

# Analysis of 215 Cases of Ludwig's Angina: A Retrospective Study at the Federal Medical Centre, Nguru, Yobe State

**\*Thomas OWOBU, \*\*Babatude Oludare FAKUADE, \*\*\*Uchenna Kelvin OMEJE, \*Shehu Adamu SULAIMAN, \*Oba Onisoman AZAH**

*\*Dental and Maxillofacial Department, Federal Medical Centre, Nguru, Yobe State.*

*\*\*Dental and Maxillofacial Department, Teaching Hospital Gombe.*

*\*\*\*Department of Oral and Maxillofacial Surgery, Aminu Kano Teaching Hospital, Kano.*

## Correspondence

*Dr. Thomas Owobu  
Department of Dental and Maxillofacial  
Federal Medical Centre, Nguru  
Yobe State, Nigeria.  
Email: tomowobu@yahoo.com*

## ABSTRACT

**Objective:** To examine cases of Ludwig's angina managed at Federal Medical Centre, Nguru, Yobe State.

**Methods:** A total of 215 patient's case files of ages between 8 to 80 years who were diagnosed and treated of Ludwig's angina, were analyzed retrospectively. The information collated include demographic characteristics, causes, signs and symptoms at presentation, and treatment. Also recorded were patient's baseline laboratory investigations. Patients with predisposing factors and complications arising from the disorder during their hospital stay were also documented. Data analysis was done using IBM SPSS version 20.0.

**Results:** There was a steady increase number of Ludwig's angina cases managed between 2014 to 2019. Ludwig's angina was predominant among uneducated individuals and those above 35 years. The mean age of affected individuals was 45.38 years. More females 118 (54.88%) than males 97 (45.12%) were affected giving male to female ratio of 1:1.2. Odontogenic infection accounted for more than 80% of cases. Anaemia and diabetes mellitus were the main comorbid conditions among the patients. Necrotizing fasciitis, medianstis and septicaemia were the leading complications. Mortality rate was 3%

**Conclusion:** Early detection of Ludwig's angina followed by prompt diagnosis and institution of appropriate antibiotics, as well as possible surgical intervention in the course of management remain the key to reducing mortality and severe morbidity.

**Keywords:** Insurgency, Ludwig's angina, Socioeconomic status

## INTRODUCTION

Ludwig's angina has been described as a potentially life-threatening surgical emergency characterized by rapidly expanding, diffuse inflammation of the submandibular and sublingual spaces that occurs most often in young adults with dental infections (Saifeldeen and Evans, 2004; Ugboko et al., 2005; Botha et al., 2015). The disorder can also occur in children, in whom it can cause serious airway compromise (Clifton et al., 1982; Greenberg et al., 2007; Sujatha et al., 2015; Botha et al., 2015). Ludwig's angina is a severe form of diffuse cellulitis usually of acute onset usually manifesting as brawny suprahyoid induration, tender swelling in the floor of

the mouth associated with elevation and posterior displacement of the tongue (Greenberg et al., 2007; (Mccaskeyh, 1942; Iwu, 1990; Nguyen et al., 1992; Har-El, 1994; Durand & Joseph, 2001; Larawin et al., 2006).

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Ludwig's angina was initially described in 1836 by German physician Wilhelm Frederick von Ludwig (Mccaskeyh, 1942; Larawin et al., 2006; Greenberg

et al. 2007). His description was based on the observation of five patients with "gangrenous induration of the connective tissues of the neck that advanced to involve the tissues that cover the small muscles between the larynx and the floor of the mouth (Fischmann & Graham, 1985; Moreland et al., 1988; Spitalnic & Sucov, 1995). There are many alternative names of Ludwig's Angina, including cynanche, carbunculus gangraenosus, angina maligna, morbus triangularis, and garotillo. Although traditionally associated with pain of cardiac origin, the term "Angina" is derived from the Latin word for choke (angere) and the Greek word for strangle (ankhōnē) (McCaskey, 1942; Har-El et al., 1994). In the case of Ludwig's angina, it refers to the feeling of strangling and choking secondary to lingual airway obstruction, which is the most serious potential complication of this condition (Clifton et al., 1982). Deep neck infections may be a rare occurrence but potentially fatal complication of pulpal abscess of the teeth especially the last lower molars (Grod-Niskymy, 1939; McCaskey, 1942; Iwu, 1990; Nguyen et al., 1992; Har-El et al., 1994; Durand & Joseph, 2001; Larawin et al., 2006; Greenberg et al., 2007).

Before the development of penicillin by Alexander Fleming and its mass production in the 1950s, mortality associated with Ludwig's angina exceeded 50% (Owens & Schuman, 1993; Owens & Schuman, 1994; LeJeune & Amedee, 1994; Larawin et al., 2006; Osunde et al., 2014). As a result of current antibiotic therapies and surgical techniques, current mortality estimates are in the range of 8% (Clifton et al., 1982; Owens & Schuman, 1994; Saifeldien & Evans, 2004). However, in a civilized society, this condition is observed rarely in everyday general dental practice. But we observed a different trend at the pattern and rate of presentation in our health institution in the recent time. The objective of this study was to examine the cases of Ludwig's angina managed at Federal Medical Centre, Nguru, Yobe state.

## MATERIALS AND METHODS

The medical and dental records of patients treated for Ludwig's angina over six years period (January 2014 to December 2019) at the Accident and Emergency unit, department of Dental and Maxillofacial Surgery of Federal Medical Centre, Nguru, (FMC) were reviewed retrospectively. The sources of clinical information were patient's case folders, procedure register and clinic attendance register. The information collated includes patients' age, gender, educational background, source of infection, signs and symptoms at presentation, and treatment options. Also recorded were patient's baseline laboratory investigations. Patients with predisposing factors (hypertension, diabetes and anemic conditions) and complications arising from the disorder during their hospital stay were also documented. All patients were managed by the researcher and other visiting consultants to the department. Patients with other medical conditions were co-managed with physicians of appropriate specialty. The data were analyzed using IBM SPSS version 20.0 to present descriptive statistics.

## RESULTS

A total of 215 patient's case files of ages between 8 to 80 years who met the inclusion criteria, diagnosed and treated of Ludwig's angina were analyzed retrospectively. This consists of 97 (45.12%) males and 118 (54.88%) females, with a male to female ratio of (1:1.11) (Tables 1). The mean age of the patients was 45.38 years (Tables 2). Odontogenic source accounted for more than 80% of the cases seen in the years under review (Tables 2). The majority of the patients were uneducated (Figure 1). All patients presented with fever, poor oral hygiene, trismus, bilateral submandibular and submental swelling. Other symptoms that were present in some patients include; respiratory distress, dysphagia and stridor (Figure 2). Figure 3 depicted the clinical presentation of some patients

Table 1: Sex distribution of patients with Ludwig's Angina per year

Year	Male	Female	Frequency	Percent
2014	6	8	14	1.51
2015	7	10	17	7.91
2016	10	19	29	13.49
2017	15	20	35	16.28
2018	29	28	57	26.51
2019	30	33	63	29.30
Total	97 (45.12)	118 (54.88)	215	100.00

Table 2: Age distribution and aetiology of patients

Age (years)	X	F	XF	Odontogenic n (%)	Traumatic n (%)	Lymphatic n (%)
1-10	5.5	4	22	3 (75.00)	1 (25.00)	-
11-20	15.5	9	139.5	7 (77.80)	2 (22.20)	-
21-30	25.5	15	382.5	12 (80.00)	2 (13.3)	1 (6.70)
31-40	35.5	41	1455.5	37 (90.20)	4 (9.80)	-
41-50	45.5	69	3139.5	66 (95.70)	3 (4.30)	-
51-60	55.5	54	2997	46 (90.70)	3 (5.60)	2 (3.70)
61-80	70.5	23	1621.5	21 (91.30)	1 (8.70)	-
		215	9757.5			

N/B: X-mean age, F-frequency, Mean age=  $(\sum FX/\sum F) = (9757.5/215) = 45.38$

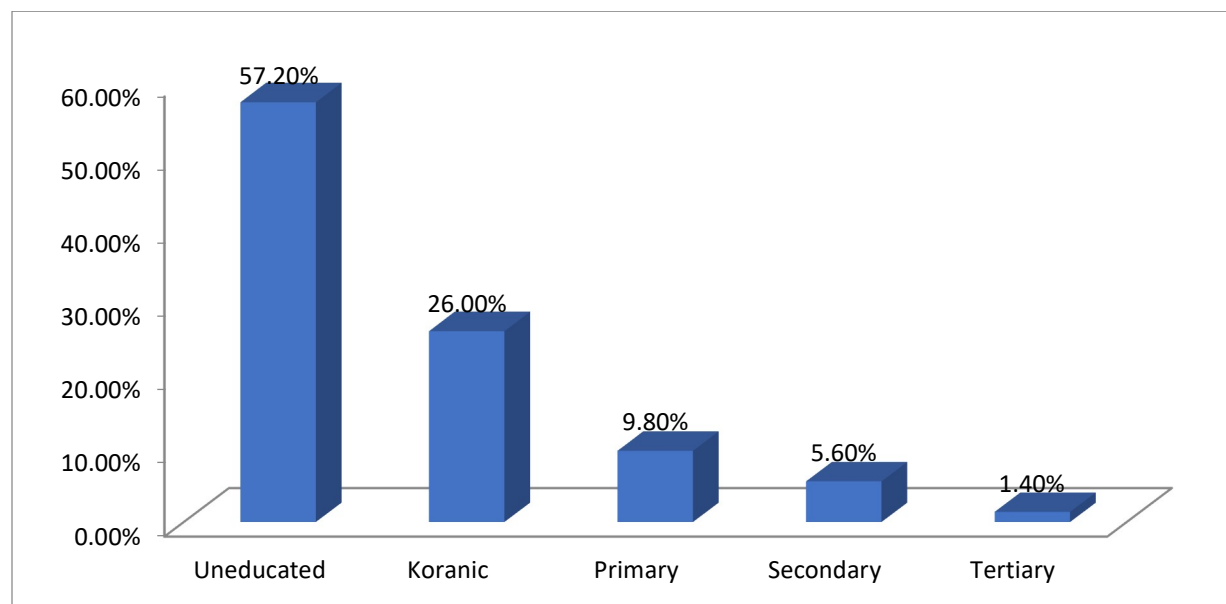


Figure 2: Educational status of patients

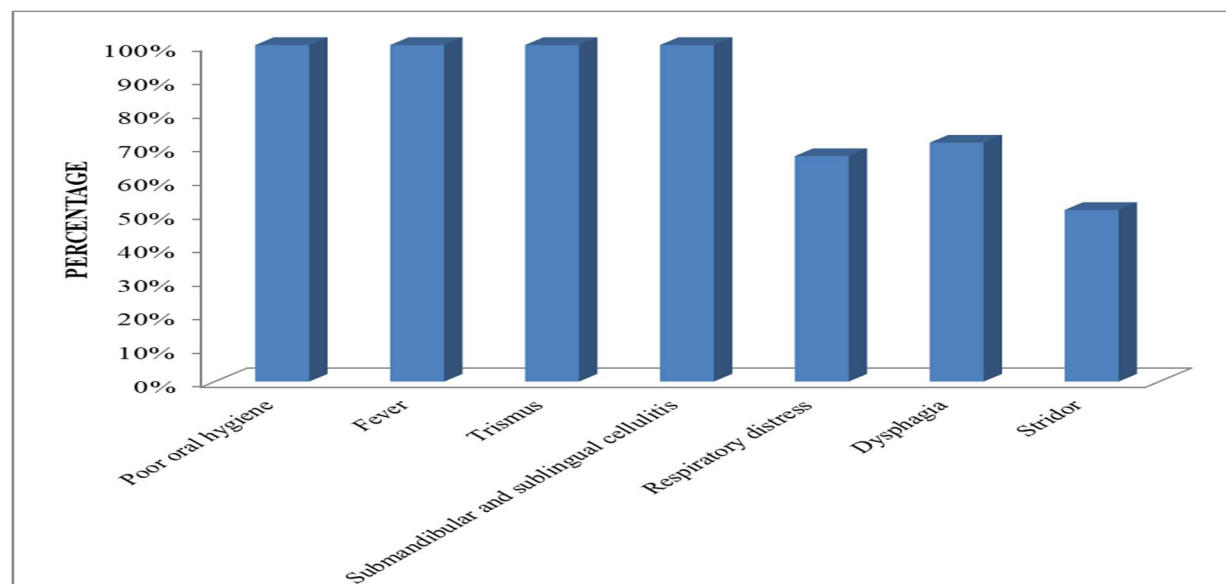


Figure 2: Frequency of symptoms among the patients



Figure 3: Clinical photograph showing Ludwig's angina patients at presentations

The culture obtained from incision and drainage revealed a mixed microbial flora consisting of *Bacteroides*, *Actinomyces* spp, *Streptococcus viridans*, *Staphylococcus aureus*, *Enterococcus*, *E. coli* and *Pseudomonas* with *Streptococcus* being the most common microorganism isolated (Table 3). Most of the patients (n=144) underwent surgical treatment which consisted of an extraction of the offending teeth, incision and drainage for surgical decompression where necessary with the insertion of a rubber drain under local or general anesthesia. Twenty-nine patients had simple extractions with antibiotics and analgesics under local anesthesia. Fifteen patients who presented with severe respiratory distress had an emergency tracheostomy for their immediate airway management (Table 4).

Patients with co-morbid conditions such as; hypertension, diabetes and anemic conditions, had a longer hospital stay (Table 5). Some complications recorded as a result of delayed treatment include; mediastinitis, cervical fasciitis, asphyxia and septicemia. Five patients developed eclampsia which required an emergency caesarian delivery. Five deaths were recorded within the period under review, three passed on shortly after being admitted at the Accident and Emergency department of the hospital, while the other two died a few days after admission. (Table 6). Overall, more than 97% of patients presented with Ludwig's angina at the hospital within the period under review were successfully treated and discharged home.

Table 3: Frequency distribution of various cultured organisms among the patients (n=157)

Microorganism	Frequency	Percent
<i>Pseudomonas</i>	152	96.82
<i>Proteus</i>	149	94.90
<i>Staphylococcus. aureus</i>	109	69.43
<i>Beta hemolytic streptococcus</i>	122	77.71

Table 4: Associated co-morbidities among the patients

Co-morbidities	Frequency	Percent
Anaemia	78	36.28
Diabetics mellitus	62	28.84
Hypertension	45	20.93
None	30	13.95
Total	215	100.00

Table 5: Different treatment given to the patients

Options	Frequency	Percent
A IV antibiotics, analgesic and steroid.	5	2.30
B Option A plus extraction	29	13.50
C Option B plus incision and drainage for surgical decompression	144	67.00
D Option C plus conventional tracheostomy for immediate Airway management	15	7.00
E Option A plus incision and drainage for surgical decompression	22	10.20
Total	215	100.00

Table 6: Frequency and distribution of complications among the patients

Complications	Frequency	Percent
None	104	48.37
Necrotizing fasciitis	35	16.27
Mediastinitis	21	9.77
Septicemia	16	7.44
Asphyxia	15	6.98
Diabetic ketoacidosis	7	3.26
Aspiration pneumonia	7	3.26
Eclampsia	5	2.33
Death	5	2.33
Total	215	100.00

## DISCUSSION

Ludwig's Angina has been described as a surgical emergency that is potentially life-threatening but were observed rarely in everyday general dental practice (Clifton et al., 1982; Saifeldeen & Evans, 2004; Ugboke et al., 2005; Sujatha et al., 2015). Prior to 2014, patients' record revealed that few cases of Ludwig's angina presented and were managed at Accident and Emergency Unit, and Dental Outpatient Clinic of the Federal Medical Centre, Nguru, Yobe State, Nigeria. That has changed. This study revealed a gradual and steady increase in the number of cases presented for management from 2014 to date. Although the exact reasons for the sudden increase have not been fully understood, but it may due to the insurgency in region which hinders the access of individuals to health facilities. The socioeconomic status of the people around this region may have also influenced the high rate of the disease condition as the region has the highest poverty in Nigeria. The fact that the majority of the affected patients had low educational attainment may be a contributory explanation of the increasing incidence of the disease as low educational attainment has been linked with more infections. Among the age groups recorded, the disease condition was highest between the ages of 41 to 50 years and more common amongst the educationally deprived individuals. This was in line with previous

studies (Grod-Nskmyd, 1939; Owens & Schuman, 1993; LeJeune & Amedee, 1994; Owens & Schuman, 1994; Busch & Shah, 1997; Osunde et al., 2014), which revealed that the disease is more commonly seen in the older population with a mean age of 40 to 50 years. The mean age of the patients in this study was 45.38 years which fell within the reported mean values. The fact that majority of patients with untreated oral diseases and indulge in delayed dental treatment seeking behaviour are in this age range explains why they were dominantly affected by Ludwig's angina.

Clinical presentation of the patients in this study was in tandem with classical definition of Ludwig's angina as all patients seen had bilateral submandibular and sublingual swelling, trismus, fever, and poor oral hygiene. Respiratory distress, dysphagia and stridor are the other symptoms seen in some patients which are signal indicators of different levels of severity.

Studies have shown that Ludwig's angina to be more common in males than females with a ratio of 2.32:1 to 5.5:1 (Williams & Guralnick, 1943; Clifton et al., 1982; Saifeldeen & Evans, 2004). The main reason attributed to these discrepancies was that males exhibit less concern about their dental care. However, the result from this retrospective analysis revealed a different gender ratio. It was found that the disease condition occurred more in females compared to the males, in a ratio of 1.1:2. This may

be due to the fact that females are less empowered financially and this may have resulted in delayed treatment seeking behaviour among female patients. Religious inhibition of females in northern Nigeria where the study was conducted may be a contributory explanation for more affection of females by Ludwig's angina.

The majority of the patients with the Ludwig's angina were of odontogenic origin with carious second or third mandibular molars implicated in line with previous studies (Clifton et al., 1982; Saifeldeen & Evans, 2004; Botha, 2015). This may be due to the fact that most of the patients had history of toothache which were not treated but later become severe. The indulgence in self-medication either because of ignorance or inability to pay for the required dental treatment thereby delaying professional care seeking behaviour. It has been documented that patients on self-medication seek professional care on worsening of their symptoms. This study also revealed quite a substantial number of cases which had developed Ludwig's angina as a result of untreated/poorly managed maxillofacial injuries and lymphadenitis.

Patients with no pre-existing co-morbidities had a less severe condition and less hospital stay. Few patients with underlying co-morbidities with mainly anaemia and diabetes mellitus had a severe form of the disease, developed complications and delayed hospital stay. Necrotizing fasciitis, mediastinitis and septicaemia were the leading complications which may be linked the rapid spreading nature of the Ludwig's angina and late hospital presentation for oral health related problems among Nigerians. Eclampsia and Diabetic ketoacidosis were also recorded because some of the patients were pregnant and some had uncontrolled diabetes mellitus respectively.

Globally, Ludwig's Angina is considered as a dental emergency which can cause serious airway compromise (Har-El et al., 1994; Caplan et al., 2003; Saifeldeen & Evans, 2004; Botha et al., 2015). Maintenance and protection of the airway are the most important component of the comprehensive management of Ludwig's angina. Ludwig's angina is potentially life threatening and require aggressive medical and surgical management ((Shockley, 999; Neff et al., 1999; Candamourty 2012; Saifeldeen & Evans, 2004; Botha, 2015). Early recognition is usually essential for the overall success in the management of these patients. The first line of management is surgical drainage, removal of the cause of the infection and drainage of accumulated

pus and necrotic tissue. Microbial culture and sensitivity indicated the appropriate antibiotics but in the initial management broad spectrum antibiotics are prescribed because Ludwig's angina is polymicrobial in nature. This was confirmed by culture of sample obtained from incision and drainage which revealed a mixed microbial flora of *Bacteroides* *Actinomyces* spp, *Streptococcus viridans*, *Staphylococcus aureus*, *Enterococcus*, *E. coli* and *Pseudomonas* with *Streptococcus* being the most common microorganism isolated. The mortality rate of Ludwig's angina is estimated to be in the range of 8% (Linder, 1986; Moreland et al., 1988; Barakate et al., 2001; Ovassapian et al., 2005), but our result revealed a less than 3% mortality rate. This high rate of success in the management of Ludwig's Angina at this hospital has been attributed to the well-established management protocol design at the Department to handle such related medical and surgical emergencies.

## CONCLUSION

Early detection of Ludwig's angina followed by prompt diagnosis and institution of appropriate antibiotics, as well as possible surgical intervention in the course of management remain a valid option to reducing severe morbidity. However, socioeconomic status and insurgency have inevitably have hampered these efforts.

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## Conflict of interest

The authors declare that they have no conflicts of interest.

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