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RESEARCH ARTICLE

STUDY OF BACTERIAL PATHOGENS WITH THEIR ANTIBIOGRAM CAUSING DIABETIC FOOT ULCERS.

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Abstract

Globally and nationally, Diabetes mellitus with its complications has become the contemporary and challenging health problem. Diabetic foot ulcers are the most serious complication of the disease. Diabetes mellitus appears to be an independent risk factor for infection with multi drug resistant organisms causing several abnormalities of the host defense mechanisms that might result in a higher risk of certain infections. Hence early diagnosis of microbial infections will aim to appropriate antibiotic therapy to avoid further complications such as cellulitis, gas gangrene and amputation. Hence this study had been done to evaluate the microbial pathogens causing diabetic foot ulcers along with its antibiogram. Pus samples were collected from 100 patients with diabetic foot ulcers attending Department of Surgery, Government General Hospital, Vijayawada and sent to Microbiology department, Siddhartha Medical College for processing. Diabetic patients of all age groups and both gender were included and those patients who were on antibiotic therapy were excluded. Out of 100 samples processed 90(90%) were culture positives, of which 101 pathogens were isolated, 70(69.3%) were Gram negative and 31(30.6%) were Gram positive *Pseudomonas ssp* were found to be predominant followed by *Escherichia.coli* and *Staphylococcus aureus*. All the pathogens were found to be highly sensitive to Piperacillin-tazobactam, Gentamicin and least sensitivity to Azithromycin. The results of this study therefore alert us to the need for proper management of antibiotics to optimize patient care and improve clinical outcome.

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Introduction:-

Diabetes is a metabolic disorder which affects, around one million people nationwide, it is often accompanied by serious complication and still today there is no cure yet. Globally and nationally, Diabetes mellitus with its complications has become the contemporary and challenging health problem.

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Diabetes mellitus appears to be an independent risk factor for infection with multi drug resistant organisms causing several abnormalities of the host defense mechanisms that might result in a higher risk of certain infections. Diabetic foot infections include cellulitis, abscess, necrotizing fasciitis, septic arthritis, tendonitis and osteomyelitis. Diabetic foot ulcers are the most serious complication of the disease. Hence early diagnosis of microbial infections will aim to appropriate antibiotic therapy to avoid further complications such as cellulitis, gangrene and amputation. If not treated promptly sometimes infection leads to amputation of foot.

Methods:-

The study was conducted for a period of 8 months (May-Dec 2018) in Government General Hospital, Vijayawada on 100 Diabetic patients with infected foot ulcers who were admitted in surgical unit of Government General Hospital, Vijayawada. To avoid contamination, specimens were collected under aseptic condition and samples were transported to Microbiology department in Siddhartha Medical College. Samples were subjected to direct Gram staining and then inoculated on Nutrient agar, Blood agar, MacConkey agar. Isolates were identified and confirmed by biochemical reactions. Antibiotic susceptibility testing was performed by Kirby Bauer Disk Diffusion method as per CLSI (2017) guidelines. Gram positive isolates were tested for Ampicillin, Piperacillin-tazobactam, Cefoxitin, Cephalosporins, Gentamycin, Ciprofloxacin, Vancomycin, Linezolid. Gram negative isolates were tested for Piperacillin-tazobactam, Cephalosporins, Azithromycin, Levofloxacin, Cotrimoxazole, Imepenem.

Results:-

Out of 100 samples processed 72 were from males & 28 samples were from females, and male to female ratio was 2.6:1. Majority of the patients in the present study were more than 51 years i.e. 33(33%) being in the 51-60 years of age, 29(29%) in between the age of 41-50 years and 25(25%) in > 61 years of age. Diabetic foot complications manifests in myriad forms and in this study it was observed that 50(50%) were with ulcer foot, 22(22%) patients were presented with cellulitis, 14(14%) with abscess, 10(10%) with gangrene of one or more toes, and 4(4%) with necrotizing fasciitis

.Out of 100 samples processed 90(90%) were culture positive. Out of 90 culture positives, 89% (n=80) yielded monomicrobial growth and 11% (n=10) with polymicrobial growth. Out of 101 pathogens isolated, 70(69.30%) were Gram negative and 31(30.6%) were Gram positive. *Pseudomonas aeruginosa* 23(23%), was most common isolate causing diabetic foot infections, followed by *Escherichia coli* 19(19%), *Staphylococcus aureus* 18(18%), *Klebsiella* spp., 15(15%), *Proteus* sp., 11(11%), CONS 10(10%), *Enterococci* 3(3%) and *Citrobacter* 2(2%).

Out of 23(23%) *Pseudomonas* isolates, 22(95%) were sensitivity to Piperacillin tazobactam. 13(56%) were sensitivity to Gentamicin and Only 2(8%) least sensitive to Azithromycin. Out of 19(19%) *E.coli* isolates 15(78%) were sensitive to Gentamicin and 12(63%) were sensitive to Piperacillin tazobactam and 2(10%) least sensitive to Azithromycin. Out of 15(15%) *Klebsiella* isolates 12(80%) were sensitive to Piperacillin tazobactam, least sensitive 1(1.66%) to Azithromycin. Out of 11(11%) *Proteus* isolated, 9(81%) were sensitive to Piperacillin tazobactam, 3(27%) to Gentamicin and least sensitivity 2(18%) to Levofloxacin. All the *Citrobacter* isolates were 100% sensitive to Piperacillin tazobactam.

Out of 31(30.6%) Gram positive organisms isolates, 18(18%) were *Staphylococcus aureus* of which 12(66.6%) were sensitive to Vancomycin, Linezolid, Piperacillin tazobactam and low sensitive 1(33.3%) to Cefepime. Out of 10(10%) CONS 8(80%) were sensitive to Piperacillin tazobactam and least sensitive 1(10%) to Cefepime. *Enterococci* isolates were sensitive to 3(100%) Piperacillin tazobactam.

Discussion:-

Most of the patients in this study belonged to age group 51-60 years, which is in accordance to studies by Patil SV et al, Jain & Barman et al, and Khare J et al. Age distribution: In this study, males were more prone for Diabetic foot lesions compared to females with M:F ratio 2.5:1 this is in relevance to the study done by Khare J et al who has shown M:F ratio 2.6:1. Higher male prevalence is seen in some other studies like Jain & Barman et al and Shareef et al with M:F ratio 9:2 & 6.1:2 respectively. 90% of the samples has shown culture positivity, Out of which 89% yielded monomicrobial and 11% yielded polymicrobial growth which is comparable to the study done by Khare J et al i.e., 90.4% and 9.6% respectively. Out of 101 pathogens isolated 69.3% were Gram negative and 30.6% were Gram positive organisms, this is in relevance to the study of Shareef et al with 64.75% Gram negative and study by Patil SV et al with 30.55% Gram positive organisms.

The study showed a preponderance of gram-negative bacilli among the isolates from the diabetic foot ulcers, hence all patients with Diabetic foot infections admitted to a tertiary care hospital in India may not require empirical therapy for Gram-positive coverage. A β -lactum agent with/without inhibitor combination or a quinolone as an empirical agent after establishing the patients history of previous antibiotic usage would probably be more appropriate. In the event of the *Pseudomonas* infection, an anti-pseudomonal drug can be added. In the present study, Piperacillin-tazobactam/Cefaperazone salbactam adequately covered such infection. The lack of multi-disciplinary approach in the treatment of diabetic foot is quite obvious and there is a lot of scope of improvement in the form of holistic approach to a patient with diabetic foot rather than just treating the ulcer foot. The results of this study therefore alerts us to need for proper management of antibiotics to optimize patient care and improve clinical outcome.

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Fig no 1:-Sample Collection & Diabetic foot ulcer



Table no 1:-Age and sex distribution of the study population.

31-40	9	4	13
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41-50	21	8	29
51-60	22	11	33
>60	20	5	25
Total	72	28	100

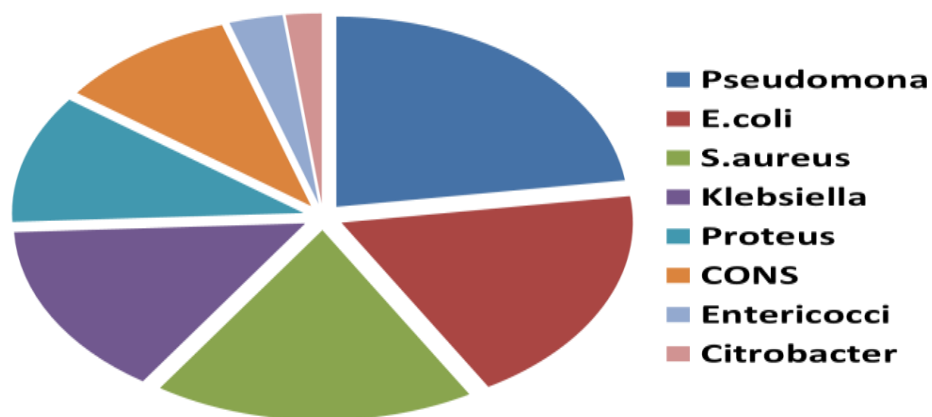
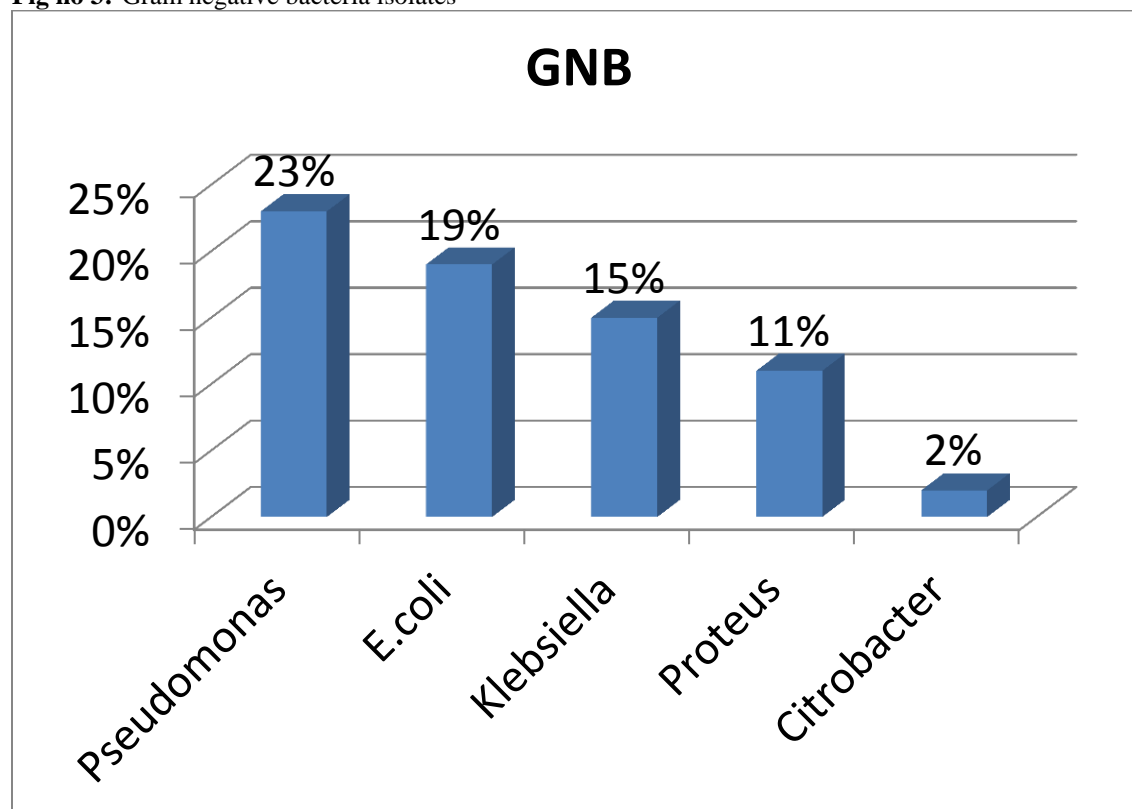
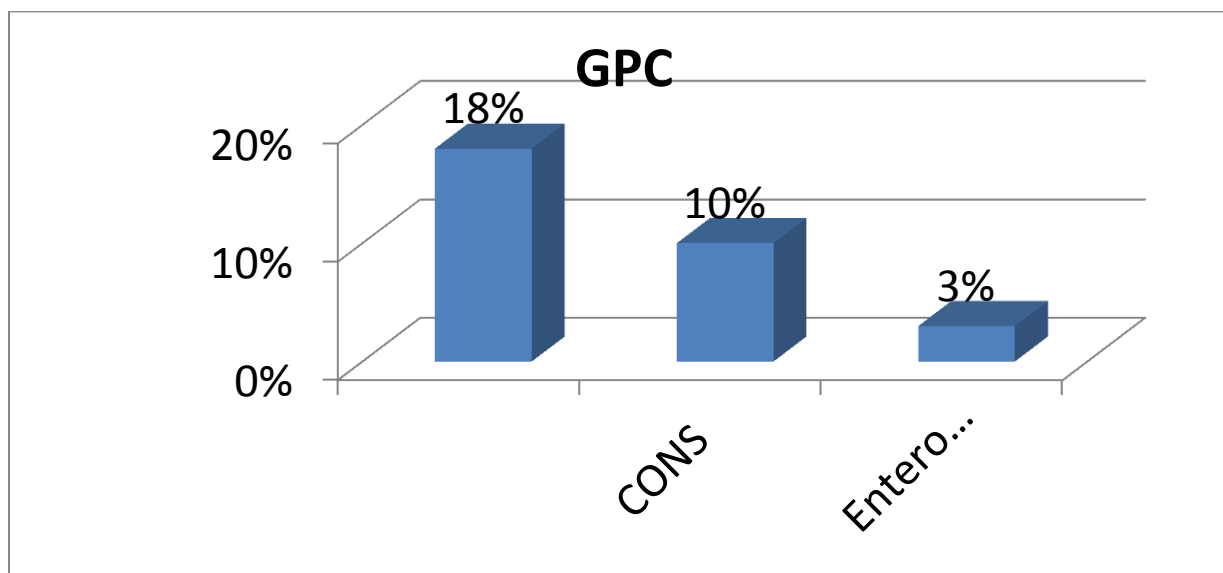
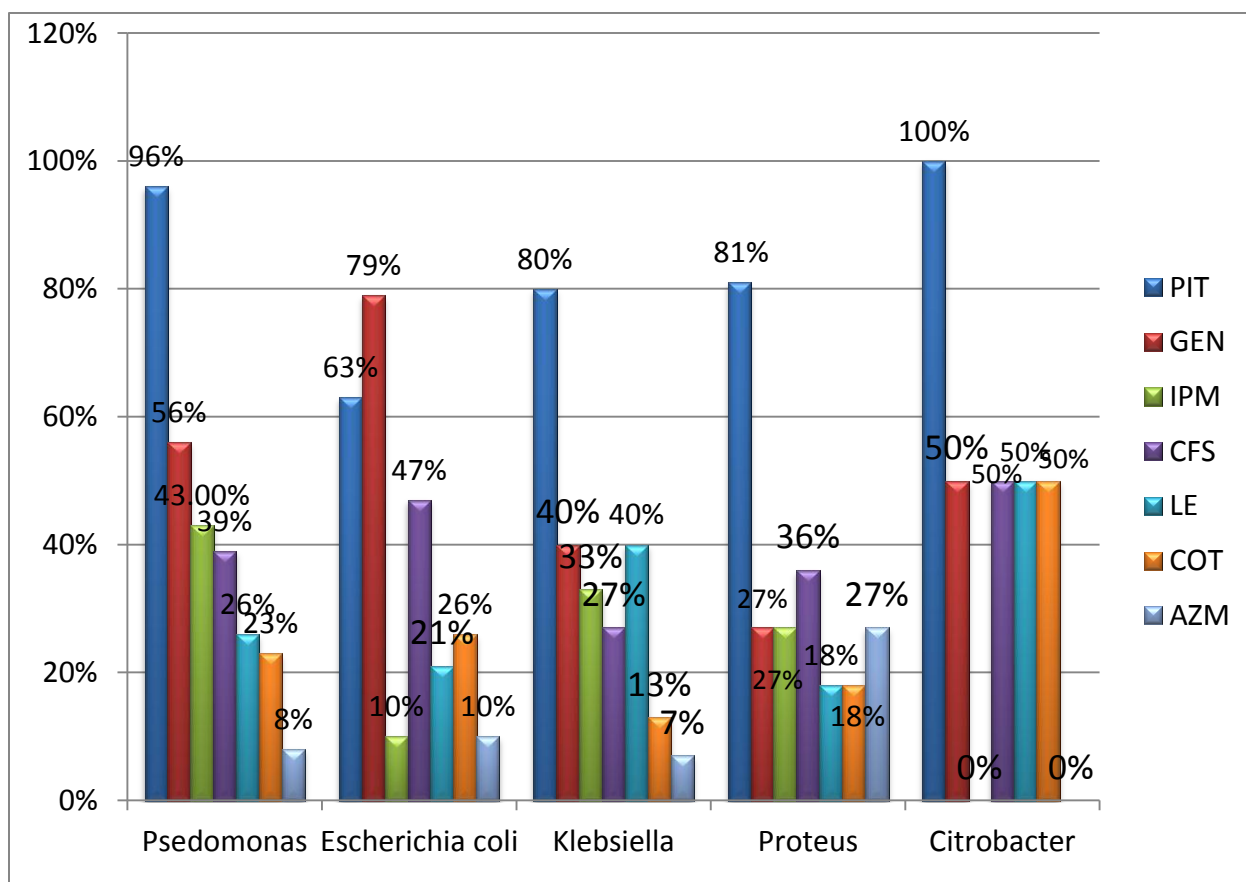
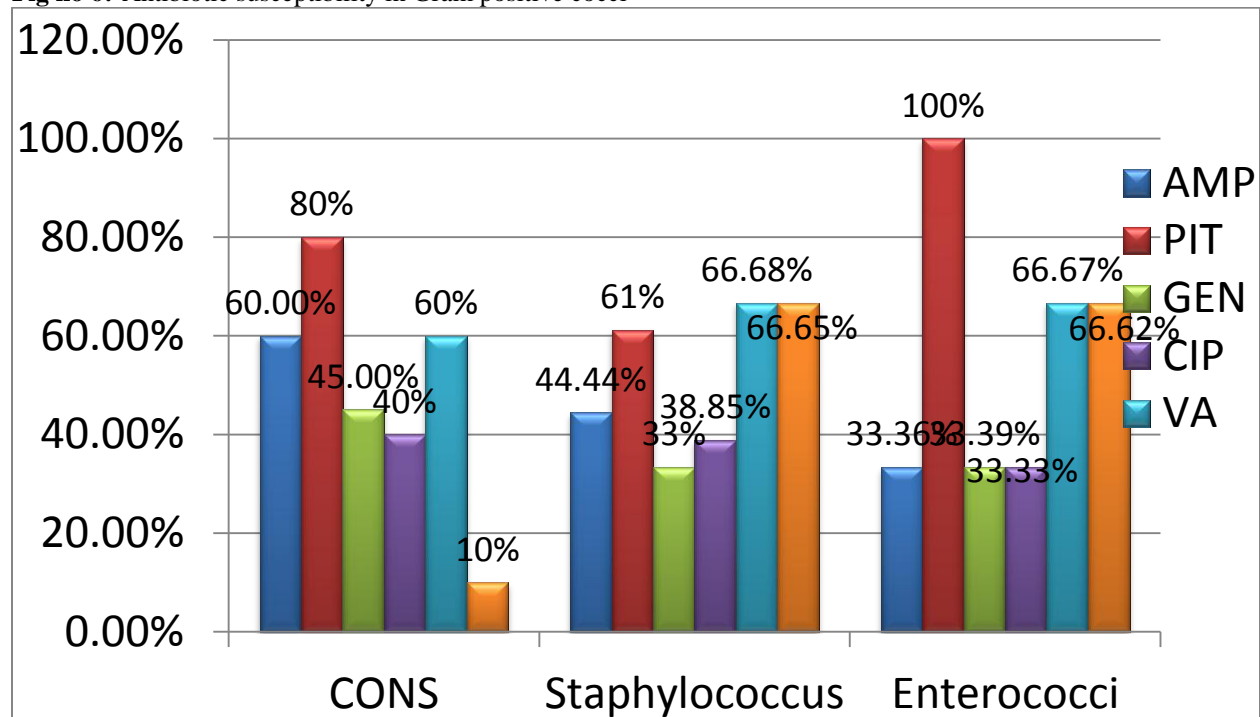
Fig no 2:-Organisms isolated in pus culture**Fig no 3:-**Gram negative bacteria isolates

Fig no 4:-Gram positive bacteria isolates**Fig no 5:-**Antibiotic susceptibility in Gram negative bacilli

PIT - Piperacillin-tazobactam, GEN – Gentamicin, IPM – Imepenem, CFS – Cefaperzone salbactam, LE – Levofloxacin, COT – Cotrimoxazole, AZM – Azithromycin.

Fig no 6:-Antibiotic susceptibility in Gram positive cocci

AMP – Ampicillin, PIT – Piperacillin tazobactam, GEN – Gentamicin, CIP – Ciprofloxacin, VA – Vancomycin, LZ – Linezolid.

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