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AEROBIC BACTERIOLOGICAL PROFILE OF SKIN AND SOFT TISSUE INFECTIONS (SSTI`S) WITH IT`S ANTIMICROBIAL SENSITIVITY PATTERN AT JORHAT MEDICAL COLLEGE& HOSPITAL.

Microbiology

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ABSTRACT

BACKGROUND- The development of wound infection depends on the integrity and prospective function of skin(1). Skin and soft-tissue infections (SSTIs) are a common presenting problem in both inpatients and outpatients (2).). Wound infection is one of the most common hospital acquired infections and important cause of morbidity and accounts for 70-80 %.(3).

AIMS- The study is conducted to find out the common organisms in skin and soft tissue infections and their antibiotic sensitivity pattern.

MATERIALS & METHODS- The study was conducted in department of Microbiology of Jorhat Medical College & Hospital between October, 2017 to March,2018. Pus,wound swabs,aural swabs collected from various clinical departments were processed according to standard microbiological techniques and Antibiotic sensitivity testing is done using Kirby Bauer Disc diffusion technique according to C.L.S.I guideline .

RESULTS- Out of 207 samples received 134 cases (64.73%) showed culture positivity while 73(35.27%) were culture negative. The most common organism isolated was Staphylococcus aureus (47.01%) followed by Klebsiella species (24.63%), Pseudomonas (13.43%), Escherichia coli(8.96%), Enterococcus species(3.73%) & Proteus (2.24%).Gram positive cocci were 100% sensitive to Vancomycin . Gram negative bacilli showed highest susceptibility to Imipenem & least sensitive to Amoxycillin\Clavulanic acid.

CONCLUSION- The study concludes that the most common organism causing skin and soft tissue infections is Staphylococcus aureus followed by Klebsiella. . However a changing pattern were noted among the organisms isolated as well as their antibiotic sensitivity pattern in various studies from different geographical locations. Hence, a local antibiotic policy based on common organisms isolated and their antibiotic susceptibility pattern can be adopted which will prevent resistance among organisms and help in early recovery from infection.

KEYWORDS

Skin and Soft tissue infection, Staphylococcus aureus, MRSA, Antibiotic sensitivity testing.

INTRODUCTION

The development of wound infection depends on the integrity and prospective function of skin.(1). Skin and soft-tissue infections (SSTIs) are a common presenting problem in both inpatients and outpatients. SSTIs may range from simple uncomplicated superficial infections such as folliculitis, cellulitis, and abscesses to deeper complicated infections such as necrotizing fasciitis, burn infections and diabetic foot (2). Wound infection is one of the most common hospital acquired infections and important cause of morbidity and accounts for 70-80 %.(3). Skin and soft tissue infections(SSTIs) are a common type of infection that may contribute to longer hospital stays , increase the cost of medical care and play an important role in development of antimicrobial resistance.They are a common cause of morbidity in both community and hospital(4). An SSTI is classified as complicated if the infection has spread to the deeper soft tissue, if surgical intervention is necessary or if the patient has comorbid conditions hindering treatment response (eg. Diabetes mellitus or human immune deficiency virus).(1,5). SSTIs may be caused by a wide range of pathogens. Staphylococcus aureus is recovered from maximum number of SSTIs. Other organisms recovered included Pseudomonas aeruginosa, Escherichia coli, Enterococcus, Klebsiella and Enterobacter species.(5)

MATERIALS AND METHODS

A total of 207 pus samples, wound swabs and aural swabs were collected from various departments of Jorhat Medical College & Hospital, Jorhat. Under strict aseptic condition samples were collected using sterile cotton swabs and it was properly labeled.

Study period- 6 months study period(October, 2017 to March, 2018).

PROCESSING OF SAMPLE- The samples collected were immediately transferred to Bacteriology section of Department of Microbiology for processing. The media and reagents were purchased from HIMEDIA laboratories. First samples were inoculated on to Blood agar and MacConkey agar . Then samples were subjected to gram stain of Direct smear to examine for the presence of pus cells and any bacteria. Culture plates were incubated at 37degree Celsius for 24hrs to 48hrs in aerobic condition. If there was no growth it was considered sterile. After incubation ,identification of bacterium from positive cultures was done with a standard microbiological technique which includes motility testing by hanging drop preparation ,gram staining and biochemical reactions such as catalase, coagulase, indole,methylred , Voges-Proskauer,citrate,urease, Phenyl pyruvic acid test and oxidase test(6).Further biochemical tests done were carbohydrate fermentation test using Lactose, sucrose, mannitol & Maltose, Triple sugar Iron test, Nitrate reduction test, Arginine dihydrolase production, lysine and ornithine decarboxylase test,Hugh and leifson test.

The antimicrobial susceptibility testing were done by Kirby Bauer Disk Diffusion method and interpreted as per Clinical Laboratory Standard Institution (CLSI) guidelines(7). For antimicrobial sensitivity testing Muellar Hinton agar was used. The antimicrobial discs used were purchased from HiMedia Laboratory Ltd. Inhibition zones were measured and reported as sensitive or resistant according to manufacturer,s guidelines. Escherichia coli ATCC 25922, Pseudomonas aeruginosa ATCC 27853 and Staphylococcus aureus ATCC 25923 were used as quality control strains.Antimicrobial discs used for sensitivity testing by disc diffusion method were Imipenem 10mcg,piperacillin/tazobactam 100/10 mcg,Ceftazidime 30mcg,Cefotaxime 30mcg,Amikacin 30mcg,Gentamicin 10mcg,Levofloxacin 5mcg,Ceftriaxone 30mcg,Cefoxitin 30mcg,Amoxycillin/Clavulanic acid 20/10 mcg,Vancomycin 30 mcg, Linezolid 30mcg ,Cefuroxime 30 mcg,Penicillin 10 units,Ceftriaxone 30 mcg,Aztreonam 30mcg,Clindamycin 2mcg ,Erythromycin 10mcg, Doxycycline 30mcg and Ofloxacin 5mcg.

RESULTS

Out of 207 pus samples, wound swabs and aural swabs received for aerobic culture and sensitivity from different departments of Jorhat Medical College & Hospital 134(64.73%) cases were found to be culture positive while 73(35.27%) cases showed no growth.

Out of 134 culture positive cases 68(50.75%) cases were gram positive while 66(49.25%)cases were gram negative.

The most common organism isolated was Staphylococcus aureus (47.01%) followed by Klebsiella species (24.63%), Pseudomonas (13.43%),Escherichia coli(8.96%), Enterococcus species(3.73%) & Proteus (2.24%).

The antibiogram of gram positive cocci showed 100% sensitivity to Vancomycin and Linezolid followed by high sensitivity to Gentamicin ,Clindamycin,Amikacin while moderate sensitivity was observed to Cotrimoxazole, Erythromycin ,Doxycycline and Ceftriaxone . Gram positive cocci showed high resistance to Amoxycillin/ Clavulanic acid and Penicillin. MRSA was found to be 28.57%.

The antibiogram of Enterobacteriaceae showed high susceptibility to Imipenem ,Aztreonam,Levofloxacin,Piperacillin/Tazobactum, Ofloxacin, Gentamicin,and Amikacin.High reistance is observed

towards Amoxycillin /Clavulanic acid,Cefotaxime,Ceftriaxone ,Cefuroxime and Ceftazidime. Pseudomonas showed maximum susceptibility to Imipenem while showed least sensitivity to Amoxycillin/Clavulanic acid .

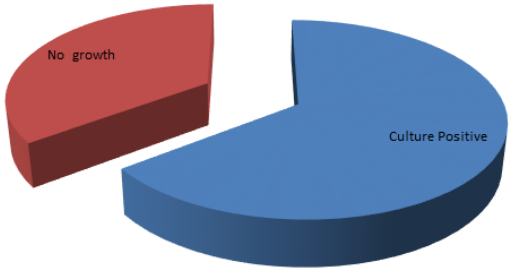

FIG 1: PIE DIAGRAM SHOWING CULTURE POSITIVITY

CULTURE POSITIVE 64.73% NO GROWTH 35.27%

TABLE 1- Distribution of Isolates based on Gram Staining

ISOLATES	NUMBER	PERCENTAGE
GRAM POSITIVE	68	50.75%
GRAM NEGATIVE	66	49.25%
TOTAL	134	100%

TABLE 2- Different Organisms isolated

SERIAL NO.	ORGANISM	NUMBER(%)
1	Staphylococcus aureus	63(47.01%)
2	Klebsiella species	33(24.63%)
3	Pseudomonas	18(13.43%)
4	Escherichia coli	12(8.96%)
5	Enterococcus species	5(3.73%)
6	Proteus	3(2.24%)

TABLE 3- ANTIBIOGRAM OF GRAM POSITIVE COCCI

Antibiotics	Staph. aureus		Enterococcus spp.	
	Sensitive	Resistant	Sensitive	Resistant
Cefoxitin	45(71.43%)	18(28.57%)	4(80%)	1(20%)
Amoxycillin/ Clavulanic	12(19.05%)	51(80.95%)	1(20%)	4(80%)
Vancomycin	63(100%)	0(0%)	5(100%)	0(0%)
Doxycycline	38(60.32%)	25(39.68%)	3(60%)	2(40%)
Erythromycin	39(61.9%)	24(38.1%)	3(60%)	2(40%)
Linezolid	63(100%)	0(0%)	5(100%)	0(0%)
Amikacin	49(77.78%)	14(22.22%)	3(60%)	2(40%)
Cotrimoxazole	40(63.5%)	23(36.5%)	3(60%)	2(40%)
Clindamycin	50(79.4%)	13(20.6%)	3(60%)	2(40%)
Ceftriaxone	33(52.4%)	30(47.6%)	3(60%)	2(40%)
Penicillin	15(23.8%)	48(76.2%)	1(20%)	4(80%)
Gentamicin	52(82.5%)	11(17.5%)	3(60%)	2(40%)

TABLE 4 – ANTIBIOGRAM OF ENTEROBACTERIACEAE

Antibiotics	KLEBSIELLA		E.COLI		PROTEUS	
	S	R	S	R	S	R
Amikacin	18(54.5%)	15(45.5%)	9(75%)	3(25%)	2(66.67%)	1(33.33%)
Levofloxacin	22(66.67%)	11(33.33%)	10(83.33%)	2(16.67%)	2(66.67%)	1(33.33%)
Ceftazidime	5(15.2%)	28(84.8%)	6(50%)	6(50%)	1(33.33%)	2(66.67%)
Ceftriaxone	10(30.3%)	23(69.7%)	4(33.33%)	8(66.67%)	1(33.33%)	2(66.67%)
PIT	26(78.8%)	7(21.2%)	9(75%)	3(25%)	2(66.67%)	1(33.33%)
Cefotaxime	12(36.4%)	21(63.6%)	5(41.7%)	7(58.3%)	1(33.33%)	2(66.67%)
Gentamicin	19(57.6%)	14(42.4%)	7(58.3%)	5(41.7%)	2(66.67%)	1(33.33%)
Imipenem	30(90.9%)	3(9.1%)	10(83.33%)	2(16.67%)	3(100%)	0(0%)
Cefuroxime	7(21.2%)	26(78.8%)	3(25%)	9(75%)	1(33.33%)	2(66.67%)
Amoxyclav	4(12.1%)	29(87.9%)	1(8.3%)	11(91.7%)	0(0%)	3(100%)
Aztreonam	29(87.9%)	4(12.1%)	10(83.33%)	2(16.67%)	3(100%)	0(0%)
Ofloxacin	19(57.6%)	14(42.4%)	8(66.67%)	4(33.33%)	2(66.67%)	1(33.33%)

PIT- PIPERACILLIN/TAZOBACTUM

TABLE 5- ANTIBIOGRAM OF PSEUDOMONAS

ANTIBIOTICS	PSEUDOMONAS	
	SENSITIVE	RESISTANT
Amikacin	16(88.9%	2(11.1%)
Levofloxacin	12(66.67%)	6(33.33%)
Ceftazidime	3(16.7%)	15(83.3%)
Ceftriaxone	5(27.8%)	13(72.2%)
PIT	15(83.3%)	3(16.7%)
Cefotaxime	8(44.4%)	10(55.56%)
Gentamicin	12(66.67%)	6(33.33%)
Imipenem	17(94.4%)	1(5.6%)
Cefuroxime	3(16.7%)	15(83.3%)
Amoxyclav	2(11.1%)	16(88.9%)
Aztreonam	14(77.78%)	4(22.22%)
Ofloxacin	13(72.2%)	5(27.8%)

PIT- PIPERACILLIN/TAZOBACTUM

DISCUSSION

The Prevalence of culture positive samples in present study is 64.73% .Similar findings were found in Hanumanthappa P et al(8) and Sah P et al(9) .Both the studies had prevalence of Culture positive samples as 56% and 62% respectively.

The present study shows domination of Gram positive organisms which comprises 50.75% .In Sah P et al (9) out of 96 bacterial isolates there were 52 Gram positive isolates which also shows domination of Gram positive isolates .However studies like Afroz Z et al (10),Najotra K et al (12),Madhavi S et al (13) showed domination of Gram negative isolate. In Afroz Z et al(10) and Najotra K et al (12) the prevalence of Gram negative isolate is 57.40% and 64.02 % respectively. Also in Madhavi S et al (13)out of 68 isolates ,45 isolates comprised of Gram negative organisms.

The most common organism isolated in this study is Staphylococcus aureus which agrees with various studies like Najotra K et al (12), Hanumanthappa P et al(8),Sah P et al (9) and Madhavi S et al (13) .

Among the Gram negative organisms, the most common isolate is Klebsiella species. Similar findings was reported in Hanumanthappa P et al (8). However in studies like Afroz Z et al (10),Najotra K et al(12) , Mishra D et al (14) the most common isolate is Pseudomonas and in Sah P et al(9) the most common isolate is Escherichia coli.

In the present study Staphylococcus aureus is 100% sensitive to Vancomycin and Linezolid .Similar finding was found in Mishra D et al (14), Najotra K et al (12).However in studies like Sah P et al (9) Vancomycin resistance noted is 5.56%.

In the present study Staphylococcus aureus is least sensitive to Amoxycillin/ Clavulanic acid. But in a study conducted by Madhavi S et al (13) Staphylococcus aureus showed maximum resistance towards Ampicillin.

The prevalence of MRSA in present study is 28.57%. Similar finding was found in Mishra D et al (14) where the prevalence of MRSA noted was 24.14%. Higher prevalence of MRSA was noted in Hanumanthappa et al(8), Mohanty S et al(4), Najotra K et al (12). The prevalence of MRSA in these studies are 53.96%,38.56%, 34.41% respectively.

While studies like Rani S et al (15) , Shetty J et al (16) showed low prevalence of MRSA which were 13% and 16% respectively.

Among Gram negative isolates, the most common organism found in this study is Klebsiella species. Klebsiella showed highest susceptibility towards Imipenem and maximum resistance towards Amoxyclav. In other studies conducted by Mohanty S et al (4) Klebsiella showed maximum sensitivity towards Piperacillin/ Tazobactum and maximum resistance towards Piperacillin. In Sah P et al (9) Klebsiella showed maximum susceptibility towards Ciprofloxacin and maximum resistance towards Cefepime and Amoxycillin. Hence the antibiotic susceptibility pattern of Klebsiella changed in different studies.

CONCLUSION

The study concludes that the most common organism causing skin and soft tissue infections is Staphylococcus aureus followed by Klebsiella. The study also finds a rise in prevalence of MRSA. However a changing pattern were noted among the organisms isolated as well as their antibiotic sensitivity pattern in various studies from different geographical locations. Hence it is crucial to conduct frequent monitoring of antibiotic susceptibility pattern to curb the increasing trend of antimicrobial resistance. Moreover, a local antibiotic policy based on common organisms isolated and their antibiotic susceptibility pattern can be adopted which will prevent resistance among organisms and help in early recovery from infection.

The study emphasizes on appropriate and judicious use of antibiotics .In vitro testing of antibiotics prior to its use should be conducted to prevent the spread of Multi drug resistant organisms.

References

1) Calvin M. Cutaneous wound repair. Wounds. 1998; 10:12-14
2) Rajan, S. (2012). Skin and soft-tissue infections: classifying and treating a spectrum. Cleveland Clinic journal of medicine, 79(1), 57.
3) Collier M. Recognition and management of wound infections Wounds. available from URL:http://www.worldwide wounds.com.
4) Mohanty, S., Kapil, A., Dhawan, B., & Das, B. K. (2004). Bacteriological and antimicrobial susceptibility profile of soft tissue infections from Northern India.
5) Weigelt, J., Itani, K., Stevens, D., Lau, W., Dryden, M., Knirsch, C., & Linezolid CSSTI Study Group. (2005). Linezolid versus vancomycin in treatment of complicated skin and soft tissue infections. Antimicrobial agents and chemotherapy, 49(6), 2260-2266.
6) Parajuli P,Basnyat S R,Shrestha R,Shah PK,Gurung P.Identification and antibiotic susceptibility pattern of aerobic bacterial wound isolates in Scheer memorial hospital.JSM Microbiology 2014;2(2)
7) Clinical and Laboratory Standard Institute;Performance Standards for antimicrobial Susceptibility testing;Clinical and Laboratory Standards Institute,Wayne;2012;22nd Informational Supplement:32(3)
8) Hanumanthappa, P., Vishalakshi, B., & Krishna, S. A. (2016). Study on aerobic Bacteriological profile and Drug sensitivity pattern of Pus samples in a tertiary care hospital. Int. J. Curr. Microbiol. App. Sci, 5(1), 95-102.
9) Sah, P., Khanal, R., & Upadhaya, S. (2013). Skin and soft tissue infections: bacteriological profile and antibiotic resistance pattern of isolates. J Universal Coll Med Sci, 1(3), 18-21.
10) Afroz, Z., Metri, B. C., & Jyothi, P. (2015). Bacteriological profile and antimicrobial susceptibility pattern of skin and soft tissue infections among gram negative bacilli in a tertiary care hospital of South India. Journal of Pharmaceutical Sciences and Research, 7(7), 397.
11) Gupta, V., Datta, P., & Singla, N. (2008). Skin and soft tissue infection: frequency of aerobic bacterial isolates and their antimicrobial susceptibility pattern. The Journal of the Association of Physicians of India, 56, 389-390.
12) Kaur Najotra, D., & Kakru, D. K. (2012). Bacteriology and antibiogram of skin and soft tissue infections from a tertiary care hospital. Indian Journal of Medical Specialities, 3(1).
13) Madhavi S, Parveen SS. Bacteriological Profile and Antimicrobial Sensitivity of Wound Infections. Int. J. Curr. Microbiol. App. Sci. 2015;4(12):248-54.
14) Mishra, D., & Palo, S. (2016). Antibiotic resistance pattern of bacterial isolates from skin and soft tissue infections. International Journal of Research in Medical Sciences, 4(5), 1458-1462
15) Rani, S., Jayalekha, B., & Sreekumary, P. K. (2016). Bacteriological profile of pyoderma in a tertiary care centre in Kerala, India. International Journal of Research in Dermatology, 2(1), 1-11.
16) Shetty, J. Skin And Soft Tissue Infections Associated with Methicillin Resistant Staphylococcus Aureus, Esbl, Amp C And Metallo B-Lactamase Producing Bacilli In A Tertiary Care Hospital.