e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(4); 1370-1376

Original Research Article

Comprehensive Study of Deep Neck Space Infections: Etiology, Microbiological Profile & Clinical Outcomes

Kishan Soni[1], Ishita Bhatt[2]

[1]Resident Doctor, ENT, Sardar Vallabhbhai Patel Institute of Medical Sciences & Research (SVPIMSR), Ahmedabad, Gujarat, India

[2]Resident Doctor, ENT, Sardar Vallabhbhai Patel Institute of Medical Sciences & Research (SVPIMSR), Ahmedabad, Gujarat, India

Received: 06-02-2026 / Revised: 16-03-2026 / Accepted: 10-04-2026

Corresponding Author: Dr. Ishita Bhatt

Conflict of interest: Nil

Abstract

Background: Deep neck space infections (DNSIs) are potentially life-threatening conditions requiring prompt diagnosis and management. The aetiology and clinical profile have evolved, with odontogenic infections emerging as a leading cause.

Aim: To evaluate the aetiology, microbiological profile, clinical presentation, management, and outcomes of deep neck space infections.

Materials and Methods: This prospective observational study included 100 patients diagnosed with DNSIs at a tertiary care centre over one year. Clinical evaluation, laboratory investigations, and imaging (USG/CECT) were performed. Pus samples were subjected to microbiological analysis. Patients were managed with antibiotics and/or surgical intervention. Data were analysed using SPSS version 26.

Results: The majority of patients were aged 21–30 years (22%) with male predominance (62%). Odontogenic infection was the most common aetiology (40%). Neck swelling (90%) and pain (85%) were the most frequent symptoms. The submandibular space was most commonly involved (35%). *Staphylococcus aureus* (28%) and *Streptococcus* species (25%) were the predominant organisms. Surgical drainage was required in 65% of cases, while 30% were managed conservatively. Most patients had a hospital stay of 6–10 days (50%). Complications occurred in 20% of cases, with airway obstruction being the most common. The recovery rate was 96%, with a mortality of 4%.

Conclusion: DNSIs are predominantly odontogenic and polymicrobial. Early diagnosis, appropriate antibiotics, and timely surgical intervention result in favourable outcomes, though careful monitoring is essential to prevent complications.

Keywords: Deep neck space infections, odontogenic infection, abscess, microbiology, surgical drainage, airway obstruction.

DOI: 10.25258/ijcpr.18.4.218

Introduction

Deep neck space infections (DNSIs) are serious infections involving the potential fascial planes and spaces of the neck. These spaces, defined by layers of deep cervical fascia, allow rapid spread of infection to adjacent vital structures, including the airway, major vessels, and mediastinum. Despite advancements in antimicrobial therapy and surgical techniques, DNSIs continue to be associated with significant morbidity and mortality if not diagnosed and managed promptly [1].

Historically, tonsillopharyngitis was the leading cause of DNSIs; however, in the modern antibiotic era, odontogenic infections have emerged as the most common aetiology, particularly among adults. Poor oral hygiene, delayed dental care, and increasing prevalence of systemic illnesses such as diabetes mellitus contribute significantly to this shift in disease pattern [2,3]. Other etiological factors include upper respiratory infections, trauma, salivary gland infections, and foreign body ingestion [4].

Clinically, DNSIs often present with nonspecific symptoms such as fever, neck swelling, pain, dysphagia, odynophagia, and trismus. In advanced cases, airway compromise may occur, posing an immediate life-threatening emergency. Due to the anatomical complexity of the cervical fascial planes, infections can rapidly spread to involve multiple spaces, leading to severe complications such as mediastinitis, septicemia, internal jugular vein thrombosis, and carotid artery erosion [5,6].

Early and accurate diagnosis is essential for effective management. Imaging modalities, particularly contrast-enhanced computed tomography (CECT), play a pivotal role in identifying the extent of infection, differentiating cellulitis from abscess formation, and guiding surgical intervention [7]. Microbiologically, DNSIs are typically polymicrobial, involving a combination of aerobic and anaerobic organisms. Common pathogens include *Staphylococcus aureus*, *Streptococcus* species, and gram-negative bacilli [8].

Management of DNSIs requires a multidisciplinary approach, including airway stabilisation, empirical broad-spectrum intravenous antibiotics, and timely surgical drainage when indicated. Early intervention significantly reduces the risk of complications and improves clinical outcomes [9]. Given the changing trends in aetiology, microbiological patterns, and treatment strategies, continuous evaluation of DNSIs is essential for optimising patient care.

Materials and Methods

Study Design and Setting: This was a hospital-based, prospective observational study conducted in the Department of Otorhinolaryngology (ENT) at Sardar Vallabhbhai Patel Institute of Medical Sciences & Research, a tertiary care teaching institute with advanced diagnostic, microbiological, and surgical facilities. The hospital serves a large urban and referral population, enabling comprehensive evaluation and management of deep neck space infections.

Study Duration: The study was conducted over a period of one year, from August 2022 to July 2023.

Study Population and Sample Size: A total of 100 consecutive patients presenting with clinical features suggestive of deep neck space infections were enrolled. A consecutive sampling technique was adopted to minimise selection bias.

Case Definition: Deep neck space infection was defined as an infection involving the potential fascial spaces of the neck (e.g., submandibular, parapharyngeal, retropharyngeal, peritonsillar spaces), confirmed clinically and/or radiologically (ultrasonography or contrast-enhanced computed tomography).

Inclusion Criteria

- Patients of all age groups and both sexes diagnosed with deep neck space infections based on clinical and/or radiological findings
- Patients requiring medical and/or surgical management
- Patients providing written informed consent

Exclusion Criteria

- Superficial infections such as cellulitis or skin/soft tissue abscess not involving deep cervical fascia
- Neck swellings due to non-infective causes (e.g., benign or malignant tumors, congenital cysts)
- Patients previously treated surgically elsewhere for the same episode
- Patients who refused consent

Clinical Assessment: A detailed history was recorded, including demographic data, presenting symptoms (neck swelling, pain, fever, dysphagia, odynophagia, trismus, dyspnea), duration of illness, and etiological factors such as odontogenic infections, tonsillopharyngitis, trauma, foreign body ingestion, and systemic comorbidities (especially diabetes mellitus and immunocompromised states). Comprehensive clinical examination included general physical examination, airway assessment, and detailed local examination of the neck to identify the involved anatomical space.

Laboratory Investigations

Baseline investigations included:

- Complete blood count (CBC)
- Random blood sugar and HbA1c (in suspected/known diabetics)
- Renal function tests
- C-reactive protein (CRP), where indicated
- Blood cultures in patients with systemic toxicity

Radiological Evaluation: Ultrasonography (USG) of the neck was used as the initial imaging modality for detecting fluid collections. Contrast-enhanced computed tomography (CECT) of the neck was performed in cases with suspected deep space involvement, airway compromise, multiple space infections, or inconclusive USG findings. Imaging findings were used to determine the extent of infection, number of spaces involved, and presence of abscess formation.

Microbiological Evaluation: Pus samples were obtained via needle aspiration or during incision and drainage under strict aseptic precautions. Samples were processed for:

- Gram staining
- Aerobic culture and sensitivity
- Anaerobic culture (where feasible)

Microorganisms were identified using standard microbiological techniques, and antibiotic susceptibility testing was performed using the Kirby–Bauer disk diffusion method in accordance with Clinical and Laboratory Standards Institute (CLSI) guidelines.

Treatment Protocol: All patients were initially managed with empirical broad-spectrum intravenous antibiotics covering gram-positive, gram-negative, and anaerobic organisms (e.g., third-generation cephalosporins combined with metronidazole or beta-lactam/beta-lactamase inhibitor combinations). Antibiotic therapy was subsequently tailored based on culture and sensitivity reports.

Indications for surgical intervention included:

- Presence of a well-formed abscess on imaging
- Airway compromise
- Failure to respond to conservative medical management within 48–72 hours

Surgical management consisted of incision and drainage under local or general anaesthesia. Airway management (endotracheal intubation or tracheostomy) was performed in patients with impending or established airway obstruction. Supportive management included intravenous fluids, analgesics, antipyretics, nutritional support, and strict glycemic control in diabetic patients.

Outcome Measures: Primary and secondary outcomes assessed were:

- Etiological distribution of deep neck space infections
- Microbiological profile and antibiotic sensitivity patterns
- Type of management (conservative vs surgical)
- Duration of hospital stay
- Complications (airway obstruction, mediastinitis, septicemia, internal jugular vein thrombosis)
- Mortality rate

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) software version 26. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were expressed as frequencies and percentages. Association between categorical variables was analysed using the chi-square test or Fisher's exact test. A p-value <0.05 was considered statistically significant.

Ethical Considerations: The study protocol was reviewed and approved by the Institutional Ethics Committee of Sardar Vallabhbhai Patel Institute of Medical Sciences & Research. Written informed consent was obtained from all participants or their legal guardians prior to inclusion. Patient confidentiality and anonymity were strictly maintained throughout the study.

Results and Observations

A total of 100 patients diagnosed with deep neck space infections were included in the study and analysed with respect to demographic profile, aetiology, microbiological pattern, clinical presentation, management, and outcomes.

Table 1: Age Distribution of Patients (N = 100)

Age Group (years)	Number of Patients	Percentage (%)
0–10	8	8%
11–20	12	12%
21–30	22	22%
31–40	20	20%
41–50	18	18%
51–60	12	12%
>60	8	8%

The largest number of patients (22%) were in the 21–30-year age group.

Table 2: Gender Distribution (N = 100)

Gender	Number	Percentage (%)
Male	62	62%
Female	38	38%

Male predominance was noted with a male-to-female ratio of approximately 1.6:1.

Table 3: Aetiology of Deep Neck Space Infections

Etiological Factor	Number	Percentage (%)
Odontogenic infection	40	40%
Tonsillopharyngitis	22	22%
Upper respiratory infection	10	10%
Trauma	8	8%
Salivary gland infection	6	6%
Unknown (Idiopathic)	14	14%

Odontogenic infections were the most common cause (40%).

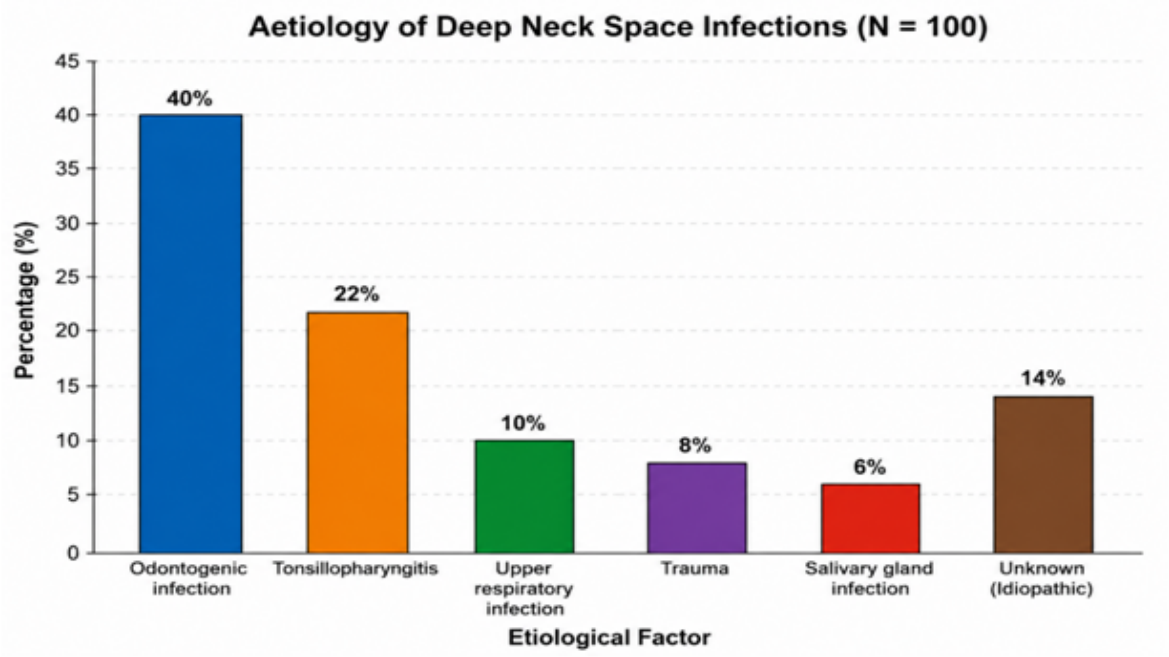

Figure 1: Aetiology of deep neck space infections (N=100)

Table 4: Clinical Presentation

Symptoms	Number	Percentage (%)
Neck swelling	90	90%
Pain	85	85%
Fever	78	78%
Dysphagia	60	60%
Trismus	42	42%
Dyspnea	15	15%

Neck swelling and pain were the most common presenting symptoms.

Table 5: Involved Neck Spaces

Neck Space Involved	Number	Percentage (%)
Submandibular space	35	35%
Peritonsillar space	20	20%
Parapharyngeal space	15	15%
Retropharyngeal space	10	10%
Multiple spaces	20	20%

The submandibular space was the most commonly involved site.

Table 6: Microbiological Profile

Organism Identified	Number	Percentage (%)
Staphylococcus aureus	28	28%
Streptococcus species	25	25%
Klebsiella species	15	15%
Pseudomonas aeruginosa	10	10%
Anaerobes	8	8%
No growth	14	14%

Staphylococcus aureus was the most commonly isolated organism.

Table 7: Management Modality

Treatment Type	Number	Percentage (%)
Conservative (IV antibiotics)	30	30%
Incision & drainage	65	65%
Airway intervention (Tracheostomy)	5	5%

The majority of patients (65%) required surgical drainage.

Table 8: Duration of Hospital Stay

Hospital Stay (days)	Number	Percentage (%)
1–5 days	25	25%
6–10 days	50	50%
>10 days	25	25%

Most patients stayed between 6 and 10 days.

Table 9: Complications

Complication	Number	Percentage (%)
Airway obstruction	10	10%
Septicemia	8	8%
Mediastinitis	2	2%
No complications	80	80%

The majority (80%) had no complications; airway obstruction was the most common complication.

Table 10: Outcome

Outcome	Number	Percentage (%)
Recovered	96	96%
Mortality	4	4%

The overall recovery rate was high (96%), with a mortality rate of 4%.

Discussion

Deep neck space infections remain a challenging clinical entity due to their variable presentation and potential for rapid deterioration. The present study provides valuable insights into the current epidemiological trends, clinical characteristics, and outcomes of DNSIs in a tertiary care setting.

The age distribution in this study demonstrated a higher prevalence among young adults, particularly in the 21–30-year age group. Similar findings have been reported in recent studies, suggesting that this population is more susceptible due to increased exposure to odontogenic infections and lifestyle-related risk factors [10]. The observed male predominance is consistent with existing literature and may be attributed to differences in health-seeking behaviour, occupational exposure, and oral hygiene practices [11]. Odontogenic infections were identified as the most common etiological factor, accounting for 40% of cases. This finding aligns with the global shift from tonsillopharyngeal to dental origins of DNSIs. The increasing burden of dental infections underscores the need for improved oral healthcare and early dental intervention [12]. Tonsillopharyngitis remains an important cause, particularly in younger individuals, while other etiologies, such as trauma and salivary gland infections, contribute to a smaller proportion of cases.

The clinical presentation observed in this study—predominantly neck swelling, pain, and fever—is consistent with previous reports. Symptoms such as dysphagia and trismus indicate deeper space involvement, whereas dyspnea signifies impending airway compromise and requires urgent management [13]. Early recognition of these symptoms is critical for preventing disease progression.

The submandibular space was the most commonly involved anatomical site, which correlates with the high prevalence of odontogenic infections. Infections originating from mandibular teeth frequently spread to this space due to anatomical continuity. Multiple space involvement, observed in a significant proportion of patients, reflects advanced disease and delayed presentation [14]. Microbiologically, the predominance of *Staphylococcus aureus* and *Streptococcus* species, along with gram-negative organisms, confirms the polymicrobial nature of DNSIs. The presence of anaerobic bacteria further emphasizes the importance of empirical antibiotic regimens covering both aerobic and anaerobic pathogens [15]. Culture-negative cases may be explained by prior antibiotic use before hospital presentation. The majority of patients in this study required surgical intervention, highlighting the importance of incision and drainage in cases of abscess formation. Conservative management was effective in selected patients without abscess or complications. These findings are in accordance with current clinical guidelines, which recommend early surgical drainage to prevent disease progression and complications [16]. The duration of hospital stay in most patients ranged between 6 and 10 days, indicating effective management and timely intervention. However, prolonged hospitalisation in some cases may be associated with complications or comorbid conditions such as diabetes mellitus, which is known to adversely affect outcomes [17]. Complications were observed in a subset of patients, with airway obstruction being the most common. Serious complications such as septicemia and mediastinitis, although less frequent, highlight the aggressive nature of DNSIs and the importance of early diagnosis and management [18]. The high recovery rate (96%) and relatively low mortality (4%) observed in this study reflect the effectiveness of prompt diagnosis, appropriate antibiotic therapy, and timely surgical intervention. Improved outcomes can also be attributed to advancements in imaging techniques, better critical care support, and a multidisciplinary approach to management [19].

Conclusion

Deep neck space infections are serious conditions most commonly arising from odontogenic sources. Early diagnosis, appropriate broad-spectrum antibiotics, and timely surgical drainage are key to effective management. With prompt multidisciplinary care, most patients have favourable outcomes, though vigilance is essential to prevent complications such as airway obstruction and septicemia.

References

1. Parhiscar A, Har-El G. Deep neck abscess: a retrospective review of 210 cases. Ann OtolRhinolLaryngol. 2001;110:1051–1054.
2. Huang TT, Liu TC, Chen PR, et al. Deep neck infection: analysis of 185 cases. Head Neck. 2004;26:854–860.
3. Wang LF, Kuo WR, Tsai SM, et al. Characterizations of life-threatening deep cervical space infections. Am J Otolaryngol. 2003;24:111–117.
4. Eftekharian A, Roozbahany NA, Vaezeafshar R, et al. Deep neck infections: a retrospective review. Eur Arch Otorhinolaryngol. 2009;266:273–277.
5. Boscolo-Rizzo P, Stellin M, Muzzi E, et al. Deep neck infections: a constant challenge. ORL J OtorhinolaryngolRelat Spec. 2006;68:259–265.
6. Marioni G, Rinaldi R, Staffieri C, et al. Deep neck infection with dental origin. ActaOtolaryngol. 2008;128:201–206.
7. Becker M, Zbären P, Hermans R, et al. Imaging of deep neck infections. Radiology. 2008;249:551–560.
8. Brook I. Microbiology and management of deep facial infections. ORL J OtorhinolaryngolRelat Spec. 2003;65:117–120.
9. Har-El G. Deep neck abscess. OtolaryngolClin North Am. 2001;34:743–752.
10. Cramer JD, Purkey MR, Smith SS, et al. Impact of delayed presentation. Laryngoscope. 2016;126:1756–1760.
11. Adoviča A, Veidere L, Ronis M, et al. Deep neck infections review. Otolaryngol Pol. 2017;71:37–42.
12. Almutairi DM, Alqahtani RM, Alshareef N, et al. Deep neck space infections. Ann Saudi Med. 2020;40:432–439.
13. Kauffmann P, Cordesmeyer R, Tröltzsch M, et al. Clinical outcomes of DNSIs. Med Oral Patol Oral Cir Bucal. 2017;22:e452–e457.
14. Bali RK, Sharma P, Gaba S, et al. Odontogenic infection complications. Natl J Maxillofac Surg. 2015;6:136–143.
15. Heim N, Warwas FB, Wiedemeyer V, et al. Role of anaerobic bacteria. Anaerobe. 2019;59:145–149.

16. Wang TY, Chen CY, Chen YL, et al. Predictors for surgical drainage. J Chin Med Assoc. 2019;82:845–850.
17. Huang YC, Liu CJ, Chen TJ, et al. Diabetes and DNSIs risk. J Infect. 2011;63:210–215.
18. Prado-Calleros HM, Jiménez-Fuentes E, et al. Mediastinitis review. Eur Arch Otorhinolaryngol. 2016;273:1823–1830.
19. Kim SY, Kim JW, Lee YS, et al. Changing trends in DNSIs. ClinExpOtorhinolaryngol. 2020;13:270–276.