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Deep Neck Space Infections in Northern Ghana

Theophilus Adjeso[1,2*], Mawutor Dzogbefia[3] and Edem Kojo Dzantor[4]

[1]Department of Eye, Ear, Nose and Throat, School of Medicine and Health Sciences, University for Development Studies, Tamale, Ghana.
[2]Department of Surgery, Ear, Nose and Throat Unit, Tamale Teaching Hospital, P. O. Box 16, Tamale, Ghana.
[3]Department of Ear, Nose and Throat, Komfo Anokye Teaching Hospital, P. O. Box 1934, Kumasi, Ghana.
[4]Department of Community Health and Family Medicine, School of Medicine and Health Sciences, University for Development Studies, Tamale, Ghana.

Authors' contributions

This work was carried out in collaboration among all authors. Author TA designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Author MD performed the critical review of the study and author EKD wrote the discussion, conclusion and abstract. All authors read and approved the final manuscript.

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ABSTRACT

Background: Deep neck space infections (DNSI) continue to pose a challenge due to its potentially lethal complications that can arise despite the reduced prevalence as a result of widespread antibiotic use and improved dental care. We conducted a review of our experience with DNSI at the Ear, Nose and Throat (ENT) Unit, Tamale Teaching Hospital (TTH).
Materials and Methods: We performed a retrospective analysis of patients hospitalized with a diagnosis DNSI at the ENT Unit, TTH from January 2013 to June 2020. Parameters analyzed included the age and sex distribution of patients, source of infection, sites involved, duration of admission and outcomes. Data analysis was done using SPSS version 20.0 (Chicago, IBM 2010).
Results: The study involved 135 cases of DNSIs with age range of 5 months to 76 years (35.7± 19.0 years). Majority of the DNSIs cases occurred within the third decade of life and slightly more

**Corresponding author: E-mail: tadjeso@uds.edu.gh;*

common among males (50.4%). The duration of hospital stays ranged from a day to 41 days (10.1± 8.2 days). Multi-space abscesses were the most common diagnosed DNSIs with odontogenic infections (63%) being the most common source of DNSIs. Majority (83.7%) of the patients were successfully treated with a mortality rate of 12.6%.

Conclusion: DNSIs was most common among males with patients in their third decade most affected. Odontogenic infections were the most common source of DNSI with multi-space abscesses being the most common presentation. Majority of the patients were treated successfully.

Keywords: Deep neck space; infections; TTH.

1. INTRODUCTION

Deep neck space infections are infections of the potential anatomic spaces and deep cervical fascial planes of the neck [1–3]. These infections can expand rapidly along the fascial planes leading to potentially fatal outcomes [4–6]. These include mediastinitis, jugular venous thrombosis, upper airway obstruction, septic shock, pneumonia and carotid artery blowout [2,3,6].

DSNIs are usually a polymicrobial infection with Streptococcal, Staphylococcal and Klebsiella species being the most commonly isolated microorganisms [7,8]. Several studies have reported dental infections as the most common source of DSNIs. Other sources included pharyngitis, tonsillitis, foreign bodies, salivary gland infections and instrumentations [1,3–5], [8,9].

The clinical presentations of DNSIs are dependent on the space involved, however, the most common clinical features are neck pain, neck swelling, difficulty breathing, odynophagia, dysphagia, fever, trismus and dysphonia [4,5,9].

The treatment of infections of the deep neck spaces can be quite challenging due to the complex anatomy, difficult access, proximity to important neurovascular structures and direct communication with adjacent spaces. The treatment protocol includes prompt airway management, resuscitation, intravenous antibiotics and surgery [9].

The global incidence of DNSIs has reduced remarkably due to the availability and use of antibiotic as well as improvement in oral hygiene. However, these infections continue to be a very common presentation in our environment [9].

Despite being one of the common conditions seen at our hospital there are no published reports from our centre, however there are few reports from Southern Ghana [10,11]. This study seeks to review our experience with DNSIs at the ENT Unit of the Tamale Teaching Hospital.

2. MATERIALS AND METHODS

TTH is the third largest tertiary hospital in Ghana situated in Tamale, Northern Region, with a bed capacity of 480 beds. The ENT Unit serves as the only referral facility for the five regions of the North Regions (Upper East, Upper West, North East, Savanna and Northern), with a catchment population of 4.3 million people.

A seven and half year review of all cases of DNSI in the ENT Unit, from January 2013 to June 2020 was conducted. The theatre records as well as the Admission and Death book were evaluated for age and sex of patients, source of infection, sites involved, duration of admission and outcome of interventions. Patients with incomplete records were excluded from the study.

All the patients received adequate airway management (including tracheostomy), resuscitation, intravenous antibiotics. The surgical management included incision and drainage, debridement, tooth extraction, skin grafting and/or flap coverage.

Statistical analysis of means, medians and standard deviation were done using SPSS version 20.0 (Chicago, IBM 2010).

3. RESULTS

A total of 135 cases of DNSIs were managed within the study period. The ages ranged from 5 months to 76 years with mean age of 35.7 years (± 19.0). The peak incidence of DNSIs occurred within the third

decade of life. The males were 68 (50.4) with a male to female ratio of approximately 1:1 (Table 1).

Table 1. Age group of DNSI patients

Age group (years)	Frequency	Percentage (%)
≤ 10	9	6.7
11-20	20	14.8
21-30	32	23.7
31-40	28	20.7
41-50	16	11.9
51-60	14	10.4
61-70	7	5.2
71-80	9	6.7
Total	**135**	**100**

The duration of hospital stay ranged from a day to 41 days with a mean duration of 10.1 (± 8.2) days. Multi-space abscesses, Ludwig's angina and retropharyngeal abscess were the most diagnosed DNSIs (Table 2).

Odontogenic infections (63%) was the most common source of deep neck space infection. Other sources of infection were unknown sources (27%), tonsillar infection (5%), fishbone infection (4%), and HIV infection (1%) (Fig. 1.)

Majority (83.7%) of the patients with DNSIs were successfully treated and discharged home including two who required treatment in the intensive care unit. Upper airway obstruction and septic shock were the most common complications following DNSIs. Four patients were referred to higher centres for further management with seventeen deaths (Table 2).

4. DISCUSSION

The study described our experience with DNSIs among 135 patients at the ENT Unit of the Tamale Teaching Hospital, Ghana. DNSIs cases are a common occurrence among both genders and among all ages of life. In this current study, however, we noted that males (50.4%) were relatively more affected, and the infections were most common among persons within their third decade of life. Our observation was consistent with Har-El et al. [12] and Gujrathi et al. [13] who equally reported that DNSIs were high among males and persons in their third decade of life. Similarly, Almutairi et al. [14] reported higher cases of DNSIs among males but majority of their cases were found among persons in their fourth decade. These observations continue to demonstrate that DNSIs are a threat to all walks of life and therefore targeted interventions such as good oral hygiene practices and early presentation at the hospital should be encouraged among all persons.

Table 2. Diagnosis, duration of hospital stay and treatment outcomes

Diagnosis	Frequency	Percentage (%)
Anterior Neck Abscess	3	2.2
Buccal Abscess	1	0.7
Ludwig's Angina	32	24.4
Multispace Abscess	67	49.6
Peritonsillar Abscess	8	5.9
Retropharyngeal Abscess	22	16.3
Submandibular Abscess	1	0.7
Total	135	100
Duration (days)		
≤ 1	14	10.4
2-7	55	40.7
8-14	41	30.4
15-28	20	14.8
≥ 29	5	3.7
Total	135	100
Treatment Outcomes		
Discharges	114	84.4
Deaths	17	12.6
Referrals	4	3.0
Total	135	100

The common DNSIs observed in our study were multi-space abscesses, Ludwig's angina, and retropharyngeal abscess with duration of hospital stay ranging from a day to 41 days. Multi-space abscesses were the most common presentation resulting from late reporting and use of herbal preparations in our locality. Previous studies including that of Kauffmann et al. [14] recorded about 46.1% multiple space involvement and 11.7% retropharyngeal abscesses among patients with DNSIs in a related study. Additionally, Almutairi et al. [15], found Ludwig's angina (7.7%) as one of the common presentations of DNSIs in a similar study.

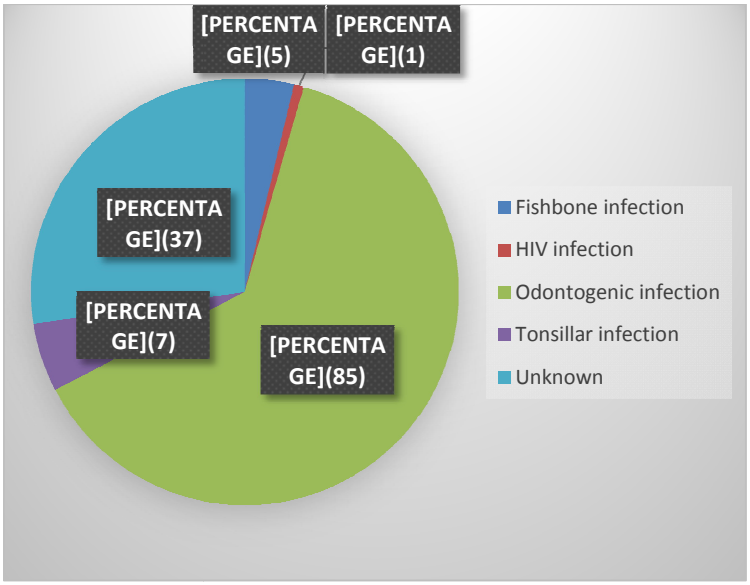

Fig. 1. Sources of infection

Though there are varying proportions of the common DNSIs from these studies, paralleled to our observation, it shows that DNSIs has common medical presentations irrespective of the region or locality. Similarly, Kauffmann et al. [15] observed prolonged hospital stay among patients with multiple space at average days of 23.6, which is higher than the average days spent by patients in the current study. The prolonged hospital stay in Kauffmann et al. [15] study might be attributed to the large number of patients with associated complications. Likewise, Maharaj et al. [1] noted in a similar study that the duration of hospital stay among patients with DNSIs ranged between a day to 67 days. It is important to stress that the duration of the hospital stay is dependent on the severity of the observed DNSIs and other co-morbidities [1,15].

Odontogenic infections (63%) was the most common source of deep neck space infection in our study. Our observation is relatively higher than Almutairi et al. [13] and Yang et al. [14] who reported approximately 42.6% and 12.3% odontogenic infections, respectively. The differences in the proportions can largely be attributed to the varying sample sizes used. Other sources of infection in this current study included about 27% unknown source, an observation which was also reported by Almutairi et al. [13] and Yang et al. [14] with proportions of 7.1% and 55.4%, respectively among patients with DNSIs. Similarly, tonsillar infection, and foreign body (fishbone) infection, were observed as sources of infections in this current study. These were equally reported by Velhonoja et al. [3] as the second and sixth common sources of infections among patients with DNSIs.

The most common complications observed among patients with DNSIs in this study included upper airway obstruction and septic shock which was consistent with other studies [2,15,14]. Majority of the patients in this study were successfully treated and discharged home with four referrals to other centers for advanced treatment not available in TTH and a 12.6% mortality rate mainly from overwhelming septic shock in patients with multi-space abscesses. Our observed mortality rate is relatively lower than the overall mortality rate (18.75%) reported by Ma et al. [2] but higher than the observation made by Yang et al. [14] with only one death (0.8%). Comparing our study to the other related studies, DNSIs significantly poses serious public health threat despite the increasing use of antibiotics and good oral hygiene practices. It therefore calls for concerted efforts by medical and public health practitioners to address the challenge of DNSIs.

The limitations of this study were mainly from the lack of bacteriology and co-morbidity data as well as the retrospective nature of our study.

5. CONCLUSION

Majority of the patients with DNSIs were in their third decade of life with males being most affected. Multi-space abscesses were the most common presentation with odontogenic infections being the most common source of infection with an average hospital stay of 10.1 (± 8.2) days. Upper airway obstruction was the common complication with majority been treated successfully and discharged.

The study showed that DNSIs remain life-threatening medical condition with a relatively substantial mortality rate in the Tamale Teaching Hospital ENT Unit. There is the need to pay close attention to the management and prevention of DNSIs in our study setting.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT AND ETHICAL APPROVAL

As per international standard or university standard guideline participant consent and ethical approval has been collected and preserved by the authors.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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