

RETROSPECTIVE ANALYSIS OF CLINICAL PRESENTATIONS AND MANAGEMENT OUTCOMES OF PATIENTS MANAGED FOR CERVICOFACIAL NECROTIZING FASCIITIS AT THE UNIVERSITY COLLEGE HOSPITAL, IBADAN

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ABSTRACT

Background: Cervicofacial necrotizing fasciitis is a rare, rapidly progressive and fatal polymicrobial necrotizing infection of the fascial and subcutaneous tissue of the head and neck resulting from the vascular thrombosis and ischemia within the fascial plane.

Aim: The aim of this study was to evaluate the clinical presentations and management outcomes of patients managed for cervicofacial necrotizing fasciitis at the University College Hospital, Ibadan.

Methods: The data of patients managed for cervicofacial necrotizing fasciitis between January 2018 and December 2023 were extracted from case notes obtained from the medical records. All patients were admitted and those with comorbidities were co-managed with the physicians. Antibiotics were administered empirically after samples for microbiology culture and sensitivity were taken. Patients had extraction of offending teeth, serial debridement and honey dressing until no visible sign of infection and wounds epithelized. SPSS was used for data analysis.

Results: During this period, seventeen patients with cervicofacial necrotizing fasciitis were managed. The male to female ratio was 1.8:1 with mean age of 57.65 (+17.674) years. Most (88.2%) of the patients were of low socio-economic status. Anaemia was the commonest underlying systemic condition while about half (47.1%) of the patients were diagnosed with diabetes mellitus. The only identified aetiology was odontogenic infection among all patients. Seventy-five percent of patients with diabetes presented with features of sepsis. The Chi-test test showed statistical significance association between the diagnosis of diabetes mellitus and sepsis at presentation ($P\text{-value}=0.030$). Submandibulocervical region was the commonest affected site and average hospital stay was 13.59 (+8.382) days. The major complication encountered was scar formation with no mortality recorded.

Conclusion: Cervicofacial necrotizing fasciitis is a rare but debilitating disease which is usually associated with poverty and presence of comorbidities. Its non-specific symptoms make late presentations common. Hence, the need for high index of suspicion for prompt management.

INTRODUCTION

Cervicofacial necrotizing fasciitis (CNF) is a rare, rapidly progressive and fatal polymicrobial necrotizing infection of the fascial layers and subcutaneous tissue of the head and neck region with potential to involve the overlying skin and underlying muscles.¹ Cervicofacial necrotizing fasciitis results from localized tissue necrosis due to vascular thrombosis and ischemic necrosis within the fascial plane.² Cervicofacial necrotizing fasciitis accounts for about 10% of cases of necrotizing soft

tissue infections affecting all parts of the body particularly in individuals with uncontrolled diabetes mellitus and other immunosuppressive conditions like HIV, malnutrition, chronic renal disease and chronic alcoholism.^{3,4} Though dental infection is the commonest cause of cervicofacial necrotizing fasciitis, infection secondary to orofacial trauma, salivary gland infections, peritonsillar infections, sinusitis have all been reported in literature.⁵ The group A beta-hemolytic

streptococci, staphylococci and obligate anaerobic bacteria have been reported as the major causative bacteria.⁶

Cervicofacial necrotizing fasciitis is associated with severe pain, rapidly progressive swelling, high grade fever, dishwater pus discharge and erythematous skin with or without necrosis. The presence of subcutaneous crepitus characteristic of subcutaneous emphysema is almost always diagnostic of cervicofacial necrotizing fasciitis. This could be established with clinical examination and radiological finding consistent with irregular linear bubbly dark areas within the fascial plane in a feathery pattern.^{7,8} However, prompt diagnosis could be challenging due to the rarity of CNF and its non-specific symptoms. Hence, a high index of suspicion is usually required especially at the early stages of the disease.

Cervicofacial necrotizing fasciitis is usually associated with comorbid conditions especially uncontrolled diabetes mellitus and it is diagnosed in up to 72% of individuals with CNF.⁹⁻¹¹ These individuals usually present with severe clinical symptoms including septic shock due to the disruption of host's immunologic mechanisms, poor wound healing and microvascular complications.⁹⁻¹¹ Therefore, early recognition, intervention as well as a multidisciplinary treatment approach involving the endocrinologists is usually indispensable to limit the morbidity or mortality of this condition.¹² The presence of uncontrolled diabetes mellitus, late presentation also affects clinical outcomes as it is associated with longer hospital stay and higher incidence of complications with about 30% mortality rate.^{13,14}

Most of the recent literature on cervicofacial necrotizing fasciitis among the Nigeria population consists of individual case reports or case series due to rarity of the disease and these do not adequately permit the understanding of the clinical presentation and management outcomes of the disease.¹⁵⁻¹⁸

Therefore, this study aims to evaluate the clinical presentations and management outcome of patients with cervicofacial necrotizing fasciitis who were managed at the University College Hospital, Ibadan over a five-year period. We hope that this study will contribute to the body of knowledge and provide an update on the clinical pattern and management outcomes of cervicofacial necrotizing fasciitis in Nigeria.

MATERIAL AND METHODS

This is a retrospective cross-sectional study. We collected sociodemographic and clinical data of all

patients managed for cervicofacial necrotizing fasciitis between January 2018 and December 2023 from the patients' case notes obtained from the medical records department of the University College Hospital, Ibadan.

Data on age, gender, socioeconomic status according to the Oyediji's classification¹⁹ and clinical parameters including duration of symptoms before presentation, history of treatment prior to presentation, and diagnosis of immunosuppressive conditions including diabetes mellitus and retroviral diseases were obtained. Evidence of sepsis at presentation, anaemia at presentation, source of infection from clinical evaluation and radiological investigations, site of infection, management approach, hospital stay of patients, complications and mortality rates were also obtained. All patients who were diagnosed with cervicofacial necrotizing fasciitis and have complete management records in their hospital case notes were included in the study. Also, all patients were admitted on the ward during management and followed up in the oral and maxillofacial surgery clinic after discharge. The diagnosis of cervicofacial necrotizing fasciitis was established by presence of ecchymotic skin changes, pain, subcutaneous crepitus or fascial necrosis with purulent dish-water discharge on surgical exploration²⁰ while the diagnosis of diabetes mellitus was made based on patients' history and laboratory investigation in accordance with the 2010 American Diabetes Association criteria.²¹ The 2010 American Diabetes Association criteria include a fasting plasma glucose level of > 126 mg per dL (6.99 mmol per Litre), two-hour plasma glucose level of >200 mg per dL (11.10 mmol per Litre) during an oral glucose tolerance test; or a random plasma glucose of 200 mg per dL in a patient with hyperglycemia or hyperglycemic symptoms and HbA1C level of >6.5%. Additionally, presence of sepsis was made at presentation based on the Systemic Inflammatory Response Syndrome (SIRS) criteria²² and assessment of anaemia was determined at presentation based on the haemoglobin concentration of each patient following a complete blood count report. A haemoglobin concentration between 13-17.5mg/dl was regarded as normal, while a haemoglobin concentration between 10-12mg/dl, 8-9.9mg/dl, 6.5-7.9mg/dl and <6.5mg/dl were diagnosed as mild, moderate, severe and life-threatening anaemia respectively.²³ All patients received in-patient care and resuscitated with intravenous crystalloids in form of 0.9% normal saline. Glycemic control was done by endocrinologists for those patients with diabetes mellitus. The broad-spectrum antibiotics were administered empirically; this includes intravenous ceftriaxone (Rocephin brand) 2g stat, then 1g 12 hourly and intravenous metronidazole (Unigyl brand) 500mg stat and 500mg 8 hourly after samples were taken for

pus microbiology culture and sensitivity (MCS). The pus MCS samples were obtained for all patients using swab sticks. Swab pus samples were collected directly from a pus draining site without skin contamination and processed at the microbiology laboratory of the University College Hospital, Ibadan. Patients had the extraction of the offending tooth/teeth, serial debridement of the wound and irrigation of the wound using 0.9% normal saline and antimicrobials (metronidazole infusion). All patients were managed by administering broad spectrum antibiotics empirically. Patients with anaemia were managed with double dose haematinics (Syrup Asyfer 10mls; 12 hourly) and the only patient with life-threatening anaemia had transfusion of 2 units of whole blood while on admission. Patients had supportive treatment including adequate nutrition and hydration. All the wounds were dressed twice daily with pure natural honey until the wound defect was filled with healthy granulation tissue with no recesses at the periphery. All patients receive nutritional support in form of high protein diet by consuming at least 4 eggs per day while on admission. Statistical Product and Service Solution (SPSS) version 26 software was used to analyze the recorded data and results were presented with descriptive statistics in texts, charts and tables. A *P*-value of <0.05 was set to be statistically significant.

RESULTS

In this study, 17 patients who were diagnosed with cervicofacial necrotizing fasciitis were managed at our facility. There were 11 (64.7%) males and 6 (35.3%) females with male to female ratio of 1.8:1. The mean age of patients was 57.65 (+17.674) years and most (88.2%) of the patients were of low socio-economic status (Table 1). On the presence of comorbidity, 8 patients (47.1%) were diagnosed with diabetes mellitus while all the patient tested negative to retroviral screening. The mean time before presentation was 12.82 (+7.100) days and odontogenic infection was the only identified etiology among all the patients. On clinical parameters, 75% of the patients with diabetes mellitus also presented with features of sepsis and 87.5% were

Table 1: Sociodemographic characteristics

Variable	Mean (+SD)
Age (Years)	
Mean (+SD)	57.65 (+17.674)
Sex	
Male	11(64.7%)
Female	6 (35.3%)
Socioeconomic Status	
High	0 (0%)
Intermediate	2 (11.8%)
Low	15 (88.2%)

Table 2: Summary of results

Parameters	Frequency (%)
Source of infection (N=17)	
Odontogenic	17 (100)
Non-odontogenic	0 (0)
Diagnosis of Diabetes mellitus (N=17)	
Yes	8 (47.1)
No	9 (52.9)
Sepsis at presentation among patients with no diabetes mellitus (N=9)	
Yes	2 (22.2)
No	7 (77.8)
Sepsis at presentation among patients with diabetes mellitus (N=8)	
Yes	6 (75)
No	2 (25)
Anaemia at presentation among patients with no diabetes mellitus (N=8)	
Mild	4 (50)
Moderate	2 (25)
Severe	2 (25)
Life-threatening	0 (0)
Anaemia at presentation among patients with diabetes mellitus (N=7)	
Mild	3 (42.9)
Moderate	3 (42.9)
Severe	0 (0)
Life-threatening	1 (14.2)
Site of occurrence (N=17)	
Buccal	2 (11.8)
Submandibular	5 (29.4)
Submandibulocervical	8 (47.1)
Submandibulocervical + anterior chest extension	1 (5.9)
Submentocervical	1(5.9)
Site of occurrence among patients with no diabetes (N=9)	
Buccal	0 (0.0)
Submandibular	3 (33.3)
Submandibulocervical	5 (55.6)
Submandibulocervical + anterior chest extension	0 (0.0)
Submentocervical	1 (11.1)
Site of occurrence among patients with diabetes mellitus (N=8)	
Buccal	2 (25)
Submandibular	2 (25)
Submandibulocervical	3 (37.5)
Submandibulocervical + anterior chest extension	1 (12.5)
Submentocervical	0 (0.0)
Presence of Retroviral disease (N=17)	
Yes	0 (0.0)
No	100 (100)
Mortality (N=17)	
Yes	0 (0.0)
No	17 (100)

diagnosed with various degrees of anaemia at presentations. Among those diagnosed with diabetes, 14.2% suffered life-threatening anaemia (Table 2). The submandibulocervical region was the most common site of affectation (47.1%), followed by the submandibular region (29.4%) while the submentocervical and the submandibulocervical with anterior chest extension were the least affected sites (5.9%). One (12.5%) of the patients with diabetes

Table 3: Chi-square tests showing association between diagnosis of diabetes mellitus and sepsis at presentation. *P-value=0.030*

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.735 ^a	1	0.030
Likelihood Ratio	4.976	1	0.026
Continuity Correction ^b	2.854	1	0.091
N of Valid Cases	17		

a. 4 cells (100.0%) have expected count less than 5. The minimum expected count is 3.76

b. Computed only for a 2x2 table

mellitus suffered a more severe infective process with an anterior neck extension of the swelling. The Chi-test test showed statistical significance association between the diagnosis of diabetes mellitus and sepsis

Table 4: Degree of association between diabetes and sepsis at presentation (*P-value=0.030*)

	Value	Approximate Significance
Nominal by Nominal Phi	.528	.030
Cramer's V	.528	.030
N of Valid Cases	17	

at presentation (*P-value=0.030*). However, there was no association between the diagnosis of diabetes mellitus and presentation with anaemia (*P-value=0.510*). The pus MCS test yielded no growth for all the samples

Table 5: Chi-Square Tests showing association between diagnosis of diabetes mellitus and anaemia at presentation. *P-Value=0.510*

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.295 ^a	4	.510
Likelihood Ratio	4.445	4	.349
N of Valid Cases	17		

a. 10 cells (100.0%) have expected count less than 5. The minimum expected count is .47

Table 6: Degree of association between diabetes and anaemia at presentation. *P-value=0.510*

	Value	Approximate Significance
Nominal by Nominal Phi	.440	.510
Cramer's V	.440	.510
N of Valid Cases	17	

retrieved and the average hospital stay was 13.59 (+8.382) days. The major complication encountered following treatment was scar formation and wound contracture as none of the patients had skin grafting done due to financial constraints. There was no mortality recorded.

DISCUSSION

Necrotizing fasciitis remains less common in the oral and maxillofacial region due to rich vascular supply to this region. However, when it occurs, it is usually associated with comorbidities and they have fatal outcomes.²⁴ This study evaluated the clinical presentations and management outcomes of patients with cervicofacial necrotizing fasciitis managed at the University College Hospital, Ibadan over a five-year period.

In this study, 17 patients were diagnosed with cervicofacial necrotizing fasciitis, out of which majority were of low socio-economic status. This however confirms the rarity of cervicofacial necrotizing fasciitis and emphasizes cervicofacial necrotizing fasciitis as a condition found in people of low-socio-economic status.^{2,25-28} The mean age of 57.65 years as reported in this study is similar to those reported in previous studies.^{1,2,29-31} Most of the patients with cervicofacial necrotizing fasciitis usually experience significant delays before seeking care. A problem due to lack of knowledge, to unregulated use of antibiotics because of lack of strict enforcement of use in the country, poverty, barriers to care and myths associated with dental extractions.³²⁻³⁵ In this study, the average time before presentation was reported as 12.8 days which is similar to reports from previous studies.^{1,2,32}

This usually impacts the prognosis of the diseases, affects the overall cost of treatment and may determine the average duration of hospital admission.³⁶ Diabetes mellitus, anaemia, retroviral diseases, chronic renal failure are common underlying systemic conditions associated with cervicofacial necrotizing fasciitis and up to 70% of patients with cervicofacial necrotizing fasciitis have one of these underlying systemic conditions.³⁷ In this study, anaemia and diabetes mellitus were the major underlying systemic conditions found among the patients. Majority of the patients presented with various degrees of anemia which may be due to malnutrition as a result of poverty.³⁸⁻⁴⁰ While about half of the patients presented with diabetes mellitus, none of the patients had a diagnosis of

retroviral disease. This confirms diabetes mellitus as another important systemic condition associated with cervicofacial necrotizing fasciitis. When cervicofacial necrotizing fasciitis occurs in patients with immunosuppressive conditions like HIV, uncontrolled diabetes mellitus or malnutrition, it is usually associated with fatal symptoms including sepsis and multiorgan dysfunction.^{1,41,42} In this study, the presence of comorbidities such as diabetes mellitus showed significant statistical association with sepsis at presentation and anterior chest wall involvement. This underscores the severity of the disease in immunocompromised individuals.⁴³ However, we found no association between presence of diabetes mellitus and anemia at presentation even though they both constitute the major risk factors for cervicofacial necrotizing fasciitis.⁴⁴

The only identified aetiological factor in this study was odontogenic infection even though other aetiological factors like peritonsillar infections, parapharyngeal interstitial infections, trauma, insect bites amongst others are possible aetiologies.⁴⁵ This however underscores the importance of odontogenic infection in the aetiology of cervicofacial necrotizing fasciitis.⁴³

On the management of cervicofacial necrotizing fasciitis, the empirical use of antibiotics as well as hydration with crystalloids like 0.9% normal saline and immediate extraction of the offending tooth/teeth have been adopted as the early management protocol to reduce the systemic toxins, pain and resuscitate patients after a pus sample has been taken for microbiology, culture and sensitivity test (MCS).^{1,2,25} This is usually followed by serial mechanical debridement using normal saline and antimicrobials and subsequent dressing with sterile gauze, alginate, honey or iodine.^{2,16,27} In this study, an extensive serial debridement of the wound was done for all the patients using normal saline and antimicrobial infusion in form of IV metronidazole infusion. Then, pure natural honey was applied for dressing following debridement to promote granulation within the wound until no sign of local infection was observed. The debridement and dressing were done two times daily. Nutritional support was also encouraged for all patients as reported in previous studies.^{27,46} All the MCS samples taken yielded no growth. This may be due to the inability to culture anaerobic organisms in the microbiology laboratory of our facility or excessive abuse of antibiotics by the patients before presentation as most of the patients presented after more than 12 days after first noticing the symptoms.

The average length of hospital stay was 13.59 (+8.382) days which is shorter than reports from other studies around the world.^{2,27,47} This may be attributable to lack

of severe complications among the patients in this review. Finally, cervicofacial necrotizing fasciitis is a serious necrotizing condition with up to 64% mortality rate and early diagnosis, multimodal treatment and aggressive surgical management has been indicated as drivers for reducing mortality.^{1,48,49} In this study, we reported no mortality among the patients, which may be due to lack of major systemic complications among the patients and a low sample size in this series.

Limitations of the study

This study has some limitations. First, the small sample size made it difficult to evaluate the multiple aetiological factors of cervicofacial necrotizing fasciitis. Also, the generalization of the findings in this study should be treated with caution due to this small sample size.

Finally, the microbiology department of our facility does not have the capacity to culture anaerobic organisms, and this could be responsible for the lack of yield of any organism as reported on the MCS reports of all the patients.

CONCLUSION

Overall, cervicofacial necrotizing fasciitis is a rare but debilitating disease usually seen among people of low socio-economic status and associated comorbidities especially anaemia and diabetes mellitus. They may present with non-specific symptoms which make late presentations common. Therefore, prompt management of comorbidities and the infective process is usually desirable to reduce morbidities or mortalities.

Ethical consideration

This study was conducted in accordance with the Declaration of Helsinki.

Funding

This study is self-funded.

Conflict of interest

Afeez Abolarinwa Salami, the corresponding author of this manuscript is a member of the Annals of Ibadan Postgraduate Medicine (AIPM), and they will be exempted from all decisions relating to the review of this manuscript. Other authors have no conflict of interest to declare.

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