ISSN: 2309-5288 (Print)
ISSN: 2309-6152 (Online)
CODEN: JCLMC4

Journal of Coastal Life Medicine

Prevalence of Antibiotic Resistance Pattern of Bacterial Isolates in a Tertiary Care Hospital

Received: 25 August 2022, **Revised:** 17 September 2022, **Accepted:** 18 October 2022

Niharika Singh
Post graduate student, Department of Microbiology, Santosh Medical College and Hospital, Ghaziabad, Uttar Pradesh, India.
Vikas Saini
Assistant Professor, Department of Microbiology, Santosh Medical College and Hospital, Ghaziabad, Uttar Pradesh, India.
Ritu Jain
Assistant Professor, Department of Microbiology, Santosh Medical College and Hospital, Ghaziabad, Uttar Pradesh, India.
Ashutosh Rawat
Professor and Head, Department of Microbiology, Santosh Medical College and Hospital, Ghaziabad, Uttar Pradesh, India.
Correspondence – Dr Ashutosh Rawat,
E-Mail – dr.rawat.ashutosh@gmail.com

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. The Department of Microbiology at Santosh Medical College & Hospital in Ghaziabad, Uttar Pradesh, carried out this prospective study from January to December of 2021. Cumulative antibiograms were created using the species and their patterns of sensitivity that had been gathered. Santosh Hospital in Ghaziabad provided a total of 1395 specimens for culture and sensitivity testing; 450 (32.2%) of those samples produced a positive culture, whereas 945 (67.7%) of those samples produced no growth. It is imperative to make the best possible decision. Antibiotics balance the necessity for a wide array of empiric coverage of possible bacteria with the need to conserve effective antibiotics when they are really necessary.

1. 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. This profile is created by a laboratory using aggregate data gathered from healthcare facilities or hospitals; the data is compiled on a regular basis and displayed as percentages of tested organisms that are susceptible to a particular antimicrobial medication. Clinicians should be given the results of antimicrobial drug tests for medications that can be used to treat patients.

"Analysis and Presentation of Cumulative Antimicrobial Susceptibility Test Data" is a set of instructions for constructing an antibiogram that were issued by the Clinical and Laboratory Standards Institute (formerly NCCLS). According to CLSI guidelines, the antibiogram should be updated at least once a year and only include the first isolate for each patient throughout the analysis period and species for which at least 30 isolates were screened during the study period. Microbiology laboratory technologists are the major people that create antibiograms. However, it might be a collaborative endeavour between the lab, pharmacy, infection preventionists, and medical professionals.[2]

The antibiogram is useful for tracking trends in antimicrobial resistance over time, including information specific to an ICU or ward or comparing

ISSN: 2309-5288 (Print)
ISSN: 2309-6152 (Online)
CODEN: JCLMC4
Journal of Coastal Life Medicine

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.

When establishing an empiric antibiotic policy in a hospital, antibiogram analysis specific to a subgroup is used. The local microbiology findings and the local antibiogram should be used to guide appropriate empiric antibiotic therapy for the treatment of ventilator-associated pneumonia, according to the American Thoracic Society and the Infectious Diseases Society of America. [5]

Since infections vary in severity and kind, choosing the best empiric therapy requires consideration of a number of factors, including the type of infection, the patient's medical history, past antibiotic use, and hospital antibiogram.

The hospital antibiogram lists the antibiotic susceptibilities of regional bacterial isolates that are routinely supplied to the hospital's clinical microbiology laboratory. Antibiograms are often used by clinicians to assess local susceptibility rates, help with the selection of empiric antibiotic medications, and monitor long-term changes in resistance within a given institution. Antibiograms can help track institutional resistance patterns and compare resistance rates.[6]

2. Material and methods

This prospective study was carried out between January and December 2021 by the Department of Microbiology at Santosh Medical College & Hospital in Ghaziabad, Uttar Pradesh. For the purposes of collecting information for culture and sensitivity, all received outpatient and inpatient specimens were analysed. Cumulative antibiograms were created using the isolated organisms and susceptibility patterns from the microbiology lab.

A sterile container, disposable cotton swabs, and a sterile aspirates syringe were used to collect the specimens, which included blood, urine, sputum, wound swabs, pus, and bodily fluids. The specimens were then taken to the microbiology lab and processed there right away. Inoculations of all samples were made onto Blood Agar (BA), Mac Conkey Agar (MA), and Nutrient Agar (NA).

Warmth was provided by aerobic incubation on culture plates for 24 to 48 hours at 37°C. The method entails gramme staining, urease, oxidase, catalase, coagulase, indole, methyl red, citrate, and urease in addition to motility testing using hanging drop preparation. The Kirby Bauer's disc diffusion method on Muller Hinton agar was used to test the antibiotic sensitivity of all isolates. The findings were analysed in accordance with CLSI guidelines and classified as sensitive, intermediate, or resistant. (7)

3. 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%)).

ISSN: 2309-5288 (Print)
ISSN: 2309-6152 (Online)
CODEN: JCLMC4
Journal of Coastal Life Medicine

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.

Table 1: percentage susceptibility among gram positive cocci.

NO OF ISLOATE	ANTIBIOTIC															
	Ampicilin	Cotrimoxazole	Cloxacillin	Penicillin	Levofloxacin	Tetracycline	Gentamicin	Linezolid	Cefoperazone/Sulbactum	Roxithromycin	Vancomycin	Ofloxacin	Doxycyclinehydrochloride	Ciprofloxacin	Ampicilin/Sulbactum	Azithromycin
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

ISSN: 2309-5288 (Print)
ISSN: 2309-6152 (Online)
CODEN: JCLMC4
Journal of Coastal Life Medicine

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

4. Discussion

1395 patients participated in our study, and 450 (32.2%) of those samples produced a positive culture. According to the current study, 245 patients were female and 215 (53.3%) were male. Staphylococcus aureus and Escherichia coli are the two most prevalent pathogens. This research was connected to that conducted in 2016 by Sarangi et al. [8]

Vancomycin and Linezolid both completely inhibited the growth of gram-positive cocci, namely Coagulase Negative Staphylococci. This is consistent with the Shahsanam Gheibi et al. investigation, which revealed vancomycin's great sensitivity. Significant (100%) sensitivity to Vancomycin and Linezolid was shown in Staphylococcus aureus. Our results support earlier research conducted in 2006 by Jones RN et al. [9]

Among all the bacterial isolates, gram-negative bacteria were more prevalent than gram-positive bacteria. This gram-negative bacterial predominance is consistent with the results of a related investigation carried out by Al-Jawady et al. (2012) [10]. Escherichia coli (28.8%), followed by Klebsiella spp. (17.7%), was the most prevalent uropathogen.

Ceftriaxone first empiric treatment is recommended for the majority of patients who are hospitalised for a severe UTI or acute pyelonephritis while waiting for culture results. Vancomycin and linezolid should be added if MRSA is detected.

ISSN: 2309-5288 (Print)
ISSN: 2309-6152 (Online)
CODEN: JCLMC4
Journal of Coastal Life Medicine

It is essential to make every effort to make an informed decision. Antibiotics strike a balance between the necessity for comprehensive empiric coverage of possible bacteria and the need to keep strong antibiotics on hand for use only when absolutely essential.

References

[1] Joshi S. Hospital antibiogram: a necessity. Indian journal of medical microbiology. 2010 Oct 1;28(4):277-80.

[2] Law T, Chibabhai V, Nana T. Analysis and comparison of cumulative antibiograms for the Charlotte Maxeke Johannesburg Academic Hospital adult intensive care and high-care units, 2013 and 2017. South African Medical Journal. 2020 Jan 1;110(1):55-64.

[3] Binkley S, Fishman NO, LaRosa LA, Marr AM, Nachamkin I, Wordell D, et al. Comparison of unit-specifc and hospitalwide antibiograms: potential implications for selection of empirical antimicrobial therapy. Infect Control Hosp Epidemiol 2006;27:682-7

[4] Daxboeck F, Assadian O, Apfalter P, Koller W. Resistance rates of Staphylococcus aureus in relation to patient status and type of specimen. J Antimicrob Chemother 2004;54:163-7.

[5] American Thoracic Society and the Infectious Disease Society of America. Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia. Am J Respir Crit Care Med 2005;171:388-416.

[6] Joshi S. Hospital antibiogram: a necessity. Indian journal of medical microbiology. 2010 Oct 1;28(4):277-80.

[7] Bauer AW, PERRY DM, KIRBY WM. Single-disk antibiotic-sensitivity testing of staphylococci: An analysis of technique and results. AMA archives of internal medicine. 1959 Aug 1;104(2):208-16.

[8] Sarangi KK, Pattnaik D, Mishra SN, Nayak MK, Jena J. Bacteriological profile and antibiogram of blood culture isolates done by automated culture and sensitivity method in a neonatal intensive care unit in a tertiary care hospital in Odisha, India. Int j adv med. 2015 Oct;2(4):387-92.

[9] GHEYBI S, FAKOUR Z, KARAMYAR M, Khashabi J, Ilkhanizadeh B, ASGHARI SF, MAHMOUDZADEH H, Majlesi AH. Coagulase negative staphylococcus, the most common cause of neonatal septicemia in Urmia, Iran.

[10] Al-Jawady Z, Al-Habib HM: Antibiogram profiles of bacterial isolates from intensive care unitsin Mosul Teaching Hospitals. Raf J Sci. 2012, 23:52-5