**ORIGINAL ARTICLE**

# Current Empirical Therapy; Is it in Accordance with Local Antibiogram of a Tertiary Care Hospital

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## ABSTRACT

**Background:** Rise in antibiotic resistance due to injudicious use of antibiotics is worrying. Our clinicians routinely start empirical therapy and discharge patients on same treatment without doing culture /sensitivity. This practice leads to over and misuse of antibiotics. To motivate the clinicians and build their faith on culture reports we started this comparative study in which empirical therapy started by the clinicians is compared with actual sensitivity results.
**Aim:** By highlighting the gap between empirical therapy and actual antibiotic susceptibility pattern and motivating consultants that empirical therapy should be based on local culture sensitivity pattern.
**Methodology**: Pus samples were collected aseptically from infected surgical sites. A profoma was filled with detailed clinical history and empirical therapy prescribed. Culture/ sensitivity results were noted. Results of sensitivity were compared with empirical therapy prescribed.
**Results:** A total 110 patients were included in the study. Out of total samples growth was obtained in 84 (76.4%) samples while remaining samples 26 (23.6%) shown no growth. Empirical therapy was in accordance in 10 (11.9%) patients while it was not in 74 (88.1%) patients. Gram negative organisms were more common 64/84 (76%) as compared to Gram positive organisms 12/84 (14.5%), while remaining 08/84 (9.5%) grown both gram positive and negative organisms.
**Conclusion:** Empirical therapy is not in accordance with actual sensitivity pattern.
**Key words:** Antibiotics, antibiogram, definitive therapy, empirical therapy.

## INTRODUCTION

In 20th century discovery of antibiotic was celebrated as big achievement of modern medicine. This golden era of antibiotics increased the life expectancy and provided treatment of previously fatal infections. However, antibiotic resistance was noted almost one year after discovery of first antibiotic. This rise in antibiotic resistance continued and now we are facing a major threat of multidrug resistant, pan drug resistant and extensively drug resistant microorganisms.[1]This situation is more alarming in developing countries where burden of infectious diseases is high and healthcare budget is low. Alarming outcome is that microorganisms which became resistant to multiple drugs pose challenges to healthcare and society including: increased drug cost, prolonged hospital stay, increase in morbidity and mortality[2].

The most important cause for development of antibiotic resistance is un-judicial use of antibiotics. According to CDC guidelines 80% unnecessary antibiotics were used for acute respiratory tract infections.[3]This indiscriminate use may be due to peer pressure, demands of patient, incentives of pharmaceutical industries, diagnostic uncertainty, pressure to keep hospital stay short, non existence of local antibiogram in setups and the most important is lack of knowledge of physician about local antibiogram. Thus local antibiogram is necessary to highlight all these problems and their possible solutions[1].

Cumulative antibiogram of a hospital is a regular surveillance of antimicrobial susceptibility pattern of microorganisms isolated in microbiology laboratory of that hospital.[4]This data will be useful for clinicians to choose antibiotic for empirical therapy and regular monitoring of antimicrobial resistance pattern within institution. Antibiogram data of one institution can be compared with other institutions. Variation of antibiogram may occur among different departments, ICU is suspected to have more resistant organisms as compared to general wards. Antibiogram also help in formulating infection control policies and to trace outbreaks of infectious diseases.[5]Regular monitoring of antibiogram and presenting it on different forums will also stimulate clinicians, who routinely do not follow antibiogram while selecting empirical therapy.

Empirical therapy should be based on local antibiogram, which otherwise routinely not followed upon. In developing countries like Pakistan, although antibiograms are being developed by few institutions and its usefulness is also limited to those institutions. Cumulative data should be prepared and presented in conferences, so that it can be implemented across the country. Clinical laboratory standard institute (CLSI) developed guidelines for analysis and presentation of antibiogram, these guidelines can be used to develop

Received on 28-12-2019
Accepted on 24-05-2020

institutional antibiogram[6]. Antimicrobial stewardship program can help in the development of infection site specific antibiogram to choose proper empirical therapy. We planned this study to find out surgical site specific antibiogram and also compared it with empirical therapy used for those specific patients.

## MATERIALS AND METHODS

This descriptive cross-sectional study was conducted in department of surgery and microbiology from July to December 2019. Objective of the study was to determine whether our empirical therapy is in accordance with local antibiogram pattern. A total 110 patients were enrolled from surgical ward with surgical site infections. A Performa was designed to note patient's details and history of empirical therapy used. Pus samples were collected from different infected sites on sterile culture swab and submitted to microbiology lab along with pROforma for each patient. Pus samples were cultured on blood and Mac Conkey agar (Oxoid, Basingstoke, UK) and incubated at 37°C for 24-48 hours in microbiology lab. Growth of microorganisms was identified by colony morphology, Gram staining and biochemical tests.

Antimicrobial susceptibility testing was done by modified Kirbey Bauer disc diffusion method on Mueller Hinton agar (Oxoid, Basingstoke, UK). Antimicrobial sensitivity was interpreted as recommended by Clinical Laboratory Standard Institute (CLSI) 2019.[7] The production of ESBL enzymes among Gram negative rods was detected by combination disc synergy method. If difference between single and combination disc is more ≥ 5 mm then it will be considered as ESBL producer. Methicillin resistance was detected by using cefoxitin disc (30µg) for *Staphylococcus aureus* and coagulase negative staphylococci. If zone diameter of cefoxitin is ≤ 21mm for *Staphylococcus aureus*, it will be considered methicillin resistant *Staphylococcus aureus* (MRSA) and a zone diameter ≤ 24 mm for *Staphylococcus epidermidis*, it will be methicillin resistant *Staphylococcus epidermidis* (MRSE).

*Staphylococcus aureus* (ATCC 25923), *Escherichia coli* (ATCC 25922) and *Pseudomonas aeruginosa* (ATCC 27853) were used as control stains. Sensitivity pattern of different microorganism for respective patients was noted and compared with empirical therapy used for that patient. It was noted whether empirical therapy is in accordance to sensitivity reports or different. Results were conveyed to the clinicians so that they may change antibiotic therapy accordingly. Data was entered in SPSS-20 for statistical evaluation. Descriptive statistics was applied to calculate mean standard deviation for age and percentages for antibiogram.

## RESULTS

A total 110 patients were included in the study. Age range of patient was between 20 to 65 years with a mean of 34.23 years. Out of total samples growth was obtained in 84(76.4%) samples while remaining samples 26(23.6%) shown no growth. Empirical therapy was in accordance in 10(11.9%) patients while it was not in 74(88.1%) patients. This is alarming situation. Ten organisms were resistant to all available antibiotics except polymixin. Gram negative organisms were more common 64/84 (76%) as compared to Gram positive organisms 12/84 (14.5%), while remaining 08/84 (9.5%) grown both gram positive and negative organisms. Sensitivity pattern of gram negative organisms is shown in table 1. Sensitivity pattern of Gram positive bacteria is shown in table 2

Table 1: Antibiotic sensitivity pattern of Gram negative bacteria (n=72)

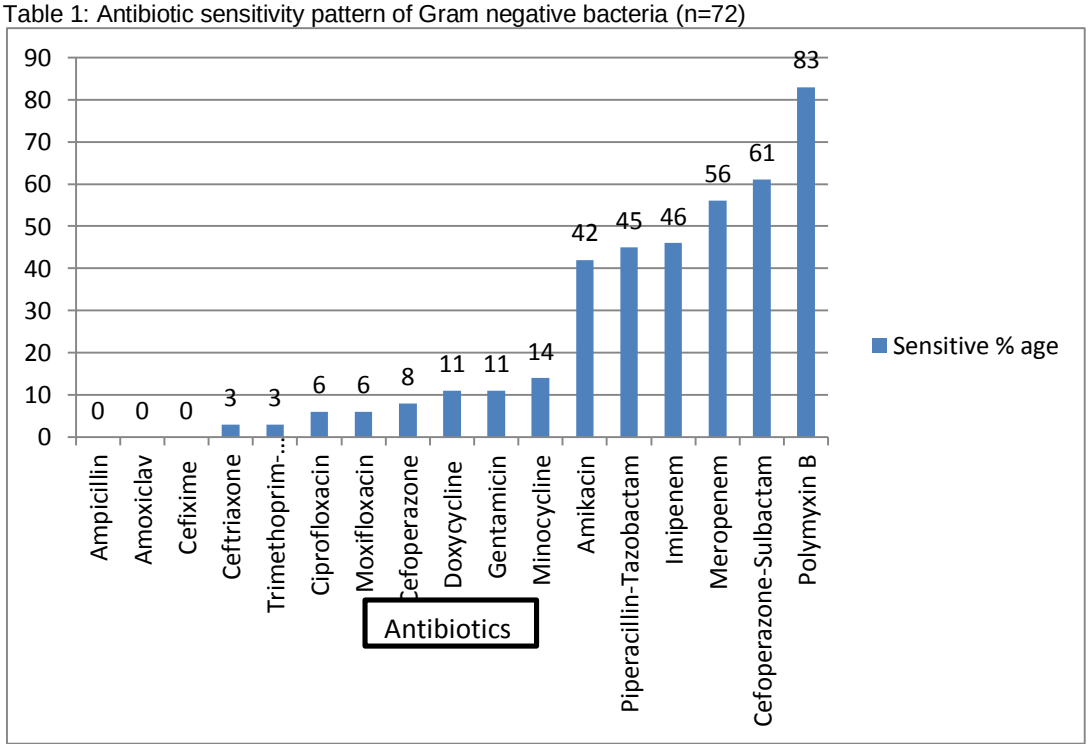
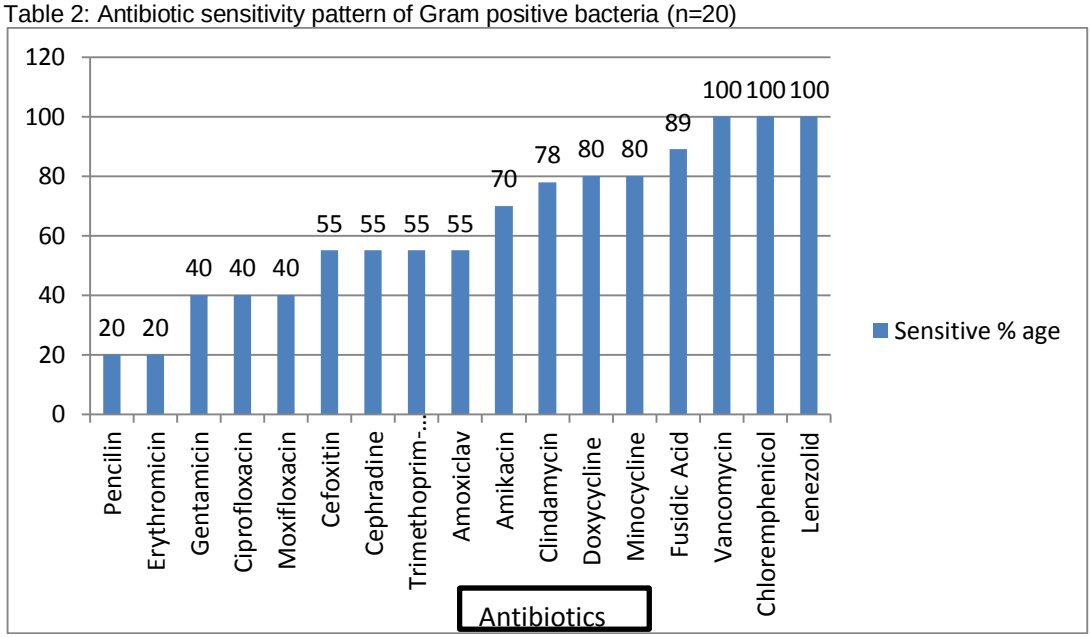


Table 2: Antibiotic sensitivity pattern of Gram positive bacteria (n=20)




## DISCUSSION

Antimicrobial resistance has posed a serious threat to the human globally especially in developing countries, where there is no restriction to broad spectrum antibiotics.[8] Among the factors which are responsible for antibiotic resistance in developing countries are 1) poor quality of available antibiotics, 2) lack of surveillance about antibiogram, 3) lack of studies about resistance development, 4) injudicious use of antibiotics, 5) over the counter availability of antibiotics[9]. Although some studies are conducted recently on antibiogram in different cities of Pakistan by Zafar A et al (Karachi), Gilani M et al (Rawalpindi), Qadeer A et al (Islamabad), Farooq L et al(Karachi) and Saleem MZ et al (multicentre) but they mostly focused on single microorganism[10,11,12,13,14].

Antibiogram should be cumulative data of different departments in a hospital. Pakistan antimicrobial resistance network (PARN) is doing wonderful job in collecting antibiogram from different hospitals and labs. Only few hospitals and are voluntarily participating in this program and it is not updating regularly. It should be compulsory for every hospital to share their antibiogram on uniformed Performa. So that on the basis of those data empirical therapy guidelines may be conveyed to the clinicians. Up till now no such data published from Sialkot city.

As a pilot project we started this study in surgical ward and compared the sensitivity pattern with empirical therapy already prescribed by surgeons. In our study we noted higher antibiotic resistance to the drugs which are considered as last resort against gram negative bacteria. As sensitivity to carbapenem is not more than 60% in this study. A study by Ali et al in which data was collected from 43 centre of Punjab shown sensitivity of Gram negative bacteria to carbapenem about 70%.[15] Another study by Sana et al from Rawalpindi shows sensitivity of gram negative bacteria is only 55% against carbapenem, which even lower than our results[16]. Saleem et al shown sensitivity of *Pseudomonas aeruginosa* to carbapenem is 57%.[17] The reason of higher antibiotic resistance in our study may be because we collected samples from post surgical site infections and they are hospital acquired microorganisms.

We isolated mostly gram negative bacteria which in accordance with other studies Qadeer and Ali et al.[12,15] As we compared empirical therapy prescribed by surgeons with actual sensitivity pattern which was in accordance in 12% patients and not in 88% cases. These results are alarming as in most of cases empirical therapy is continued and not changed to definitive therapy. The results were conveyed to the concerned clinicians so that they may be vigilant in prescribing antibiotics in future and also motivated to send culture before start of antibiotics. About 10% bacteria were extensively drug resistant (resistant to all antibiotics except polymyxin), which is alarming as we kept on changing and adding antibiotics instead of doing culture/ sensitivity and start definitive therapy with narrow spectrum antibiotics.

## CONCLUSION

Currently used empirical therapy by our clinicians is not in accordance with actual sensitivity pattern. This type of studies should be conducted in every hospital to formulate proper empirical therapy guidelines and motivate surgeons to send sample for culture /sensitivity before starting antibiotics.

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