

Prevalence of Death from Necrotising Fasciitis of Odontogenic Origin and Associated Factors among Patients Presented to Levy Mwanawasa University Teaching Hospital

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Abstract

Background: High mortality and morbidity rate has been associated with Necrotizing fasciitis of odontogenic origin. Surgery delays are most often associated with a considerably high mortality risk. Delays in surgical intervention and patients with diabetes mellitus further puts one at risk of dying from necrotizing fasciitis resulting from odontogenic infection or cause. A knowledge gap still existed on the other factors (clinical and sociodemographic) that influence the probability of one dying from Necrotizing fasciitis arising from odontogenic infection and origin are not well documented in the available literature. Therefore, this retrospective study aimed at investigating the prevalence of death from Necrotizing fasciitis of odontogenic origin and associated factors among patients that were presented to Levy Mwanawasa University Teaching Hospital from 2013-2022.

Methodology: This study used a retrospective cross-sectional design on secondary data of patient files that were presented and managed for necrotizing fasciitis of odontogenic origin at Levy Mwanawasa University Teaching Hospital at the Dental department from 2013 to 2022 (10-year period). A checklist tool that was made electronic in kobo collect tool was used to extract variables from the files. Prevalence was calculated by using the total number of all extracted files as a denominator. Logistic regression analysis was done both at unadjusted and adjusted analysis. All analysis was performed at a 5% significance level.

Results: Overall, a total number of 304 participants were included in the study and analysis. The prevalence of necrotizing fasciitis of odontogenic origin was 8% (24/304). The bivariate analysis reviewed significant differences in death from Necrotizing fasciitis of odontogenic origin between people that had diabetes (P value= ≤ 0.001), hypertension (P value=0.001), were living with HIV (P value=0.005) had Tuberculosis (P value < 0.001). Logistic regression analysis reviewed that people who had diabetes (AOR: 10.008, 95% CI: 0.002-0.031, P value:0.001), and tuberculosis (AOR: 31.991, 95% CI: 7.926 - 129.123, P value:0.001) had greater odds of death.

Conclusion: The prevalence was relatively lower, continuation of the management of patients through surgical intervention would help provide the best care to patients diagnosed with necrotizing fasciitis of odontogenic origin. Surgical debridement remains the first-line treatment of necrotizing fasciitis of odontogenic origin and infections. However, special attention and care are needed to be provided to patients that have got necrotizing fasciitis with underlying conditions such as Acquired Immune Deficiency Syndrome (AIDS), diabetes, and hypertension. Immediate conventional surgical and supportive medical therapy is highly recommended for a good prognosis.

Keywords: Prevalence, Necrotizing fasciitis, Odontogenic origin

Background

Necrotizing fasciitis is a severe, life-threatening disease often leads to a highly septic clinical presentation with severe tissue necrosis in various areas of the body, and a poor outcome [1]. This is defined as a bacterial infection of the superficial fascial layer and the adjacent cutaneous tissues leading to a fulminant, devastating, and rapidly progressive necrosis of the affected tissues [2]. Statistics show that Necrotizing fasciitis affects 0.4 individuals per 100,000 in the United States of America, and 1 person per 100,000 in Western Europe each year [3]. All genders are affected equally [4]. It is less common in children and more common in the elderly. The disease is most common in the trunk, the extremities, and the perineum and sometimes it also affects the head and neck cervicofacial necrotizing fasciitis.

The majority of cases of cervicofacial necrotizing fasciitis are caused by an odontogenic focus (Necrotizing fasciitis of odontogenic origin [5]. Necrotizing fasciitis arising from odontogenic infection is a rap-

idly progressive and life-threatening illness. Thus, similar to other odontogenic infections, the diagnosis is usually based on clinical and radiological findings [6], but the disease can easily be misdiagnosed as a common odontogenic abscess, cellulitis, or erysipelas in its early stages; thus, the resulting danger for the patient might be underestimated. Only advanced stages show the almost pathognomonic picture of necrotizing fasciitis with small purple spots [5-7], dark hemorrhagic blisters, crepitus, complete anesthesia, and dusky necrosis of the affected skin. Concomitant septic symptoms such as hypotension, tachypnea, and impaired consciousness usually already indicate a life-threatening condition [7]. Numerous authors, therefore, have pointed out the importance of rapid diagnosis and prompt intervention, since a delay in therapy usually leads to a significant decrease in the probability of survival [7].

Past studies had even suggested that even in cases where excellent care was given, there is still a 25 to 35% chance of death [8]. De-

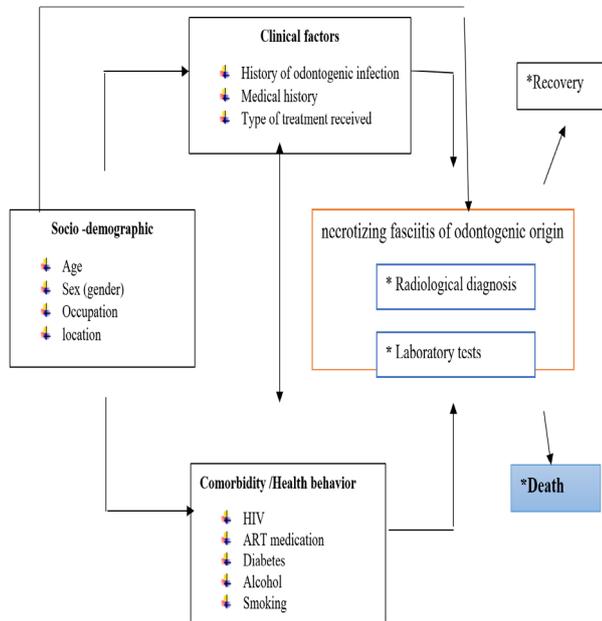
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spite this, the epidemiology of Necrotizing fasciitis of odontogenic origin has rarely been explored in African countries [9]. This study, therefore, set out to assess the prevalence of death from Necrotizing fasciitis of odontogenic origin and associated factors among patients presented to Levy Mwanawasa University Teaching Hospital from 2013 - 2022.

Figure 1: Conceptual Framework of Death from necrotizing fasciitis of Odontogenic Origin adopted and modified from (Tesema et al., 2020).



METHODS

Research approach

A quantitative methodology to investigate the prevalence of death from Necrotizing fasciitis of odontogenic origin and associated factors among patients presented to Levy Mwanawasa University Teaching Hospital from 2013 – 2022 was used.

Statistical Analysis

Software STATA version 14.0 was used to analyze the data for the current investigation. Descriptive statistics was used to summarize the participants' baseline characteristics. We'll display categorical variables as percentages and frequencies. Based on the normality assumption, which was verified using the Shapiro-Wilk test, continuous variables were reported as means and standard deviations or as medians and interquartile ranges.

The prevalence of death from Necrotizing fasciitis of odontogenic origin was calculated by taking the number of patients that died from Necrotizing fasciitis of odontogenic origin and dividing it by the total number of study participants. This prevalence was presented as a frequency and percentage.

The Chi-square test, fishers exact test, and T-test based on the assumption of each were used to compare death outcomes across different sociodemographic characteristics as well as across different clinical characteristics. Where the assumption of the chi-square tests will not be met, fishers exact test was used. Logistic regression was used to determine factors associated with death from Necrotizing fasciitis of odontogenic origin. The outcome was death which was coded = 1, otherwise=0. This was done both at adjusted and unadjusted levels. At adjusted analysis machine-lead backward stepwise logistic regression as well as investigator-led stepwise logistic regression was run. In order to choose the best-fit model, we used the models of Bayesian information criteria (BIC), Akaike information criteria (AIC), as well as the pseudo R2. The investigator-led stepwise logistic

regressions came out as the best-fit model. All forms of analyses in this study was done at 5% significance levels.

RESULTS

Descriptive statistics of patients

Overall, a total of 304 files were extracted as patients that were managed for necrotizing fasciitis of odontogenic at Levy Mwanawasa University Teaching Hospital from 2013 to 2022. The mean age was 46 years (SD=14.54) and the majority 58% (176/304) were males. More than half of the patients 56% (139/250) were married people. About 30% (90/304) of the participants reported a history of smoking and more than half of the participants 60% (182/304) reported a history of alcohol as shown in Table 1. For the clinical characteristics of patients, 18% (56/303) reported a history of being diabetic while 35% (106/300) reported a history of being hypertensive. Furthermore, 33% (101/303) of patients were people living with HIV and 12% (35/303) reported a history of suffering from tuberculosis. Most patients 98% (298/304) underwent surgical treatment for necrotizing fasciitis of odontogenic origin as shown in Table 1.

Prevalence of death from Necrotizing Fasciitis of odontogenic origin.

The prevalence of death from necrotizing fasciitis of odontogenic origin was determined to be 8% (24/304), on the other hand, 92% (280/304) of patients who survived and got discharged as shown in Table 1.

4.2. Comparison of patients who died because of Necrotizing fasciitis of odontogenic origin across different patient characteristics.

Social demographic characteristics

The mean age for people that died was 48 years (SD=12.72) while the mean age for people that didn't die was lower than 45 years (SD=14.68) this difference was found not to be statistically significant at (P value=0.3383) based on a T-test result. There was also no statistical difference in death between males and females (P value=0.964) where 7.81% (10/24) of females died and 7.95% (14/24) of males died as shown in Table 2.

On the other hand, using the chi-square results, the results showed that they was no statistically significant difference at (P value=0.964) in the proportions of males and females that died from the disease. Among females about 7.81% died from necrotizing fasciitis of odontogenic origin as compared to 7.95% of individuals who died among the males.

For the marital status of study participants, results from the fishers' exact test revealed that there also not statistically significant (P value=0.942) difference in the number of people that died from necrotizing fasciitis of odontogenic origin among the people that were divorced, married, single and those that were widowed. For the social history of study participants among the study participants that reported taking alcohol, about 8.79% died, while among those that reported not taking alcohol, about 6.56% died. Despite this difference, the chi-square test results reviewed that there was still no statistically significant difference with a p-value of 0.479.

On the other side, among study participants that reported a smoking history, it was reported that about 11.11% died from necrotizing fasciitis of odontogenic origin, while among the study participants that reported no history of smoking, it was reported that 6.54% died. However, the chi-square test reviewed that there was no statistical difference with a P-value of 0.177.

Table 1: Prevalence of death from necrotizing fasciitis of odontogenic origin and descriptive analysis of basic characteristics of patients.

SD=STANDARD DEVIATION, HIV=HUMAN IMMUNE VIRUS, TB=TUBERCULOSIS

Variable	Frequency	Percentage
Overall total	304	100%
Death from necrotizing fasciitis of odontogenic origin		
Yes	24	8%
No	280	92%
Total	304	100%
Social demographic characteristics		
Age		
Mean (SD)	45.1	14.54
Sex		
Female	128	42%
Male	176	58%
Total	304	100%
Marital Status		
Divorced	13	5%
Married	139	56%
Single	57	23%
Widowed	41	16%
Total	250	100%
History of smoking		
No	214	70%
Yes	90	30%
Total	304	100%
History of Alcohol		
No	122	40%
Yes	182	60%
Total	304	100%
Clinical characteristics		
History of Diabetes		
No	247	82%
Yes	56	18%
Total	303	100%
History of hypertension		
No	194	65%
Yes	106	35%
Total	300	100%
HIV status		
Negative	93	31%
Positive	101	33%
Unknown	110	36%
Total	304	100%
History of TB		
No	268	88%
Yes	35	12%
Total	303	100%
Type of treatment		
Conservative	6	2%
Surgical	298	98%
Total	304	100%

Table 2: Death from Necrotizing fasciitis of odontogenic origin across different patient characteristics.

Variable	Death from necrotizing fasciitis of odontogenic origin		P value
	Yes	No	
Social demographic characteristics			
Age			
Mean/SD	47.8 (12.72)	44.87 (14.68)	0.3383 ^T
Sex			
Female	10 (7.81)	118 (92.19)	0.964 ^C
Male	14 (7.95)	162 (92.05)	
Marital Status			
Divorced	1 (7.69)	12 (92.31)	0.942 ^E
Married	14 (10.07)	125 (89.93)	
Single	6 (10.53)	51 (89.47)	
Widowed	3 (7.32)	38 (92.68)	
History of smoking			
No	14 (6.54)	200 (93.46)	0.177 ^C
Yes	10 (11.11)	80 (88.89)	
History of Alcohol			
No	8 (6.56)	114 (93.44)	0.479 ^C
Yes	16 (8.79)	166 (91.21)	
Clinical characteristics			
History of Diabetes			
No	11 (4.45)	236 (95.55)	<0.001 ^C
Yes	13 (23.21)	43 (76.79)	
History of hypertension			
No	7 (3.61)	187 (96.30)	0.001 ^C
Yes	15 (14.15)	91 (85.85)	
HIV status			
Negative	8 (8.60)	85 (91.40)	0.005 ^E
Positive	14 (13.86)	87 (86.14)	
Unknown	2 (1.82)	108 (98.18)	
History of TB			
No	13 (4.85)	255 (95.15)	<0.001 ^C
Yes	11 (31.43)	24 (68.57)	
Type of treatment			
Conservative	0	6 (100)	1.00 ^E
Surgical	24 (8.05)	274 (92.11)	

SD=Standard deviation, HIV=Human Immune Virus, TB=Tuberculosis, C chi square test, E=Fishers exact test, T=T test

Clinical characteristics

There was a statistically significant difference in death from Necrotizing fasciitis of odontogenic origin between people that had diabetes and those that didn't have (P value=<0.001). Among the people that didn't have diabetes, 4.45% died while among the people that had diabetes 23.21%. On the other hand, among the people that didn't have hypertension, 3.61% died while among those that had hypertension, 14.15% died. The difference was found to be statistically significant at (P value=0.001).

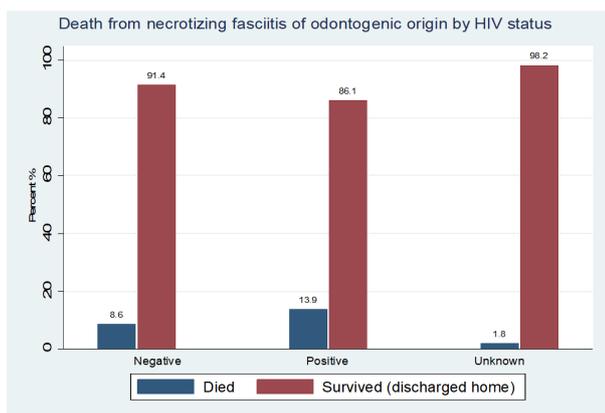
Furthermore, among the people that were living with HIV, it was found that 8.6% died while among those that were HIV negative,

about 13.86% people died and among those with unknown status, only 1.82% patients died. These differences were statistically significant (P value=0.005). For tuberculosis, it was found that among the patients that reported not having tuberculosis 4.85% died while among those that reported having tuberculosis, 31.43% died. The difference was also found to be statistically significant (P value<0.001). Lastly, 0 people died among those that were managed conservatively and 8.05% of people died. This difference was however not statistically significant (P value=1) as shown in Table 2.

On the other hand, it was reported that among the patients with necrotizing fasciitis of odontogenic origin who were managed conservatively, 0 patients died and 100% survived on the other hand, among the patients with Necrotizing Fasciitis of odontogenic origin who were managed surgically, it was reported that 8.05% died while 92.11% survived as shown table 2.

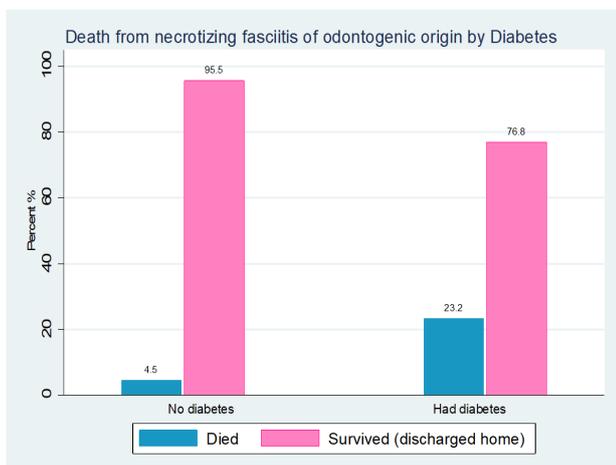
Figure 1 shows the difference in death from necrotizing fasciitis of odontogenic origin by the HIV status of the study participants. It was reported that 8.6% died while among those that were HIV negative, about 13.86% people died and among those with unknown status, only 1.82% of patients died.

Figure 1: Death from necrotizing fasciitis of odontogenic origin by HIV status.



On the other side, figure 1 shows death from necrotizing fasciitis of odontogenic origin by the diabetes history of participants. Here it was reported that among the people that didn't have diabetes, 4.45% died while among the people that had diabetes, 23.21% died.

Figure 2: Death from necrotizing fasciitis of odontogenic origin by diabetes history.



4.3 Factors associated with death from necrotizing fasciitis of odontogenic origin.

Taking death from necrotizing fasciitis of odontogenic origin (death=1) (otherwise=0) as the outcome variable of interest in this study, logistic regression analysis was conducted to investigate factors associated with death from necrotizing fasciitis of odontogenic origin. This was done at both adjusted (simple) and unadjusted (multiple) analysis levels.

Unadjusted analysis

At the unadjusted logistic regression analysis level, it was reviewed that the variables age, sex, marital status, history of smoking, history of alcohol, and type of treatment received did not have a statistically significant association with death from necrotizing fasciitis of odontogenic origin at 5% significance level as shown in Table 3. One unit increase in age increased the odds of death from necrotizing fasciitis of odontogenic origin by a factor of 1.009. The 95% confidence interval was 0.980 to 1.39. However, this was found not to be statistically significant with ($P=0.549$) at 5% significance level. Being male as compared to being female had 1.214 times greater odds of death from necrotizing fasciitis of odontogenic origin. The 95% confidence interval was 0.514 to 2.868. However, this was also not statistically significant at 5% significance level.

People that reported of history of smoking had 1.755 times greater odds of death from necrotizing fasciitis of odontogenic origin. The 95% confidence interval was 0.749 to 4.112. However, this was also not statistically significant at 5% significance level with a p-value of 0.196. People that had a history of diabetes as compared to those that didn't have diabetes had 5.488 times greater odds of death from necrotizing fasciitis of odontogenic origin and this relationship was statistically significant (P value <0.001). The 95% confidence interval was 2.314 to 13.017.

On the other side, people that had hypertension as compared to those that didn't have, had 3.596 times greater odds of death from necrotizing fasciitis of odontogenic origin and it was also statistically significant (P value = 0.006) at 5% significance level. The 95% was 0.456 to 8.881. Participants reported of having tuberculosis as compared to those that didn't have tuberculosis had 8.990 times greater odds of death from necrotizing fasciitis of odontogenic origin and this relationship was statistically significant (P value <0.001) at 5% significance level. People that were living with HIV as compared to those that didn't have were found to have 0.585 times greater odds of death from necrotizing fasciitis of odontogenic origin. However, this was not statistically significant (P value=0.252) at 5% significance level as shown in Table 3.

Adjusted analysis

At adjusted analysis, backward stepwise logistic regression and investigator-led logistic regression analysis were performed. Table 3 shows results from the investigator lead logistic regression as it came out with the best-fit model over the stepwise logistic regression. Only 3 independent variables made it to the final model. These were a history of diabetes, history of hypertension, and history of tuberculosis. People that had diabetes as compared to those that didn't have diabetes had 10.008 times greater odds of death from necrotizing fasciitis of odontogenic origin while controlling for a history of tuberculosis and hypertension. This was statistically significant (P value<0.001) at 5% significance level. The 95% confidence interval was 0.002 to 0.031.

Similarly, people that had tuberculosis as compared to those that didn't have tuberculosis had 31.991 times greater odds of death

from necrotizing fasciitis of odontogenic origin while controlling for a history of diabetes and hypertension. This was statistically significant (P value=0.001) at 5% significance level. The 95% confidence interval was 7.926 to 129.123. For hypertension, it was reviewed that people that had hypertension as compared to those that didn't have hypertension had 3.050 times greater odds of death from necrotizing fasciitis of odontogenic origin while controlling for a history of diabetes and tuberculosis. However, this wasn't statistically significant (P value=0.074) at 5% significance level. The 95% confidence interval was 0.896 to 10.375 as shown in table 3.

Table 3: Adjusted and unadjusted logistic regression of factors associated with death from Necrotizing Fasciitis of odontogenic origin.

CI=Confidence Interval, HIV=Human Immune Virus

Variable	Unadjusted			Adjusted		
	Odds ratio	95% CI	P value	Odds ratio	95% CI	P value
Age	1.009	0.980-1.039	0.549			
Sex						
Female	Ref					
Male	1.214	0.514-2.868	0.658			
Marital Status						
Divorced	Ref					
Married	0.737	0.278-1.955	0.540			
Single	0.595	0.067-5.308	0.642			
Widowed	0.563	0.137-2.325	0.428			
History of smoking						
No	Ref					
Yes	1.755	0.749-4.112	0.196			
History of Alcohol						
No	Ref					
Yes	1.353	0.560-3.268	0.501			
History of Diabetes						
No	Ref			Ref		
Yes	5.488	2.314-13.017	<0.001	10.008	0.002-0.031	<0.001
History of hypertension						
No	Ref			Ref		
Yes	3.596	0.456-8.881	0.006	3.050	0.896-10.375	0.074
HIV status						
Negative	Ref					
Positive	0.585	0.233-1.466	0.252			
Unknown	0.115	0.025-0.520	0.005			
History of Tuberculosis						
No	Ref			Ref		
Yes	8.990	3.635-22.234	<0.001	31.991	7.926-129.123	0.001
Type of treatment						
Conservative						
Surgical						

DISCUSSION

The major findings of this study are that only 304 files were included in this study. The prevalence of death from Necrotizing Fasciitis of odontogenic origin was determined to be 8%. There was a statistically significant difference in age, sex, marital status, history of smoking, history of alcohol, and type of treatment between the people that died from death from necrotizing fasciitis of odontogenic origin and those that didn't die. A statistically significant difference was only reported for a history of diabetes, hypertension, HIV status, and history of tuberculosis. At multiple regression analysis, only a history of diabetes and tuberculosis was found to be statistically associated with death from necrotizing fasciitis of odontogenic origin.

From 2013 to 2022, only a total number of 304 files of patients were included in this study. Looking at a period of 10 years, the files appeared to be few. However, this fact can be explained by the fact that Necrotizing fasciitis of odontogenic origin has been documented and shown to be a condition that is rare even though it progresses and spreads rapidly and is often life-threatening [10]. Furthermore, some files were not included in the study because of missing information based on the inclusion and exclusion criteria of the study. This was a surprising experience when performing this study and this collaborated with the previous studies that have been done in Zambia [11] and in South Africa [12] have reported that record-keeping is not done properly in health facilities which is problematic. These challenges in record keeping in health facilities might explain why not all patient files were found at Levy Mwanawasa University Teaching Hospital.

In the current study, the prevalence of death from necrotizing fasciitis of odontogenic origin was 8%. These findings were like some previous studies in literature. In the systematic review done by Gore the prevalence was reported to be at 9.8% [13]. However, other studies that were done elsewhere reported a higher prevalence than what the current study found. For example, studies that were done in sub-Saharan African countries have reported a slightly higher prevalence of 14.7%. another study that was done in China [14] on cervical necrotizing fasciitis of odontogenic origin, reported a prevalence death prevalence of 18%. Another study done in the United Kingdom [15] on outcomes of necrotizing fasciitis in the head and neck region reported a prevalence of 17.6%, and another systematic review on cervical necrotizing fasciitis of the reported 1,235 cases from the literature that was reviewed showed prevalence of 13.6% [16].

Generally, it was observed that our study reported a lower prevalence of necrotizing fasciitis of odontogenic origin. One of the reasons why it came out like this could be attributed to the fact that 98% of our study participants were managed surgically and only 2% were managed conservatively even though the current study didn't report a statistically significant difference (P=1.00) in death between patients managed surgically and those managed conservatively. Other studies reported lower percentages of people that were managed surgically. For example, in the United Kingdom study, only 90% of the study participants were managed surgically [16].

In the current study, the mean age for those that survived was lower (45 years) that the mean age of the patients that died (48 years). Even though this is the case, there was no statistically significant difference in death between the patients that died from necrotizing fasciitis and those that survived. This might suggest that the condition was affecting all age groups in a similar manner. Furthermore, the mean ages reported in our study were similar to what has been reported in literature. For example, in the literature review on a total of 1235 reported cases, it was that their mean age was 49.1 years [15].

Under adjusted analysis, the current study found diabetes to be associated with death from necrotizing fasciitis of odontogenic origin. And this was statistically significant (P value < 0.001). This was not a surprising finding in this study. This is because past studies have reported similar findings. A systematic review study that was done on necrotizing fasciitis reported that there was also a statistically significant increase in mortality from the disease among the patients that had diabetes mellitus ($p = 0.0001$) [17]. It is medically reasonable that diabetes might be linked to death from necrotizing fasciitis, this is because patients with diabetes are generally more susceptible to necrotizing fasciitis of not only of odontogenic origin but even in other parts of the body e.g., limbs [18].

On the other hand, the current study also found tuberculosis to have a statistically significant association ($P=0.001$) with death from necrotizing fasciitis of odontogenic origin. Necrotizing fasciitis of odontogenic origin usually causes infections. Therefore, this finding of tuberculosis being associated with death from necrotizing fasciitis is in line with literature as tuberculosis has been linked with a caseous type of necrosis before [18]. A systematic literature review of studies that reported on laboratory findings of cultures obtained from individuals with odontogenic necrotizing fasciitis yielded 30 different unique microbiological results. These were numerous strains of streptococcus and Staphylococcus, different anaerobic bacterial species, and uncommon strains including fusobacterium and Prevotella. Unfortunately, aerobic types of bacteria such as tuberculosis were not mentioned in this review.

The history of hypertension was also one of the variables that made it to the final model. However, this wasn't statistically significant ($P=0.076$). This variable was left in the best-fit model as removing it was affecting the statistical significance of tuberculosis. On the previous studies that have been done in literature had reported of hypotension and not hypertension to be linked to some forms of necrosis in other parts of the body and not necessarily in the head and neck regions. A study that was done in Thailand on necrotizing fasciitis and risk factors reported hypertension as one of the risk factors found [19].

In the current study, the HIV status of patients did not make it to the final multiple logistic regression model, this is because the best-fit model for logistic regression was removing the HIV variable because it had high p values which were highly insignificant. Similarly, another study in the literature did not find any statistical significance between HIV and death from necrotizing fasciitis of odontogenic origin (Gore, 2018b).

Majority of patients in this study were managed surgically 98%, and only 2% of the patients were managed conservatively. Surgical management involving debridement has been documented to be the main stay line of treatment for patients suffering from necrotizing fasciitis. Therefore, these results were seen to be a good practice in the health care system that is concerned with managing patients with necrotizing fasciitis of odontogenic origin. These results were consistent with findings from other previous studies in literature who also reported that the majority of patients in their studies were managed surgically [20].

Conclusion

The prevalence of death from necrotizing fasciitis among patients that were presented and managed at Levy Mwanawasa University Teaching Hospital was found to be 8%. It was found that there was no statistically significant difference in the factors of age, sex, marital status, history of smoking, and history of alcohol among those that died from necrotizing fasciitis of odontogenic and those that didn't

die. The study also found that a history of diabetes in the study participants as well as a history of hypertension was associated with the death of necrotizing fasciitis of odontogenic origin.

Surgical management and debridement is the first-line treatment of Necrotizing Fasciitis of odontogenic infections. The prevalence was relatively lower, continuation of the management of patients through surgical intervention would help provide the best care to these patients diagnosed with the disease under discussion. However, special attention and care are needed to be provided to patients that have got necrotizing fasciitis and other laying conditions such as diabetes, hypertension, and Acquired Immune Deficiency Syndrome (AIDS). Immediate conventional surgical and supportive medical therapy is highly recommended for a good prognosis.

Recommendations

The study would put up a recommendation for the proper recording of all necessary patient details and the keeping of hospital record files. This would help in a more accurate estimation of death among patients suffering from necrotizing fasciitis of odontogenic origin. Another recommendation can be put across for similar future research works to be conducted from other health institutions in Zambia such as The University Teaching Hospital, Ndola Teaching Hospital and Kitwe Teaching Hospital that might have attended to more cases of necrotizing fasciitis of odontogenic origin. Doing similar studies from these other institutions would enable meaningful comparisons to be made within the Zambian context.

A message of recommendation might also be applicable to the healthcare workers concerned with the management of patients that are suffering from necrotizing fasciitis of odontogenic origin to continue paying extra care and attention to patients with comorbidities such as diabetes mellitus, hypertension, and tuberculosis or any other comorbidity as this affect the outcome of treatment for patients with Necrotizing Fasciitis of odontogenic origin. Recommendation of immediate conventional surgical debridement and supportive medical therapy to be initiated on patients who present with this severe illness.

Availability of data and materials:

All data is contained within the manuscript.

Authors' contributions: SS designed the study, performed the literature search, reviewed articles for inclusion and exclusion, SS, CP, GM performed literature review and statistical analysis, and Co wrote the manuscript. JM, DN read and approved the final manuscript.

Ethics approval: Obtained from UNILUSBREC .

Consent for publication: Requested from NHRA.

Competing interests: The authors declares that there is no competing interests.

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