DOI: 10.21088/nijs.0976.4747.16125.2

New Indian Journal of Surgery
Volume 16 Number 1, January - March 2025

ORIGINAL ARTICLE

Management of Cellulitis in Adults

Payal Dhanraj[1], Rohit Bajrang Mangrulkar[2], Siddharth Jain[3], Anitha Jagdish Kandi[4], Sarojini Pramod Jadhav[5]

How to cite this article:
***Payal D., Mangrulkar R.B.** et al.,* Management of Cellulitis in Adults. New Indian J Surg. 2025; 16(1): 13-18.

ABSTRACT

Background: Cellulitis is a bacterial skin and soft tissue infection which occur when the physical skin barrier, the immune system and/or the circulatory systems are impaired.

Objectives: The purpose of our prospective observational study was to see the outcome of management of cellulitis in adults in department of General Surgery at tertiary care centre catering the patients from rural areas.

Material: Present prospective observational study was carried out on 200 patients who aged more than 18 years & were hospitalized to the department of General Surgery in tertiary care centre from December 2020 to November 2022.

Result: Total 200 patients with cellulitis were enrolled in this study with mean age of 44.79 and range was 21-70 years. The most common age group in present study was 41-50 years of age 71(35.5%). There was male preponderance with male – female ratio of 3 : 2. About 71(35.5%) cases had trauma and 34(17%). Pain 189 (94%), swelling 178 (89%), redness 159 (79.5%) and local rise of temperature 150 (75%) were seen as hallmark features of cellulitis. Most common anatomical involvement in cellulitis was lower extremities 165 (82.5%). About 63.5% cases belonged to Class I according to CREST classification. About 60% of cases underwent surgical management while 40% cases responded to conservative line of management. All

AUTHOR'S AFFILIATION:

[1]Senior Resident Department of General Surgery, Government Medical College, Chhatrapati, Sambhajinagar, Maharashtra 431001, India.

[2]Junior Resident, Department of General Surgery, Government Medical College, Chhatrapati, Sambhajinagar, Maharashtra 431001, India.

[3]Assistant Lecture, Department of General Surgery, Government Medical College, Chhatrapati, Sambhajinagar, Maharashtra 431001, India.

[4]Associate Professor, Department of General Surgery, Government Medical College, Chhatrapati, Sambhajinagar, Maharashtra 431001, India.

[5]Professor, Department of General Surgery, Government Medical College, Chhatrapati, Sambhajinagar, Maharashtra 431001, India.

CORRESPONDING AUTHOR:

Rohit Bajrang Mangrulkar, Junior Resident, Department of General Surgery, Government Medical College, Chhatrapati, Sambhajinagar, Maharashtra 431001, India.
E-mail: Rohitmangrulkar2612@gmail.com

➢ **Received:** 03-01-2025 ➢ **Revised:** 25-01-2025 ➢ **Accepted:** 03-02-2025

Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution NonCommercial 4.0 License (http://www.creativecommons.org/licenses/by-nc/4.0/) which permits non-Commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the Red Flower Publication and Open Access pages (https://www.rfppl.co.in)

120 patients who were managed surgically underwent fasciotomy. 50.8% cases underwent debridement. Morbidity was higher in elderly individuals above 60 years, male patients & who had history of trauma followed by DM.

Conclusion: From this study we conclude that, as the age increases, complications and morbidity associated with cellulitis increases. CREST classification demonstrates good precision in deciding the duration of hospitalization. Proper understanding of the risk factors and factors associated with the complications of cellulitis will help healthcare professionals in implementing preventive measures

KEYWORDS

• Cellulitis • CREST classification • Cellulitis management

INTRODUCTION

Cellulitis is a bacterial skin and soft tissue infection which occur when the physical skin barrier, the immune system and/or the circulatory systems are impaired. Under normal circumstances, the skin provides an effective barrier against invasion by micro-organism that live on the skin or that are present in environment. It is a first line defence that stops microorganism from entering the body and multiplying. It is a common medical condition with different severity varies from mild to life threatening disease.[1] Most commonly, cellulitis involves the lower extremities but may involve any parts of the body.[2]

The diagnosis of cellulitis is generally based on the morphologic features of the lesion and the clinical setting characterized by erythema, swelling, warmth and pain. Fever and constitutional symptoms are often mild or absent in uncomplicated cellulitis.[3]

Several risk factors for the cellulitis have been described. The most common of them are trauma, oedema, prior radiation therapy, previous surgery and skin disorders that cause a potential portal of entry such as toe web intertrigo.[4] Some other potential risk factors reported in studies including diabetes mellitus, prior malignancy, body mass index (BMI), smoking, alcoholism and ethnicity with controversial findings.

The local care of cellulitis involves the elevation and immobilization of the involved limb to reduce swelling and cool sterile saline dressings to remove purulence from any open lesions. Surgical regimen practiced is such that the surgical incisions involved and also extended beyond the area of devitalized skin until the zone of fresh viable tissue is reached. Fasciotomy is done when there in threat of compartment syndrome.

Most cellulitis recovers completely; however, few may show complications including gangrene of infected parts, lymphangitis, lymphadenitis, shock, acute glomerulonephritis and renal failure, acute respiratory distress syndrome, sub-acute bacterial endocarditis and rarely death. It is important to diagnose cellulitis in early stages and start emergency management on war-footing to prevent its rapid spread. Co-morbid conditions need to be identified and treated along with cellulitis[5]. Inappropriate diagnosis of cellulitis is a problem and would need prospective rather than retrospective studies to quantify the extent.

The purpose of our prospective observational study was to see the outcome of management of cellulitis in adults in department of General Surgery at tertiary care centre catering the patients from rural areas.

MATERIAL METHOD

Present prospective observational study was carried out on 200 patients who aged more than 18 years & were hospitalized to the department of General Surgery in tertiary care centre from December 2020 to November 2022, after Ethical committee approval. After obtaining well informed written consent from diagnosed patients of cellulitis, complete history with history of predisposing factors, any co-

morbid condition was drawn out, followed by complete clinical examination with inspection and palpation. All the necessary investigations were done and patients were managed accordingly. The data recorded included demographics, onset of symptoms, clinical findings, medical history, co-morbidities, laboratory findings like CBC, BSL, HbA1C, LFT, Xray, colour doppler & local USG, etiology, therapeutic interventions, duration of hospital stay, morbidity and mortality. Morbidity was studied in the terms of the parameters like duration of hospital stay, duration of ICU stays, multiple debridement, discharging the patient with wounds, in view of healing by secondary intention. Management of cellulitis in classical case was done conservatively but, in some cases, required surgical management as well. In cases where patients presented late after onset of the initial symptoms, failure of the conservative management or in case of complications required surgical interventions.

Data was entered systematically in master chart by using MS excel. The data on categorical variables was presented as n (% of cases) and the values on continuous variables were presented as Mean ± Standard deviation (SD).

RESULT

Total 200 patients with cellulitis were enrolled in this study with mean age of 44.79 and range was 21-70 years. The most common age group in present study was 41-50 years of age 71 (35.5%). There was male preponderance with male – female ratio of 3:2. About 71(35.5%) cases had trauma and 34 (17%) cases had bites of any kind as predisposing factors respectively. In 64 (32%) cases had diabetes mellitus, 17 (8.5%) had hypertension while 7% had obesity as co-morbid condition. (*Table 1*)

Pain 189 (94%), swelling 178 (89%), redness 159 (79.5%) and local rise of temperature 150 (75%) were seen as hallmark features of cellulitis. (*Table 2*)

Most common anatomical involvement in cellulitis was lower extremities 165 (82.5%) followed by upper extremities 30 (15%). About 63.5% cases belonged to Class I, 28.5% cases in Class II, 5% cases in Class III and 3% cases in Class IV according to CREST classification. About 60% of cases underwent surgical management while 40% cases responded to conservative line of management. All 120 patients who were managed surgically underwent fasciotomy. 50.8% cases underwent debridement while 45.6% cases required re-debridement, hence had prolonged hospital stay. 10% cases skin cover was obtained by split skin grafting. (*Table 3*) Morbidity was higher in elderly individuals above 60 years, male patients & who had history of trauma followed by DM. (*Table 3 & 4*)

Table 1: Distribution of patients according to demographic profile.

Parameter		Frequency	Percentage
Age Group	18-20	2	1%
	21-30	23	11.50%
	31- 40	44	22%
	41-50	71	35.50%
	51-60	38	19%
	Above 60	22	11%
Gender	Male	123	61.50%
	Female	77	38.50%
Risk Factor	Trauma	71	35.50%
	Bites (Insect/ Animals/Human)	34	17%
	Diabetes mellitus	64	32%
	Hypertension	17	8.50%
	Obesity	14	7%

Table 2: Distribution of patients according to clinical feature

Clinical feature	Frequency	Percentage
Pain	189	94.50%
Redness	159	79.50%
Swelling	178	89%
Local rise of temperature	150	75%
Blistering	20	10%
Others (Itching/Discharge/ Dis-colouraion of skin)	26	13%

Table 3: Distribution of patients according to clinical profile

Parameter		Frequency	Percentage
Anatomical Location	Lower extremities	165	82.50%
	Upper extremities	30	15%
	Thorax/Trunk	5	2.50%

Parameter		Frequency	Percentage
CREST classification	Class I	127	63.50%
	Class II	57	28.50%
	Class III	10	5%
	Class IV	6	3%
Management	Conservative	80	40%
	Surgery	120	60%
Surgical Management	Fasciotomy	120	100%
	Debridement	61	50.80%
	Re-debridement	38	45.60%
	SSG	12	10%
Morbidity	Longer hospital stays	35	17.5%
	ICU stay	2	1%
	Discharged with wound	80	40%
	Death	2	1%

Table 4: Morbidity among patients

Morta		Frequency	Percentage
Age Group	18-20	0	0.00%
	21-30	5	21.70%
	31- 40	19	43.10%
	41-50	48	67.60%
	51-60	26	68.40%
	Above 60	20	90.90%
Gender	Male	86	69.90%
	Female	32	41.50%
Risk Factor	Trauma	47	66.10%
	Bites (Insect/ Animals/Human)	17	50.00%
	Diabetes mellitus	38	59.30%
	Hypertension	5	29.40%
	Obesity	11	78.50%

DISCUSSION

Cellulitis is an acute serious skin infection affecting the subcutaneous tissue which has a tendency to spread via the lymphatic and blood stream. Actual prevalence is uncertain due to the fact that clinical manifestation involves several disciplines such as dermatology, infectious diseases, internal medicine, general surgery etc. and that some of the patients were followed as outpatients while some ought to be hospitalized. It was noted that the incidence and prevalence of cellulitis increases as the age increases. Exact incidence of cellulitis in India is unknown but in USA, it is a common infection affecting 2-3 persons/100 persons/ year.[6] or its overall frequency is approximately 199 per 100,000 person-years, with nearly equal rates in men and women[7].

In the current study, 22% of the patients were between the ages of 31 and 40, and 35.5% of the patients were between the ages of 41 and 50. With a mean age of 44.79 years, the youngest patient was 21 years old and the oldest was 70 years old.

This was similar to studies conducted by Nassaji *et al*[8], Kour *et al*[9] and Kumar *et al.*[10] Morbidity was higher in elderly individuals. which was similar to Sharma, *et al.*[7] which stated that as the age increases, the incidence of cellulitis increases.

We had also found, male preponderance in this study with male : female ratio of 3 : 2. The present study findings correlating with the study conducted by Grover A *et al.* 2017[11], Khadilkar R *et al.* 2017[12], Sharma *et al.* 2019[7]. There was difference in the gender distribution in Kour *et al*[9] and Kumar *et al.* 10 they found female preponderance which maybe due to difference in the sample sizes.

In present study 162(82.5%) cases had cellulitis affecting the lower extremities. The study conducted by Grover A *et al.* 2017[11] & Khadilkar R *et al.* 2017[12] also found that in their study that, lower extremities were mostly involved in cellulitis.

In current study, 35.5% cases had trauma, 17% cases had Bites (insect, animal or human) as pre-disposing factor. 32% cases had diabetes mellitus 7% had obesity and 8.5% had hypertension as co-morbidities. The study findings correlate with the above mentioned studies with trauma was found in majority of cases in Nassaji *et al*[8] and Badipatla VN *et al.*[13], similarly diabetes mellitus was major co-morbidity in Nassaji *et al*[8], Khadilkar R *et al*[12], Sharma, *et al.*[7]

In present study, 94% cases had pain, 89% had swelling, 79.5%cases had redness and 75% had local rise of temperature. Similar result was also found in study conducted by Jain *et al*[14] & Grover A *et al.*[11] Also present study reported 127(63.5%) of cases found in Class I,

57(28.5%) found in Class II, 10 cases in Class III (5%) and 6 cases was found in Class IV (3%). Similar result was found in study conducted by Jain *et al*. Sharma *et al.*[14] found that most of the patients were belong to class III (67 patients) according to CREST classification, this might be due to difference in the sample sizes and shorter duration of study.

Out of 200 patients, 80(40%) patients were managed conservatively with IV empirical antibiotics, analgesics and anti-inflammatory agents in this present investigation. In addition to these supportive treatment with magnesium sulphate dressing, crepe bandaging and limb elevation was done. 120(60%) patients required surgical management. Similar findings found in the study conducted by Jain *et al*. 2018[14], Sharma, *et al*. 2019[7] Kumar *et al*. 2021[10] & Badipatla VN *et al*. 2022[13]. In the study conducted by Grover A *et al*. had majority of patients treated conservatively, as the patient presented early. WE had also found that, 35 patients had prolonged duration of hospital stay(17.5%), 02 cases had ICU stay (01%), 80 patients discharged with wound (40%), 13 discharged after SSG (6.5%) and 02 patients died (01%). Similar findings were found in study conducted by Sharma *et al*[7] & Collazos J *et al*.[15]

CONCLUSION

From this study we conclude that, as the age increases, complications and morbidity associated with cellulitis increases. Trauma was found to be the most common cause as predisposing factor, diabetes mellitus and obesity found to be the most common associated co-morbidities. 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 trivial trauma in the foot, web space infections, cracks in the sole. CREST classification demonstrates good precision in deciding the duration of hospitalization. Hospital admission for the severe forms of cellulitis, appropriate and emergency surgical intervention as needed. Managing the comorbidities can prevent further complications associated with it. Proper understanding of the risk factors and factors associated with the complications of cellulitis will help healthcare professionals in implementing preventive measures. Since our study was done over a short duration, certain long term outcomes could not be assessed. Hence, there is still need for further studies

Conflict of Intestate: No

Funding: No

Ethics Declaration: Ethical committee approval taken.

REFERENCES

1. Gunderson C.G. Cellulitis: Definition, etiology, and clinical features. Am J Med Internet. 2011; 124(12): 1113–22. Available from: http://dx.doi.org/10.1016/j.amjmed.2011.06.028
2. Swartz M.N. swartz 2004 Cellulitis. 2004; 904–12.
3. Elizabeth B., Daniela K. Cellulitis: Diagnosis and management. Dermatol Ther. 2011; 24(2): 229–39.
4. Laine C., Goldmann D.R., Sox H.C. In the clinic Cellulitis and Soft-Tissue Infections. 2016;
5. Björndóttir S., Gottfredsson M., Thórisdóttir A.S., Gunnarsson G.B., Ríkardsdóttir H., Kristjánsson M., *et al.* Risk factors for acute cellulitis of the lower limb: A prospective case-control study. Clin Infect Dis. 2005; 41(10): 1416–22.
6. Grover A., Shahapurkar V., Shinde R.K. Limb cellulitis in rural setting in India: a case control study. Int Surg J. 2017; 4(8): 2751.
7. Sharma G.R.B., Massodu K.S.M., Collins A., Parthipan G. Clinical Study of Risk Factors, Clinical Presentation and Management of Cellulitis Lower Limb. Int J Contemp Med Surg Radiol. 2019; 4(2): 177–81.
8. Nassaji M., Ghorbani R., Ghashghaee S. Risk factors of acute cellulitis in adult patients: A case-control study. East J Med. 2016; 21(1): 26–30.
9. Kour D.R., Kour D.G., Singh D.I., Kslsotra D.N., Sharma D.R. Determining the clinico-demographic-etiologic profile of lower limb cellulitis in non-diabetics: a cross sectional study. Int J Surg Sci. 2019; 3(4): 537–9.
10. Kumar R., Prakash P., Faiz N. The clinico-demographic and etiologic profile of lower limb cellulitis in non-diabetics: a hospital based study. Int J Heal Clin Res. 2020; 3(3): 68–71
11. Grover A., Shahapurkar V., Shinde R.K. Limb cellulitis in rural setting in India: a case control study. Int Surg J. 2017; 4(8): 2751.

12. Khadilkar R., Dnyanmote A., *et al.* A Clinical Study of 50 Patients of Cellulitis Treated in our Hospital. New Indian J Surg. 2017; 8(4): 543–5.
13. Badipatla V.N., Gurugubelli S.R., Chandra M.R., Teja P.L., Bade V., Erabati S.R. A clinical study of lower limb cellulitis. Int Surg J. 2022; 9(8): 1421.
14. Jain A.K.C. Evaluation and Management of Cellulitis and its Local Complications in Diabetic Lower Limb using the New Amit Jain's Staging System for Cellulitis - A Retrospective study. 2019; (June).
15. Collazos J., De La Fuente B., García A., Gómez H., Menéndez C., Enríquez H., *et al.* Cellulitis in adult patients: A large, multicenter, observational, prospective study of 606 episodes and analysis of the factors related to the response to treatment. PLoS One. 2018; 13(9): 1–15.