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Original Article

Distribution and Determinants of Ludwig's Angina: Experience of 30 Cases in Bangladesh

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Abstract

Background: Ludwig's angina produces a serious morbidity. **Objective:** The purpose of the present study was to find out the risk factors, treatment response of the antibiotics and complication of the Ludwig's angina, which will help in prevention and management of this potentially dangerous condition. **Methodology:** A prospective study was carried out from September 2014 to August 2015 at the department of Otolaryngology-Head & Neck surgery of Banghabandhu Sheikh Mujib Medical University (BSMMU), BIRDEM general hospital and DMCH. This study included 30 patients with Ludwig's angina. In this study minimum age, maximum age and mean age were taken. **Result:** Highest numbers of patients were in the 3rd decade of life. Out of 30 patients, male were 70% and female were 30%. Majority of the patients (76.59%) were from rural area. And the nutritional statuses of the patients were below average. Almost all the patients came with the complaints of neck swelling, pain and fever. Dental infection was the commonest source of infection. Here growth of colony found 76.67% and *Streptococci* (*strep. Viridans*) was found in 30% cases. Maximum patients were treated by parental antibiotics with surgical drainage. Eight patients developed complications, and five patients died in this series. Average hospital stays of the patients were 11.2 days. **Conclusion:** Most of the patients are male with poor socioeconomic class and *Streptococci* Viridans is the commonest organism. [*Journal of Current and Advance Medical Research 2016;3(1):16-21*]

Keywords: Ludwig's angina; *Streptococci* Viridans; distribution and determinants

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Introduction

Ludwig's angina is a rapidly spreading cellulitis of the floor of the mouth and submandibular space secondary to soft tissue infection, tonsillar infection and infection of lower second and third molar teeth, first described by Wilhelm Fredric Von Ludwig's in 1836[1]. Most of the patients have dental disease particularly in the lower molars are set eccentrically with the roots closer to the inner than the outer side of the jaw, or the roots of the second and third molars may lie inferior to the mylohyoid line. Root abscess of these teeth therefore drain into the

submandibular space. This space may be affected with minimal discomfort from the tooth; pain comes from tension within the bone, but if this gives way and drains there is no dental pain[2].

There are five identifying characteristics for the diagnosis of Ludwig's angina developed by Grodinsky are the infection is a cellulitis of the submandibular space, not an abscess; it never involves only one space, and it is usually bilateral; the cellulitis causes gangrene with serosanguineous infiltration and very little or no frank pus; the cellulitis attack the connective tissue, fascia and muscles but not the glandular structures and the cellulitis is spread by continuity, not by the lymphatics[1]. Predisposing factors include dental caries, recent dental treatment, systemic illness such as AIDS and organ transplantation and trauma[3-5]. Mandibular trauma, penetrating injuries of the floor of mouth, oral neoplasm and lymphangiomas have been reported as potential causes of Ludwig's angina as well[1]. In cases of dental origin the most usual organism are *Streptococcus viridans* and Escherichia coli. Before antibiotics were available, swelling frequently led to respiratory obstruction & death[2].

For centuries, the diagnosis and treatment of deep neck space infections have challenged physicians and surgeons. The complexity and the deep location of this region make diagnosis and treatment of infections in this area difficult with significant risks of morbidity and mortality. The overwhelming complication rates of the past have been reduced with the advent of modern microbiology and haematology, the development of sophisticated diagnostic tools like CT, MRI, the effectiveness of modern antibiotics and the continued development of medical intensive care protocols and surgical techniques[2]. Ludwig's angina is managed by parental therapy, surgical drainage and protection and control of the airway[2-5]. Usually the illness is associated with other comorbid conditions and it is very important to identify and address these co morbidities. Diabetes mellitus is an important co morbid condition which should be checked for and proper handling of diabetes is also an important part of comprehensive treatment.

Because the incidence of Ludwig's angina has steadily declined, fewer physicians are experienced in diagnosing it and in identifying the etiological agent. Stridor and cyanosis are the late manifestations of impending airway obstruction and airway management should remain the primary therapeutic concern[6]. In a developing country like ours, with poor nutritional status, poor dental hygiene and lack of proper medical support, the incidence of neck space infection is a major problem. This study is planned to find out the risk factors, treatment response of the antibiotics and complication of the Ludwig's angina, which will help in prevention and management of this potentially dangerous condition.

Methodology

Thirty patients included in the study were collected from BSMMU, BIRDEM and DMCH. The study was carried out from September 2014 to August 2015. Diagnosis of Ludwig's angina was achieved by the criteria like the infection is a cellulitis of the submandibular space, not an abscess; it never involves only one space, and it is usually bilateral; the cellulitis causes gangrene with serosanguineous infiltration and very little or no frank pus; the cellulitis attacks the connective tissue, fascia and muscles but not the glandular structures; the cellulitis is spread by continuity, not by the lymphatics. When a patient reports to hospital detailed history was taken. This included duration of each symptom, relevant history of present and post illness, dental infection, throat infection and diabetes mellitus. At first local examination of neck and ENT were done. Then routine investigations like blood for TC, DC, ESR, Hb%, Urine R/M/E, RBS/FBS were done in all cases. Radiological investigations such as X-ray soft tissue neck A/P and lateral view were done in all cases, in some cases X-ray Chest P/A view was done where thoracic involvement were suspected. Where odontogenic infection was thought to be the indicating factor, orthopantogram (OPG) of jaw were done to identify the offending tooth/teeth. In some instances the swelling was aspirated and the aspirated material send for culture and sensitivity, the drained material were also sent for C/S. The patient treated with intravenous fluid, parental antibiotics, injectable analgesic, oral hygiene was maintaining by gargling with hydrogen peroxide mouth wash. Incision and drainage of abscess were done in majority of the patient. They required daily dressing with aseptic precaution and most of the patients were improved gradually within few days and most of the patients were released with advices such as proper dental care, control of diabetes etc.

Result

Minimum age, maximum age and average age were 1.5 years, 67 years and 39.3 years respectively. Maximum number of the patients was in 3rd decade

(26.67). 70% of the patients were male with a male to female ratio of 2.33:1 (Table 1).

Table 1: Age distribution of patients (n=30)

Age Group	Male	Female	Total
0-10 yr	1	1	2(6.67)
11-20 yr	2	1	3(10.00)
21-30 yr	4	2	6(20.00)
31-40 yr	6	2	8(26.67)
41-50 yr	3	1	4(13.33)
51-60 yr	3	1	4(13.33)
61-70	2	1	3(10.00)
Total	**21**	**09**	**30(100.0)**

Majority of the study population were from low socioeconomic status which was 66.66% followed by middle class and affluent classes which were 23.33% and 10.0% respectively.

Table 2: Socio Economic Status (n=30)

Class	Frequency	Percentage
Poor	20	66.66
Middle class	7	23.33
Affluent	3	10
Total	**30**	**100.0**

Table 3: Types of Habitat (n=30)

Habitat	Frequency	Percentage
Rural	23	76.59
Urban	7	23.41
Total	**30**	**100.0**

Rural dwellers (75%) dominated over the urban dwellers (25%), with rural to urban ratio of 3:1

Table 4: Nutritional Status (n=30)

Status	Frequency	Percentage
Average	7	23.33
Below Average	23	76.67
Total	**30**	**100.0**

Majority of patients (76.67%) in this series were under nourished Clinical presentation of the patients was diverse. Most of the patients presented with multiple complaints. Neck swelling, fever and pain were commonest presentation. 50% Patients of Ludwig's angina caused due to dental infection. Majority of the cases (76.67%) the causative organism can be identified by the aerobic culture. Commonest organism was Streptococci (*Strep. viridans*) in 30% cases.

Table 5: Clinical presentation of patients (n=30)

Presentation	Frequency	Percentage
Neck Swelling	30	100
Pain	30	100
Fever	30	100
Dysphagia	25	83.34
Dental complaints	18	60
Voice change	07	23.34
Foul smelling breath	05	16.67
Trismus	04	13.34
Respiratory distress	02	6.67
Sore throat	03	10

Most of the patients (50%) were treated by Penicillin, Gentamycin, Metronidazole and response was satisfactory. Most of the patients 86.66% were treated surgically as well as parental antibiotics and response were good. Three patients (10%) develop necrotizing fasciitis. Duration of hospital stay for majority of the patients (33.33%) was up to 2 weeks with average hospital stay of 11.2 days.

Table 6: Risk factors (n=30)

Aetiology	Frequency	Percentage
Dental infection	15	50
Diabetic mellitus	2	6.67
Tonsiller infection	5	16.67
Oral mucosal injury	5	16.67
Fracture mandible	2	6.67
Submandibular sialadenitis	1	3.34
Total	**30**	**100**

Discussion

Before antibiotics were available swelling in the submandibular space frequently led to respiratory obstruction and death. The overwhelming complication rates of the past have been reduced due to the effectiveness of modern antibiotics, modern microbiology and hematology and sophisticated diagnostic tools. In this prospective study, thirty patients of Ludwig's angina were included. All cases were attending in Otolaryngology-Head and neck surgery department of BSMMU, BIRDEM hospital and DMCH for one year (September 2014 to August 2015). Patients of all age, sex and social classes were included. This study had been carried out in a limited number of cases and a limited period of times. Still then the cases were collected from three important tertiary referral hospitals in Dhaka city. The result of this

study is likely to be a reflection of certain facts regarding Ludwig's angina in our country.

Table 7: Pattern of microorganism in aerobic culture (n=30)

Organism	Frequency	Percentage
Growth of colony	23	76.67
Streptococci	09	30
Staphylococci	07	23.34
E. coli	3	10
Pseudomonas	2	6.67
Proteus	1	3.34
Klebsiella	1	3.34
No growth	07	23.34
Total	**30**	**100**

In this study, minimum age, maximum age and mean age were 1.5 years, 67 years and 39 years respectively. Majority (26.67%) of patients were in the 3rd decade of life (Table 1). The average age was 39 years which was nearly consistent with Wang et al[30] who found it to be 41.7 years.

Table 8: Antibiotics used in patients (n=30)

Antibiotics	Frequency	Percentage
Penicillin, Gentamycin & Metronidazole	15	50
Ceftriaxone & Metronidazole	7	23.34
Ciprofloxacin & Metronidazole	8	26.66

Here males were prominent sex, male to female ratio was 2.33:1 (Table 1), which was nearly consistent with the findings of a previous study[33] in DMCH (2.16:1). Majorities of the patients came from lower social class (66.66%) with only 10% of the patients from affluent class (Table 2). In this study Seventy seven percent patients were from rural area, only twenty three percent from urban area, with a rural urban ratio of 3:1 (Table 3). Nutritional status of 76% patients was below average (Table 4).

These may due to be the fact that most people of our country live in rural area and their socioeconomic condition and nutritional status was not good. The patients did not seek proper medical care in the early stage of disease due to poverty and facilities especially specialist services are lacking in rural areas.

Table 9: Treatment plan used (n=30)

Treatment	Frequency	Percentage
Surgical drainage + Parental antibiotics	26	86.66
Parental antibiotics	4	13.33

In this study clinical presentations of the patients were different. Most patients presented with multiple complaints. Neck swelling, pain and fever were the commonest presentations (Table 5). Next common presentation was dysphagia. Maras also found symptoms of fever, sore throat, dysphagia and trismus as common[16]. Here dental infection is the commonest source of infection fifty percent (Table 6). Kurien et al[31] shows that in adults 60% of Ludwig's angina is caused by dental diseases.

Table 10: Complications of the Ludwig's angina (n=30)

Name	Frequency	Percentage
Necrotizing fasciitis	3	10
Septicaemia	2	6.67
Mediastinitis	2	6.67
Laryngeal oedema	1	3.34
Total	**8**	**26.67**

In this study an attempt was made to know the organism responsible for Ludwig's angina by aerobic culture. Anaerobic culture was not done because it is not available in Bangladesh. Here growth of organism in aerobic culture was found in 76.67% cases (Table 7). *Streptococcus viridans* was found in 30% cases. Culture did not yield growth of colony in 23.34% cases; most of the patients start antibiotics before sending sample for culture sensitivity. A study in DMCH found growth of colony in aerobic culture was 58%. Most of the organism was *Strepto viridans* in that series[33].

Table 11: Duration of Hospital Stay (n-30)

Hospital Stay (week)	Frequency	Percentage
Up to 1	5	16.67
1-2	10	33.33
2-3	7	23.34
3-4	6	20
4 & above	2	6.67

In this study most of patients (50%) were treated by parental Penicillin, Gentamycin and Metronidazole (Table 8). Next group of patient (26.66%) were treated by Ciprofloxacin, Metronidazole and 23.34% were treated by Ceftriaxone and

Metronidazole. Metronidazole is used for anaerobic organism. Seventy seven percent of patients were treated by 1st two groups of antibiotics. Use of penicillin and metronidazole were consistence with Ashraf[34]. Best response observed by use of Ceftriaxone and Metronidazole in this series. In this study most of the patients treated by parental antibiotics and surgical drainage. Four (13.33%) patients were treated successfully with parental antibiotics alone (Table 9). In a study 3 cases out of 14 were treated successfully by conservative approach[5].

In this study eight patients develop complications. Main complications were necrotizing fasciitis 10%, septicaemia 6.67%, mediastinitis 6.67% and laryngeal oedema 3.34% (Table 10). In this study five patients (16.6%) died. Two patients due to septicaemia, two due to mediastinitis and one due to laryngeal oedema.

In a series of 14 patients, only one needed tracheostomy[5]. Here duration of hospital stay for majority of patients thirty three percent was up to two weeks, with average hospital stay of 11.2 days (Table 11). A review of literature showed that early recognition and aggressive management significantly reduced the mortality rate by 50% and it was 8.5%[4].

Conclusion

From this study it can be concluded that most of the patients are male with poor socioeconomic class; however, dental infection is an important risk factor where *Streptococci* Viridans is the commonest organism. Combination of parental antibiotics plays an important role in the control of infection. Most of the patients need surgical decompression. Main cause of death is septicaemia, mediastinitis and laryngeal oedema. Therefore, proper dental care and good control of diabetes mellitus and early intervention will reduce the morbidity and mortality of this disease.

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