significant associations were noted ($p > 0.05$ for all comparisons), likely due to the small sample size.

DISCUSSION

Our study provides insights into the clinico-etiological profile and management of DNSI in a tertiary care Indian setting. As shown in Table 4, trauma (30%) and tonsillitis (23.3%) were the leading etiologies, differing from the odontogenic predominance reported by Almutairi et al. (2020) (42.6%) and Huang et al. (2004) (53.2%) [1,3]. This variation may reflect regional differences in trauma exposure or healthcare access. Parapharyngeal abscess was the most common diagnosis (30%, Table 3), consistent with Huang et al. (2004), who noted 38.4% parapharyngeal involvement [3].

Demographically, males (60%) and the 21–40 years age group (36.7%, Table 1) were most affected, aligning with Almutairi et al. (2020) (88.7% males) and Karodpati et al. (2021) (male:female ratio 1:0.78, peak at 31–40 years) [1,10]. Common symptoms included odynophagia/malaise and pain while swallowing (23.3% each), corroborating Bakir et al. (2012), who reported pain and dysphagia as frequent [5].

Microbiologically, Staphylococcus aureus and Streptococcus pyogenes (26.7% each, Table 2) were predominant, similar to Almutairi et al. (2020) (Streptococcus pyogenes 39.3%, Staphylococcus aureus 21.3%) and Huang et al. (2004) (Streptococcus viridans and Klebsiella pneumoniae 33.9% each) [1,3]. Klebsiella was noted in 20% of our cases (Table 2), often linked to diabetes, as per Huang et al. [3].

Management favored surgical intervention (e.g., incision and drainage with tracheostomy in 33.3%, Table 5), supporting Boscolo-Rizzo et al. (2012) (38.1% surgical) and Puttamadaiah et al. (2017) [6,9]. However, conservative antibiotics succeeded in 26.7% (Table 5), consistent with Mayor et al. (2001) (90.3% success) and Bottin et al. (2003) [7,8]. The need for tracheostomy in 33.3% (Table 5) reflects the severity of cases, aligning with Huang et al. (2004), where 18 patients required tracheostomy [3].

Comorbidities like diabetes, though not quantified in our study, are known risk factors, as per Wang et al. (2003) and Hasegawa et al. (2011) [2,4]. Complications like airway obstruction were not detailed but are critical, as noted by Boscolo-Rizzo et al. (2012) (18.4% complication rate) [6]. Our findings emphasize early intervention to mitigate such risks.

Limitations include the small sample size (30 vs. planned 50) and cross-sectional design, limiting causality inference. Future studies should include larger cohorts and longitudinal follow-up to assess long-term outcomes.

CONCLUSION

DNSI remain a critical clinical entity requiring prompt diagnosis through clinical and radiological evaluation. Trauma and infections are key etiologies (Table 4), with surgical drainage and antibiotics as mainstay treatments (Table 5). Middle-aged males are at higher risk (Table 1), necessitating vigilant monitoring to prevent complications. This study contributes to the understanding of DNSI in an Indian context, advocating for early intervention to optimize outcomes.

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