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PREVALENCE OF ANTIBIOTIC RESISTANCE PATTERN OF BACTERIAL ISOLATES IN A TERTIARY CARE HOSPITAL.

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ABSTRACT

The antibiogram is useful for tracking trends in antimicrobial resistance over time, including information specific to an ICU or ward or comparing inpatients and outpatients. A cumulative antibiogram will be compiled for our institution as part of our antibiotic stewardship programme.This prospective study was conducted by the Department of Microbiology, Santosh Medical College & Hospital, Ghaziabad, Uttar Pradesh from January to December 2021. The organisms and their susceptibility patterns were collected and cumulative antibiograms were prepared. A total of 1395 specimens were received in the Microbiology laboratory from various departments of Santosh Hospital, Ghaziabad, for culture and sensitivity; 450(32.2%) samples yielded a positive culture, whereas 945(67.7%) samples yielded no growth. It is crucial to try everything possible to choose wisely. Antibiotics balance the need for a broad spectrum of empiric coverage of potential microorganisms with the need to preserve effective available antibiotics when they are absolutely necessary.

INTRODUCTION

Antibiograms indicate the cumulative susceptibility of bacteria to formulary antibiotics over time. Bacteria susceptible to a specific antibiotic are expressed as a percentage. The formulary contains a specific antibiotic. [1] The results of antibiotic susceptibility tests performed on a specific microorganism from Patient to Patient. A laboratory generates this profile from aggregate data collected from hospitals or healthcare organizations; the data is summarized periodically and presented as percentages of organisms tested susceptible to a given antimicrobial drug. Results for antimicrobial drugs that are routinely tested and can be used to treat patients should be provided to clinicians.

The Clinical and Laboratory Standards Institute (formerly NCCLS) published guidelines entitled"Analysis and Presentation of Cumulative Antimicrobial Susceptibility Test Data" for use

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increating an antibiogram. The antibiogram should be updated at least once a year, according to CLSI criteria, including only the first isolate per Patient in the period analyzed and including only organisms for which at least ≥30 isolates were screened during the study period. Antibiograms are compiled mainly by microbiology laboratory technologists. However, it may be a team effort involving the lab, pharmacy, infection preventionists, and doctors.[2]

The antibiogram is useful for tracking trends in antimicrobial resistance over time, including information specific to an ICU or ward or comparing inpatients and outpatients. Patterns of antimicrobial use and resistance may differ among different areas of a healthcare facility. [3]

Data stratification impacts resistance rates of *Staphylococcus aureus*, particularly from blood cultures;[4] isolates from inpatients and outpatients showed lower MRSA rates than those from intensive care units.

Antibiogram analysis specific to a subgroup is used when creating an empiric antibiotic policy in a hospital. The American Thoracic Society and the Infectious Diseases Society of America recommend using appropriate empiric antibiotic therapy based on local microbiology results and the local antibiogram for the treatment of ventilator-associated pneumonia. [5]

Infections vary in severity and type, the infecting organism, the Patient's history and past antibiotic use, the hospital antibiogram cannot be used solely to select the optimal empiric therapy.

The hospital antibiogram summarises local bacterial isolates' antibiotic susceptibilities provided to the hospital's clinical microbiology laboratory regularly. Clinicians frequently utilize antibiograms to determine local susceptibility rates, aid in empiric antibiotic medication selection, and track resistance trends within an institution over time. Antibiograms can also compare susceptibility rates and follow resistance trends among institutions.[6]

Material and methods

This prospective study was conducted by the Department of Microbiology, Santosh Medical College & Hospital, Ghaziabad, Uttar Pradesh from January to December 2021. Data was collected from all outpatient and inpatient specimens received for culture and sensitivity. The organisms and their susceptibility patterns isolated in the microbiology laboratory were collected, and cumulative antibiograms were prepared.

Specimens collected were blood, urine, sputum, wound swabs, pus, and body fluids with a sterile container, disposable cotton swabs, and sterile aspirates syringe and were transported and processed in the microbiology laboratory immediately. All samples were inoculated onto Blood agar (BA) ,Mac Conkey agar(MA), and Nutrient agar(NA).

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Culture plates were kept warm at 37ºC for 24 hrs to 48 hrs under aerobic incubation. The technique includes motility testing by hanging drop preparation, gram staining, and biochemical reactions such as catalase, coagulase, indole, methyl red, citrate, urease, and oxidase. All isolates were tested for antibiotic sensitivity using Kirby Bauer's disc diffusion method on Muller Hinton agar, and the results were evaluated in accordance with CLSI recommendations and categorized as sensitive, intermediate, and resistant.(7)

Results

A total of 1395 specimens were received in the Microbiology laboratory during this study period from various departments of Santosh Hospital, Ghaziabad, for aerobic culture and sensitivity; 450(32.2%) samples yielded a positive culture, whereas 945(67.7%) samples yielded no growth.

Furthermore, among them, urine (45.8%) was the most commonly received sample, followed by Blood (26.4%), sputum (9%), and Pus(9%) .

Urine samples (45.8%) from OPD (58.4%) ,IPD (30%) and ICU(10%) showed a culture positivity of OPD(23%), IPD(19.3%) and ICU (56%) respectively . *Escherichia coli* (54.7%) was the predominant isolate in urine samples.

Blood samples(26.4%) from OPD (44.7%), IPD(40.1%) and ICU(14.9%) showed a culture positivity of OPD(19%), IPD (17%) and ICU(36.3) respectively . Blood samples from OPD and IPD frequently grew *Staphylococcus aureus* at 22.1% and *Escherichia coli* at 17.7%, respectively.

Sputum samples (9%) from OPD(44.7%),IPD(42.2%) and ICU(13%) showed a culture positivity of OPD(45%),IPD(48%) and ICU(50%) . *Escherichia coli*, *Staphylococcus aureus*, and *Streptococcus* groups were the predominant.

Pus samples (9%) from OPD (65%), IPD(20%) and ICU(14.6%) gave a culture positivity of OPD (63%%),IPD (56%) and ICU (38.1%)). *Staphylococcus aureus* was the most predominant in pus samples.

Percentage susceptibility of gram positive and gram negative bacilli were shown in table 1 and 2.

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Table 1: percentage susceptibility among gram positive cocci.

NO OF ISLOATE	ANTIBIOTIC															
	Ampicilin	Cotrimoxazole						Linezolid								
Staphylococcus aureus																
20	0	40	5	40	40	35	60	100	90	0	100	0	100	0	0	0
20		35	5	20	28	30	56	100	60	10	100	10	100	10	10	5
30	4	20	4	37	41	58	53	100	90	16	100	15	100	18	20	5
Coagulase Negative staphylococci(CoNs)																
12	0	33	33	33	66	66	83	100	66	0	100	66	100	0	33	8
13		63	11	21	55	55	100	100	67	44	100	55	100	33	33	11
20	8	23	8	22	61	61	100	100	46	8	100	55	98	23	15	11
Streptococcus groupA																
10		80	0	20	60	60	100	100	20	0	95	60	100	40	60	8
20	0	0	0	20	20	20	100	95	40	20	95	70	95	60	40	0
20	0	20	20	60	60	60	100	100	40	30	100	60	100	40	60	0

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Table 2: percentage susceptibility among gram negative bacilli.

NO OF ISLOATE	Antibiotics																								
	Ampicili	Cotrimox	Cephelex	Amikaci	Cefepim	Levofloxa	Tigecycli	Meropen	Moxiflox	Tetracycl	Gentami	Chloramph	Roxithro	Ofloxaci	Doxycyclinehydrochloride	Nitrofura	Norfloxa	Cefixim	Ceftazidi	Ceftriaxo	Piperacillin/Tazobactam	Cefotaxim/sulbactum	Ciproflox	AMPICILLIN/SULBACT	Imipenam
Escherichia coli																									
32	22	23	65	93	22	20	100	94	40	25	79	50	100	25	55	100	12	80	0	15	83	31	22	22	100
38	3	10	65	79	33	15	98	95	20	20	50	53	85	30	60	91	13	60	8	13	76	15	12	35	94
60	5	34	74	69	30	11	100	73	38	11	67	35	80	33	73	98	11	70	27	27	40	25	17	35	72
Klebsiella pneumonia																									
15	0	0	67	73	20	13	100	84	7	-	73	50	80	20	73	84	13	100	7	-	84	67	7	30	84
15	7	30	73	67	20	20	100	55	7	-	54	40	73	13	50	100	13	100	13	-	67	40	13	20	50
20	0	30	65	50	20	10	99	54	0	-	60	64	50	15	25	98	15	84	0	-	70	60	15	30	50
Pseudomonas spp																									
10	-	-	-	70	70	0	-	80	70	-	70	-	-	-	-	-	10	10	10	0	80	70	-	-	80
15	-	-	-	67	67	0	-	80	67	-	73	-	-	-	-	-	13	13	13	13	67	67	-	-	73
15	-	-	-	73	56	7	-	73	67	-	54	-	-	-	-	-	0	7	7	7	67	56	-	-	67

DISCUSSION

In our study, 1395 patients underwent various samples, out of which 450(32.2%) yielded positive culture. The present study revealed that 215(46.7%) were male patients and 245(53.3%) were female patients. The most common pathogen is *Staphylococcus aureus* followed by *Escherichia coli*. This study was related to the one done in 2016 by Sarangi et al.[8]

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Amongst gram-positive cocci, Coagulase Negative *Staphylococci* showed 100% sensitivity to Vancomycin, followed by Linezolid. This is correlated with the study conducted by Shahsanam Gheibi et al., where extreme sensitivity was discovered to vancomycin. *Staphylococcus aureus* showed significant (100%) sensitivity to Linezolid and Vancomycin(100%). Our findings concur with the previous research by Jones RN et al. in 2006.[9]

Gram-negative bacteria were more common than gram-positive bacteria among all the bacterial isolates . This predominance of gram-negative bacteria consistent with the findings of a similar study conducted by Al-Jawady et al. (2012) [10]. The most common uropathogen was *Escherichia coli* (28.8%), followed by *Klebsiella* spp. (17.7%).

For most patients hospitalized for a complicated UTI or acute pyelonephritis, initial empiric treatment with Ceftriaxone while awaiting culture results is appropriate. If MRSA is suspected, vancomycin and linezolid should be added.

It is crucial to try everything possible to choose wisely. Antibiotics balance the need for a broad spectrum of empiric coverage of potential microorganisms with the need to preserve effective available antibiotics when they are absolutely necessary.

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