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Study on the Prescription Pattern and Antibiogram in the Management of Cellulitis

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ABSTRACT

Cellulitis is a very serious bacterial infection, although seen commonly in most individuals. Recurrent episodes of cellulitis has been becoming a burden to patients as well as physicians making it difficult to treat. Managing the patients with low dose long-term antibiotic therapy based on the antimicrobial culture sensitivity reports helps to reduce the recurrent episodes of cellulitis. This study has been conducted to observe and study the antibiotic patterns prescribed to patients with cellulitis and development of resistance in recurrent episodes, thereby determining the bacterial pathogens isolated and studying it's sensitivity pattern for each recurrent episode. This is a prospective observational study carried out in the Department of General Surgery over a period of 6 months. A total of 99 recurrent cellulitis patients were included in the study, in which 69(69.6%) were males and 30(30.3%) were females. Age groups between 51-60 were utmost percentage of 31.3%(31). 38(38.4%) Lower limb cellulitis was at great number in disease patterns among recurrent cellulitis patients. Preponderance of patients (53 patients) were prescribed with Dual antibiotic therapy (Magnex and Metrogyl). Frequency of Staphylococcus aureus species stays first in AST reports. Antibiogram of E.Coli showed decreased sensitivity in 2^{nd} AST towards almost all antibiotics when compared with other pathogens for which the test was performed. This study concludes that rationale of antibiotic use and close monitoring is essential in the treatment of cellulitis with the help of standard treatment guidelines of SSTI's (Treatment based on AST reports) to prevent the further recurrent episodes and associated complications of cellulitis.

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INTRODUCTION

Cellulitis is one of the most common and serious bacterial infections involving deep layers of skin and tissues, thus falls into skin and soft tissue infections(SSTI) [1]. Cellulitis may be categorized as either purulent or non-purulent; purulent form of cellulitis is associated with abscess or pus discharge in contrast to non-purulent cellulitis [1]. The foot cellulitis (or) lowerlimb cellulitis has relatively more frequency when compared with other parts of the body, cellulitis was estimated to be the third most frequently managed infectious disease and it has been seen as one of the economic and health burden condition.

The incidence rate of cellulitis has been noted to be higher in males and in individuals aged above 45 years. A large epidemiologic hospital-based study on skin, soft tissue, bone & joint injections, concluded that 37.3% of the patients admitted are of cellulitis. Risk factors of cellulitis includes immunodeficiency, obesity and over-weight, lymphedema, use of illicit injectable drugs and mostly having a history of cellulitis or any other skin problems. Cellulitis is clinically presented with the acute onset of the erythema of skin, swelling, warmth & tenderness and if it is left untreated the complications such as abscess, necrotizing fasciitis, amputation etc can be seen more commonly. Hence, treating the cellulitis as early as possible is very essential to prevent the early & late complications.

The 2 major pathogens causing cellulitis are streptococcus pyrogens (GAS) and staphylococcus aureus. The standard treatment for the uncomplicated cellulitis includes the short course betalactum antibiotics (for 5-7days) [2]. Even after the completion of the treatment, care to be taken on the cellulitic area with some non–medicative methods like cool compressions on the infected area, bathings with lukewarm water, elevation of the infected part etc.

Even with utmost care, recurrence of the cellulitis can occur. Two hypotheses are explained for the recurrence of the cellulitis are -1. The traditional Reinfection Hypothesis which explains that the recurrence risk is increased due to the local tissue modifications that are induced by the previous disease episodes. 2. An alternate hypothesis gives the pathophysiologic explanation which is the pathogen survival and its perseverance in the infected skin and tissues [3]. Hence after the first recurrence, the relapsing of the disease cannot be prevented. This directly or indirectly affects the quality of patient's everyday life. The only way to improve the patient's quality of life is sticking to the antibiotic treatment regimen, either long term or short term based on the disease severity.

Antibiotics are the medications which are used to treat and prevent all the bacterial infections. Cephalosporins falls under most commonly prescribed class of antibiotics in cellulitis patients. When dual therapy is needed, Cefoperazone+Sulbactum and Piperacillin+Tazobactum(according to National Treatment Guidelines for Antimicrobial Use in Infectious Diseases of NCDC) were mostly prescribed treatments. However, changes are made in treatment according to the patient condition or antimicrobial culture sensitivity test(AST) reports. Despite the treatment given, some of them would fail and there may be no signs of improvement. This may imply that the bacteria in the body has developed the resistance against the antibiotic.

Performing culture sensisitivity tests and treating the patients with specific antibiotic which is active against the organism present in the body results in effective treatment [4]. Culture sensitivity based antibiotic treatment helps to reduce the chance of resistance and its associated risks [4]. One consensus study in UK, interpreted that nearly 20% of the patients admitted into the hospital because of the bacterial infections are mostly due to the antibiotic resistance. Hence it is most important to obtain culture test reports in any septic conditions, especially cellulitis and treat them accordingly which can even help to reduce the recurrence of infection.

The initial episode of cellulitis can be treated with empirical regimen which is mainly active against streptococci bacteria. For cellulitis showing systemic signs, parenteral antibiotic therapy can be given and can be converted to oral antibiotics when symptoms are improved [3]. Nonetheless, there is a need for the culture sensitivity tests to choose the right antibiotics which in turn can also help to reduce the recurrence of infection.

According to a meta-analysis [5], antibiotic prophylaxis can reduce the risk of recurrent cellulitis when compared to no antibiotic prophylaxis. Hence, for patients with two or more episode low dose antibiotic therapy can be given by choosing the antibiotic regimen based on the patients culture reports to reduce (or) prevent the recurrence of cellulitis. Also, the significance of non-pharmacological interventions should be made known to the patients and they should be recommended to the patients for the better improvement of the clinical condition.

METHODOLOGY

Department of General Surgery, Sri Venkateswara Institute of Medical Sciences, SPMC(W) –Tirupati, was selected as the field of work under the guidance of Dr B.Sriharirao and the Institutional guide Dr Robin George. The study title was selected and framed after a thorough literature review and detailed discussion concerning the practical possibilities and difficulties.

The study proposal was prepared and the approval was obtained from the Head of the Institution and the Institutional Ethical Committee. Detailed data collection forms with Informed consent were prepared. The detailed purpose of the study and benefits are explained in local language to the individual patients and care takers before obtaining informed

consent without any force or compulsion. Data was collected from the patients who falls under the inclusion and exclusion criteria.

All the patients diagnosed with recurrent cellulitis attending General surgery department were enrolled for the study according to the study criteria. All the patients are examined and the demographic details, clinical features along with Antimicrobial culture reports were documented and tabulated. Antimicrobial culture sensitivity result analysis includes the Antibiotics used (from prescriptions), Course of antibiotic treatment (in days), Organism identified (based on antimicrobial culture reports), Sensitive antibiotics, Resistant antibiotics and the need of antibiotic reconciliation. All the clinical details and drug related details were analyzed for consecutive recurrent episodes statistically. These results were used to review the rationale of prescription patterns.

RESULTS

A total number of 99 cellulitis patient's records were assessed by considering inclusion criteria and enrolled into our study after obtaining a detailed informed consent, from the department of General Surgery.

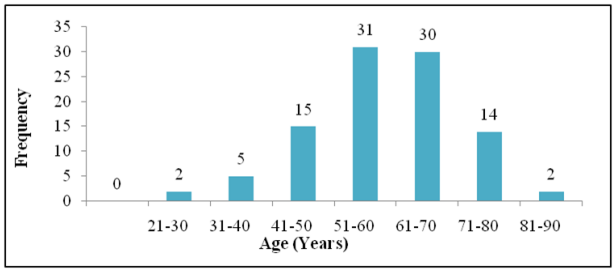

Figure 1: Frequency of distribution of age among the subjects

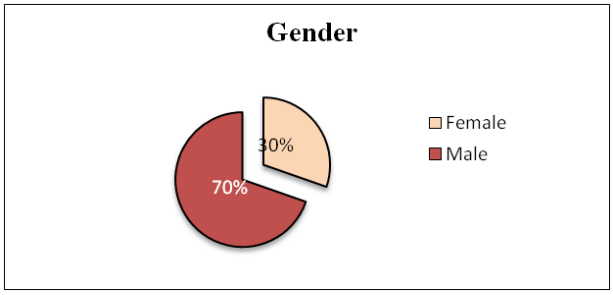

Figure 2: Distribution of subjects based on gender

Frequency of Age Distribution

A total of 99 subjects were enrolled in the study, among which the highest number of subjects i.e., 31(31.3%) and 30(30.3%) were in the age group of

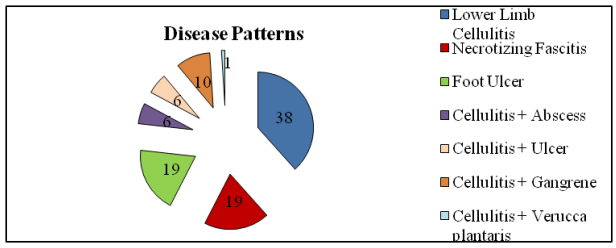

Figure 3: Distribution of disease patterns

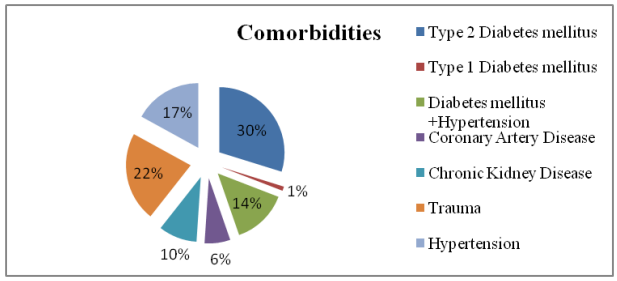

Figure 4: Distribution of comorbidities among subjects

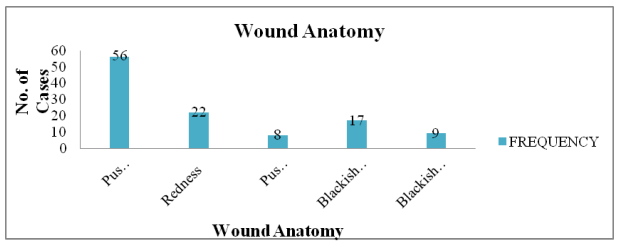

Figure 5: Categorization of wound anatomy among subjects

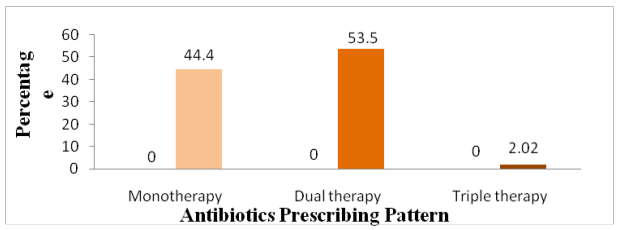

Figure 6: Pattern of use of Antibiotics among subjects

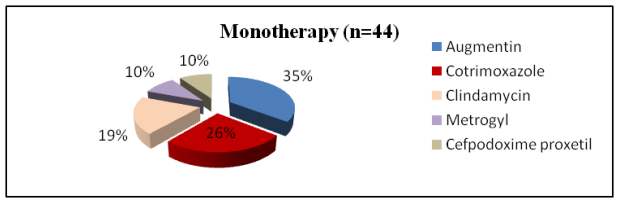

Figure 7: Distribution of antibiotic prescribing pattern in Monotherapy

Table 1: Frequency of distribution of age among the subjects

S.NO.	AGE (YEARS)	FREQUENCY	PERCENTAGE (%)
1.	21-30	2	2.02
2.	31-40	5	5.05
3.	41-50	15	15.1
4.	51-60	31	31.3
5.	61-70	30	30.3
6.	71-80	14	14.1
7.	81-90	2	2.02

Table 2: Gender categorization of subjects

S.NO.	GENDER	FREQUENCY	PERCENTAGE (%)
1.	Female	30	30.3
2.	Male	69	69.6

Table 3: Disease patterns among subjects

S.No.	Disease	FREQUENCY	PERCENTAGE OF DIAGNOSIS (%)
1.	Lower Limb Cellulitis	38	38.4
2.	Necrotizing Fascitis	19	19.2
3.	Foot Ulcer	19	19.2
4.	Cellulitis + Abscess	6	6.1
5.	Cellulitis + Ulcer	6	6.1
6.	Cellulitis + Gangrene	10	10.1
7.	Cellulitis + Verucca plantaris	1	1.01

Table 4: Comorbidities observed among subjects

S.NO.	COMORBIDITY	FREQUENCY	PERCENTAGE OF COMORBIDITY PRESENT
1.	Type 2 Diabetes mellitus	28	28.3
2.	Type 1 Diabetes mellitus	1	1.01
3.	Diabetes mellitus + Hypertension	13	13.1
4.	Coronary Artery Disease	6	6.1
5.	Chronic Kidney Disease	9	9.1
6.	Trauma	21	21.2
7.	Hypertension	16	16.2

Table 5: Wound anatomy of subjects

S.NO.	WOUND ANATOMY	FREQUENCY	PERCENTAGE OF WOUND ANATOMY
1.	Pus Discharge	56	56.56
2.	Redness	22	22.22
3.	Pus Discharge + Redness	8	8.08
4.	Blackish Discolouration	17	17.17
5.	Blackish Discolouration + Pus Discharge	9	9.09

Table 6: Antibiotics prescribing pattern among subjects

S.No	Antibiotics Prescribing Pattern	No. Of Patients (n=99)	Percentage Of Antibiotic Prescribing Pattern
1.	Monotherapy	44	44.4
2.	Dual therapy	53	53.5
3.	Triple therapy	2	2.02

Table 7: Antibiotic Prescribing Pattern in Monotherapy

S.NO	DRUGS IN MONOTHERAPY	NO.OF PATIENTS (n=44)	PERCENTAGE OF DRUGS (%)
1.	Augmentin	11	25
2.	Cotrimoxazole	8	18.2
3.	Clindamycin	6	13.6
4.	Metrogyl	3	6.8
5.	Cefpodoxime proxetil	3	6.8

Table 8: Antibiotic Prescribing Pattern in Dual therapy

S.NO.	DRUGS IN DUAL THERAPY	NO.OF PATIENTS (n=53)	PERCENTAGE OF DRUGS(%)
1.	Magnex and Metrogyl	31	58.49
2.	Augmentin and Metrogyl	7	13.20
3.	Amoxil and Clindamycin	3	5.66
4.	Piptaz and Metrogyl	3	5.66
5.	Farobact and Clindamycin	2	3.77

Table 9: Antibiotic Prescribing Pattern in Triple therapy

S.NO.	DRUGS IN TRIPLE THERAPY	NO. OF PATIENTS(N=2)	PERCENTAGE OF DRUGS (%)
1.	Piptaz, Clindamycin and Metrogyl	1	50
2.	Augmentin, Clindamycin and Meropenem	1	50

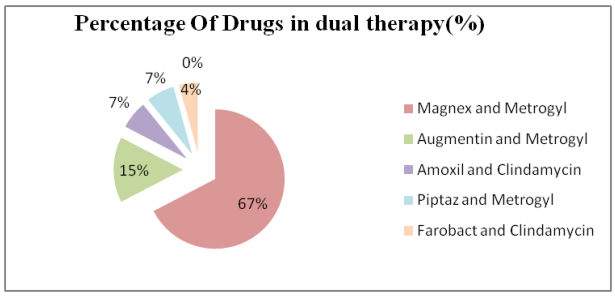

Figure 8: Percentage of Drugs in dual therapy (%)

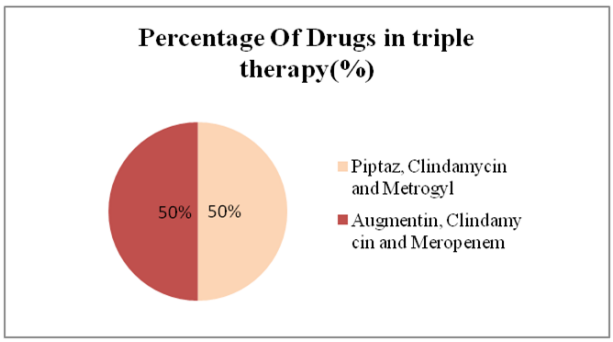

Figure 9: Distribution of antibiotic prescribing pattern in Triple therapy

51-60 and 61-70 respectively, followed by the age groups of 41-50(15.1%) and 71-80(14.1%). The

Table 10: Organisms identified based on Culture sensitivity reports

S.No.	Name of the Organism.	Type of the Organism.	No. of Bacteria cultured (n=131)	Percentage of bacteria cultured (%).
1.	Staphylococcus aureus	Gram-Positive	29	22.1
2.	Klebsiella species	Gram-Negative	17	12.9
3.	Escherichia coli	Gram-Negative	28	21.3
4.	Pseudomonas species	Gram-Negative	16	12.2
5.	Proteus mirabilis	Gram-Negative	15	11.4
6.	Enterococcus Faecalis	Gram-Positive	6	4.5
7.	Enterobacter species-I	Gram-Positive	3	2.3
8.	Enterobacter species-II	Gram-Positive	2	1.5
9.	Staphylococcus haemolyticus	Gram-Negative	3	2.3
10.	Morganella morganii	Gram-Negative	2	1.5
11.	Non-Fermentive gram –ve Bacilli	Gram-Negative	1	0.8
12.	Burkholderia	Gram-Negative	2	1.5
13.	Beta-Haemolytic Streptococci	Gram-Positive	1	0.8
14.	Non-Haemolytic Streptococci	Gram-Positive	1	0.8
15.	Citrobacter	Gram-Negative	1	0.8
16.	Enterococcus faecium	Gram-Positive	1	0.8
17.	Pseudomonas BHI	Gram-Negative	1	0.8
18.	Streptococcus pyogenes	Gram-Positive	1	0.8
19.	Acinetobacter	Gram-Negative	1	0.8

Table 11: 1^{st} and 2^{nd} sensitivity patterns of Escherichia coli

S.No.	Antibiotics	1st time sensitivity pattern of E-Coli		2nd time sensitivity pattern of E-Coli	
		Frequency	Percentage (%)	Frequency	Percentage(%)
1.	Amikacin	26	92.8	23	82.1
2.	Amoxy-Clav	19	67.8	16	57.1
3.	Ampicillin	17	60.7	16	57.1
4.	Cefoperazone + Sulbactum	20	71.4	14	50
5.	Ceftriaxone	12	42.8	10	35.7
6.	Ciprofloxacin	10	35.7	10	35.7
7.	Co-trimoxazole	17	60.7	14	50
8.	Gentamicin	27	96.4	27	96.4
9.	Meropenem	28	100	28	100
10.	Cefazolin	22	78.5	19	67.8
11.	Ertapenem	28	100	28	100
12.	Piperacillin + Tazobactum	25	89.3	20	71.4

Table 12: 1^{st} and 2^{nd} sensitivity patterns of Staphylococcus aureus

S.No.	ANTIBIOTICS	1ST TIME SENSITIVITY PATTERN OF S.AUREUS		2ND TIME SENSITIVITY PATTERN OF S.AUREUS	
		Frequency	Percentage (%)	Frequency	Percentage(%)
1.	Ampicillin	5	17.2	3	10.3
2.	Cefoxitin	25	86.2	27	93.1
3.	Ciprofloxacin	11	37.9	10	34.4
4.	Clindamycin	18	62.0	15	51.7
5.	Co-trimoxazole	23	79.3	20	68.9
6.	Erythromycin	22	75.8	20	68.9
7.	Gentamicin	25	86.2	24	82.7
8.	Linezolid	28	96.5	29	100
9.	Penicillin	12	41.3	9	31.0
10.	Tetracycline	27	93.1	27	93.1
11.	Vancomycin	27	93.1	27	93.1
12.	Tigecycline	22	75.8	21	72.4

Table 13: 1^{st} and 2^{nd} sensitivity patterns of Klebsiella species

S.No.	Antibiotics	1st time sensitivity pattern of Klebsiella species		2nd time sensitivity pattern of Klebsiella species	
		Frequency	Percentage (%)	Frequency	Percentage (%)
1.	Amikacin	12	70.5	11	64.7
2.	Amoxy-Clav	10	58.8	10	58.8
3.	Ampicillin	13	76.4	12	70.5
4.	Cefoperazone + Sulbactum	12	70.5	8	47.0
5.	Ceftriaxone	12	70.5	10	58.8
6.	Ciprofloxacin	10	58.8	9	52.4
7.	Co-trimoxazole	9	52.4	9	52.4
8.	Gentamicin	11	64.7	12	70.5
9.	Meropenem	14	82.3	11	64.7
10.	Piperacillin + Tazobactum	14	82.3	9	52.9
11.	Cefazolin	13	76.4	10	58.8
12.	Levofloxacin	17	100	17	100
13.	Ertapenem	17	100	17	100

least number of subjects were found in the age group of 21-30(2.02%) as shown in the Table 1 and Figure 1.

Frequency of Gender Distribution

Out of 99 subjects with Cellulitis, 30(30.3%) were females and 69 (69.6%) were males as shown in Table 2 and Figure 2.

Disease Patterns of Cellulitis

The different disease patterns were observed among the Recurrent Cellulitis patients. Out of 99 patients, we found 38.4% with Lower Limb Cellulitis(38), 19.19% with Necrotizing Fascitis and Foot Ulcer(19), 6.1% with Cellulitis + Abscess(6), 6.1% with Cellulitis + Ulcer(6), 10.1% with Cellulitis + Gangrene(10), 1.01% with Cellulitis + Verucca plantaris as shown in Table 3 and Figure 3.

Comorbidities

Out of 99 patients, it was observed that the high-

Table 14: 1^{st} and 2^{nd} sensitivity patterns of Pseudomonas species

S.No.	Antibiotics	1st time sensitivity pattern of Pseudomonas species		2nd time sensitivity pattern of Pseudomonas species.	
		Frequency	Percentage (%)	Frequency	Percentage(%)
1.	Amikacin	14	87.5	13	81.2
2.	Aztreonam	15	93.7	15	93.7
3.	Carbenicillin	16	100	16	100
4.	Cefoperazone + Sulbactum	12	75	9	56.2
5.	Cefotaxime	7	43.7	6	37.5
6.	Ceftazidime	10	62.5	10	62.5
7.	Ciprofloxacin	6	37.5	5	31.2
8.	Erithromycin	15	93.7	12	75
9.	Gentamicin	14	87.5	11	64.7
10.	Imipenem	16	100	16	100
11.	Meropenem	14	87.5	12	75
12.	Netilmycin	14	87.5	14	87.5
13.	Piperacillin + Tazobactum	9	56.2	7	43.7
14.	Polymyxin-B	16	100	15	93.7
15.	Tobramycin	16	100	16	100

Table 15: 1^{st} and 2^{nd} sensitivity patterns of Proteus mirabilis

S.No.	ANTIBIOTICS	1ST TIME SENSITIVITY PATTERN OF PROTEUS MIRABILIS.		2ND TIME SENSITIVITY PATTERN OF PROTEUS MIRABILIS.	
		Frequency	Percentage (%)	Frequency	Percentage (%)
1.	Amikacin	14	93.3	13	86.6
2.	Amoxy-Clav	11	73.3	11	73.3
3.	Ampicillin	9	60	7	46.6
4.	Cefoperazone+Sulbactum	12	80	7	46.6
5.	Ceftriaxone	11	73.3	10	66.6
6.	Ciprofloxacin	11	73.3	11	73.3
7.	Co-trimoxazole	10	66.6	10	66.6
8.	Gentamicin	11	73.3	9	60
9.	Meropenem	14	93.3	14	93.3
10.	Piperacillin+Tazobactum	13	86.6	10	66.6
11.	Cefazolin	15	100	14	93.3
12.	Levofloxacin	15	100	14	93.3
13.	Ertapenem	15	100	15	100

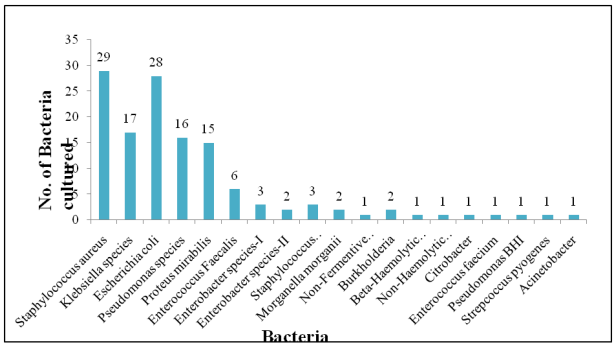

Figure 10: Distribution of Organisms identified based on Culture sensitivity reports

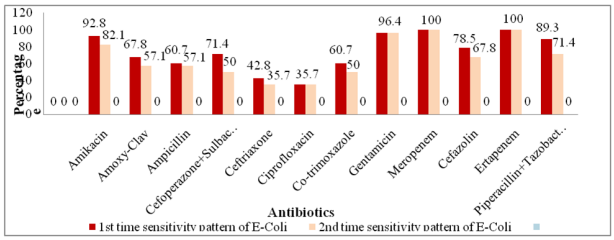

Figure 11: Antibiogram of Escherichia coli

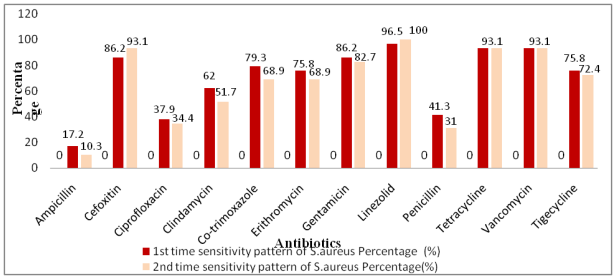

Figure 12: Antibiogram of Staphylococcus aureus

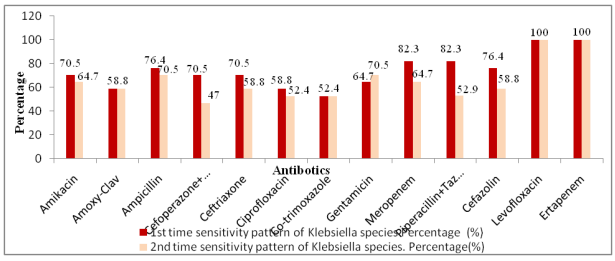

Figure 13: Antibiogram of Klebsiella species

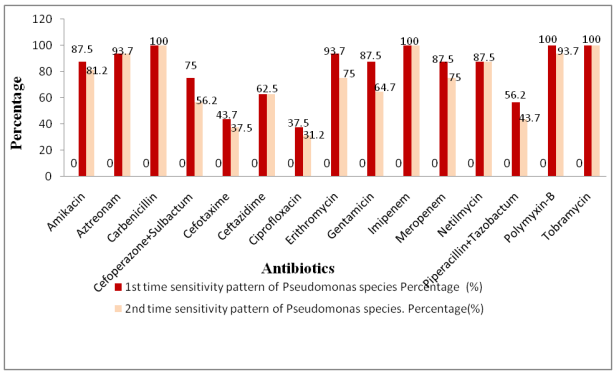

Figure 14: Antibiogram of Pseudomonas species

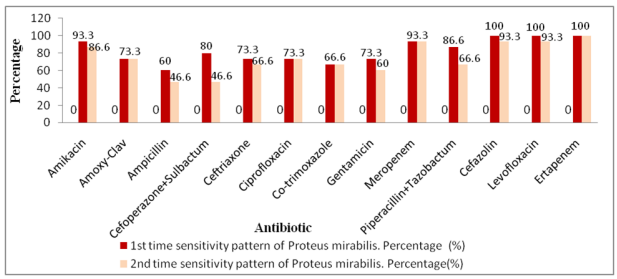

Figure 15: Antibiogram of Proteus mirabilis

est percentage 28.3% (28) of patients having comorbidity of Type II Diabetes mellitus followed by 21.2% (21) of patients having Trauma, 16.2%(16) of patients having hypertension, 13.1% (13) of patients having Diabetes mellitus + Hypertension, 9.09% (9) of patients having Chronic Kidney Disease, 6.1%(6) of patients having Coronary Artery Disease. While patients with Type I Diabetes mellitus 1.01%(1) were found least (Table 4 and Figure 4).

Wound Anatomy

A total number of 99 patients with Recurrent cellulitis were included in the study and their wound anatomy was observed. We found that 56.56% of patients having Pus Discharge(56), 22.22% of patients having Redness(22), 17.17% of patients having Blackish Discolouration(17), 9.09% of patients having Blackish Discolouration + Pus Discharge(9) and 8.08% of patients having Pus Discharge + Redness(8) (Table 5 and Figure 5).

Antibiotic Prescribing Pattern Based on Regimen

Among all the 99 patients who were on Antibiotic treatment, we observed utmost percentage of 53.53% of patients receiving antibiotics of dual regimen followed by 44.44% of monotherapy and 2.02% of Triple therapy (Table 6 and Figure 6).

Antibiotics Prescribing Pattern in Monotherapy

Among the Monotherapy prescriptions, the most commonly prescribed antibiotics were 11(25%) Augmentin followed by Cotrimoxazole 8(18.2%) and Clindamycin 6(13.6%) followed by Metrogyl 3(6.8%) and Cefpodoxime-proxetil 3(6.8%) (Table 7 and Figure 7).

Antibiotics Prescribing Pattern in Dual Therapy

Among the dual therapy prescriptions, most commonly prescribed drugs were 31(58.49%) Magnex and Metrogyl followed by 7(13.20%) Augmentin and Metrogyl and 3 (5.66%) for both Amoxil and Clindamycin, Piptaz and Metrogyl and the least frequently prescribed dual therapy was 2 (3.77%) Farobact and Clindamycin as shown in Table 8 and

Figure 8.

Antibiotics Prescribing Pattern in Triple Therapy

Out of 99 prescriptions, 2 prescriptions were having triple therapy. Most commonly prescribed drugs were 1 (50%) Piptaz, Clindamycin and Metrogyl and the another drugs were Augmentin, Clindamycin and Meropenem (Table 9 and Figure 9).

Culture Sensitivity Patterns

Out of 99 subjects in the study, AST is performed for all the subjects, in which 84 subjects showed microbial growth involving various pathogens and no organisms were found in 15 subjects. Out of these 84 culture reports, the most frequently isolated organism was S.aureus 29 times(22.1%), followed by E-coli 28 times(21.3%), Klebsiella species 17times(12.9%), Pseudomonas species 16 times(12.2%) and Proteus mirabilis 15 times(11.4%). The least frequently isolated organisms were B-haemolytic species(0.8%), Enterococcus faecium(0.8%), Streptococcus pyogenes(0.8%) and so on as shown in Table 10 and Figure 10.

Antibiogram of Escherichia coli (n=28)

E-coli was identified in 28 cultures and the sensitivity test was performed 2 times. Sensitivity rate was decreased in almost all antibiotics showing that the organism has developed resistance to remaining antibiotics. Sensitivity rate was mostly decreased for the drugs cefaperazone+sulbactum, followed by Piperacillin+Tazobactum as shown in Table 11 and Figure 11.

Antibiogram of Staphylococcus aureus (n=29)

Out of 29 cultures in which S.aureus was identified, the sensitivity rate was decreased in almost all antibiotics. The sensitivity rate was increased in 2 antibiotics showing that the treatment has been effective after 1^{st} culture sensitivity test (Table 12 and Figure 12).

Antibiogram of Klebsiella species (n=17)

Out of 17 cultures in which klebsiella species was identified, Cefoperazone+sulbactum and Piperacillin+Tazobactum showed more decrease in sensitivity rate in 2^{nd} culture when compared to 1^{st} one. Other antibiotics showed minimal decrease in sensitivity pattern as shown in Table 13 and Figure 13.

Antibiogram of Pseudomonas species (n=16)

Out of 16 cultures in which pseudomonas species was identified, the sensitivity rate was decreased in only some of the antibiotics showing that the treatment regimen was effective towards pseudomonas species which was prescribed after 1^{st} culture sensitivity test as shown in Table 14 and Figure 14.

Antibiogram of Proteus mirabilis (n=15)

Out of 15 cultures in which Proteus mirabilis was identified, almost all antibiotics showed decreased sensitivity rate in the 2^{nd} culture sensitivity test when compared to 1^{st} culture test (Table 15 and Figure 15).

DISCUSSION

The present study was carried out with 99 patients who were presented with recurrent episodes of cellulitis of leg to General surgery department of SVIMS-SPMC(W), Tirupati. We carried out this study as Antimicrobial resistance and irrelevant use of antibiotics can be the causes for recurrence of cellulitis.

Cellulitis is one of the most common and serious bacterial infection involving deep layers of skin and tissues, thus falls into Skin and Soft Tissue Infections. Recurrent Cellulitis is the cellulitis which is reappearing again after the 1^{st} episode. Many predisposing factors are responsible for the relapse of the cellulitis, in which the fail of the antibiotic treatment stands at first in most of the cases followed by the associated comorbidities.

In this study we found that the recurrent episodes were most frequently found in the male subjects of age above 50 years. Many literature and surveys concluded that patients of age above 50 years are more prone to infections such as cellulitis. A study conducted by Ellis Simonsen, et. al(2005) on cellulitis incidence in a defined population, concluded that the cellulitis incidence rate is higher in individuals aged 45-64 years.

Considering the disease patterns, in our study we observed that 38(38.38%) patients with lower limb cellulitis, 19(19.19%) patients with Necrotizing Fascitis and Foot ulcer, 10(10.10%) patients with Cellulitis + Gangrene, 6(6.06%) patients with Cellulitis + Abscess and Cellulitis + Ulcer and 1(1.01%) patient with Cellulitis + Verucca plantaris.

Moreover, in this study 44(44.44%) prescriptions had Antibiotic monotherapy, 53(53.53%) prescriptions had Antibiotic dual therapy and only 2(2.02) prescriptions had Triple therapy.

Furthermore, commonly prescribed drug combination patterns were analysed, out of 99 prescriptions, 44 are monotherapy antibiotics, among these 11(25%) were Augmentin, 8(18.18%) were cotrimoxazole, 6(13.63%) were Clindamycin, 3(6.81%)were Metrogyl and 3(6.81%) were Cefpo-

doximeproxetil. Among 53 dual therapy antibiotics, 31(58.49%) were Magnex and Metrogyl, 7(13.20%) were Augmentin and Metrogyl, 3(5.66%) were Amoxil and Clindamycin, Piptaz and Metrogyl and 2(3.77%) were Farobact and Clindamycin. Among 2 triple therapy antibiotics, 1(50%) is Piptaz, Clindamycin and Metrogyl and 1(50%) is Augmentin, Clindamycin and Meropenem.

Considering the culture sensitivity patterns, out of 99 patients, Organisms were identified in 84 patients and no organisms were found in 15 patients. Their reports were analyzed for Cultured bacterial pathogens, 29(22.1%) cultures had Staphylococcus aureus, 28(21.3%) cultures had Escherichia coli, 17(12.9%) cultures had Klebsiella species, 16(12.2%) cultures had Pseudomonas species and 15(11.4%) cultures had Proteus mirabilis.

A study conducted by D.Mishra et.al., on Antibiotic resistance pattern of bacterial isolates from Skin and Soft Tissue Infections, concluded that Staphylococcus aureus was the commonest pathogen. Our study population also reflects the same that 29(22.1%) cultures had Staphylococcus aureus.

Considering comorbidities, it was observed that the highest percentage 28.3% (28) of patients having Type II Diabetes mellitus followed by 21.2% (21) of patients having trauma, 16.2% (16) of patients having hypertension, 13.1% (13) of patients having Diabetes mellitus + Hypertension, 9.1%(9) of patients having Chronic Kidney Disease, 6.1%(6) of patients having Coronary Artery Disease. While patients with Type I Diabetes mellitus 1.01% (1) was found atleast. A study conducted by G.Zacay et.al.,(2020) on Interpretation of Correlation between the level of Glycemic control and Rate of Infection, concluded that HbA1C greater than 7.5% was associated with a 1.4 fold increased risk of cellulitis and 1.12 fold increased risk of cellulitis for every 1% elevation in HbA1C. In our study also the highest percentage 28.28% (28) of patients having comorbidity of Type II Diabetes mellitus.

By filtering out the Antibiogram of most common micro-organisms, E.Coli showed decreased sensitivity percentage in 2^{nd} AST towards almost all antibiotics compared to 1^{st} AST for which the test was performed. Out of 12 antibiotics, Staphylococcus aureus showed decreased sensitivity percentage in 2^{nd} AST for 8 antibiotics.

Out of 13 antibiotics, Klebsiella species showed decreased sensitivity percentage in 2^{nd} AST for 8 antibiotics. Out of 13 antibiotics, Proteus mirabilis showed decreased sensitivity percentage in 2^{nd} AST for 8 antibiotics. Out of 15 antibiotics, Pseudomonas species showed decreased sensitivity percentage in 2^{nd} AST for 9 antibiotics.

In all the above organisms which were more frequently isolated, cefoperazone+sulbactum and Piperacillin+Tazobactum showed higher resistance rate in 2^{nd} AST compared to 1^{st} AST.

A Comparative study that is conducted by Huili Zhang et.al., on the changes of bacterial species and severity of antimicrobial resistance during 13 years has interpreted that the resistance rate of some bacteria to piperacillin/tazobactam, cefoperazone/sulbactam has increased significantly followed by other antibiotics.

CONCLUSION

Our prospective observational study concluded that the antibiotics were most effective in the treatment of cellulitis in adjuvant with surgical interventions and other non-pharmacological interventions. Dual therapy was the most prescribed antibiotic regimen followed by monotherapy and triple therapy. It was found that augmentin was most frequently prescribed as monotherapy and Magnex forte + metronidazole was most frequently prescribed as dual therapy. Antimicrobial culture sensitivity test was performed and out of 99 subjects, no organism was identified in 15 subjects while 84 of them showed various organisms that were isolated with the help of pus and tissue cultures. The most frequently isolated bacterial pathogens were staphylococcus aureus and Escherichia coli followed by Klebsiella species, pseudomonas species and proteus mirabilis. The antibiogram of Escherichia coli showed that the sensitivity rate is decreased when AST is performed for 2^{nd} time compared with that of 1^{st} one, showing that the bacteria has developed resistance towards remaining antibiotics. Cefoperazone+sulbactum and Piperacillin + tazobactum showed high resistance rate compared to others. The antibiogram of staphylococcus also showed the utmost decline in sensitivity rate of 2^{nd} AST towards Cefoperazone+sulbactum and Piperacillin+tazobactum similar to E-coli. Klebsiella species, Pseudomonas species and proteus mirabilis also showed similar sensitivity patterns. This study concludes that rationale of antibiotic use and close monitoring is essential in the treatment of cellulitis with the help of standard treatment guidelines of SSTI's (Treatment based on AST reports) to prevent the further recurrent episodes and associated complications of cellulitis.

Conflict of interest

No authors declared conflict of interest.

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