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Original Research Article

Antibiotic Susceptibility Patterns among Aerobic Bacterial Isolates from Pus Samples at Sir Takhtsinhji Hospital, Bhavnagar

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Abstract

Introduction: Wound infection remains an important cause of morbidity and mortality among humans, especially in developing countries. Knowledge regarding Bacterial isolates and their antibiotic susceptibility pattern in pus isolate is necessary for empirical treatment of wound infections and useful for making antibiotic policy of hospital. ***Aim:*** The present study was conducted to assess bacterial isolates and their antimicrobial susceptibility patterns from pus samples of Sir T Hospital, Bhavnagar. ***Material and method***: The present study was carried out during July 2019 to November 2019 in Microbiology Department, Sir T Hospital, and Bhavnagar. The pus samples received in bacteriology section of microbiology laboratory were preceded for bacterial identification and antibiotic susceptibility testing. It was done by Modified kirbybauer disk diffusion method according to CLSI guidelines 2019. ***Result:*** A total of 1110 pus samples were received from which 477 (42.97%) samples were positive for gram positive 117(24.52%) and gram negative 360 (75.47%) bacteria. About 117(24.52%) of the total isolates were Staphylococcus aureus, 220 Escherichia coli (41%), 96 Klebsiellaspp (17%), 16 Pseudomonas (13%), 13 Proteus mirabilis (2%), 11 Proteus vulgaris (2%), 4 Acinatobacter species (0.74%). Gram negative organisms were sensitive for Meropenem (98%), Piperacillin Tazobactem (77%) Gram positive organism were completely sensitive to Vancomycin (100%), Linezolid (100%). ***Conclusion:*** Thus the present study shows that Escherichia coli, Klebsiellaspp, Pseudomonas and Staphylococcus aureus are the most common bacteria showing sensitivity towards vancomycin, linezolid, meropenem, piperacillin tazobactum. This study helps in decidiing proper treatment of wound infection.

Keywords: Pus samples, antimicrobial susceptibility.

INTRODUCTION

Skin and soft tissue infections (SSTIs) and pyogenic infection caused by microbial pathogens during or after trauma, surgical procedures and burns injury result in the production of pus. Which is white to yellow fluid comprised of dead WBCs, cellular debris and necrotic tissues [1]. Microbes found on the skin are usually regarded as potential pathogens, pathogens, or innocuous symbiotic organisms [2].

Pus formation is one of several cardinal indicators of suppurative infections caused by bacteria that are pyogenic, resulting in collection & aggregation of dead leukocytes, bacteria and tissue debris [3].

An entry for bacteria into the body through the break or abrasion in the skin, and they stick very well to the moist edges of a cut. The bacteria begin to multiply and extend into the cut [4]. Proliferation and colonization of bacteria in wound may lead to wound infection. Therefore the knowledge of infectious agents causing wound infection is necessary for selection of appropriate antimicrobial therapy [5]. The emerging antibiotic resistance and i rapid spread among pathogenic bacterial isolates are considered as grave threats to the public health worldwide [6].

During the last few decades, multidrug-resistant Gram negative bacterial strains such as, Escherichia coli, Klebsiella spp, Pseudomonas aeruginosa, and Gram-positive methicillin-resistant Staphylococcus aureus (MRSA) were increasingly associated with pus infections under hospital settings

due to extensive use of antibiotics which are inadequate in dose regimen and also misprescription [7, 8].

Rapid emergence of multidrug-resistant bacteria that possess a serious threat and complication to public health globally due to the treatment options is limited and lukewarm discovery of new classes of antibiotics [9].

MATERIAL & METHOD

The present study is carried out to determine Antibiotic susceptibility patterns among aerobic bacterial isolates from pus samples at Tertiary Care Hospital, Bhavnagar. The study was conducted during July 2019 to November 2019 in Microbiology Department, Sir T Hospital, and Bhavnagar. As this study has been conducted using clinical samples sent to microbiology laboratory for routine investigation so the study does not need any ethical approval.

Inclusion criteria

Pus samples received in bacteriology section of microbiology laboratory were included in the study.

Exclusion criteria

Repeat samples were excluded.

Sample size

Total 1110 pus samples were preceded in this study.

Sample processing

Pus samples received in bacteriology section of microbiology laboratory were included in this study. Those samples were collected from skin (pustules, furuncles, and abrasions), nasal wounds, legs, ear, internal organs (lungs, bladder, and kidney), and catheters. These samples were identified and isolated using gram stain and aseptically inoculated on MacConkey agar and blood agar. The inoculated plates were incubated for 37°C for 16-18 hours. Identification of these isolated strains done according to their microscopic features, colony morphology and biochemical reaction1 [10-12].

Antimicrobial susceptibility testing of isolates

All isolates from the pus samples were future tested for that antimicrobial susceptibility testing on Muller Hinton agar by Modified kirbybauer disc diffusion method according to CLSI guideline 2019 [13].

The zone of inhibition was measured and the isolates were classified as sensitive, intermediate, andresistant towards various antibiotics according to CLSI guidelines 2019[13].

OBSERVATIONS AND RESULTS

Bacterial isolate

A total of 1110 pus samples were received from which 477(42.97 %) samples were positive for gram positive bacteria and gram negative bacteria based on Gram staining, morphological features, culture characteristics, and biochemical characterization, the bacterial isolates were assigned to seven bacterial. species. In this 117(24.52%) were Gram Positive cocci and 360 (75.47%) were Gram Negative bacilli.E. coli was the most frequent pathogen as revealed by 220 (47%) occurrence followed by 117 Staphylococcus aureus (24.52%), 96 Klebsiella spp. (20%), 16 Pseudomonas (3%), 13 Proteus mirabilis (2%), 11 Proteus vulgaris (2%), 4 Acinetobacter species (1 %).

Table-1: Total positive isolates from total pus samples

Total no. of samples	No. of GPC isolates	No. of GNB isolates
1110	117	360

Table-2: Categorization of aerobic bacterial isolates obtained from positive pus cultures (n=477)

Gram positive cocci		
Isolate	No.	%
Staphylococci aureus	117	24.52

Gram negative bacilli		
Isolate	No	%
Escherichia coli	220	47
Klebsiella species	96	20
Pseudomonas	16	3
Proteus mirabilis	13	2
Proteus vulgaris	11	2
Acinetobacter species	4	1

Table-3: Antibiogram Gram negative bacteria

GRAM NEGATIVE BACTERIA ISOLATES	Escherichia coli	Klebsiella species
NO OF ISOLATES	**220**	**96**
ANTIBIOTIC	**% SENSITIVETY**	**% SENSITIVETY**
Ampicillin	8	4
Piperacillin	48	58
Amoxicillin/Clavulanic acid	8	4
Ceftazidime/Clavulanic acid	45	54
Ampicillin/Sulbactam	13	8
Piperacillin/Tazobactam	75	82
Cefuroxime	29	40
Cefotaxime	30	38
Ceftizoxime	32	40
Cefepime	38	48
Aztreonam	60	67
Ertapenem	100	100
Meropenem	100	100
Amikacin	91	94
Gentamicin	88	92
Tobramycin	87	92
Ciprofloxacin	60	70
Levofloxacin	62	73
Trimethoprim/Sulfamethoxazole	40	46
Chloramphenicol	60	60
Tetracycline	42	52
cefazolin	42	43

GNB isolated	Pseudomonas
No of isolates	**16**
ANTIBIOTICS	**% SENSITIVETY**
Piperacillin/Tazobactam	85
Ceftazidime	14
Cefepime	29
Imipenem	100
Meropenem	100
Amikacin	80
Gentamicin	80
Tobramycin	80
Ciprofloxacin	63
Levofloxacin	64
Colistin	100
Polymixin B	100

GNB isolated	Acinetobacter species
No of isolates	**4**
ANTIBIOTICS	**% SENSITIVETY**
Ampicillin/Sulbactam	8
Piperacillin/Tazobactam	19
Ceftazidime	25
Ceftriaxone	16
Cefotaxime	30
Ceftizoxime	34
Cefepime	30
Meropenem	100
Amikacin	70
Gentamicin	70
Tobramycin	70

Ciprofloxacin	81
Levofloxacin	81
Trimethoprim/Sulfamethoxazole	51
Colistin	100
Polymixin B	100

Table-4: Antibiogram Gram positive Cocci

GPC isolated	**STAPHYLOCOCCUS AUREUS**
NO OF ISOLATES	**117**
ANTIBIOTIC	**% SENSITIVITY**
Penicillin G	3
Cefoxitin	94
Gentamicin	90
Ciprofloxacin	82
Levofloxacin	82
Trimethoprim/Sulfamethoxazole	79
Clindamycin	89
Azithromycin	21
Erythromycin	21
Linezolid	100
Vancomycin	100
Teicoplanin	100
Chloramphenicol	87
Tetracycline	90

DISCUSSION

In the study, gram-negative bacteria were the more isolates (75.4%) from pus samples compared to gram-positive bacteria which are similar to several studies. Our findings are similar with findings of Zhang *et al*. A study on wound microbiology also implies that the normal microbial flora of the gut, oral cavity, skin and genitourinary mucous membranes contain bacteria that can easily colonize wounds especially the ones in close proximity to those sites so this could be reason for Escherichia coli preponderance [15]. This study suggests the high prevalence of antibiotic resistant bacteria in pus samples of patients collected. From a tertiary care hospital environment. Our findings indicate the predominance of Escherichia coli among the bacterial isolates of pus.

Other study like Zhang *et al*. also suggests that the predominance of Escherichia coli, Staphylococcus aureus, Klebsiella spp. and Pseudomonas aeruginosa in pus samples from patients with severe intra-abdominal infection & other infection like burns injury, skin & ear infections.

Antibiogram results shows in the present study that Escherichia coli, was more sensitive to amikacin, imipenem, gentamicin, and meropenem, while least sensitive to ampicillin, ampicillin/Sulbactam, amoxicillin-clavulanic acid, cephalosporine. Similar results were also shown by other studies like Biradar *et al.* [16] Roopa *et al*. [17].

Staphylococcus aureus was highly susceptible to vancomycin (100%), linezolid (100%), teicoplanin (100%) while it showed resistance to penicillin G, ampicillin and azithromycin. Similar findings were found in other studies like Jain *et al*. [18] andPrajuli *et al*. [19]

Our study shows Pseudomonas aeruginosa was more susceptible for antibiotics compared to Klebsiella species. Both species resistance towards cephalosporin &least resistance towards fluoroquinolones group. Studies like Bubonja-Sonje *et al*. [20] & J. A. Labara *et al*. [21] shows that previous studies from Canada, Latin America and Croatia found Pseudomonas aeruginosa isolates resistant to carbapenems, aminoglycosides, and ciprofloxacin but not topiperacillin.

CONCLUSION

Appropriate use of antibiotics is very crucial in preventing emergence of multidrug resistance bacteria. It is essential to monitoring of antimicrobial susceptibility testing regularly. Antibiogram should be prepared regularly that help clinicians to guide them in therapy.

REFERENCES

1. Trojan, R., Razdan, L., & Singh, N. (2016). Antibiotic susceptibility patterns of bacterial isolates from pus samples in a tertiary care hospital of Punjab, India. *International journal of microbiology*, *2016*.
2. Cogen, A. L., Nizet, V., & Gallo, R. L. (2008). Skin microbiota: a source of disease or

defence?. *British Journal of Dermatology*, *158*(3), 442-455.
3. Gill, M. K., & Sharma, S. (2019). Bacteriological profile and antibiotic sensitivity patterns of aerobic pus isolates: A study conducted in tertiary care hospital of North India. *Int J Med Microbiol Trop Dis*, *5*(2), 99-102.
4. Rao, D. R., Basu, R., & Biswas, D. R. (2014). Aerobic bacterial profile and antimicrobial susceptibility pattern of pus isolates in a South Indian Tertiary Care Hospital. *Surgery*, *36*, 35-29.
5. Tayfour, M. A., Al-Ghamdi, S. M., & Al-Ghamdi, A. S. (2005). Surgical wound infections in King Fahad Hospital at Al-Baha. *Saudi medical journal*, *26*(8), 1305.
6. Misic, A. M., Gardner, S. E., & Grice, E. A. (2014). The wound microbiome: modern approaches to examining the role of microorganisms in impaired chronic wound healing. *Advances in wound care*, *3*(7), 502-510.
7. Iredell, J., Brown, J., & Tagg, K. (2016). Antibiotic resistance in Enterobacteriaceae: mechanisms and clinical implications. *Bmj*, *352*.
8. Rice, L. B. (2006). Antimicrobial resistance in gram-positive bacteria. *American journal of infection control*, *34*(5), S11-S19.
9. Cerceo, E., Deitelzweig, S. B., Sherman, B. M., & Amin, A. N. (2016). Multidrug-resistant gram-negative bacterial infections in the hospital setting: overview, implications for clinical practice, and emerging treatment options. *Microbial Drug Resistance*, *22*(5), 412-431.
10. Ananthanarayan, R. (2006). *Ananthanarayan and Paniker's textbook of microbiology*. Orient Blackswan.
11. Sastry, A. S., & Bhat, S. (2018). *Essentials of medical microbiology*. JP Medical Ltd.
12. Collee, J. G., Mackie, T. J., & McCartney, J. E. (1996). *Mackie & McCartney practical medical microbiology*. Harcourt Health Sciences.
13. Wayne, P. A. (2011). Clinical and laboratory standards institute. Performance standards for antimicrobial susceptibility testing.
14. Zhang, S., Ren, L., Li, Y., Wang, J., Yu, W., Li, N., & Li, J. (2014). Bacteriology and drug susceptibility analysis of pus from patients with severe intra-abdominal infection induced by abdominal trauma. *Experimental and therapeutic medicine*, *7*(5), 1427-1431.
15. Bowler, P. G., Duerden, B. I., & Armstrong, D. G. (2001). Wound microbiology and associated approaches to wound management. *Clinical microbiology reviews*, *14*(2), 244-269.
16. Biradar, A., Farooqui, F., Prakash, R., Khaqri, S. Y., & Itagi, I. (2016). Aerobic bacteriological profile with antibiogram of pus isolates. *Medicine*, *2*, 1-18.
17. Roopa, C., & Deepali, V. (2017). PUS culture isolates and their antibiotic sensitivity at a tertiary care hospital in Hyderabad Karnataka Region. *International Journal of Medical Microbiology and Tropical Diseases*, *3*(4), 140-145.
18. Jain, V., Ramnani, V. K., & Kaore, N. (2015). Antimicrobial susceptibility pattern amongst aerobic bacteriological isolates in infected wounds of patients attending tertiary care hospital in Central India. *Int. J. Curr. Microbiol. App. Sci*, *4*(5), 711-719.
19. Ghosh, A., Karmakar, P. S., Pal, J., Chakraborty, N., Debnath, N. B., & Mukherjee, J. D. (2009). Bacterial incidence and antibiotic sensitivity pattern in moderate and severe infections in hospitalised patients. *Journal of the Indian Medical Association*, *107*(1), 21-2.
20. Bubonja-Sonje, M., Matovina, M., Skrobonja, I., Bedenic, B., & Abram, M. (2015). Mechanisms of carbapenem resistance in multidrug-resistant clinical isolates of Pseudomonas aeruginosa from a Croatian hospital. *Microbial Drug Resistance*, *21*(3), 261-269.
21. Labara, J. A., Salles, M. J., & Seas, C. M. (2016). Guzm'an-Blanco,"Carbapenem resistance in Pseudomonas aeruginosa and Acinetobacterbaumanniiin the nosocomial sets in Latin America, "*Critical Review of Microbiology*, *42*, 2; 276-292, 2016.