

PATTERN OF DEEP NECK SPACE INFECTIONS AT A TERTIARY HOSPITAL, KATHMANDU, NEPAL

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ABSTRACT

Deep neck space infection is characterized by infections of the deep neck space either in the form of abscess or cellulitis. Common infective conditions like aero-digestive tract infections like tonsillitis, pharyngitis and dental infections can lead to infection of the deep neck spaces. This can prove fatal in the form of acute respiratory obstruction, descending mediastinitis and septic shock. This was a descriptive cross-sectional study conducted in Department of Otorhinolaryngology in Nepal Medical College from July 2017 to June 2019. All the patients diagnosed as deep neck abscess were enrolled in the study and pus was collected and sent for gram stain and culture and sensitivity. Out of 87 patients, 50 were females and 37 males. The mean age was 24.2 years. Peritonsillar abscess was the commonest space involved followed by submandibular abscess and Ludwig's angina (36.8%, 24.1% and 11.5%). Upper respiratory tract infections (32.2%) and dental caries (27.6%) were the commonest source of infection. Empyema thoracis was seen as a complication in a patient of Ludwig's angina. Growth in the sample accounted for 33.3%. The commonest organism found was Coagulase negative *Staphylococcus* (10.3%), followed by *Mycobacterium tuberculosis* (6.9%), *Staphylococcus aureus* (4.6%), *Enterococcus* species (3.4%) and methicillin-resistant *S. aureus* (3.4%) respectively. The growth between the culture with or without previous antibiotic exposure were statistically significant (p-value-0.04) which suggest that inadvertent use of antibiotics lead to difficulty in identifying causative organism. Deep neck abscess is a dreadful condition, therefore proper knowledge, early detection and timely intervention of the disease can prevent complications.

KEYWORDS

Deep neck space, infection, micro-organisms.

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INTRODUCTION

Deep neck space infection (DNSI) is characterized by infection in the potential spaces and fascial planes of the neck either with abscess formation or cellulitis.¹ Any bacterial infection originating from the upper aerodigestive tract and head and neck region like tonsillitis, dental caries, sialoadenitis, vestibulitis, otitis externa, otitis media can be complicated with inflammation and suppuration of deep neck spaces.² The commonest cause is dental infection followed by suppurative lymphadenitis.³⁻⁶ In most instances, these conditions resolve without surgical intervention. However, at times it can lead to life threatening conditions like acute airway obstruction, jugular venous thrombosis, pneumonia, descending mediastinitis, pericarditis and empyema thoracis despite widespread use of antibiotics.⁷ DNSI is usually multibacterial in etiology. *Streptococcus viridans* is the commonest organism isolated followed by *Staphylococcus* spp. and *Klebsiella pneumoniae*.⁸ Submandibular space is the commonest space to be affected.⁹ The presence of co-morbid conditions like diabetes mellitus, fistulas, cysts, HIV infection and immunosuppression attribute to formation of abscess. Lack of health education, unawareness of health, unreachable health system, lower socio-economic conditions and improper dispensation of drugs contribute to late presentation with complications like necrotizing fasciitis, respiratory distress and septic shock. Therefore, detail knowledge of the disease is necessary for early detection, proper management and prevention of complications. This study aimed to see the patterns of DNSI in terms of demography, frequency of involvement of different neck spaces and the commonest causative organisms.

MATERIALS AND METHODS

This was a descriptive cross-sectional study done in the Department of Otorhinolaryngology and Head & Neck Surgery in Nepal Medical College Teaching Hospital from July 2017 to June 2019. Ethical clearance was taken from Institutional Review Committee prior to the study. Sample size was calculated to be 87. All the patients with clinical as well as radiological diagnosis of deep neck space infection were included. Post-surgical abscesses and abscesses in malignancy were excluded. The pus was collected under aseptic condition either by aspiration or by incision and drainage. Patient was given general anaesthesia whenever necessary. The sample was sent for gram staining and culture and sensitivity. Zeihl Neelson staining was done in suspicious cases of tuberculosis. Patient was started with empirical

antibiotic therapy of ceftriaxone and if required, later changed according to the sensitivity report. Statistical analysis was done using SPSS 17. Chi-square test was used and p-value <0.05 was considered significant.

RESULTS

Out of 87 patients, 57.5% were female and 42.5% were male. Their ages ranged from 1 to 82 years with a mean age of 24.2 years. Most patients were between 20-29 years of age accounting for 28.7% of all cases.

Table 1: Age distribution

Age group (years)	n	%
0-9	19	21.8
10-19	17	19.5
20-29	25	28.7
30-39	9	10.3
40-49	10	11.5
50-59	2	2.3
60-69	3	3.4
70-79	1	1.1
80-89	1	1.1
Total	87	100.0

The most common deep neck space involved was peritonsillar space (36.8%) followed by submandibular space (24.1%) and Ludwig's angina (11.5%). Majority of the patients needed surgical intervention accounting for 95.4%.

Table 2: Frequency of different deep neck abscesses

Types	n	%
Peritonsillar abscess	32	36.8
Submandibular abscess	21	24.1
Ludwig's angina	10	11.5
Posterior neck abscess	9	10.3
Infra-auricular abscess	5	5.7
Parotid abscess	3	3.4
Submental abscess	2	2.3
Submandibular and periparotid abscess	2	2.3
Submandibular and submental abscess	1	1.1
Periparotid abscess	1	1.1
Postauricular abscess	1	1.1
Total	87	100.0

Most of the abscesses had upper respiratory tract infections (28; 32.2%) and dental caries (24; 27.6%) as a predisposing factors. Skin infections and salivary gland infections were among others as seen in Table 3.

Table 3: Presence of predisposing factors

Predisposing factors	n	%
Unknown	29	33.3
URTI	28	32.2
Dental caries	24	27.6
Skin infection	2	2.3
Parotitis	1	1.1
Preauricular sinus	1	1.1
Sialolithiasis	1	1.1
Trauma	1	1.1
Total	87	100.0

Growth was seen in only 29 of 87 samples (33.3%). The most common organism found was *Coagulase-negative Staphylococcus* (CoNS) which was seen in 9 samples (10.3%). The second most common organism was *M. tuberculosis*, which was detected from clinically suspected cases of tuberculosis by Ziehl Neelson staining and was seen in 6 samples (6.9 %). *S. aureus* was seen in 4 samples (4.6%) followed by *Enterococcus* spp. and methicillin-resistant *S. aureus* (MRSA), which was 3 (3.4%) each.

Table 4: Growth Pattern

Organism	n	%
No growth	58	66.7
CoNS	9	10.3
<i>M. tuberculosis</i>	6	6.9
<i>S. aureus</i>	4	4.6
<i>Enterococcus</i> spp	3	3.4
MRSA	3	3.4
Normal flora	2	2.2
<i>Proteus mirabilis</i>	1	1.1
TB with CoNS	1	1.1
Total	87	100.0

Culture was negative in 58 samples (66.7%). This could be due to rampant use of improper antibiotic before seeking the treatment in the hospital which is a very common practice in our part of the world. The growth of an organism was also analyzed in relation with antibiotic usage before seeking treatment which was statistically significant in this study (p-value-0.04) (Table-5).

Table 5: Growth in culture media in relation to previous antibiotic use

Previous antibiotic use	Growth		Total
	No	Yes	
No	20	16	36
Yes	39	12	51
Total	59	28	87

p-value: 0.04 (Chi square test)

DISCUSSION

Deep neck abscess is a serious condition which can lead to severe complications and even death. It has no age or sex predilection but its incidence is estimated to be 9-12/100,000/year with increasing occurrence in children.^{16,17}

Our study has shown that the prevalence is higher in third decade of life with mean age of 24.2 years. Similar findings were reported by Brito *et al*¹⁰ and Eftekharian *et al*¹⁸ which showed mean age of 28.1 and 28.2 years respectively. However prevalence is higher in older patients in a study done by Huang *et al*.¹⁹ In a study by Kataria *et al*,⁵ more of the patients were in the third and fourth decades of life.

Our study has shown female preponderance in contrary to other studies.^{3,13,20,21} This might be due to carelessness and late presentation of the disease.

Peritonsillar space (36.8%) was the most common space involved in this study followed by submandibular space (24.1%) and Ludwig's angina (11.5%). The spaces involved in other studies were also similar but in different ratios. Ludwig's angina was the commonest abscess (28.94%), followed by peritonsillar abscess (23.68%) and submandibular abscess (18.42%) which was stated by Kataria *et al*⁵ and Varghese *et al*.²² Similarly, peritonsillar abscess and submandibular abscesses were the second and the third most common abscess in studies done by Parishchar *et al* and Stalfors *et al*.^{3,9}

Most of the patients needed surgical intervention except four patients who did well with intravenous antibiotics alone which was similar to the study done by Daramola *et al*¹ and Wang *et al*⁴ and Eftekharian *et al*.¹⁸ In contrast, Boscolo-Rizzo *et al* stated that almost two-third of the patients in his study were treated with antibiotics alone.²³

One of the patient developed a complication whose illness progressed from Ludwig's angina, multiple abscesses in the neck to empyema thoracic. Brito *et al* also found that descending mediastinitis was the commonest complication in multispace neck abscesses.¹⁰

Tracheostomy was done in the cases of Ludwig's angina in our study to alleviate the upper airway obstruction like in the studies by Brito *et al* and Har-El *et al.*^{10,24}

Most of the abscesses had upper respiratory tract infection (32.2%) and dental pathology (27.6%) as the origin of abscess in our study whereas dental focus was higher (37%) than upper aero-digestive tract infection (20%) in a study done by Coelho *et al*²⁵ and Sennes *et al.*²⁶

Diabetes mellitus was seen as an associated systemic disorder in our study which was similar to the other studies.^{3,19} Whereas cardiopulmonary diseases were more prevalent as a co-morbid condition in a study done by Kauffmann *et al.*²

The microbiology of the deep neck abscess varies with the space involved. Brook *et al*²⁷ and Dodds *et al*²⁸ stated that the spaces near oropharynx often yield normal flora from its indigenous area, where as the space that is distant from the oropharynx tend to grow organism indigenous

to the skin. Most of our culture yielded CoNS however in the study conducted by Jayagandhi *et al*, *K. pneumoniae* was the commonest organism followed by *Staphylococcus* spp.²¹ In another study done by Coticchia *et al*, *S. aureus* and Group A *Streptococcus* were found to be the common organisms.²⁹

Sixty-six percent of the sample did not yield any microorganism which might be due to random prescription of higher generation antibiotics before proper diagnosis and culture and sensitivity of the pus.

In conclusion, deep neck abscess is a dreaded disease due to its location and complication. It can occur in any age group and gender. Peritonsillar abscess is found to be the commonest space of involvement. The commonest isolate was CoNS. Upper respiratory tract infection was the most common predisposing factor for deep neck abscess. The antibiotic usage before presentation was found to have negative effect on the growth of organism and subsequent treatment.

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