A COMPARATIVE STUDY ON CELLULITIS IN PATIENTS WITH AND WITHOUT DIABETES MELLITUS

Abstract:

Cellulitis is a severe, painful, and potentially serious skin illness. It can have a substantial detrimental impact on one's quality of life and result in prolonged absences from work. The incidence ranges from 0.2 to 24.6 per 1000 person-years. The study sought to examine the therapeutic outcomes of cellulitis patients with and without diabetes mellitus. The data were collected from 200 patients, of which males 78(73.58%) and 64(68.08%) and 28(26.42%) 30(31.92%) were females among them mean age was of 61-70 (26.16%) and 51-60 (22.58%) with and without diabetic respectively. The lower extremities is the most commonly implicated site in both groups, 95 (91.35%) and 90 (92.78%) due to trauma. In comparison, patients without diabetes recovered 88 (94.62%) more than patients with diabetes 71 (66.36%), whereas patients with diabetes did not fully recover 36 (33.64%) more than non-diabetic patients 5 (5.38%). The cellulitis is an infection of the skin and soft tissues. Diabetes mellitus patients have higher morbidity and mortality rates due to longer hospital stays, amputations, and debridement procedures. The primary treatment consists of early detection, broad-spectrum antibiotics, and rigorous debridement.

Introduction:

Cellulitis is the most prevalent type of acute skin and soft tissue infection (SSTI). It is distinguished by localised discomfort, warmth, fast developing erythema, swelling, oedema, and tenderness to palpation signs and symptoms. Cellulitis is typically preceded by skin integrity damage, which is caused by trauma, inflammation, or venous insufficiency. However, many cellulitis patients may not recall any specific trauma since small skin irregularities can be enough of a predisposing factor. Cellulitis-causing skin abnormalities are typically found in the little gaps between the toes5. Antibiotics are the mainstay of treatment[1,4].

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The distribution of cellulitis has shifted over time, with 5 to 20% of cases affecting the face and 70 to 80% of cases affecting the lower limbs[2]. Cellulitis must be adequately recognised and treated as soon as feasible. Compared to staphylococcal or gram-negative infections, streptococcal disease is more likely to result in future bacteraemia, which is a true but minor

threat. Endocarditis, glomerulonephritis, osteomyelitis, toxic shock, and elephantiasis verrucosa nostra are also possibilities. Cellulitis can cause lymphoedema, which puts patients at risk for subsequent cellulitis breakouts[5,7,8]. Even for hospitalised patients with uncomplicated, nonpurulent cellulitis, the risk of death is extremely low[4].

This study will assist that Periodic reassessment, guided by culture results and clinical response, ensures a dynamic and effective treatment course. On enhancing medication adherence, glycaemic control and early debridement results in reducing the rate of lower extremity amputation[2,3,4]. On other hand the antibiotic exposure is kept to minimum without compromising patient safety and minimize the antibiotic resistance[8]. The Primary goal of the study is "Early identification and management of preventable risk factors could reduce morbidity and mortality rate and improve the patient quality of life". The study mainly focuses on the prognostic outcome of cellulitis patients with diabetes mellitus in terms of duration of hospital stay and need for surgery in terms of amputation and debridement[9,10]. The main aim of the present study is to compare the therapeutic outcomes in cellulitis patients with and without diabetes mellitus.

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Materials and methodology:

The cross-sectional study was carried out after obtaining the permission of institutional ethical committee review board, Sri Padmavathi School of Pharmacy. All the patients with cellulitis, admitted in the general surgery in-patient ward of SVRRGGH, between November 2024 to April 2025 will be included in the study. A specially designed proforma was used for collecting data which includes patient demographics, past medical history, family and surgical history, co-morbidities, diagnosis and present medications prescribed for each patient. The data was obtained by direct patient interview and from patient case profiles. The total of 200 cases is collected from general surgery wards, according to study criteria. All the prescriptions are analysed and compared for the risk factors, complications, swab culture sensitivity, pharmacological and non-pharmacological treatment options and comparing drug chart with Infectious Diseases Society of America (IDSA). The patients who meet the inclusion criteria requirements are included in the study and who are not are excluded in the study. Categorical variables were meticulously characterized in terms of their frequency and corresponding percentages. The statistical analysis is done using Chi square tests to evaluate associations between categorical variables." The correlation coefficient is applied to assess the strength and direction of relationship between variables and cellulitis[4].

Results:

Among the 200 patients, the majority age groups with diabetic were 61–70 years 28(26.16%) and majority age groups without diabetic 51-60 years 21(22.58%). Most of patients with diabetic were male 78(73.58%) a followed by female 28(26.42%) and the majority with non-diabetic were male 64(68.08%) followed by female 30(31.92%). The 105(52.5%) had Type II Diabetes, while 93(46%) did not have diabetes. 2(1%) cases of Type I Diabetes were reported in the study population. 93(46.5%) were cellulitis without diabetes followed by 82(41%) were cellulitis with diabetes on medication and 25(12.5%) were cellulitis with diabetes not on medication reported in the study population in table 1.

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Most of patients are alcoholic 44.35%, followed by smoker 34.68%, past smokers and majority with diabetic were normal weight 71.96%, followed by obese patients 24.3. The distribution of patient's co-morbidities is discussed in table 1.

Table 1- Comparison of Clinical Characteristics Between Patients With and Without Diabetes

Variables	Study Population with diabetes (n=106)	Study Population without diabetes (n=94)	P Value
Gender			
Male	78(73.58%)	64(68.08%)	0.023*
Female	28(26.42%)	30(31.92%)	
Weight Distribution			
Under-weight patient	4(3.74%)	8(8.6%)	
Normal weight patient	77(71.96%)	70(75.27%)	0.0138*
Obese patient	26(24.3%)	15(16.13%)	
Comorbidity			
HTN	62(61.4%)	26(41.27%)	
Asthma	8(7.92%)	7(11.11%)	
CKD	8(7.92%)	6(9.52%)	
CAD	7(6.93%)	2(3.17%)	
Anemia	5(4.95%)	10(15.87%)	
CVA	5(4.95%)	3(4.76%)	
Seizures	4(3.95%)	1(1.59%)	
COPD	1(0.99%)	4(6.35%)	
Thyroid	0	2(3.17%)	
TB	1(0.99%)	1(1.59%)	
Others	0	1(1.59%)	
Site of infection			
Upper Extremity	7(6.42%)	4(4.25%)	0.026*
Lower Extremity	99(90.82%)	87(92.55%)	

Scrotum	2(1.83%)	3(3.19%)	
Back	1(0.96%)	0	
Risk factors			
Trauma	54(36%)	46(40.7%)	
Lymph edema	29(19.33%)	19(16.81%)	
Obesity	26(17.33%)	15(13.3%)	0.071*
Insect bite	20(13.33%)	13(11.5%)	
History of cellulitis	9(6%)	6(5.3%)	
Occupation	5(3.33%)	4(3.54%)	
Unknown	7(4.67%)	10(8.85%)	
Bacteria profile			
Staphylococcus Aureus	59(47.2%)	33(36.7%)	
Klebsiella Pneumonia	21(16.8%)	19(21.11%)	
Streptococcus Pneumonia	19(15.2%)	6(6.66%)	
Pseudomonas Aeruginosa	10(8%)	6(6.66%)	
E Coli	8(6.4%)	12(13.33%)	
Proteus Mirabilus	6(4.8%)	3(3.33%)	
Others	0	1(1.11%)	
No Bacteria	2(1.6%)	10(11.11%)	
Antibiotics			
Ceftriaxone	48(15.34%)	33(16.42%)	
Cefsulbactum	40(12.77%)	26(12.94%)	
Cefixime	13(4.15%)	13(6.47%)	
Ciprofloxacin	13(4.15%)	8(3.98%)	
Amoxicillin-Potassium Clavulanate	34(10.86%)	26(12.94%)	
Piperacillin – Tazobactam	24(7.66%)	7(3.48%)	
Amikacin	18(5.75%)	2(0.99%)	
Meropenem	24(7.67%)	13(6.47%)	
Metronidazole	77(24.6%)	59(29.35%)	
Linezolid	9(2.9%)	4(1.99%)	
Other	13(4.15%)	10(4.97%)	
Therapeutic Intervention			
Conservative Management	9(5.26%)	32(24.81%)	
Fasciotomy	57(33.33%)	29(22.48%)	
Debridement	87(50.88%)	67(51.94%)	
Amputation	18(10.53%)	1(0.77%)	
Others	0	0	

Among 200 patients, majority of patients without Diabetes Recovered 88 (94.62%) drastically over patients with Diabetes.71(66.36%), Patients Not completely recovered with Diabetes 36(33.64%) over without Diabetic patients 5(5.38%). The complications were documented in study population among them, majority of patients with diabetics having one complication 67.04% followed by two complication 20.45% and more than three 12.5% and in majority in non-diabetic having one complication 71.43% followed by two complications seen in 28.57%.

Commented [AN4]: Bacterial Profile

Out of 150 complications, majority of patients with diabetic have Osteomyelitis 19 (13.2%), followed by necrotising fasciitis 31(21.52%), bacteraemia 46 (31.94%) , tissue damage and gangrene 24(16.67%), sepsis 22(15.27%) and other complications 2 (1.4%) and majority of patients without diabetic such as osteomyelitis (0), followed by necrotising fasciitis (0) ,bacteraemia 3 (50%) , tissue damage and gangrene 1 (16.67%) , sepsis 2 (33.33%).

In the study, majority of patients Glucose levels are not controlled patients performed / recovered with fasciotomy, Debridement and conservative Treatment 153 (89.47%) followed by some of went to Amputation 18(10.53%), and glucose level controlled patients recovered with fasciotomy, Debridement and conservative treatment 128(99.22%) followed by 1(0.78%) underwent to amputation (table 1).

Discussion

The cellulitis is a relatively common skin infection, there remains uncertainty about management, particularly the length and route of antimicrobials required. Further information on the symptomatology and biomarker changes associated with cellulitis over time would guide clinicians and patients as to the expected natural history. The cross-sectional comparative study was conducted in the department of general surgery of SVRRGGH Tirupati. Two hundred cases of cellulitis were divided into two groups: group A included cases of cellulitis patients with diabetes mellitus, and group B included the comparative group of cellulitis patients without diabetes mellitus.

Cellulitis can occur at any age group, but the most common age group involved is middle age to old age. This might be due to occurrence of risk factors in these age groups. In current study out of 200 patients included in the study, the disease was most prevalent in aged population. The mean age was of 61-70 with diabetic and 51-60 without diabetic. These findings were similar to the Gopal[2] et al study where they reported the occurrence of cellulitis were above 40 years of age with mean age in the study was 56 years. 15 In current study cellulitis is more prevalent in patients >60 years of age in group A, while in group B most patients affected are more commonly involved in outdoor activities and work place hazards. Similarly in current study disease is more prevalent in males.

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Most common site involved in cellulitis is lower limb. This might be due to lower limbs being commonly injured by trauma. Jain[7] et al in their study states that cellulitis in the lower limb is potentially serious infection that commonly occurs and recurs in diabetics. Similarly in current study, most common site involved is lower extremity in both the groups 95(91.35%) (Group A

with diabetic and Group B 90(92.78%) without diabetes of the patients are known to develop recurrent lower limb cellulitis. Other sites involved are scrotum (1.92% in group A and3.1% in group B), upper extremity (6.73% in group A and4.12% in group B).

Swab culture is important for the management of cellulitis. On the basis of swab culture sensitivity report patient can be managed by appropriate antibiotics. On swab culture sensitivity of patients with necrotizing fasciitis growth can be monomicrobial or polymicrobial. A study conducted by Carratala[6] et al factors associated with complications and mortality in adult patients hospitalized for infectious cellulitis. All Staphylococcus aureus isolates were susceptible to methicillin. Similarly in current study, most common organism isolated on swab culture sensitivity is Staphylococcus aureus (59 (47.2%) Group A with diabetic and 33(36.7%) Group B without diabetic.

In a study of cellulitis in chronic oedema of the lower leg by Burian[1] et al concluded that various risk factors are responsible for development of cellulitis. Wounds, obesity, male sex, diabetes, midline swelling and particularly advanced stages of chronic oedema were independent risk factors for cellulitis, while control of swelling was associated with a lower risk. Similarly, in current study most common etiological factors in both the groups is trauma 36%% in group A and 46% in group B). Other etiological factors are lymph oedema, obesity, insect bite, history of cellulitis, occupation.

In a study conducted by Kaur et al[1] concluded that debridement was the most common surgical procedure performed among the patients who underwent surgery as the initial treatment (61.5%). 15 The study also showed that, a patient with higher stage of cellulitis had more chances of undergoing multiple surgical procedures (repeat debridement's, fasciotomy followed by debridement etc) compared to a patient with a lower stage of cellulitis. Similarly in current study, 18(10.53%) with diabetic and 67(51.94%) underwent debridement and 9(5.26%) with diabetic and 32 (24.81%) underwent conservative management. The number of debridement's required was more in group A as compared to group B.

Among total study population, 18(10.53%) and 1(0.77%) required amputation because of the loss of almost all viable soft tissues and the possibility of sepsis syndrome due to the severely infected limb. Sharma[5] et al also reported similar findings in their investigation concluded that Bony changes were observed in the patients with cellulitis of the concerned limb in the phalanges or metatarsals in patients with diabetes mellitus. patients with less severe forms of

cellulitis were managed conservatively with parenteral antibiotics, anti-inflammatory agents, and limb elevation to reduce the associated oedema.

Piperacillin & Tazobactam was the most effective antibiotic but first-generation cephalosporins were frequently used in the study by Yeh[8] et al. Similarly in current study, among 200 study population Piperacillin, Tazobactam 24(7.66%) in with diabetic cases and 7(3.48%) in without diabetics and other antibiotics including cephalosporins, metronidazole, meropenem, amikacin as a supportive treatment. The mean hospital stays in days found to be higher in diabetic patients as compared to nondiabetic. These findings were similar to the kaur[4] et al study were they reported demonstrate the dramatic increase in cases requiring hospitalization show a striking increase in incidence in hospital admissions for cellulitis during current study period. Accordingly, the healthcare charges attributable to hospitalizations for cellulitis have more than doubled. demonstrate the dramatic increase in cases requiring hospitalization.

Our Research and clinical studies have shown that cellulitis is more frequently seen in diabetic patients compared to non-diabetics. This is primarily because diabetes can weaken the immune system, impair blood circulation, and reduce the skin's ability to heal. In this particular study, it was observed that diabetic patients with cellulitis had a lower rate of recovery 71(66.36%) when compared to non-diabetic patients 88(94.62%). There are several reasons for this. Because of these challenges, diabetic patients with cellulitis are more likely to suffer from complications, such as osteomyelitis, Necrotising Fasciitis and even sepsis. In many cases, these complications lead to the need for multiple surgical interventions, including debridement, fasciotomy or even limb amputation in severe cases.

The study highlights that better control of blood sugar levels can significantly reduce the risk of cellulitis and its complications in diabetic patients. Effective diabetes management strengthens the immune system, improves circulation, and enhances the body’s natural healing processes. As a result, it can reduce the severity of cellulitis and limit the need for surgical treatment. Early diagnosis, broad spectrum antibiotics and early aggressive debridement in cellulitis patients results in better outcomes.

Conclusion

In conclusion cellulitis is a skin and soft tissue infection. Diabetes mellitus patients have more morbidity and mortality in term of more days of hospital stay, rate of amputations and amount of debridement’s. Early diagnosis and early broad-spectrum antibiotics and aggressive debridement is the mainstay of management. Piperacillin & tazobactam, and cephalosporins

are the most sensitive antibiotics in most cases, and this shows emerging resistance to commonly used antibiotics (ampicillin, doxycycline, and cephalosporins). In diabetic patients' debridement alone is not sufficient and amputation may be required in some cases. Early screening for diabetes mellitus and good glycaemic control prevent the incidence of cellulitis in the lower limbs. Staphylococcus SP and klebsiella SP, Streptococcus SP were the common organisms responsible for cellulitis in the study group. Elderly patients have to be motivated to take care of their feet as the diabetic patients, as neglect of minor trauma or bites can lead to morbid illness necessitating major treatment like skin grafting.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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