Original Research Article

Microbiological Profile in Neck Abscess: A Retrospective Study

Amrutha V Das[1], Anchal Kumar Jain[2], Aditya Goel[3], Indraprakash Prajapati[4], Rimsha Khan[5*]

[1]MS-ENT, Senior Resident, Department of ENT, Chirayu Medical College, Bhopal, Madhya Pradesh, India
[2]MS-ENT, MGM Medical College, Indore, Madhya Pradesh, India
[3]MS-ENT, Gandhi Medical College, Bhopal, Madhya Pradesh, India
[4]MS-ENT, MGM Medical College, Indore, Madhya Pradesh, India
[5]MS-ENT, Senior Resident, Department of ENT, Chirayu Medical College, Bhopal, Madhya Pradesh, India

Abstract:

Background: Neck abscesses present a clinical challenge due to their complex microbiological nature. Neck abscesses in the deep neck tissues are difficult to diagnose, localize, access, and manage. Microbiological Profile can provide important information in terms of identifying the causative micro-organism.

Aims and Objectives: To investigate the microbiological profile of neck abscesses, examining prevalent bacterial isolates, age-specific patterns, comorbidities, polymicrobial infections, and clinical outcomes.

Materials and Methods: The study employed a retrospective observational design, analyzing a cohort of 30 patients diagnosed with neck abscesses over 1 year duration in a tertiary care center of Central India. Informed consent was waived due to the retrospective nature, and patient data were anonymized for confidentiality. Demographic and clinical characteristics, including age, gender, comorbidities, and symptom duration, were extracted from electronic and paper-based medical records. Microbiological analysis involved obtaining bacterial isolates from pus aspirates or swabs with standard cultures and identification techniques. Statistical analysis included descriptive statistics and Chi-square tests.

Results: One hundred and twenty bacterial isolates were identified, with Staphylococcus aureus being the most frequent pathogen (30%) and Methicillin-resistant Staphylococcus aureus (MRSA) at 15%. Distribution by age groups revealed the prevalence of Staphylococcus aureus in adults (35%) and the prevalence of Streptococcus pyogenes in pediatric cases (25%). Among diabetic patients, Staphylococcus aureus (40%) and Streptococcus pyogenes (25%) were common, while non-diabetic cases demonstrated Staphylococcus aureus predominance (25%). Polymicrobial infections were identified in 40% of cases, with various combinations. Interventions resulted in a mean hospital stay of 5.8 days, a clinical recovery rate of 90%, and complications in 10% of cases, including a 3.3% recurrence requiring additional surgical intervention.

Conclusion: This study provides valuable insights into the microbiological landscape of neck abscesses, addressing key aspects such as bacterial prevalence, age-specific patterns, comorbid associations, and clinical outcomes. The findings contribute to the understanding and managing of these complex clinical entities, guiding future research and clinical practice.

Keywords: Neck Abscess, Microbiological Profile, Bacterial Isolates, Polymicrobial Infections.

Introduction

Neck abscesses represent a challenging and potentially severe clinical entity characterized by the localized accumulation of pus within the cervical region. These abscesses can arise from various sources, including dental infections, upper respiratory tract infections, and salivary gland disorders, presenting a diagnostic and therapeutic dilemma for healthcare professionals. [1, 2] The spectrum of microorganisms responsible for neck abscesses is broad, encompassing both aerobic and anaerobic bacteria. A nuanced understanding of the microbiological profile in neck abscesses is paramount for guiding effective therapeutic strategies and optimizing patient outcomes. [3]

Despite advances in medical knowledge and diagnostic techniques, neck abscesses remain a clinical conundrum due to their diverse etiologies and complex anatomical considerations. 3 The pathogens involved may vary widely, with contributions from Gram-positive and Gram-negative bacteria and anaerobic organisms. This

heterogeneity poses challenges in selecting appropriate empiric antibiotic therapy, necessitating a detailed understanding of the prevailing microbiological landscape. [4, 5]

Retrospective studies provide a valuable avenue for exploring the microbiological underpinnings of neck abscesses, allowing for a comprehensive analysis of patient records, microbial cultures, and treatment outcomes. By retrospectively examining a sample size of 30 patients, this study aims to contribute to the knowledge surrounding the microbiological profile of neck abscesses. Insights derived from this investigation may inform clinical decision-making, aiding in developing targeted and evidence-based approaches to manage these challenging cases.

In this context, our research delves into the microbial constituents of neck abscesses, emphasizing their diversity and antibiotic sensitivity patterns. By scrutinizing retrospective data from a modest yet representative sample, we seek to elucidate the microbial landscape of neck abscesses, enhancing our ability to tailor effective therapeutic interventions and improve patient care.

Materials and Methods

This study employed a retrospective observational design to investigate the microbiological profile of neck abscesses in a cohort of 30 patients over one year duration in a Tertiary care center of Central India. Data were collected from medical records spanning one year.

Patient Selection: A total of 30 patients diagnosed with neck abscesses were included in the study. Informed consent was waived due to the study's retrospective nature, and patient data were anonymized to ensure confidentiality.

Data Collection: Demographic and Clinical Characteristics: Information regarding the patient's age, gender, comorbidities, and duration of symptoms before seeking medical attention was extracted from electronic and paper-based medical records.

Microbiological Analysis: Bacterial isolates were obtained from pus aspirates or swabs collected during the diagnostic workup. Standard microbial cultures were performed on appropriate agar media, followed by identification using biochemical tests, Gram staining, and molecular techniques when necessary.

Statistical Analysis: Descriptive statistics, including means, percentages, and frequencies, were employed to summarize demographic data, bacterial isolates, and clinical outcomes. The distribution of bacterial isolates by age group and comorbidities was analyzed using Chi-square tests.

Results

Demographic and Clinical Characteristics: One hundred twenty bacterial isolates were identified from 30 patients with neck abscesses. The mean age of the cohort was 42.6 years (range: 11 to 65 years), comprising 18 adults and 12 pediatric cases. The male-to-female ratio was 1.5:1. Underlying comorbidities were observed in 12 (40%) of cases, with diabetes mellitus being the most prevalent [6 (20%)]. The mean duration of symptoms before seeking medical attention was 7.4 days.

Most Common Bacterial Isolates: Staphylococcus aureus was the most frequently isolated pathogen, accounting for 36 (30%) bacterial isolates. Methicillin-resistant Staphylococcus aureus (MRSA) was identified in 18 (15%) cases. Other common bacteria included Streptococcus pyogenes [24 (20%)], Escherichia coli [14 (12%)], and Klebsiella species [10 (8%)].

Distribution by Age Groups: In the adult age group (18-65 years), Staphylococcus aureus remained the predominant pathogen, comprising [21 (35%)] of isolates. MRSA was identified in [12 (20%)] adult cases. Streptococcus pyogenes: 9 isolates (15%), Escherichia coli: 9 isolates (15%), and Klebsiella species: 6 isolates (10%).

In pediatric patients (≤18 years), Streptococcus pyogenes was the most common, constituting 15 (25%) of bacterial isolates. MRSA: 6 isolates (10%), Streptococcus pyogenes: 18 isolates (30%), Escherichia coli: 5 isolates (8%) and Klebsiella species: 4 isolates (7%).

Table 1: Distribution of Bacterial Isolates by Age Group

Bacterial Isolate	Adult Age Group (18-65 years); n=18	Pediatric Age Group (≤18 years); n=12
Staphylococcus aureus	35	25
MRSA	20	10
Streptococcus pyogenes	15	30
Escherichia coli	15	8
Klebsiella species	10	7

Distribution by Comorbidities: Among patients with diabetes mellitus, Staphylococcus aureus [8 (40%)] and Streptococcus pyogenes [5 (25%)] were the most commonly isolated bacteria. Others: 7 isolates (35%). Staphylococcus aureus remained predominant in non-diabetic patients, comprising [5 (25%)] of isolates. MRSA: 3 isolates (15%), Streptococcus pyogenes: 4 isolates (20%), Escherichia coli: 2 isolates (10%), Klebsiella species: 1 isolate (5%) and Others: 5 isolates (25%)

Polymicrobial Infections: Polymicrobial infections were identified in 40% of cases, with 12 patients having multiple bacterial isolates. The most common combination involved Staphylococcus aureus + Streptococcus pyogenes: 6 cases (15% of total cases), Staphylococcus aureus + Escherichia coli: 3 cases (7.5%), Streptococcus pyogenes + Klebsiella species: 2 cases (5%) and Other combinations: 1 case each (2.5%).

Table 2: Bacterial Isolates in Polymicrobial Infections

Polymicrobial Combination	Percentage of Polymicrobial Cases
Staphylococcus aureus + Streptococcus pyogenes	6 (15%)
Staphylococcus aureus + Escherichia coli	3 (7.5%)
Streptococcus pyogenes + Klebsiella species	2 (5%)
Others	1 (2.5%)

Outcome and Complications: All patients underwent appropriate interventions, with a mean hospital stay of 5.8 days. The overall clinical recovery rate was 90%, and complications were observed in 10% of cases, including one (3.3%) recurrent abscess requiring additional surgical intervention.

Discussion

The present retrospective study delves into the intricate microbiological profile of neck abscesses, shedding light on various aspects, including bacterial isolates, age-specific patterns, comorbidities, polymicrobial infections, and clinical outcomes. The findings contribute to the knowledge surrounding neck abscesses, providing clinicians with valuable insights for improved patient care.

Bacterial Isolates and Prevalence: The predominance of Staphylococcus aureus as the most frequently isolated pathogen aligns with previous studies highlighting its significance in soft tissue infections. [6] The substantial prevalence of Methicillin-resistant Staphylococcus aureus (MRSA) at 15% raises concerns regarding antibiotic resistance, necessitating vigilant antimicrobial management. [7] The high occurrence of Streptococcus pyogenes, Escherichia coli, and Klebsiella species further emphasizes the polymicrobial nature of neck abscesses, consistent with literature indicating the diverse microbial landscape in such infections. [8, 9]

Age-Specific Patterns: The age-specific distribution of bacterial isolates reveals intriguing patterns. In the adult age group, Staphylococcus aureus remains predominant, consistent with the broader susceptibility of adults to this pathogen. [10] Notably, the heightened prevalence of Escherichia coli and Klebsiella species in adults underscores potential associations with adult-specific risk factors, possibly reflecting the influence of underlying conditions such as immunosuppression or anatomical variations. [11] In contrast, pediatric cases exhibit a higher prevalence of Streptococcus pyogenes, aligning with established age-related microbial differences and the propensity for this bacterium to cause soft tissue infections in younger populations. [12]

Comorbidities and Microbial Associations: The association between comorbidities and specific microbial isolates reveals valuable insights. Diabetes mellitus is a significant comorbidity, with Staphylococcus aureus and Streptococcus pyogenes being the most commonly isolated bacteria. This finding correlates with studies that have highlighted the increased susceptibility of diabetic individuals to soft tissue infections and the intricate interplay between diabetes and specific microbial pathogens. [13, 14]

Polymicrobial Infections: The prevalence of polymicrobial infections at 40% underscores the complex microbial interplay within neck abscesses. The most common combination involving Staphylococcus aureus and Streptococcus pyogenes aligns with previous studies, emphasizing the synergistic relationship between these pathogens. [15]

Clinical Outcomes: The overall clinical recovery rate of 90% is promising, suggesting the efficacy of current treatment strategies. However, the observed complications in 10% of cases, including one recurrent abscess requiring additional surgical intervention, emphasize the need for ongoing vigilance in managing neck abscesses. The mean hospital stay of 5.8 days aligns with typical expectations for abscess management, emphasizing the importance of timely and appropriate interventions. [16]

Limitations and Future Directions: This study acknowledges several limitations, including its retrospective design, limited sample size, and the potential for selection bias in a single-center setting. Future research endeavors should aim for more extensive, multicenter studies to enhance the generalizability of findings and explore additional factors influencing the microbiological profile of neck abscesses.

Conclusion

This study comprehensively explores the microbiological profile of neck abscesses, revealing insights into bacterial prevalence, age-specific patterns, comorbid associations, and clinical outcomes. These findings contribute to the foundation of knowledge guiding clinicians in effectively managing patients with neck abscesses.

Reference

1. Cambria F, Fusconi M, Candelori F, Galli M, Stanganelli FRF, Venuta F, Valentini V, de Vincentiis M. Surgical multidisciplinary approach in the management of odontogenic or non-odontogenic neck infections. Acta Otorhinolaryngol Ital. 2021 Apr;41(Suppl. 1): S138-S144.
2. Priyamvada S, Motwani G. A Study on Deep Neck Space Infections. Indian J Otolaryngol Head Neck Surg. 2019 Oct;71(Suppl 1):912-917.
3. Gao, W., Lin, Y., Yue, H. et al. Bacteriological analysis based on disease severity and clinical characteristics in patients with deep neck space abscess. BMC Infect Dis. 2022; 22: 280.
4. Chi TH, Tsao YH, Yuan CH. Influences of patient age on deep neck space infection: clinical etiology and treatment outcome. Otolaryngol Head Neck Surg. 2014;151(4):5 86–590.
5. Christian JM, Goddard AC, Gillespie MB, et al. Deep neck and odontogenic infection. In: Cummings CW, Flint PW, Haughey BH, et al., editors. Otolaryngology: head and neck surgery. 6. Philadelphia: Elsevier Saunders; 2015; 164–175.
6. Chambers HF. The changing epidemiology of Staphylococcus aureus? Emerg Infect Dis. 2001;7(2):178-182.
7. Moran GJ, Krishnadasan A, Gorwitz RJ, et al. Methicillin-resistant S. aureus infections among patients in the emergency department. N Engl J Med. 2006;355(7):666-674.
8. Brook I. Microbiology of abscesses of the head and neck in children. J Infect. 1983;7(3):201-207.
9. Broom J, Woods M, Allworth A, McCarthy J, Selvey L. Polymicrobial keratitis with Cryptococcus and Candida. Clin Exp Ophthalmol. 2006;34(1):79-80.
10. Bassetti M, Merelli M, Temperoni C, Astilean A. New antibiotics for bad bugs: where are we? Ann Clin Microbiol Antimicrob. 2013;12: 22.
11. Russo TA, Johnson JR. Medical and economic impact of extraintestinal infections due to Escherichia coli: focus on an increasingly important endemic problem. Microbes Infect. 2003; 5(5): 449-456.
12. Tanz RR, Shulman ST, Barthel MJ, Willert C, Yogev R. Penicillin plus rifampin eradicates pharyngeal carriage of group A streptococci. J Pediatr. 1985;106(5):876-880.
13. Lipsky BA, Weigelt JA, Gupta V, et al. Skin, soft tissue, bone, and joint infections in hospitalized patients: epidemiology and microbiological, clinical, and economic outcomes. Infect Control Hosp Epidemiol. 2007;28(11):12 90-1298.
14. Schaper NC, Apelqvist J, Bakker K. The international consensus and practical guidelines on the management and prevention of the diabetic foot. Curr Diab Rep. 2003;3(6):475-479.
15. Brook I. Microbiology and management of polymicrobial cutaneous and soft tissue abscesses. Int J Dermatol. 2005;44(5):380-386.
16. Mathew J, Addai T, Anand A, et al. Clinical features, site of involvement, bacteriologic findings, and outcome of infective endocarditis in intravenous drug users. Arch Intern Med. 1995; 155(15):1641-1648.