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ORIGINAL RESEARCH

A RESEARCH INTO THE CHANGING PATTERNS OF ANTIMICROBIAL RESISTANCE

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ABSTRACT

Introduction: A key diagnostic material for aerobic growth and susceptibility testing in the microbiology laboratory is pus. It is crucial to periodically conduct investigations to ascertain the evaluate the safety of microorganisms since the rate of emergence of resistance in bacterial isolates considerably outpaces the frequency of subsequent drug discovery and development.

Aim: This investigation was done to assess the evolving pattern of antibiotic resistance in different pus specimens.

Materials and Methods: Pus specimen was obtainedfrom several Department of Microbiology, MGM Medical college n Lion's Seva Kendra, Kishanganjover the course of six months using an aseptic approach, and they were processed right away in the lab using conventional antimicrobial techniques. Motility tests, Gram staining, and biochemical processes were used to microbes. All specimens underwent Kirby Bauer's disc diffusion method antibiotics susceptibility testing on Muller Hinton agar, with results interpreted in accordance with CLSI recommendations.

Results: 120 pus specimens were analysed, and the results revealed that surgeries departments (32.42%) contributed the most to the 93.26% culture positive. One of most prevalent organism was *Pseudomonas*, followed by *Staphylococcus aureus* (22.51%). Gram negative *bacilli* were responsive to Imipenem (87.09%), Piperacillin (61.28%), and Gentamicin (48.38%) while Gram positive cocci were susceptible to Linezolid (94.86%), Vancomycin (92.30%), and Imipenem (92.30%).

Conclusions: As per regions and growing multi-resistant bacteria, the shifting patterns of antibiotic sensitivity in isolated strains from pus might be a useful tool for doctors to begin empiric therapy of patients as soon as possible.

Keywords: Pus, Pseudomonas, Staphylococcus aureus, Imipenem.

INTRODUCTION

Topical and systemic inflammatory, generally with pus production, characterises granulomatous infections (1). These could be either exogenous or endogenous. The exterior bacteria can enter through a skin breach and start growing locally as a result. Immune cells are introduced to the area as part of the body's defence strategy to combat germs. Eventually, the build-up of these cells results in pus, a thick, white substance (2).Drug-resistant bacteria occur as a result of the unintentional use of antibiotics, posing a significant problem to the healthcare system. Additionally, extremely virulent strains and the ability to quickly adapt to

changing environments make the situation worse and raise concerns [3]. Various investigations have occasionally been carried out all over the world to evaluate the bacterial profile and the pattern of antimicrobial sensitivity in pus samples. This is especially important for the treating doctor, who must begin treating the patient empirically while waiting for the lab culture reports[4]. Although the bacterial description from pus specimens has remained stable over time, there is a substantial different in the isolates patterns of antimicrobial sensitivity, highlighting the growing danger of the emergence of resistant bacteria and the need for ongoing monitoring of these shifting patterns.
So, in order to assess the changing pattern of antimicrobial resistance in diverse pus isolates, this research was carried out.

METHOD

This retrospective, evidence showing research was carried out at Department of Microbiology, MGM Medical college n Lion's Seva Kendra, Kishanganj. The organizational ethics and scientific committee authorized the study. 120 pus samples total were collected from various IPDs and OPDs of the facility for aerobic culture and sensitivity testing. Pus specimens were obtainedusing disposable, sterile cotton swabs and aspirates in syringes, and they were then transferred and processedright away at the microbiology lab. They were injected on Nutrient agar, Blood agar,and Mac Conkey, Culture plates were cultured in an aerobic environment at 37°C for 24 to 48 hours.Culture plates were incubated aerobically at 37°C for 24 to 48 hours. A typical microbiological procedure that involves gram staining, biochemical responses, and mobility testing by hanging drop preparation was used to identify bacteria from bacteria associated after incubation (5). All isolates were screened for antibiotics resistance using Kirby Bauer's disc diffusion method [6] on Muller Hinton agar, and the results were evaluated in accordance with CLSI guidelines[7] and categorised as sensitive, intermediate, and resistant. The usual antibiotics were examined. As a means of quality control, S.aureus ATCC 25923 and E. coli ATCC 25922 were utilised [8].

STATISTICAL ANALYSIS

Using MS Excel 2010, counts and percentages were used to assess the results.

RESULTS

110 (93.26%) of the 120 pus samples from various departments of MGM Medical college n Lion's Seva Kendra, Kishanganjthat were collected for aerobic culture and drug susceptibility testing at the Microbiology lab resulted in a positive culture, whereas 7 (6.72%) of the samples produced no growth. In 110 samples, there were 46 (42.33%) female patients and 63 (57.65%) male patients. The distribution of pus specimens by departments revealed that the surgical department (32.41%) contributed the most, followed by ENT (30.61%), medicine (22.50%), orthopaedics (11.69%), ICUs (6.29%), and others (2.68%). Apart from other isolated strains like Citrobacter (0.89%), Escherichia coli (7.20%), Klebsiella spp. (18.91%), Proteus (0.89%), coagulase negative staphylococcus (12.60%), and gram positive bacilli (5.40%), the most common gram positive bacteria were Staphylococcus aureus (22.51%), and the most common gram negative bacteria were Pseudomonas. According to the antibiogram of gram-positive cocci (Table 1), Linezolid (94.86%), Vancomycin (92.30%), and Imipenem (92.30%) were the three most susceptible drugs.

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Table 1: Antibiotic susceptibility pattern of Gram-Positive Cocci- Staphylococcus aureus, Coagulase negative staphylococcus

Bacteria	Staphylococcus Aureus			Coagulase negative staphylococcus		
	Intermediate	Sensitive	Resistant	Intermediate	Sensitive	Resistant
Antibiotics	Number	Number	Number	Number	Number	Number
Amoxicillin	1	1	23	2	10	2
Amoxyclav	1	10	14	2	12	0
Ceftriaxone	5	13	7	1	12	1
Cefadroxil	3	12	10	3	10	1
Cefoperazone	5	10	10	2	11	1
Gentamicin	1	20	4	0	14	0
Imipenem	1	22	2	0	14	0
Methicillin	3	9	13	2	11	1
Linezolid	1	23	1	0	14	0
Ofloxacin	2	18	5	0	13	1
Vancomycin	1	22	2	0	14	0

Imipenem (87.09%), piperacillin (61.28%), and gentamicin (48.38%) were the drugs most effective against gram-negative Enterobacteriaceae bacteria (Table 2).

Table 2: Antibiotic susceptibility pattern of Gram-Negative Bacteria of pseudomonas and enterobacteriaceae

	Pseudomonas			Enterobacteriaceae		
	Intermediate	Sensitive	Resistant	Intermediate	Sensitive	Resistant
Antibiotics	Number	Number	Number	Number	Number	Number
Aztreonam	4	20	9	2	7	22
Piperacillin	1	10	22	7	19	5
Imipenem	0	31	2	0	27	4
Gentamicin	7	14	12	5	15	11
Ceftriaxone	2	7	24	6	13	12
Cefadroxil	3	5	25	2	8	21
Cefoperazone	7	10	16	4	16	11
Ofloxacin	1	8	24	5	14	12

Imipenem, piperacillin, and gentamicin were also effective against Pseudomonas species (93.93%, 60.60%, and 42.41%, respectively).

DISCUSSION

The most frequent causal agents of diverse pyogenic illnesses are gramme positive cocci like Staphylococcus aureus and gramme negative bacteria like Pseudomonas, Escherichia coli, and Klebsiella spp. It is concerning that these bacteria are developing resistance genes through a variety of strategies. According to Zubair et al. and our investigation, gramme negative bacteria predominate as the pyogenic lesions' causal agent (9). According to research by Tiwari et al. [10] and Lee C Y et al. [11] as well as our study, Staphylococcus aureus is the most prevalent gram-positive strain, and the prevalence of MRSA is comparable to Pramila et al. According to the study of Basu etal.[12], Pseudomonas is the most prevalent gram-negative bacterial isolate.The most pus samples were provided by the surgical ward, then the ENT department. In contrast to Samra et al, study's sensitivity, Staphylococcus aureus was tolerant to linezolid and Vancomycin (13). As observed by Balan et al. [14], the antibiotic sensitivity profile of gramme negative bacteria revealed susceptibility to imipenem, piperacillin, and gentamicin. . Given the limited number of antimicrobial medicines that are

currently available or in the drug development pipelines of the pharmaceutical industry to tackle these organisms, the appearance and multiplication of these highly resistant microbes discovered in pus samples is quite concerning. The necessity for comprehensive empiric coverage of possible bacteria and the need to keep available antibiotics for use only when absolutely necessary must be balanced when choosing antibiotics (15).

CONCLUSION

This study demonstrates that granulomatous infections, which are caused by gram-negative bacteria (Pseudomonas) rather than gram-positive ones (Staphlococcus aureus), are a significant source of mortality in patients. Since there is a limited supply of newer medications and the rate at which resistant bacteria evolve far outpaces that of new drug development, it is necessary to keep a watch on any changes in the isolates' antimicrobial susceptibility profiles.

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