Research Article

Prevalence and Antimicrobial Resistance of Deep Neck Space Infections (DNSIs) in Patients at Combined Military Hospital (CMH), Muzaffarabad, Azad Jammu & Kashmir

Muzaffar Mahmood Khan[1], Saima Saeed[2], Maryum Riaz[1], Tehniat Ghias[1], Tayyeba Sarfraz[1], Syed Saad Hussain[*,3]

[1]*ENT Department, Sheikh Khalifa Bin Zayed AL Nahyan Hospital, CMH Muzaffarabad, Azad Jammu & Kashmir.*
[2]*Department of Medical Education, Sheikh Khalifa Bin Zayed AL Nahyan Hospital,CMH Muzaffarabad, Azad Jammu & Kashmir.*
[3]*Faculty of Pharmacy, Iqra University North Campus, Karachi, Pakistan.*

Abstract: Background: Deep neck infections are one of the major threats for cellulitis and abscess in the head and neck region which may have various origins. Therefore, it is required to have microbes identified and anti-microbial sensitivity to be established which may lead to better therapeutic decisions and patient outcomes.

Objective: This study aimed to determine the clinical presentation, the bacterial agents involved, and the antimicrobial sensitivity patterns of microorganisms associated with DNSI in our hospital patients.

Materials and Methods: A cross-sectional study was conducted at the ENT department of Combined Military Hospital, Muzaffarabad, from April to October 2022 (Ethical Approval No. DME-469). The 115 patients, aged between 18 and 60 years, who were of DNSI, were included in the study. Data collection involved detailed patient history, a physical examination, a microbiological study of pus, and a CT scan. In terms of the data analysis, SPSS was utilized.

Result: Mean age of patients included were 39.8 ± 12.1 years with male to female ration being 1.6:1. Symptoms that were most frequently reported in the cases with dysphagia (29.6%) and sore throat (29.6%). The preferred site of abscess formation was the parapharynx (38.3%). *Streptococci* were the predominant isolates (40%) to be recovered from the patients, followed by *anaerobes* (30.4%) and *Staphylococci* (29.6%). The isolates were highly susceptible to the combination of amoxicillin/clavulanic acid and chloramphenicol.

Conclusion: This study emphasizes that Streptococcus is the most frequently encountered pathogen for DNSI and therefore, early diagnosis and targeted antibiotic therapy of DNSI are very important. It is recommended to use the empirical treatment of amoxicillin/clavulanic acid or chloramphenicol.

Keywords: Deep neck space infection, Antimicrobial susceptibility, Submandibular abscess, Odontogenic infections, Amoxicillin/Clavulanic acid therapy, Chloramphenicol, Cellulitis.

INTRODUCTION

DNSI or Deep Neck Space Infection is a potential threat within the head and neck region that can result in the formation of abscesses or cellulitis even though it consists of various spaces and anatomical planes. These fascial spaces consist of at least 11 deep spaces that are possibly involved in the infection process [1, 2]. These spaces can be classified based on the proximity of the hyoid bone: above the hyoid level (peritonsillar, submandibular, parapharyngeal, buccal, parotid, and masticatory/temporal spaces), around the hyoid (retropharyngeal, danger, prevertebral, and carotid spaces), and finally, the anterior or peritracheal visceral space, which is located below the hyoid bone [2].

DNSIs are bacterial infections that have their primary origin in the upper aerodigestive tract [3]. These infections subsequently infect the deep neck spaces [4]. In any case, the most common primary sources of DNSI in terms of dental issues, tonsillitis, salivary gland infections, foreign bodies, and malignancies. Infections occur after the patients had such conditions as dental caries, tonsillitis, pharyngitis, head or neck trauma, or intravenous drug use. In Pakistan there is no comprehensive study that is related to our population whereas studies in different hospital have been reported which is limited to hospital-based data for the study [5, 6]. Moreover, for county wise data Latin American and Caribbean nations were mentioned in studies as countries where infections in the oral and maxillofacial area, odontogenic ones primarily, the two of the leading infections, were found. Before the antibiotic era, tonsillar or peritonsillar infections accounted for 70% of DNSI cases, but now it differs in that the most common dental infections are the main cause [7-9]. Although in this antibiotic therapeutic era, complications due in the DNSI are very rarely found but nonetheless these infections leading to complication cannot be ruled out [10]. Potentially DNSI complications can lead to airway compromise, descending mediastinitis, septicemia and involvement of vascular structures [11].

* Address correspondence to this author at the Faculty of Pharmacy, Iqra University North Campus, Karachi, Pakistan.
Email: saad.hussain@iunc.edu.pk

DNS are usually polymicrobial in nature wherein common pathogens are *Streptococci*, Pepto *streptococcus species*, *Staphylococcus aureus*, and *anaerobes* [12, 13]. The clinical manifestations of DNS infections differ by the site of infection but commonly involve pain, fever, malaise, fatigue, swelling, odynophagia, dysphagia, trismus, dysphonia, otalgia, and dyspnea [14].

The treatment of DNSI involves antibiotic therapy, airway management, and surgical intervention [15]. Traditional management includes prompt surgical drainage of the abscess followed by antibiotics or non-surgical treatment using adequate antibiotics in cases of cellulitis [16]. Early diagnosis and timely management are crucial in treating the condition effectively and making sure of no complications during the whole recovery period [17]. In this regard, otorhinolaryngologists are called to possess in-depth knowledge of the clinical presentation, etiology, diagnostic approaches, and access to the necessary medical and surgical treatments.

The main objective of this research was to analyze the clinical features present in patients, the types of bacteria, and the responsiveness of the selected antibiotics for the microbes causing DNSIs.

MATERIALS AND METHODS

The study involved a cross-sectional survey which was carried out at the ENT department of Combined Military Hospital (CMH), Muzaffarabad, AJ&K. The analysis was done over a span from April 2022 to October 2022 which is a duration of 6 months. The study included patients of both genders aged 18-60 years, who were confirmed diagnosis of having DNSI whereas patients having pus-leaking wounds, pregnant women, and a history of tubercular infection were excluded from the study. Patients were having symptoms of airway obstruction, trismus plus DNSI were confirmed through CT scan where rim enhancement was found. The results of 115 patients were calculated using a 95% confidence level and an 8% margin of error by considering the expected prevalence of salivary gland DNSI as 13.33% [18]. Non-probability consecutive sampling was used for patient inclusion.

Data was collected from 115 in-patients meeting the inclusion criteria after obtaining approval from the ethical review committee of Sheikh Khalifa Bin Zayed AL Nahyan Hospital CMH Muzaffarabad, Azad Jammu & Kashmir (approval no. DME-469), and informed consent was done. Using a single disposable syringe sample was collected from the respective patients and microbiological analysis was done through culture sensitivity using Kirby-Bauer method as well as Zn stain testing from which results were accompanied and bacterial isolates were identified. CT scans were done where necessary. All patients received antibiotic therapy based on the culture and sensitivity results.

STATISTICAL ANALYSIS

Data was entered and analyzed using SPSS version 21.0. Numerical variables, such as age and infection duration, were presented as mean ± SD. Categorical variables including gender, smoking history, DNSI, presenting symptoms, occupation, microorganism types and antimicrobial sensitivity were presented as frequencies and percentages. Stratified analysis was performed based on age, gender, infection duration, symptoms, smoking history, and occupation. Descriptive data was assessed and collated to study the prevalence of different types of DNSI.

RESULT

A total of 115 DNSI patients were evaluated in the study. The patients had a mean age of 39.8 ± 12.1 years, with ages ranging from 18 years to 60 years. Among the study population, 71 (61.7%) were men and 44 (38.3%) were women, giving a male-to-female ratio of 1.6:1. Dysphagia and sore throat were the most commonly reported symptoms, which each occurred in 34 (29.6%) patients, followed by airway obstruction in 24 (20.8%) patients and otalgia in 23 (20.0%) patients. Symptom duration varied from 3 to 10 days, with an average of 6.4 ± 2.3 days. The majority of the patients, 36 (31.3%), were smokers. Regarding occupation, 44 (38.2%) were unemployed, 40 (34.8%) laborers, and 31 (27.0%) were self-employed.

Between the different types of deep neck space infections, the parapharyngeal abscess was the most prevalent, occurring in 44 (38.3%) patients. Next, the submandibular abscess with 29 (25.2%) patients, retropharyngeal abscess with 23 (20.0%) patients, and peritonsillar abscess with 19 (16.5%) patients followed. The distribution of abscesses with regard to the variables studied such as age, gender, symptoms, the duration of these symptoms, smoking, and occupation is displayed in Table **1**. The different organisms isolated and their sensitivity profiles of

Table 1. Stratification of Abscess Location among Study Variables.

Variables		Abscess Location							
		Parapharyngeal Abscess		*Submandibular Abscess*		*Retropharyngeal Abscess*		*Peritonsillar Abscess*	
		n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Age (years)	< 40	22	37.9	15	25.9	12	20.7	9	15.5
	≥ 40	22	38.6	14	24.6	11	19.3	10	17.5
Gender	Male	27	38.0	18	25.4	14	19.7	12	16.9
	Female	17	38.6	11	25.0	9	20.5	7	15.9

Continue

Continue

Symptoms	Dysphagia	13	38.2	8	23.5	7	20.6	6	17.6
	Sore throat	13	38.2	9	26.5	7	20.6	5	14.7
	Otalgia	9	39.1	6	26.1	4	17.4	4	17.4
	Airway obstruction	9	37.5	6	25.0	5	20.8	4	16.7
Symptoms duration (months)	< 1 week	25	38.5	16	24.6	13	20.0	11	16.9
	≥ 1 week	19	38.0	13	26.0	10	20.0	8	16.0
Smoker	Yes	14	38.9	9	25.0	8	22.2	5	13.9
	No	30	38.0	20	25.3	15	19.0	14	17.7
Occupation	Jobless	17	38.6	11	25.0	9	20.5	7	15.9
	Laborer	15	37.5	10	25.0	8	20.0	7	17.5
	Self-employed	12	38.7	8	25.8	6	19.4	5	16.1

antibiotics are shown in Fig. (**1**). The summary of both the organisms and their susceptibility to various antibiotics according to study variables can be found in Table **2** and **3**.

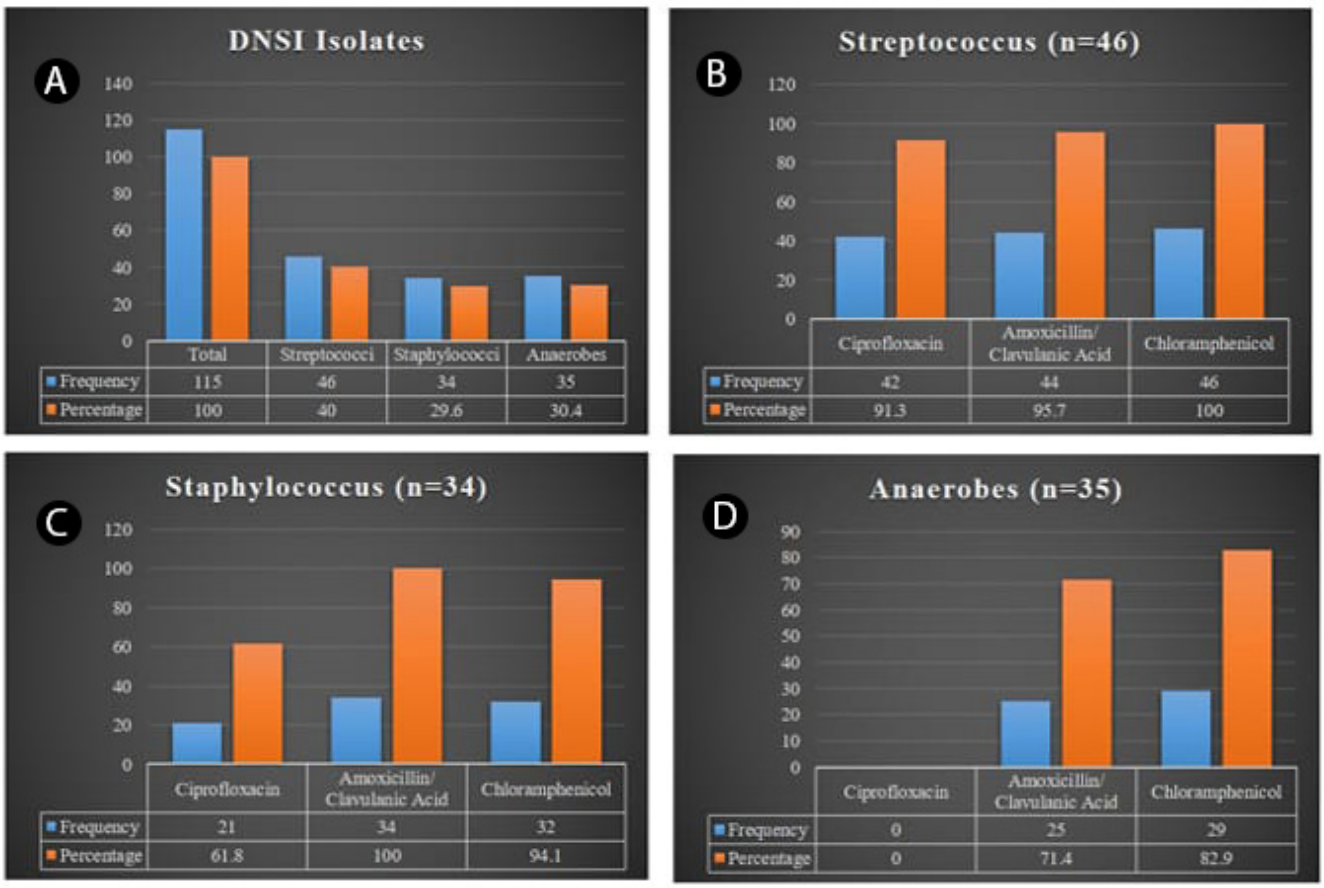

Fig. (1). A) Prevalence of microorganisms isolated from DNSI patients and their antibiotic. susceptibility. Total isolates: 115 (Streptococcus: 46, Staphylococcus: 34, *Anaerobes*: 35).

B) ***Streptococcus:*** Ciprofloxacin 91.3%, Amoxicillin/Clavulanic Acid 95.7%, Chloramphenicol 100%.

C) ***Staphylococcus*****:** Ciprofloxacin 61.8%, Amoxicillin/Clavulanic Acid 100%, Chloramphenicol 94.1%.

D) ***Anaerobes:*** Ciprofloxacin 0%, Amoxicillin/Clavulanic Acid 71.4%, Chloramphenicol 82.9%.

Table 2. Stratification of Organisms across Study Variables of Patients with DNSI.

Variables		Organisms					
		Streptococci		***Staphylococci***		***Anaerobes***	
		n	**%**	**n**	**%**	**n**	**%**
Age (years)	< 40	23	39.7	17	29.3	18	31.0
	≥ 40	23	40.4	17	29.8	17	29.8
Gender	Male	28	39.4	21	29.6	22	31.0
	Female	18	40.9	13	29.5	13	29.5
Symptoms	Dysphagia	14	41.2	10	29.4	10	29.4
	Sore throat	13	38.2	10	29.4	11	32.4
	Otalgia	9	39.1	7	30.4	7	30.4
	Airway obstruction	10	41.7	7	29.2	7	29.2
Symptoms duration (months)	< 1 week	26	40.0	19	29.2	20	30.8
	≥ 1 week	20	40.0	15	30.0	15	30.0
Smoker	Yes	15	41.7	10	27.8	11	30.6
	No	31	39.2	24	30.4	24	30.4
Occupation	Jobless	18	40.9	13	29.5	13	29.5
	Laborer	16	40.0	12	30.0	12	30.0
	Self-employed	12	38.7	9	29.0	10	32.3

Table 3. Susceptibility of Various Isolates to Antibiotics in Patients with DNSI.

Variables		***Streptococci***				***Staphylococci***				***Anaerobes***			
		Ciproflox-acin		**Amoxicil-lin/ Clavu-lanic Acid**		**Ciproflox-acin**		**Chloram-phenicol**		**Amox-icillin/ Clavulanic Acid**		**Chloram-phenicol**	
		n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Age (years)	< 40	21	91.3	22	95.7	10	58.8	16	94.1	13	72.2	15	83.3
	≥ 40	21	91.3	22	95.7	11	64.7	16	94.1	12	70.6	14	82.4
Gender	Male	26	92.9	27	96.4	13	61.9	20	95.2	16	72.7	18	81.8
	Female	16	88.9	17	94.4	8	61.5	12	92.3	9	69.2	11	84.6
Symptoms	Dysphagia	11	78.6	13	92.9	6	60.0	9	90.0	7	70.0	8	80.0
	Sore throat	13	100	12	92.3	6	60.0	10	100	8	72.7	9	81.8
	Otalgia	8	88.9	9	100	5	71.4	7	100	5	71.4	6	85.7
	Airway obstruction	10	100	10	100	4	57.1	6	85.7	5	71.4	6	85.7
Symptoms duration (months)	< 1 week	24	92.3	25	96.2	13	68.4	18	94.7	14	70.0	16	80.0
	≥ 1 week	18	90.0	19	95.0	8	53.3	14	93.3	11	73.3	13	86.7
Smoker	Yes	13	86.7	14	93.3	7	70.0	9	90.0	8	72.7	9	81.8
	No	29	93.5	30	96.8	14	58.3	23	95.8	17	70.8	20	83.3
Occupation	Jobless	16	88.9	17	94.4	8	61.5	12	92.3	10	76.9	11	84.6
	Laborer	14	87.5	15	93.8	7	58.3	11	91.7	8	66.7	10	83.3
	Self-employed	12	100	12	100	6	66.7	9	100	7	70.0	8	80.0

DISCUSSION

Large usage of antibiotics has significantly decreased DNSIs but they still remain a key clinical issue, difficult enough to be highlighted. This is the significant unrest in the ear case that even the evolution of antimicrobial therapies is still the vital element of DNSI diagnosis and management, which is the thoracic specialists. Evaluation of various factors related to life-threatening conditions in DNSI patients is very important to ensure timely intervention.

In this research, the majority of patients were in the fourth decades, which is consistent with the observations made by Kataria *et al.* [19]. Also, our study found that males had more prevalence, consistent with other studies that highlighted the higher incidence of DNSIs in males, with 42 (55.26%) male patients, 34 (44.73%) female patients, hence the male-to-female ratio of 1.23 which is corroborating with the results reported by Adoviča *et al.* [20].

The most common type of DNSI diagnosed in our research was parapharyngeal abscess (38.3%). The other ones were submandibular abscess (25.2%), retropharyngeal abscess (20.0%), and peritonsillar abscess (16.5%). Our study findings were different from Almutairi *et al.* observations that recorded peritonsillar abscess (30.6%) with submandibular and parapharyngeal abscesses being 18.6% and 16.5% respectively [21].

From a microbiological perspective, the study reported *streptococci* as the most commonly isolated pathogens (40.0%) followed by *anaerobes* (30.4%) and *staphylococci* (29.6%). These results corroborate the studies conducted by Motega *et al.* and Nabawanga *et al.* as the microbes that were identified most commonly were Streptococcus spp. followed by Staphylococcus and *anaerobic* bacteria [22, 23].

In the case of antibiotic susceptibility, it was noted that chloramphenicol was the sole source of aid for all Streptococcus isolates and amoxicillin/clavulanic acid presented the best option for the Staphylococcus ones. Moreover, 91.3% of Streptococcus and 61.8% of Staphylococcus species were found to be susceptible to ciprofloxacin, along with 95.7% of Streptococcus and 71.4% of *anaerobic* species being sensitive to amoxicillin/clavulanic acid. Also, in parallel, it follows that 94.1% of Staphylococcus and 82.9% of *anaerobic* isolates were sensitive to chloramphenicol. Although there is a lack of data on the susceptibility patterns of DNSI pathogens, some studies have been done by Saiemaldhar *et al.* and Rahman *et al.* which described various sensitivity patterns for ciprofloxacin and amoxicillin/clavulanic acid in their respective studies [24, 25].

This study, as the first of its kind in the local Muzaffarabad AJ&K is a great study with impeccable facts that relate a lot to DNSIs and their management strategies. This study shows the importance for the doctors to rule out the cases of parapharyngeal and submandibular abscesses in patients with neck pain, fever, and problems in swallowing. The identification of Streptococcus as the most frequently isolated pathogen also stresses the need for empirical antibiotic therapy targeting this organism with amoxicillin/ clavulanic acid or chloramphenicol as the first line of treatment. The difference in the prevalence of DNSI are reported also due to socioeconomic patterns of the population which we have not found to be significant in our study [26].

LIMITATIONS AND RECOMMENDATIONS

There are some limitations to this study. The fact that it was carried out at a single center is a limiting factor for the application of the results in dissimilar groups of patients with a different microbial spectrum of infections in similar scenarios outside of the institutions. Furthermore, this research did not look at a variety of treatments outcomes concerning the DNSIs, which could have given a more diversified conclusion. It is, therefore, recommended that future research that addresses these limitations should be initiated for a better understanding and management of DNSI.

CONCLUSION

This study pointed out the larger presence of parapharyngeal and submandibular abscesses and also pointed out that Streptococcus is the most frequently isolated pathogen. It emphasizes the need of diagnosing early and using empiric antibiotic therapy directed to Streptococcus with treatments being the preferred ones amoxicillin/clavulanic acid or chloramphenicol. It is suggested to conduct further research with a greater number of respondents and a variety of patient populations to improve the knowledge and management of DNSIs.

AUTHORS' CONTRIBUTION

Muzaffar Mahmood Khan: Study design, Writing draft.

Saima Saeed: Conceptualization, Study design, Methodology, Data analysis and interpretation, Writing draft.

Maryum Riaz: Study design, Methodology, Data analysis and interpretation.

Tehniat Ghias: Writing draft, Critical review and revision the manuscript.

Tayyeba Sarfraz: Writing draft, Critical review and revision the manuscript, Final approval, final proof to be published.

Syed Saad Hussain: Critical review and revision the manuscript, Final approval, final proof to be published.

ACKNOWLEDGEMENTS

Declared none.

ETHICAL DECLARATIONS

Data Availability Statement

Data are available upon reasonable request. The data used to

support the findings of this study are available from the corresponding author upon request.

Ethical Approval

Ethical approval for this study was granted by the Ethical Committee of the Institute of Sheikh Khalifa Bin Zayed AL Nahyan Hospital, CMH Muzaffarabad, Azad Jammu & Kashmir (approval no. DME-469).

Consent to Participate

Informed consented.

Consent for Publication

Consented.

Conflict of Interest

Declared none.

Competing Interest/Funding

Declared none.

Use of AI-Assisted Technologies

The authors declare that no generative artificial intelligence (AI) or AI-assisted technologies were utilized in the writing of this manuscript, in the creation of images/graphics/tables/captions, or in any other aspect of its preparation.

REFERENCES

[1] Wang LF, Kuo WR, Tsai SM, Huang KJ. Characterizations of life-threatening deep cervical space infections: A review of one hundred ninety-six cases. Am J Otolaryngol 2003; 24(2): 111-7.

[2] Vieira F, Allen SM, Stocks RM, Thompson JW. Deep neck infection. Otolaryngol Clin North Am 2008; 41(3): 459-83.

[3] Kataria G, Saxena A, Bhagat S, Singh B, Kaur M, Kaur G. Deep neck space infections: A study of 76 cases. Iran J Otorhinolaryngol 2015; 27(81): 293-9.

[4] Wong TY. A nationwide survey of deaths from oral and maxillofacial infections: the Taiwanese experience. J Oral Maxillofac Surg 1999; 57(11): 1297-9.

[5] Mumtaz R, Arain A, Suhail A, Rajput S, Adeel M, Hassan N. Deep neck space infections; retrospective review of 46 patients. J Cranio Max Dis 2014; 3(1): 21-5.

[6] Ilyas M, Iftikhar M, Iqbal M, Dastagir G, Hussain S, Khan Nu. Deep neck space infections a retrospective study. Pak Postgrad Med J 2017; 28(2): 61-4.

[7] Wong TY. A nationwide survey of deaths from oral and maxillofacial infections: The Taiwanese experience. J Oral Maxillofac Surg 1999; 57(11): 1297-9.

[8] Har-El G, Aroesty JH, Shaha A, Lucente FE. Changing trends in deep neck abscess. A retrospective study of 110 patients. Oral Surg Oral Med Oral Pathol 1994; 77(5): 446-50.

[9] Parhiscar A, Har-El G. Deep neck abscess: A retrospective review of 210 cases. Ann Otol Rhinol Laryngol 2001; 110(11): 1051-4.

[10] Dalla Torre D, Brunold S, Kisielewsky I, Kloss FR, Burtscher D. Life-threatening complications of deep neck space infections. Wiener Klinische Wochenschrift 2013; 125(21-22): 680-6.

[11] Jin L, Chang Y, Zhao Y, Fan K, Lu J, Wang Y, *et al.* Clinical features of severe deep neck space infection: Five clinical cases and our experience in their management. Open Access Emerg Med 2024; 16: 257-66.

[12] Huang TT, Liu TC, Chen PR, Tseng FY, Yeh TH, Chen YS. Deep neck infection: Analysis of 185 cases. Head Neck 2004; 26(10): 854-60.

[13] Celakovsky P, Kalfert D, Smatanova K, Tucek L, Cermakova E, Mejzlik J, *et al.* Bacteriology of deep neck infections: analysis of 634 patients. Aust Dent J 2015; 60(2): 212-5.

[14] Hasegawa J, Hidaka H, Tateda M, Kudo T, Sagai S, Miyazaki M, *et al.* An analysis of clinical risk factors of deep neck infection. Auris Nasus Larynx 2011; 38(1): 101-7.

[15] Priyamvada S, Motwani G. A study on deep neck space infections. Indian J Otolaryngol Head Neck Surg 2019; 71(Suppl 1): 912-7.

[16] Plaza Mayor G, Martínez-San Millán J, Martínez-Vidal A. Is conservative treatment of deep neck space infections appropriate? Head Neck 2001; 23(2): 126-33.

[17] Motahari SJ, Poormoosa R, Nikkhah M, Bahari M, Shirazy SM, Khavarinejad F. Treatment and prognosis of deep neck infections. Indian J Otolaryngol Head Neck Surg 2015; 67: 134-7.

[18] Gujrathi AB, Ambulgekar V, Kathait P. Deep neck space infection-A retrospective study of 270 cases at tertiary care center. World J Otorhinolaryngol Head Neck Surg 2016; 2(04): 208-13.

[19] Kataria G, Saxena A, Bhagat S, Singh B, Goyal I, Vijayvergia S, *et al.* Prevalence of odontogenic deep neck space infections (DNSI): A retrospective analysis of 76 cases of DNSI. Int J Otorhinolaryngol Head Neck Surg 2015; 1(1): 11-6.

[20] Adoviča A, Veidere L, Ronis M, Sumeraga G. Deep neck infections: Review of 263 cases. Polish J Otolaryngol 2017; 71(5): 37-42.

[21] Almutairi DM, Alqahtani RM, Alshareef N, Alghamdi YS, Al-Hakami HA, Algarni M. Deep neck space infections: A retrospective study of 183 cases at a tertiary hospital. Cureus 2020; 12(2): e6841.

[22] Motega E, Moshy J, Rugarabamu S, Sohal K, Owibingire S. The clinico-microbiological pattern of orofacial space infections in patients attending a tertiary hospital in Tanzania. Int Med 2020; 2(6): 352.

[23] Nabawanga S, Hidour R, Kajumbula H, Namwagala J, Matsiko S, Muhereza B, *et al.* Deep neck space infections among patients attending a tertiary Ugandan hospital: Clinical presentation, bacterial etiology and antimicrobial susceptibility. Int J Otorhinolaryngol Head Neck Surg 2024; 10(4): 374-80.

[24] Saiemialdhar DM, Shukri DK, Banasser FM, Albalbisi L. Antibiotic sensitivities pattern in clinical management of maxillofacial odontogenic infection. J Dent Health Oral Disord Ther 2020; 11(6): 187-92.

[25] Rahman MM, Begum M, Khan MM, Anwar MM. Antibiotic sensitivity pattern in neck space infection. Chattagram Maa-O-Shishu Hosp Med Coll J 2020; 19(2): 28-31.0

[26] Barber BR, Dziegielewski PT, Biron VL, Ma A, Seikaly H. Factors associated with severe deep neck space infections: targeting multiple fronts. J Otolaryngol Head Neck Surg 2014; 43(1): 35.

Received: April 12, 2024 Revised: May 27, 2025 Accepted: May 27, 2025

© 2025. The Authors, National Journal of Health Sciences.
This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY- NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non- commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/.