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Study of clinical profile of acute limb cellulitis patients in tertiary care center

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Abstract

Background: This high volume, single centre study investigated the clinical profile of acute limb cellulitis patients in terms of prevalence, etiological factors, bacterial epidemiology, responsiveness to antibiotic therapy and outcome of different treatment modalities.

Materials and Methods: This is a prospective observational study in our tertiary care hospital. Total 100 cases of limb cellulitis were evaluated from 2020 to 2023. Data about the selected cases collected to provide demographics, cellulitis grading, symptoms, complications, cultures, and antibiotic sensitivity patterns. After collecting the data thorough analysis conducted to obtain the results.

Conclusion: The cellulitis prevalence and severity increases with advancing age and associated comorbidities. Diabetes found to be most common cause of cellulitis which is more common in males. Empirical antibiotic therapy started with coverage for *Streptococcus* species before broadening to anti-Methicillin-resistant *Staphylococcus aureus* and anti-Gram negatives according to the culture profiles, if needed for effective treatment of extremity cellulitis. Hospital admission for the severe forms of cellulitis, appropriate and emergency surgical intervention as needed, employing cult antibiotics, managing the comorbidities can salvage the limbs and lives.

Keywords: Cellulitis, diabetes mellites, streptococcal infections

Introduction

Cellulitis is a condition which is characterized by inflammation of connective tissue of the skin with severe involvement of dermal and subcutaneous layers^[1-2]. This happens when the physical skin barrier, the immune system and or the circulatory systems are impaired. In normal circumstances the skin provides an effective barrier against invasion by micro-organisms that lie on the skin or in the environment. It acts as the first line defence against the microbes entering the body and multiplying. It is principally a bacterial infection, the organism can be either the normal skin flora or an exogenous one. The term "chronic cellulitis," which is frequently used by laypeople and infrequently by medical professionals, refers to recurring cellulitis or is a misunderstanding of the chronic skin abnormalities brought on by lymphoedema or venous insufficiency^[3].

As commonly known, diabetics are the most susceptible population for the lower limb cellulitis primarily because of the fact they have more incidence of foot ulcers (Due to the neuropathy and vasculopathy which ensues in the form of sensory loss and poor distal circulation and also because they are immune compromised. Poor glycaemic control aids the growth of the organism in the ulcers they develop and eventually results up in the cellulitis. Yet, there is a significant section of population who are non-diabetics, are also more prone for the development of lower limb cellulitis and its complications. Early cellulitis can be managed in out-patient unit with oral antibiotics, analgesics and treating the primary cause. But cellulitis of higher grades, with its complications like blisters, myositis, fasciitis needs hospital admission, parenteral antibiotics and surgical management.

Surgical regimen practiced such that surgical incisions over involved part and also extending beyond the area of devitalized skin until the zone of fresh viable tissue is reached. Abscesses, if any, drained. Fasciotomy done when there is threat of compartment syndrome. Better identification of identifiable risk factors for cellulitis has significant implications for reducing morbidity and mortality from this diseases and improving patient management. Its important to diagnose cellulitis in early stages and start prompt management.

Aims and Objectives

- 1 To study clinical presentation and prevalence of limb cellulitis.
- 2 To study Risk factors and Co-morbid conditions associated with Limb cellulitis.
- 3 To study the Microbiological profile (causative agents responsible for cellulitis and their sensitivity pattern).
- 4 To study conservative and surgical management of cellulitis
- 5 To Study Mortality and Morbidity associated with cellulitis case.
- 6 To study the outcome of the different treatment modalities of cellulitis.

Materials and Methods

Study design: Prospective Study

Study area: Tertiary care hospital

Sample size: 100 cases

Study duration: August 2020 to August 2022

Data Collection

This was a prospective study carried out at a tertiary care hospital. Included the patients visited hospital during period between August 2020 to August 2022. Total 100 patients were included in this study. Patient data was collected with detailed history and thorough clinical examination was done. Patients were investigated for routine laboratory (CBC, BSL LFT, RFT, urine culture sensitivity, pus culture sensitivity) investigation and radiological (Chest x-ray, USG abdomen + pelvis, local USG with colour doppler, X-ray of affected limb, CECT) investigations.

- Patient as indicated were operated with suitable surgical or as per needed conservative expectant management
- Patient were followed up for immediate and late postoperative complication.
- Effective modern methods of wound management like vacuum dressing and sos amputations performed with prior consent of patient and relatives.
- Data was entered in proforma in tabulated format and analysed with respect to aims and objectives.

Inclusion criteria

Patients who presented with acute swelling of affected limb or wound over affected limb with the age of more than 10 years.

Exclusion criteria

- Terminally ill patients
- Patients with malignancy and polytrauma
- Patients who are not willing to participate in study

Grade of Celluliti

Results

Age distribution

Table 1: Age distribution among the studied patients

Serial No	Age Group	No. of Patients
1	<20	1
2	21-30	1
3	31-40	7
4	41-50	20
5	51-60	25
6	>60	46

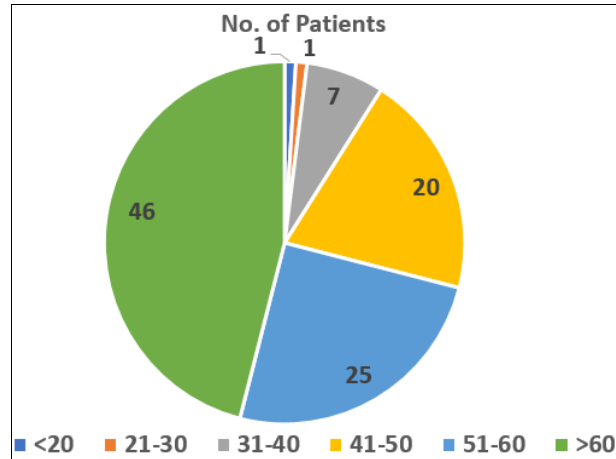


Fig 1: Incidence of limb cellulitis goes on increasing with the age with maximum patients in study group belonged to the above 60 years age group.

Sex distribution

Table 2: Sex Distribution patients

Gender	Frequency
Male	78
Female	22
Total	100

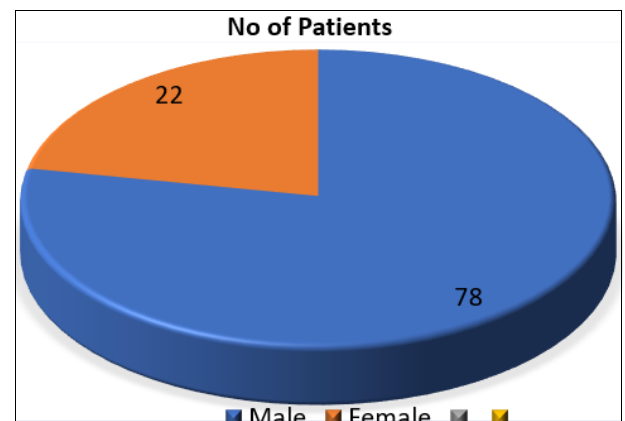


Fig 2: Among 100 patients included in study 78 were male and remaining 22 were female

Table 3: Distribution of patients according to grade of cellulitis

Serial No.	Grade of Cellulitis	No. of Patients
1	II	10
2	III	68
3	IV	22

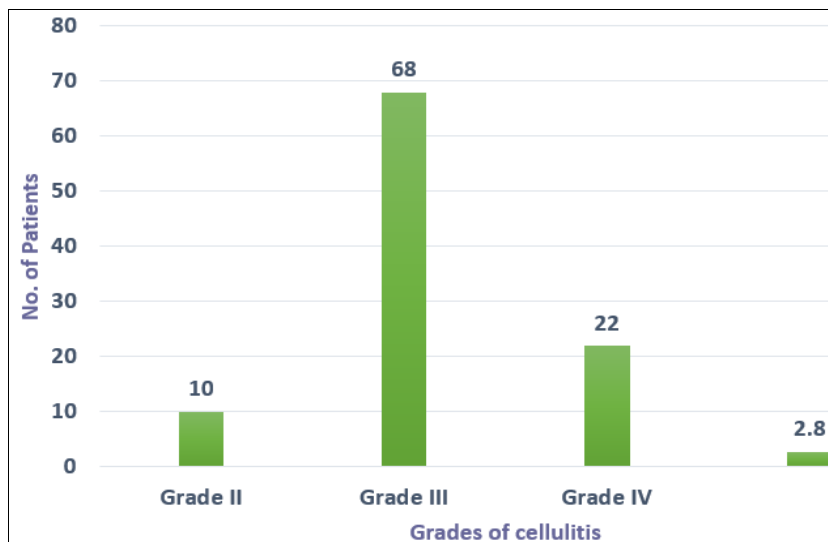


Fig 3: Total 10 patients among the study group were presented with Grade 1 cellulitis while 68 were with Grade 2 and remaining 22 were from Grade 3 cellulitis

Limb involved

Table 4: Limb involvement in cellulitis

Type	Upper Limb		Lower Limb	
	Unilateral	Bilateral	Unilateral	Bilateral
No of Patients	5	1	90	4

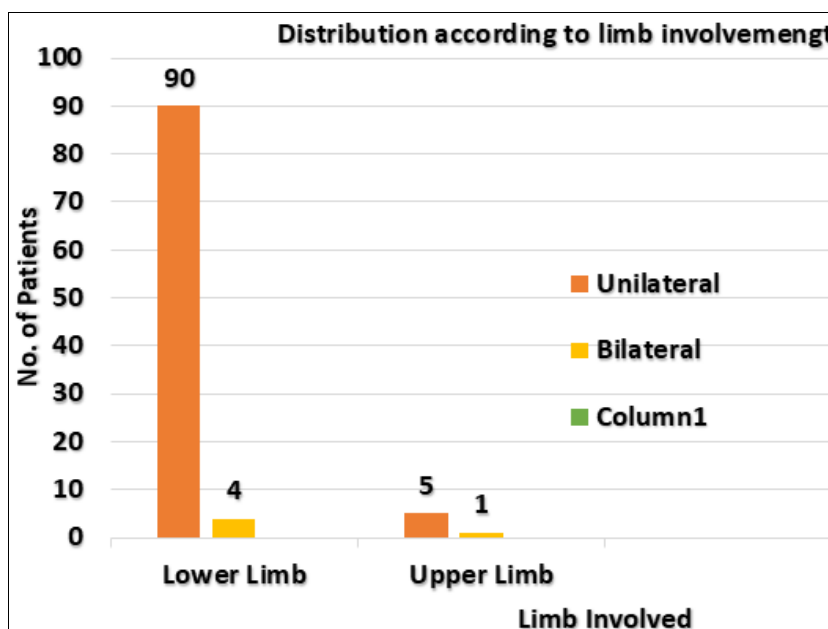


Fig 4: Maximum patients from the study group were having their unilateral lower limb affected while very few of the patients were having bilateral upper limb involvement

Etiological Factors for Cellulitis

Table 5: Etiological factors and No. of patients affected

Serial No.	Causes	No. of Patients
1	Diabetes Mellites	48
2	Bites	08
3	Traumatic wounds	18
4	Lymphedema	06
5	Chronic Kidney Disease	05
6	Web space infection	02
7	Unknown	14
8	Oedema in Cardiac Failure	06
9	Infected Burn wound	02

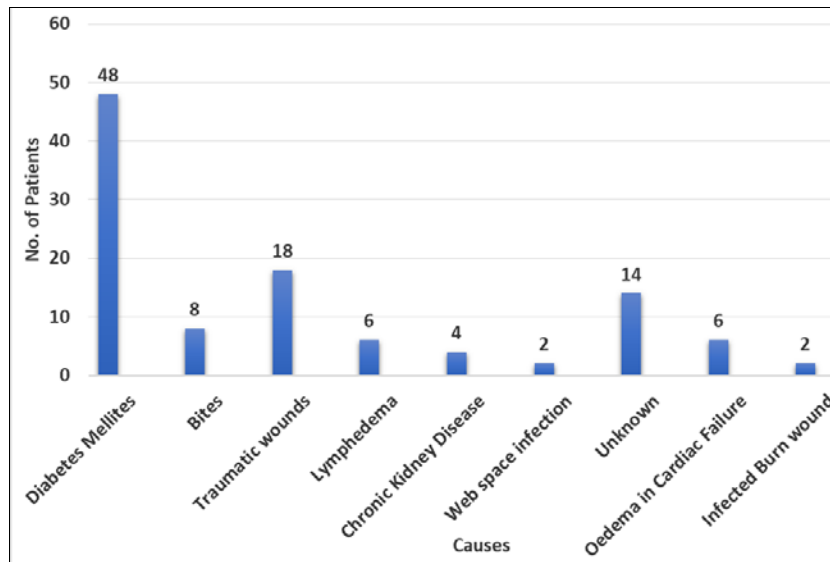


Fig 5: Distribution of patients with etiological factors

Out of total 100 patients studied, 48 patients that is the maximum among the study group were having Diabetic melilitis as the risk factor for cellulitis while next common factor being

the traumatic wounds followed by idiopathic one.

Micro-organisms grown on culture

Table 6: Distribution of different organisms grown on culture

Serial No.	Organism Grown	No. of patients
1	<i>Staphylococcus Aureus</i>	33
2	<i>Streptococcus</i> SP	11
3	<i>Klebsiella</i> SP	13
4	<i>Proteus</i>	07
5	<i>E. Coli</i>	13
6	<i>Pseudomonas</i> SP	08
7	Polymicrobial	04
8	No Growth	11

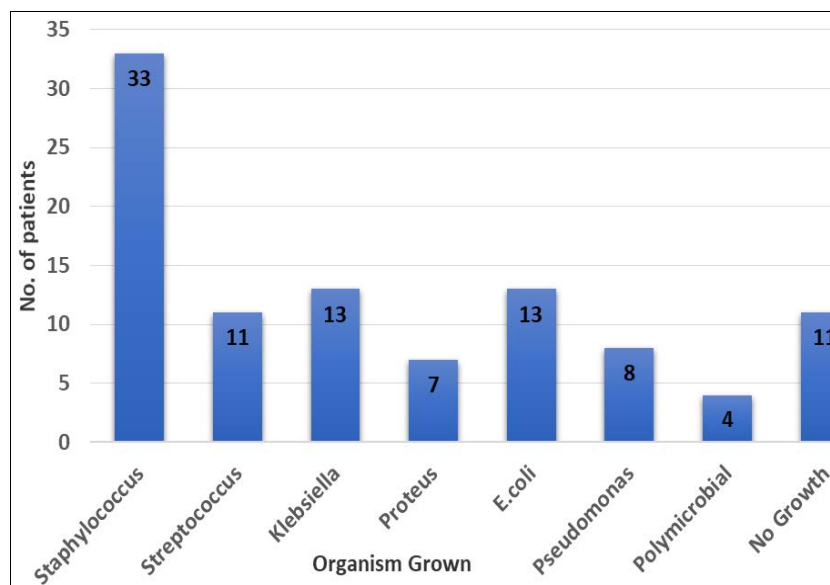


Fig 6: Distribution of organisms grown on culture

After admission all the patients were routinely investigated with swab culture from the affected limb over the hospital stay. Most common organism grown on culture was *Staphylococcus* followed by second most common being *Klebsiella* and *E. coli*.

Sensitive antibiotics

Organisms grown on the culture were instituted for the sensitivity test with different antibiotics and the following results were obtained.

Table 7: Antibiotic sensitivity pattern observed during study

Serial No.	Antibiotic Sensitivity	No. of Patients
1	Ciprofloxacin	06
2	Vancomycin	13
3	Meropenem	20
4	Imipenem	13
5	Amikacin	08
6	Amoxi-clav	06
7	Cefoperazone	04
8	Linezolid	08
9	Piperacillin and Tazobactam	22

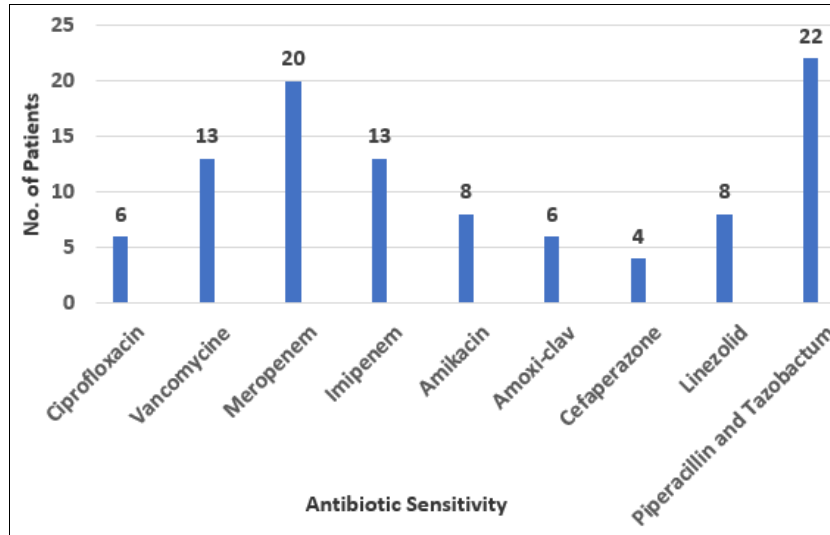


Fig 7: Sensitivity of different organisms to antibiotics

Treatment given

Table 8: Distribution of patients according to treatment given

Serial No.	Treatment Given	No. of Patients
1	Conservative	20
2	Wound Debridement	35
3	Wound Debridement with Fasciotomy	34
4	Amputation	11

Depending on the severity of the disease, each patient received a different course of treatment. Some patients received parenteral antibiotics, anti-inflammatory drugs, and limb elevation to alleviate pain. Most of the others required surgical wound debridement with or without decompression of the fascial compartment by a fasciotomy to relieve the accompanying oedema. Very few people required having a limb amputated.



Fig 8: Distribution of patients according to treatment given

It is observed that among total 100 patients, 20 patients were managed conservatively. Wound debridement was done for 35 patients while 34 patients required additional fasciotomy along with wound debridement. Only 11 patients required amputation

of affected limb having different indications

Outcome of treatment

The effectiveness of the treatment has been investigated to see

whether it is universal, whether the patient still has a wound that requires more care, whether the patient has some residual deformity, or whether the patient has died as a result of the diseases' aggravating comorbidities.

Table 9: Distribution of patients according to Outcome of Treatment given

Serial No.	Outcome	No. of Patients
1	Uneventful	20
2	Post-procedure wound	66
3	Disability	11
4	Death	03

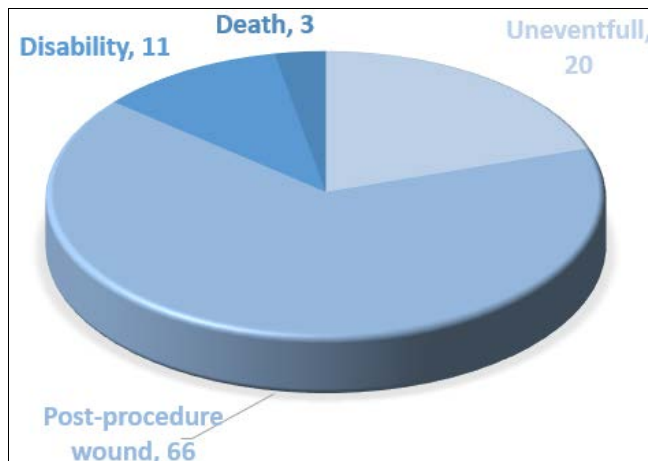


Fig 9: Distribution of patients according to Outcome of Treatment given.

It can be seen from the table that almost all the patients managed conservatively, had an uneventful recovery. Among those patients needed surgical intervention, 66 patients had the residual wound that needed further attention, 11 patients remained with disability due to amputation done for various indications. Total 3 patients died because of the disease related complications.

Discussion

Incidence

In present study total 100 patients were studied, the observation and results prove that the incidence of cellulitis increased with the increasing age. Also the severity of the disease goes on increasing with the age which correlates with literature due to immunosuppression and associated comorbidities [13]. In present study incidence of cellulitis found to be more common in males than in females [13].

Risk Factors

Common risk factors include diabetes mellitus, congestive heart failure, and renal failure with chronic oedema [5-6]. Neglected comorbidities like diabetes goes on with uncontrolled blood sugar levels that give additional risk of developing cellulitis [4]. Immuno-compromised individuals, advanced age, and obesity may also play a small role [7]. Diabetes mellitus observed as the single most common predisposing factor for the limb cellulitis and was associated with the severe grades.

Microbiological profile

Most common organism grown on cultures in present study is Staphylococcus. This finding is consistent with the studies conducted by Cox NH, Colver GB, Paterson WD. and Adimoolam E, Pitchai R. that showed the most common

organisms grown on cultures of cellulitis patients are staphylococcus and streptococcus species [8-9]. Other organisms include *Klebsiella* SP, *Proteus* SP, *pseudomonas* SP, *E coli* with variable percentage as shown in table.

Antibiotic sensitivity pattern

The sensitivity pattern studied for the organisms cultured in all the patients included in study to aid the medical line of treatment in combination with surgical treatment. This showed piperacillin-tazobactam and meropenem were the two groups of antibiotics which tend to have the maximum sensitivity for the common organisms causing the cellulitis. Cephalosporin group of antibiotics, amikacin, ciprofloxacin and gentamycin are found to be effective in good proportion of individuals. This findings are consistent with the studies conducted by Oh CC, Ko HC, Lee HY, Safdar N, Maki DG, Chlebicki MP. And Cross EL, Jordan H, Godfrey R, Onakpoya IJ [11-12].

Clinical presentation

Among total 100 patients studied, every patient had variable presentation with similarly group of symptoms. Almost all the patients complained of pain in affected limb. About 44% patients had associated wound over affected limb and 32% patients had discharge from the affected limb (serous, sero-purulent, frank pus). While 52% patients had swelling of the affected limb. 68% patients had fever. Swelling of affected limb with variable discharge from the wound were the common presentation among the majority of patients. Some people had fever and other symptoms of systemic involvement. Findings of presenting symptoms with variable combination of presentation are consistent with the literature [9-10].

Management

20% of total patients were managed conservatively. 69% patients in the study group required surgical debridement, 34% in this group required fasciotomy, and 11% of individuals in the study group required amputation. All the patients managed conservatively had an uneventful recovery and 66% of the patients had the residual wound that needed further attention 11% of the patients remained with disability, and 3% of the study group patient expired because of the comorbidities complicating the illness. Majority of the resultant wounds healed by secondary intention 72% rest were managed by split skin grafting 28%.

Outcomes

20% of total patients were managed conservatively. 69% patients in the study group required surgical debridement, 34% in this group required fasciotomy, and 11% of individuals in the study group required amputation. All the patients managed conservatively had an uneventful recovery and 66% of the patients had the residual wound that needed further attention 11% of the patients remained with disability, and 3% of the study group patient expired because of the comorbidities complicating the illness. Majority of the resultant wounds healed by secondary intention 72% rest were managed by split skin grafting 28%.

Conclusion

This study on lower limb cellulitis found that diabetes mellitus is the most common cause besides traumatic infected ulcer, post bite cellulitis, chronic kidney disease also contributing. Early diabetes mellitus screening and good glycaemic control prevent the incidence of cellulitis lower limb. Educating the people

regarding proper foot care, foot wear usage can prevent cellulitis occurring due to web space infections, cracks in the sole, trivial trauma in the foot. Hospital admission for the severe forms of cellulitis, appropriate and emergency surgical intervention as needed, employing cult antibiotics, managing the comorbidities can salvage the limbs and lives.

Conflict of Interest

Not available

Financial Support

Not available

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