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A Study on Clinicomicrobiological Profiles and Management of Cellulitis

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Abstract
***BACKGROUND:** Cellulitis is a spreading, suppurative infection of the dermal and subdermal tissues that induces host response This study is a focus on the local epidemiology, microbacterial flora and antibiotic sensitivity pattern of microorganism causing cellulitis. **METHODS:** This cross sectional observational study was conducted in surgery department of a tertiary care hospital during January 2019 to September 2020. Study population consisted of 160 patients with cellulitis admitted in surgical wards. Demography, clinical examination and details of culture, antibiotic sensitivity and management were noted. **RESULTS:** Out of 160 patients 72(45%) were in age group of 41-60 years, 100 (62.50%) were males and 60 (37.50%) were females. Most common site involved in cellulitis was lower limbs (65.00%) and most common comorbidity observed was diabetes (35.63%). The microbiological culture was found to be negative in the major number of cases i.e. 96(60%) and positive cultures were obtained in 64(40%). Piperacillin tazobactam was found most sensitive against aerobic organism isolated on culture. Most of the patient were managed conservatively 88(55%). **CONCLUSION:** Early diagnosis, broad spectrum antibiotics & subsequent antibiotics based on culture sensitivity pattern, surgical intervention whenever required, regular dressing and improved nutritional support are responsible for faster recovery and decreased morbidity.*

***Key Words:** Infection, Cellulitis, Antibiotics, Microbiological*

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I. Introduction

Cellulitis is a spreading, suppurative infection of the dermal and subdermal tissues that induces host response.[1] It most commonly affects the lower limbs, which has unique risk factors for bacterial entry, proliferation and spread of infection, but it can occur in the face, arms and other areas of body.[2,3,4] Causative organisms for cellulitis include Streptococcus pyogenes and Staphylococcus aureus followed by gram-negative bacilli.[5] Clinically, cellulitis is characterized by erythema, oedema, induration, tenderness, warmth and bullae. Inflammation within draining lymphatic tissues may also result in lymphangitis and regional lymphadenopathy.[6] Most episodes of cellulitis are treatable with systemic antibiotics active against gram-positive organisms, however prolonged inpatient treatment, recurrence, chronic oedema, tissue ulceration, necrotising infection, shock, acute glomerulonephritis and renal failure, acute respiratory distress syndrome and sub-acute bacterial endocarditis are potential complications.[7]

The purpose of these study is to understand the local epidemiology, microbacterial flora and antibiotic sensitivity pattern of microorganism causing cellulitis. The study also intends to identify the risk factors for severe extensive deep cellulites requiring surgical intervention.

II. Material And Methods

The present cross sectional observational study was conducted in wards of surgery department of a tertiary care hospital during January 2019 to September 2020. STUDY DESIGN: A cross sectional study. Study population consisted of 160 patients with cellulitis admitted in surgical wards.

Patients clinically diagnosed with deep/extensive cellulitis requiring intravenous antibiotics belonging to age group of more than 12 years irrespective of sex were included in the study.

Demographic details like age, gender, address, occupation, registration number, date of admission, history of the patient; presenting chief complaints was recorded in chronological order along with history of presenting illness, past history, personal history and family history. Clinical examination of the patient was done. Detailed local examination was recorded followed by systemic examination in every case. Laboratory investigations like routine blood investigations including hemograms, random blood sugar, liver function tests, blood urea, serum creatinine and culture from the wound were performed. General condition of the patients was assessed. All patients were started on broad spectrum parenteral antibiotics. The antibiotic response was monitored and if the disease improved, the patient was maintained on the same antibiotic. If the patient showed no response or if there was progress in the disease, change in the antibiotic was practiced based on the culture and sensitivity pattern. Management of the locally affected area was done by applying either magnesium sulphate or ichthammol glycerin and elevation of the affected area. Patients underwent incision & drainage or debridement whenever required. Evaluation of the wound was repeated on daily basis and whenever needed further debridement was done. Dressing of wound was done with normal saline, povidone iodine solution, hydrogen peroxide and EUSOL (Edinburg University Solution of Lime). Outcome of management was recorded. Categorical data were assessed in the form of absolute numbers and percentages. Quantitative data was assessed by calculating range and measures of central tendency such as mean and standard deviation.

III. Observations And Results

The present study was conducted on 160 patients of cellulitis admitted in various surgical wards.

In our study the mean age was 49.26 years. The age range was 16-95 years and most of the patients were between 41-60 years. 26 (16.25%) patients were in the age group of 16-30 years, 24 (15.0%) patients were in the age group of 31-40 years, 33 (20.63%) patients were in the age group of 41-50 years, 39 (24.38%) patients were in the age group of 51-60 years, and 38 (23.75%) patients were more than 60 years of age.

Out of 160 patients 100 (62.50%) were males and 60 (37.50%) were females, with a male female ratio of 1.6:1. The most common history in cellulitis was trauma in 82 (51.25%) patients, followed by unknown bite in 44 patients (27.50%). No cause could be found in 34 (21.25%) patients. Cellulittis is common in extremities but can occur anywhere. In our study the most common site involved in cellulitis was lower limbs in 104 (65.00%) cases, followed by upper limbs involvement in 41 (25.63%) cases and trunk in 15 (9.38%) cases.

The most frequent symptom observed at affected site was swelling in 139 (86.88%) followed by pain in 116 (72.50%) and redness in 108 (67.50%) patients. Local examination details showed that 124 (77.5%) patients had local tenderness, warmth was present in lesion of 77 (48.13%) patients and bullae were present in 46 (28.75%) patients.

History was co morbidities were elicited and the most common comorbidity observed was Diabetes mellitus in 57 (35.63%) patients, followed by obesity in 38 (23.75%), lymphedema in 19 (11.87%) and chronic kidney disease in 9 (5.6%) patients.

Table 1: Microorganisms cultured from the lesion of cellulitis

Organism	No. of patients	Percentage
No growth	96	60
Staphylococcus aureus	21	15.63
Streptococcus pyogenes	32	23.75
Pseudomonas	16	10
E.coli	14	9.37
Klebsiella	10	6.25

The microbiological culture was found to be negative in the major number of cases i.e. 96 (60%) and positive cultures were obtained in 64 (40%) patients. Upon positive cultures the most common bacteria isolated was Streptococcus pyogenes 32 (23.75%). (Table 1)

Table 2: Antibiotic sensitivity pattern upon culture for aerobic organism

Antibiotic	No. of patients	Percentage
Piperacillin-tazobactam	60	93.75
Amikacin	43	67.18
Meropenem	26	40.62
Linezolid	35	54.68
Ciprofloxacin	17	26.56
Vancomycin	24	37.5

On performing sensitivity of antibiotics upon culture, piperacillin tazobactam was found most sensitive against aerobic organism isolated on culture i.e. 60 (93.75%) followed by Amikacin in 43 (67.18%), Linezolid in 35 (54.65%), Meropenem in 26 (82.22%), Vancomycin in 24 (37.5%) and Ciprofloxacin in 17(26.56%) cases. (Table 2)

Antibiotic sensitivity pattern upon culture for gram positive organisms were studied and piperacillin-tazobactam 38(79.16%) was found to be most sensitive on gram positive organisms followed by linezolid 35 (72.9%), vancomycin 24 (50%) and amikacin in 22 (45.8%) cases.

Similarly, antibiotic sensitivity pattern upon culture for gram negative organisms revealed meropenem in 26 (86.66%) patients to be most sensitive on gram negative organisms, followed by piperacillin-tazobactam in 22 (73.33%), amikacin in 20 (66.66%), and ciprofloxacin in 17 (56.66%) cases.

Most of the patients were managed conservatively i.e. in 88 (55%) patients. Incision & drainage was done in 27 (16.87%) and debridement was done in 44 (27.5%) patients, whenever required.

IV. Discussion

In our study the mean age was 49.26 year. The age range was 16-95 years and most of the patients were between 41-60 years. These results are similar to the study conducted by S.M Simonsen et al. (2006) who observed that the incidence of cellulitis was highest among the age group of 45-64 years.[3] Similarly, Mustafavi S et al. (2020) and Swati G. Deshpande et.al (2017) observed the mean age of 53.4 and 48.6 years respectively.[5,8]

Out of 160 patients 100 (62.5%) were males and 60 (37.5%) were females with a male female ratio of 1.6:1. Our study is comparable to that of S.M Simonsen et al. (2006) who observed that incidence of cellulitis was highest among males (26.0 per 1000 person- year) in all age compare to female (23.2 per 1000 person-year).[3]

The most common history in cellulitis here found to be trauma in 82 (51.25%) followed by unknown bite 44 in (27.50%). No cause could be found in 34 (21.25%) patients. Our study is comparable to that of Morris et al. (2004) who also observed that 77% (n=645) of patients, had local skin barrier defects that may have acted as portals of entry.[9] Similarly, Mustafavi S et al. (2020) also observed that most common precedent history to cellulitis was injury to skin 85.4%.[5]

In our study the most common symptom observed at affected site was swelling followed by pain and redness. Local tenderness was the most frequent sign present, followed by local raise in temperature and bullae. Similarly, Elliot et al. (1996) observed that the most common symptom was swelling in 85% followed by pain in 70% and redness in 66% of the patients. Most common sign noted was local tenderness in 72.9% followed by raised in local temperature in 38% and bullae in 36% of the patients.[10]

The most common site involved in cellulitis was lower limbs, followed by upper limbs and trunk. The findings of our study are consistent to that of S.M. Ellis Simonsen et al. (2006) who observed that the most common anatomical site of cellulitis infection was the lower extremity, which comprised 39·9% (*n*=2970) of cases.[3]

The correlation of associated diseases in our study was consistent with the study published by Mustafavi S et al.(2020) who observed that 26 out of 76 patients (44.8%) had diabetes mellitus.[5] Park et al.(2008) who also reported 43.6%(n=82) of with cellulitis had obesity.[11]

The microbiological culture was found to be negative in the major number of cases i.e. 96(60%) and positive cultures were obtained in 64(40%). Upon positive cultures the most common bacteria isolated was Streptococcus pyogenes 32(23.75%) while Staphylococcus aureus was found in 21(15.63%), followed pseudomonas Aeruginosa in 16(10%), E. Coli in 14(9.37%) and by Klebsiella in 10(6.25%) patients.

Our study is similar to that of Mustafavi et al.(2020) who observed that microbiological culture was found to be negative in the major number of cases i.e. 36(60%) and positive cultures were obtained in 22(40%). Streptococcus was found to be positive in 9(16%) and Staphylococcus was found to be positive in 5(9%) patients. Gram negative organisms such as pseudomonas 3(5%), E. coli 3(5%), Klebsiella 2(3%) was also observed.[5] Swati G. Deshpandi et al (2017) also observed that local swab cultures were sterile in 74 (56.92%) patients while ***Streptococcus*** grew predominantly in positive cultures.[8]

Piperacillin- tazobactam tends to have the maximum sensitivity for the common micro-organisms causing the cellulitis. Our study also observed that piperacillin- tazobactam was the most sensitive against gram positive organism and meropenem was most sensitive against gram negative bacteria causing cellulitis. Our findings are similar to that of Mayilan et al (2013) who also observed that the sensitivity pattern studied for the organisms cultured showed piperacillin- tazobactam (61%) and imipenem (56%) were the two group of antibiotics which tend to have the maximum sensitivity for the common organisms causing the cellulitis.[12]

Most of the patient were managed conservatively 88(55%) with i.v antibiotics, magnesium sulphate or icthammol glycerine dressing and limb elevation. Patients underwent incision & drainage 27(16.87%) or debridement 44 (27.5%) whenever required. Nahyeni Bassah et al.(2019) observed that most of the patient were managed conservatively. Debridement (46.7%), and incision and drainage (44.4%) were the most implemented

surgical interventions observed.[13] Similarly, Mustafavi et al.(2020) also observed that most of the patients were managed conservatively, while non-resolving infections underwent surgical procedures such as debridement 15(26%) and incision & drainage 13(22%).[5]

So, it could be concluded that the patients of age group 40–60 years and those with comorbidities such as diabetes mellitus, obesity, lymphedema and chronic kidney diseases had higher incidence of cellulitis with a longer course of disease in terms of morbidity and mortality. Early diagnosis, broad spectrum antibiotics & subsequent antibiotics based on culture sensitivity pattern, surgical intervention whenever required, regular dressing and improved nutritional support are responsible for faster recovery and decreased morbidity.

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