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Original Research Article

Antimicrobial sensitivity pattern from clinical isolates at a tertiary care teaching hospital of rural Bengal: a pilot study

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ABSTRACT

Background: Antimicrobial sensitivity pattern from clinical isolates can reveal important information that can help in drafting the hospital antibiotic policy as well as help improve prescribing patterns and patient outcome in a particular region.
Methods: Data from the results of the antimicrobial sensitivity pattern of clinical isolates of the patients between 1stJuly and 31st December 2018 were collected on a pre-designed and pre tested case study form and analysed with the help of descriptive statistics.
Results: A total of 75 blood culture reports were obtained which showed 58 gram positive cultures. Further 46 of the gram positive samples were positive for Coagulase negative Staphylococcus. A total of 305 urine samples were obtained for culture which showed gram negative cultures. Paediatric and medicine wards were the common yielding sites. A total of 242 pus reports were obtained which showed 47 gram positive cultures. A total of 154 wound swab samples were obtained which showed 47 gram positive cultures. For pus and wound swab samples, surgery wards were the common yielding sites. Common gram negative organisms seen were *Klebsiella sp*., *E. coli*, *Citrobacter sp*., *Pseudomonas*, *Proteus* and *Enterobacter*. Gram positive organisms were commonly resistant to Erythromycin, orally active Penicillins, Vancomycin and Teicoplanin and gram negative organisms were commonly resistant to Cephalosporins, Aminoglycosides, Colistin, Fluroquinolones and Meropenem.
Conclusions: This study showed that over six months samples of body pus, wound swab, blood culture and urine showed high levels of resistance to commonly used antibiotics. This would provide an outline for development of an effective hospital Infection Control Policy.

Keywords: Antibiogram, Antimicrobial sensitivity pattern, Antimicrobial resistance, Bacteria, Kirby Bauer Method

INTRODUCTION

Antimicrobial resistance is one of the most threatening public health problems around the world. The main reason behind this is the relatively easy availability and higher consumption of antibiotics. Self medication remains one of the major contributors to antibiotic resistance with a large population of patients taking inadequate and inappropriate antibiotics for infections. In the rural set up another major contributor to antibiotic resistance is the presence of under qualified prescribers or quacks. Patients often visit the hospital after having being treated inadequately with unnecessary and inappropriate antibiotics prescribed by local pharmacists and quacks.

There is a disproportionately higher incidence of inappropriate use of antibiotics and greater levels of resistance in the rural areas due to this reason.[1] In India the infectious disease burden is among the highest in the world and inappropriate and irrational use of antimicrobial agents against them is one of the primary reasons behind this rise.[2] A recent study highlighted the importance of rationalizing antibiotic use to limit antibiotic resistance in India.[3]

There is very little study regarding the epidemiological aspects of antimicrobial resistance in most of South East Asian countries.[4] World Health Organization has proposed regional strategy on antimicrobial resistance with the goal to minimize the morbidity and mortality due to antimicrobial resistant infection to preserve the effectiveness of antimicrobial agents in the treatment and prevention of microbial infections.[4] This was a pilot study aimed to look at the pattern of antibiotic sensitivity among the clinical isolates at a tertiary care teaching hospital of rural Bengal. This would help develop our antibiotic policy as well as help formulate better treatment protocols locally and improve patient outcome by promoting rational antibiotic therapy.

METHODS

The study was an Institution-based prospective observational study conducted in the Department of Microbiology and Pharmacology of Bankura Sammilani Medical College, Bankura, West Bengal - a tertiary care teaching hospital in rural Bengal.

Clinical isolates including blood culture, pus, wound swab and urine collected and sent to the Department of Microbiology at Bankura Sammilani Medical College and Hospital, Bankura, were analysed and their antimicrobial susceptibility pattern was recorded. The infection trends of this hospital were inferred from this analysis as well. The study was carried out during the six month period between 1st July 2018 and December 2018. All the sensitivity was determined using the Kirby Bauer Method except Vancomycin sensitivity which was determined using MIC.

All data including demographic details, hospital based infection patterns and antimicrobial sensitivity patterns from the isolates etc. were entered in a predesigned and a pre-structured case study form. After compiling the data using Microsoft Excel, the results were calculated and analysed with the help of descriptive statistics. The study was conducted after getting approval from Institute Ethics Committee and confidentiality of data was ensured.

RESULTS

Results from blood culture samples

For the period of study, a total of 75 blood culture reports were obtained. Of these 58 were gram positive cultures while 17 were gram negative.

Among the 58 samples of Gram positive culture, 46 samples showed growth of Staphylococcus aureus and 12 showed Coagulase negative Staphylococcus. Most of these samples of blood culture came from the Male medicine ward (17 or 29.31%), SNCU (13 or 22.41%) followed by Female medicine ward (11 or 18.96%). The samples belonged to males more common than females (65.51% males) and the age of the patients ranged from 3 days to 74 years (average 24 years). The antibiotic sensitivity pattern of the samples is depicted in Figure 1. A total of 12 Gram negative cultures were obtained from the blood culture samples. Of these 5 samples showed growth of *Klebsiella sp*., 5 samples showed growth of *Escherichia coli*, 4 samples showed *Pseudomonas sp.* and 3 showed growth of Citrobacter sp. Most of these samples of blood culture came from the SNCU (9 or 52.94%). Samples were similar similar among males and females and the age of the patients ranged from 4 days to 55 years. Sensitivity pattern is depicted in Figure 2.

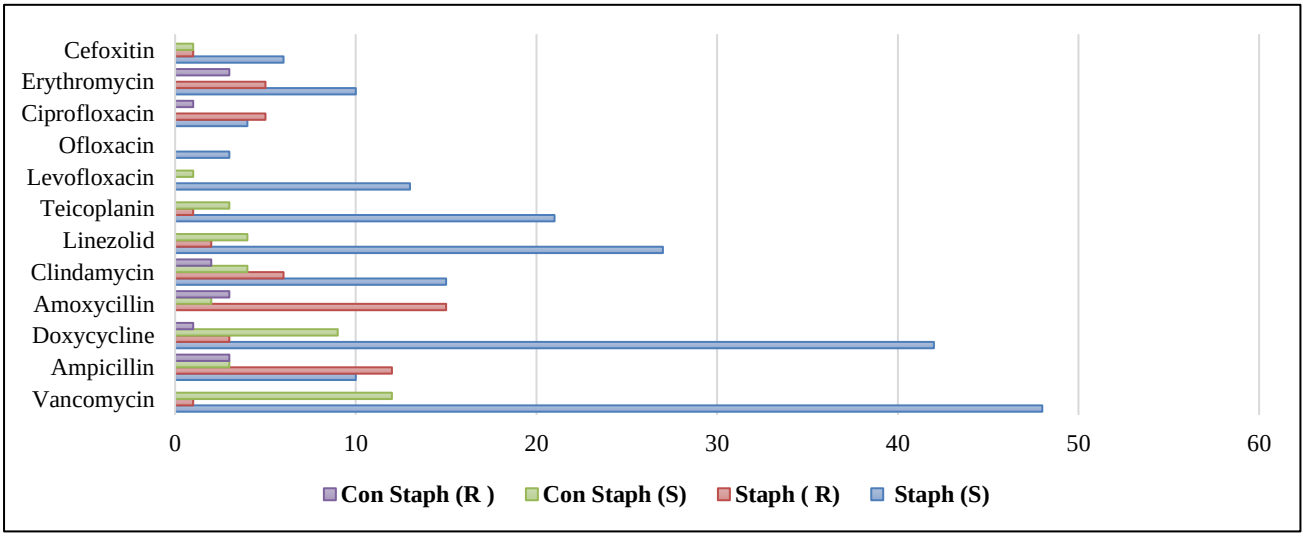

Figure 1: Antibiotic sensitivity pattern of the samples obtained for blood culture showing gram positive growth.

Bacterial isolates from Pus

For the period of study, a total of 242 samples of pus were analysed for bacterial isolates and antimicrobial sensitivity. Of these 47 were gram positive cultures while 195 were gram negative.

A total of 47 gram positive growths were obtained from the pus samples. Most of these samples of blood culture came from the female and male surgical wards respectively (18 or 38.29% from female surgical and 12 or 25.53% from male surgical ward). There was a preponderance of male patients (30 or 63.82%) and average the age of the patients ranged from 22 days to 85 years. Most of the patients were of peri-pubertal age or young adults. Sensitivity pattern is depicted in Figure 3.

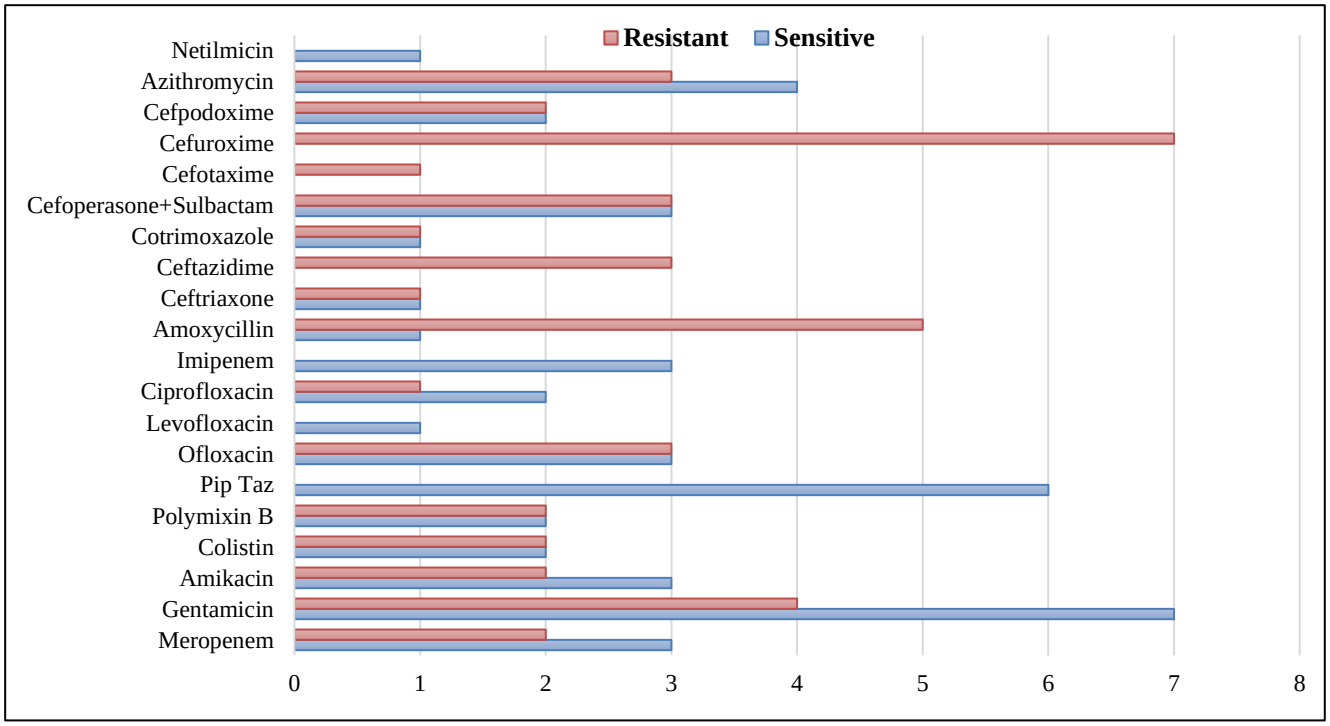

Figure 2: Antibiotic sensitivity pattern of the samples obtained for blood culture showing gram negative growth.

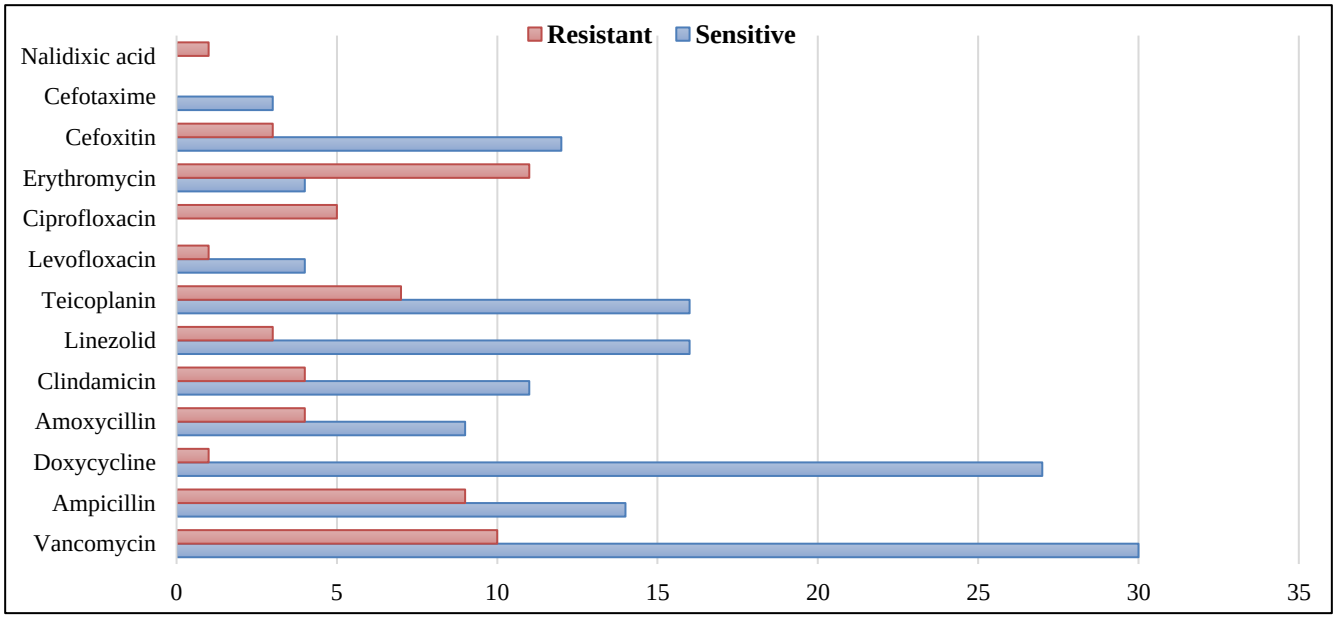

Figure 3: Antibiotic sensitivity pattern of the pus samples showing gram positive growth.

A total of 195 gram negative cultures were obtained from the pus samples. Of these 66 samples (33.84%) showed positive growth for *E. coli*, 49 samples (25.12%) showed growth for *Klebsiella sp*., 37 samples (18.97%) showed growth for Pseudomonas aeruginosa, 19 samples (9.74%) showed *Citrobacter sp*. growth and 15 samples (7.69%) showed growth for Proteus mirabilis. Most of the samples of the pus that showed bacterial isolates were from female surgical wards (56 samples or 28.71%) and male surgical wards (83 samples or 42.56%). There were a total of 133 or 68.2% from males. The age of the patients ranged from 2 years to 76 years. Sensitivity pattern is depicted in Figure 4. A total of 154 wound swab samples from surgical wound infections were obtained. Of these 47 samples showed gram positive growth (45 *Staphylococcus aureus* and 2 Coagulase negative *Staphylococcus*) and 107 samples showed gram negative growth.

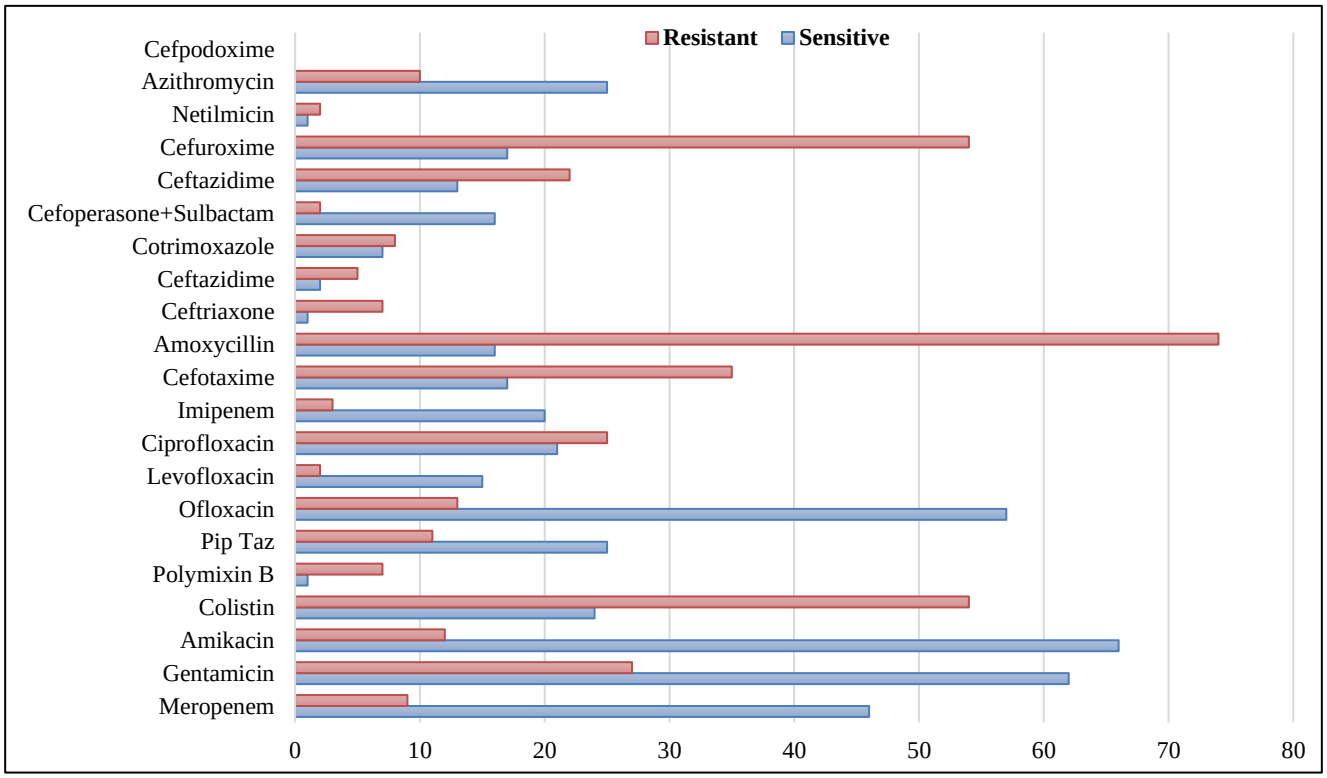

Figure 4: Antibiotic sensitivity pattern of the pus samples showing Gram negative growth.

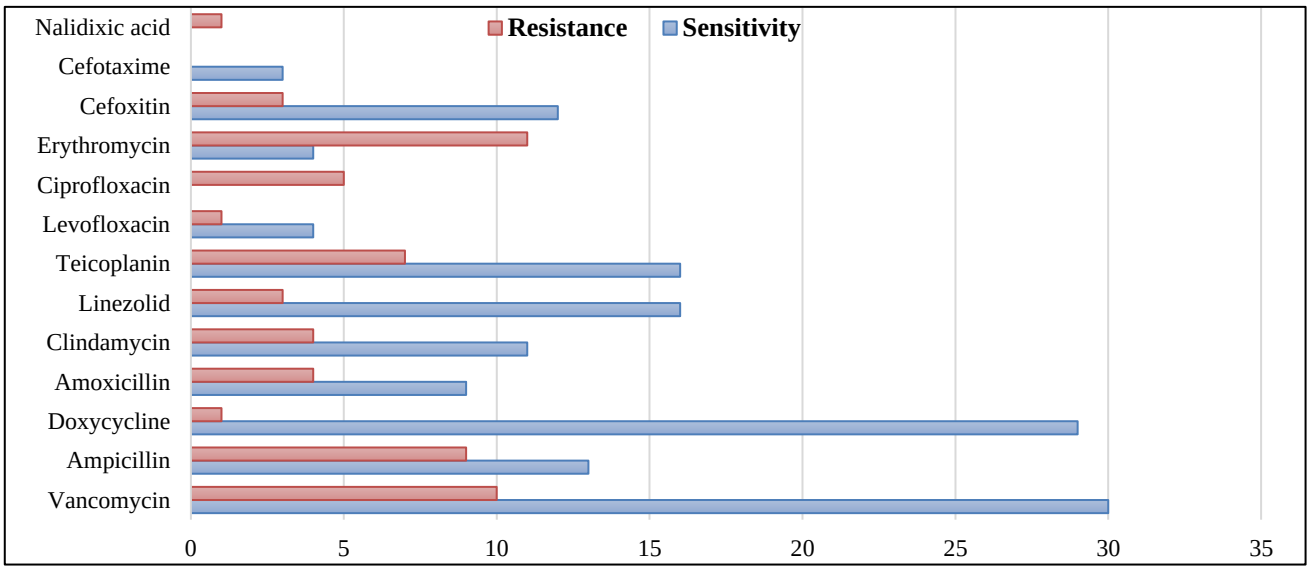

Figure 5: Antibiotic sensitivity pattern of the wound swab samples showing gram positive growth.

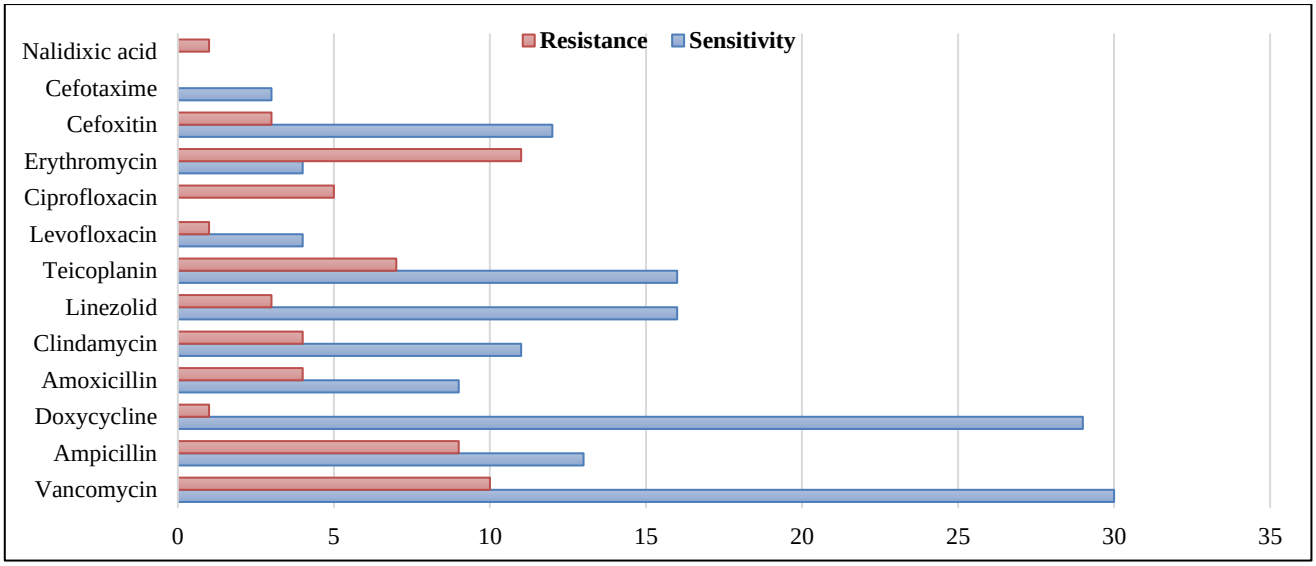

Figure 6: Antibiotic sensitivity pattern of the wound swab samples showing gram negative growth.

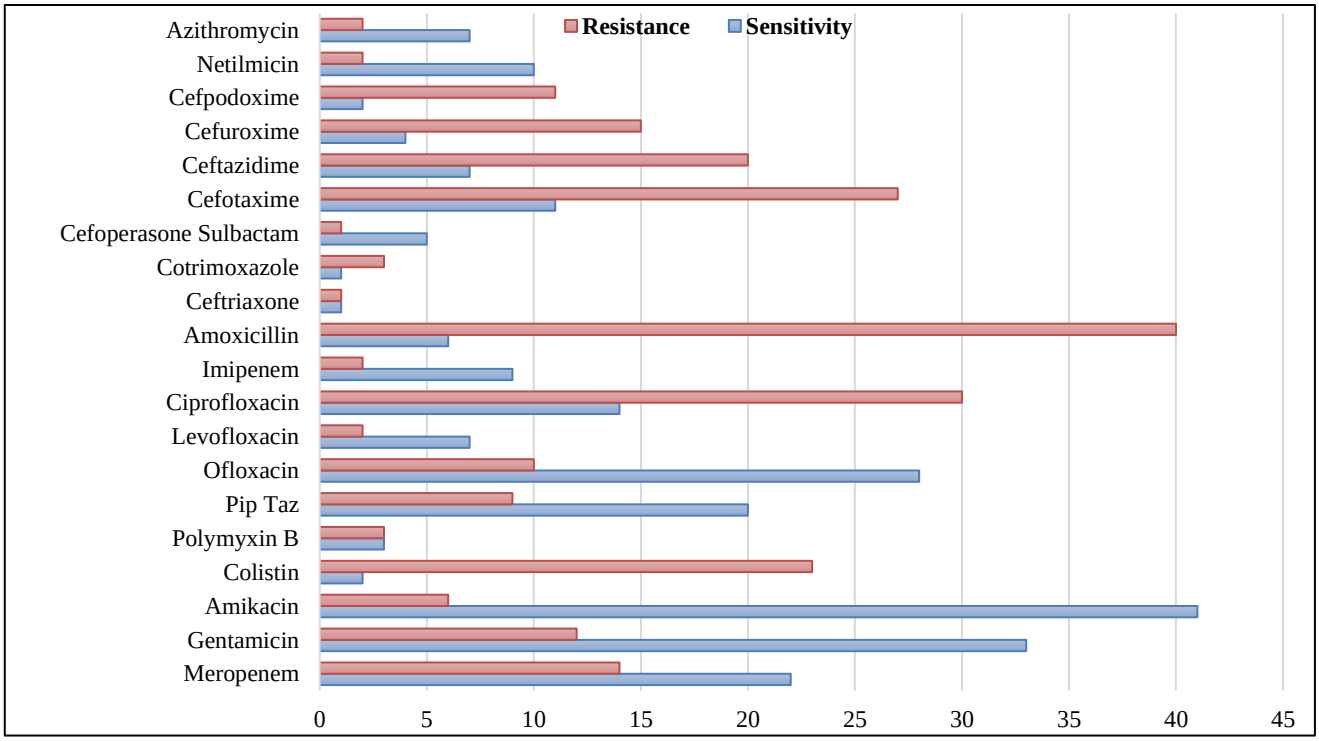

Figure 7: Antibiotic sensitivity pattern of the urine samples showing gram negative growth.

Bacterial isolates from Wound swab samples

A total of 47 gram positive growths were obtained from the wound swab samples. Of these 45 samples showed Staphylococcus aureus growth and 2 showed Coagulase negative Staphylococcal growth. Most of these samples of blood culture came from the female and male surgical wards respectively (19 or 40.42% from female surgical and 14 or 29.78% from male surgical ward). There was a preponderance of male patients (30 or 63.82%) and the age of the patients ranged from 9 days to 85 years. Sensitivity pattern is depicted in Figure 5.

A total of 107 gram negative cultures were obtained from the wound swab samples. Of these 37 samples were of *Klebsiella species* (34.57%), 28 samples were positive for *E. coli* (26.16%), 16 samples were positive for Pseudomonas sp. (14.95%), 14 were positive for *Citrobacter sp.* (13.08%), 9 (8.41%) and 3 (2.8%) were positive for *Enterobacter* and *Proteus sp.* respectively.

Most of the samples of the wound swabs were received from female surgical wards (49 samples or 45.79%) and male surgical wards (32 samples or 29.9%). There were a total of 46 samples from males (42.99%) and rest from females. The age of the patients ranged from 5 years to 80 years. Sensitivity pattern is depicted in Figure 6.

Culture and sensitivity pattern of Urine samples

A total of 305 gram negative cultures were obtained from the urine samples. Of these 167 samples (54.75%) showed positive growth for *E. coli*, 62 samples (20.32%) showed positive growth for *Klebsiella sp.,* 35 samples (11.47%) showed positive growth for Citrobacter sp. and 31 samples (10.16%) showed positive growth for Pseudomonas sp. A total of 5 (1.63%), 4 (1.31%) and 1 (0.3%) samples were positive for *Proteus*, *Enterobacter* and *Acinetobacter sp.* respectively. Most of the samples of the wound swabs that showed bacterial isolates were from Paediatric wards (113 samples or 37.04%), Male medicine wards (66 samples or 21.63%), Female medicine wards (30 or 9.83%) and Urology (Medicine) ward (24 or 7.86%). There were a total of 171 samples from males (56.06%) and rest from females. The age of the patients ranged from 2 months to 85 years. Sensitivity pattern is depicted in Figure 7.

DISCUSSION

This was a pilot study conducted over a period of six months to ascertain the infection profile from samples sent from the clinical departments to the department of microbiology as also to ascertain their antimicrobial policy.

Results have revealed that the top gram positive growths from the different types of samples (blood culture, pus and wound swabs) was Staphylococcus aureus. There is also a high prevalence of Coagulase negative Staph aureus. The resistance of these Staph isolates was high towards Erythromycin, Amoxicillin, Ampicillin, Vancomycin and Teicoplanin.

Top gram negative growth showed most common growths were *Klebsiella sp.*, *E. coli*, *Citrobacter sp.*, *Pseudomonas*, *Proteus* and *Enterobacter*. These organisms were most commonly resistant to Cefuroxime, Cefoperasone+Sulbactam, Cefotaxime, Cefpodoxime Ceftazidime, Amoxycillin, Ampicillin, Gentamicin, Amikacin, Colistin, Ciprofloxacin, Ofloxacin and Meropenem as can be seen from the figures above.

One of the major public health problems includes antimicrobial resistance in South East Asian countries.[5] Poor sanitation and malnutrition contributes to the infectious disease burden in India and makes the problem more extensive.[6] There are various national health programs under which there are definite policies or guidelines for appropriate use of antimicrobials like Integrated Management of Neonatal and Childhood Illness (IMNCI) in diarrheal diseases and respiratory infections. The resistance spectrum of pathogens varies in different regions. Therefore local resistance patterns have to be known for appropriate antimicrobial use.[7] Some information reveals that there is major increase in antibiotic resistance which can become a bigger problem if not addressed immediately like in the developed countries.[8] Studies have shown a great rise in antimicrobial resistance among *Salmonella, Shigella, Vibrio cholerae, Staphylococcus aureus, Neisseria gonorrhoeae, N. meningitidis, Klebsiella, Mycobacterium tuberculosis*, HIV, plasmodium and others.[9]

At present there is no national database on surveillance of use of antimicrobials in the community, there are a few studies in India in this context. Some studies have shown a high use of fluroquinolones. We noted that there was a high degree of resistance against commonly used Cephalosporins and against Fluroquinolones. At present there are no national programs that are targeted towards prevention of drug resistance and there is inadequacy of quality assured laboratories. There is an absence of national guidelines on antimicrobial usage and no control on sale of these drugs for public consumption.[4] There is rampant misuse and irrational use of antimicrobials that provides favorable conditions for resistant microorganisms to grow emerge and spread.[3,4,6,9,10] Further, administration of broad spectrum antibiotics as an empirical therapy to the patients in OPD is another factor that leads to emergence of resistant strains. Direct sales of antibiotics to consumers by pharmacists is a major contributor to antimicrobial resistance as well. General public awareness and knowledge of correct antimicrobial use, stopping self-medication and poor compliance could help prevent antimicrobial resistance. A change of behaviour of health care providers and consumers is important.[11-14] We hope that from this study important information can help play an important role in developing a hospital antibiotic policy.

This study also provides a picture of the microbial profile seen in our hospital. This could also help developing a hospital infection control policy and an antimicrobial policy. Publication of these reports can also help in awareness of health care providers from different departments to routinely send samples for microbiological assessment and also help in choosing antimicrobials rationally for better treatment outcome and better community outcomes.

CONCLUSION

This was a pilot study analysing the microbial pattern of the samples of blood culture, pus, wound swab and urine from the different departments of a tertiary care teaching hospital to the department of Microbiology. The samples sent over six months for analysis, revealed some of the major antimicrobials that the common organisms are resistant to. This could help physicians and prescribers choose their prescription drugs more carefully and also help develop an effective hospital Infection Control Policy.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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