Guidelines for Rational Prescription of Antibiotic in the Hospital

By

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Dissertation submitted for the partial fulfillment of the
MBA Hospital and Health Management

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The Candidate has successfully carried out the study designated to her during dissertation training and her approach to the study has been sincere, scientific and analytical.

I wish her all success in all her future endeavors.

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She comes across as a committed, sincere & diligent person who has a Strong drive and zeal for learning

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This is to certify that the dissertation titled**"Guidelines for Rational Prescription of Antibiotic in the hospital"** and submitted by **Dr. Bhavana Ghughtyal** Enrollment No. **0136** under the supervision of **Monika Chaudhary** (Associate Professor) for award of MBA in Hospital Management of the University carried out during the period from 8th feb.2016 to 8th May.2016 embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.

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Preface: -

Dissertation is an integral part of the MBA in health and hospital management programme and for this purpose I had undergone dissertation at Multi-speciality tertiary care hospital, at Lakdi ka pool, Hyderabad, Telangana.

During the dissertation period I was given a project on "formulation of antibiotic policy for hospital" and be a part of the infection control team already working in this project for the hospital. This was an opportunity for me to not only identify but deeply understanding into the problem that were existing and come up with possible solutions. I also came in my knowledge during the study was inappropriate uses of antibiotic in the hospital.

This hospital currently has 150 operational bed and on an average of 5016 out patients and 626 inpatient monthly admission. Out of total inpatients number 18-20 % are particularly of surgical gastroenterology department and approx 70% of this no. goes for surgery every month and were on antibiotics. This leads to a need of a very efficient antibiotic uses and policy to check upon the use of antibiotic and reducing the development of antibiotic resistance, so that more option remain available for patient treatment in future.

This report include study background, study problem, study objective, methodology, findings and suggestions. The project end with the list of abbreviation and references of the study.

Thanking You

Dr. Bhavana Ghughtyal

ACKNOWLEDGEMENT

The successful completion of the dissertation and final outcome of this project required a lot of guidance and assistance from different people and I consider myself fortunate to have so many people around to guide me.

First and foremost I would like to thank **Col. (Dr.) Ashok Kaushik** (Dean Academics and Student Affairs, IIHMR, Jaipur) to provide such a great learning opportunity. I own my profound gratitude to **Dr. Anand Joshi** (Consultant in Critical care & Internal Medicine) for guiding me and always adding value to my understanding of different departments in the hospital. I am also thankful to Dr. Ranganathan Iyer (HOD, Microbiology) for his help in further nurturing my understanding about the hospital and its working. The entire project would not have been possible without the important inputs from **Dr.Rekha** (M.D Microbiology).

I am also thankful to each and every staff of the Hospital, Hyderabad for sharing their experiences and knowledge and providing their precious time to add value to my knowledge. Without their cooperation, the dissertation and the project work would not have been possible.

Finally, I would like to extend my sincere regards to my mentor **Monika Chaudhary** (Associate Professor, The IIHMR University Jaipur) for her support.

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Executive Summary: -

In hospital wound infection are the commonest hospital acquired infection in surgical patients. Approximately 30-40% of antibiotics used in hospital is for surgical prophylaxis. So appropriate prescription of antibiotic is needed for an efficient treatment. If its not happen can lead to treatment failure as well as increase the emergence of antimicrobial resistance. So Judicial use of antibiotics in the hospital through effective antibiotic policy is thus essential.

The study was conducted in Multispecialty tertiary care Hospital, Hyderabad. The hospital currently has 150 operational bed and an average of 5016 out patients and 626 inpatient monthly admission. Out of total inpatients number 18-20% patient are particularly of surgical gastroenterology department and approx 70% of this no. goes for surgery and antibiotic every month .

Currently hospitals doesn't have any working antibiotic policy ,which lead to requirement of a very efficient antibiotic policy to ensure the appropriate use of antibiotics and reduce the development of antibiotic resistance, so that more option will remain available for patient in future for fighting against infection .It also provide information to the doctor regarding up going trend of infection which influence their decision while prescribing antibiotics.

To restrict the study only to the dissertation period, I could not go to all speciality department so I had to choose a specific department which is Surgical Gastroenterology.

Design A retrospective study was conducted for the year of 2014-2015.

Method Analysis and preparation of cumulative antibiograms (as per CLSI M39-A2 guidelines) and preparing an antibiotic policy for organisms causing bloodstream infection. A total of 1206 blood culture specimens were received in the microbiology department during the study period of which there were 131 blood culture positives. The demographic details and microbiology susceptibility data of the patients with positive blood cultures were recorded and this data was subsequently analysed. Antibiograms were prepared for species with minimum 30 isolates and expressed as percentage susceptible. Only routinely used drugs in our hospital were included in the antibiogram. A particular antibiotic was considered for inclusion in the antibiotic policy only if percentage susceptibility was $\geq 50\%$.

After analysis of pt. data of with respect to antibiogram report it was found that a gap in pt. prescription antibiotic and culture report suggestion, only in few cases doctor take opinion from microbiologist in cases of doubts, otherwise in mostly cases they start the broad spectrum antibiotic at the very beginning.

So for judicial use of antibiotic as per the policy the antibiotics are classified on the bases of current sensitivity in hospital antibiogram report are:

a. Empirical Drug
b. Therapeutic Drug

The cumulative antibiograms were presented on 27th April in a Hospital infection control meeting attended by clinicians, hospital administrators, microbiologist ,infection control nurse and nursing superintendent and an antibiotic policy was formulated for initial empiric therapy of bloodstream infections.

INTRODUCTION

In a hospital surgical site wound infection are the commonest hospital acquired infection in patients. This study was conducted in Multispecialty tertiary care Hospital, Hyderabad. The hospital currently has 150 operational bed and an average of 5016 out patients and 626 inpatient admission monthly. Out of total inpatients number 18-20% patient are particularly of surgical gastroenterology department and approx 70% of this no. goes for surgery and antibiotic every month.

Majority of hospitalized patients get antibiotics for prophylaxis or therapeutic purpose in their inpatients days. A group of consultants and Microbiologist in the hospital April 2016 performed a period prevalence study on 2014-2015 inpatient in surgical gastroenterology department and as a result came out that a number of patients are receiving inappropriate antimicrobial therapy. Thus under the guidance of Departmental HOD's, Infection Control Committee, and Microbiologist an antimicrobial policy was formulated to ensure the appropriate use of antibiotics.

Antibiotics policy was formed on the basis of antimicrobial report and the prevalence of bacterial infection in the hospital. Inappropriate uses of antibiotics not only increase the cost of healthcare for patient but also lead to develop multidrug resistant infection. Antibiotic resistant is the major concern for healthcare industry across the world an it's very important to ensure appropriate use of antibiotics.

Policy compliance criteria:-

a. Sample for culture need to be sent before starting antimicrobial therapy.
b. Restricted or higher antibiotic can't be prescribed in Empirical therapy without any supportive report.
c. On availability of culture sensitivity report review of antibiotic therapy need to be done by respective consultant.
d. If a consultant using any restricted antibiotic he has to submit an justification form regarding the use of it.
e. Pharmacy should also check for the frequency of uses of restricted antibiotic and information regarding this should be given to infection control committee periodically.

According to WHO the process for the development of an antibiotic policy is given below.

Process of development of antibiotic policy: -

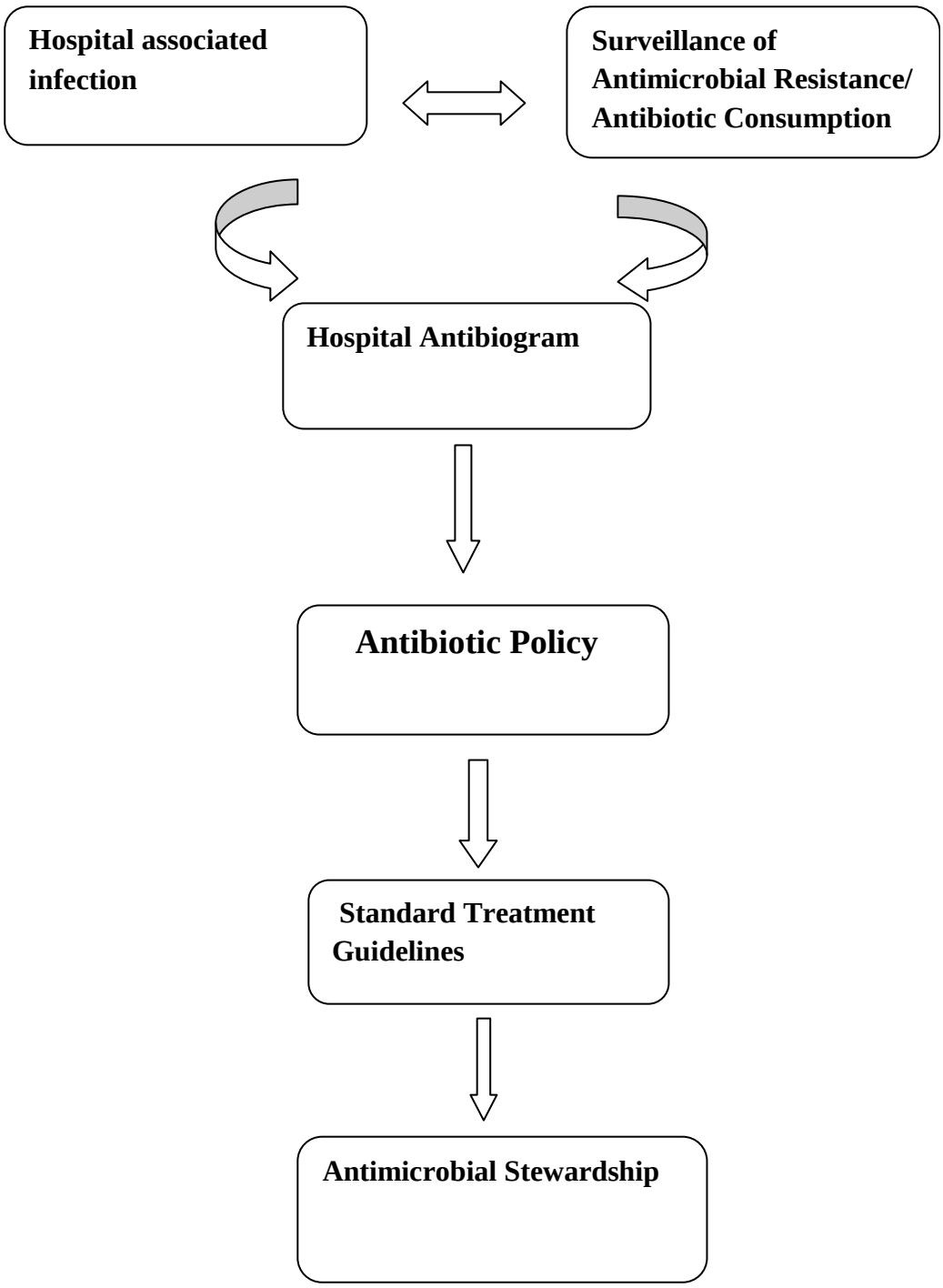


Fig:1 Process flow of antibiotic policy

Review of Literature: -

As per a study in JIPMER hospital, India shows an alarmingly high incidence of MRSA infection in the hospital. The prevalence rate MRSA infection is found to be 54.8%, which is much higher than most of the reports where it ranged between 20% to 32.8%. The only report which has given somewhat similar result i.e. 51.6% is from LN Hospital, New Delhi. Further, a study from Indore has shown a rise in MRSA prevalence from 12% in 1992 to 80.89% in 1999. The indiscriminate use of antibiotics, lack of awareness and unethical treatment before coming to the hospital might have been contributing factors. The epidemiology of MRSA is gradually changing since its emergence added to the problem B-lactam antibiotics like penicillin and cephalexin were not found to be effective against MRSA. Penicillin and cephalexin resistance were 100% and 88.7% respectively. Resistance to quinolones (ciprofloxacin) was also found to be very high i.e. 84.1%. Vancomycin seems to be the only antimicrobial agent which showed 100% sensitivity and may be used as the drug of choice for treating multidrug resistant MRSA infections. However, regular monitoring of vancomycin sensitivity, and routine testing of other newer glycopeptides like teicoplanin should be carried out. (Indian J Med Microbial 1997;15:137-138)

The earlier guidelines from British and American thoracic societies for treatment of community acquired pneumonia (CAP) resulted in overuse of cephalosporin's, quinolones and macrolides triggering MRSA outbreaks. Third generation cephalosporin's and quinolones are implicated as a risk factor for increased MRSA/ gram negative bacteria and infection. There is also ample evidence that MRSA incidence rates declined following implementation and monitoring of antibiotic policies that reduced use of cephalosporin and quinolones. similarly studies shows VRE incidence rates declined following implementation of antibiotic policies that reduced use of vancomycin and clostridium difficile following reduced use of clindamycin. (Am J Health Syst Pharm 56: 1839-1888).

A study was carried out at Basaveshwar General & teaching Hospital, Gulbarga. Three hundred twelve strains of Staphylococcus aureus were isolated from different clinical samples. Antimicrobial susceptibility testing of the Staphylococcus was performed as recommended by the Clinical and laboratory Standard Institute. Vancomycin seems to be the only antimicrobial agent which showed 100% sensitivity and so may be used as the drug of choice for treating multidrug-resistant MRSA infections. (Indian J Med Microbiol 2001;19:87-90).

The American Society of Health-System Pharmacists (ASHP) guidelines for antimicrobial prophylaxis prior to surgery and explored reasons for non-compliance. Results reflects the awareness among health-care professionals in Jordanian hospitals regarding the importance of prophylactic antimicrobial agents in preventing SSI. Overall, the physician's decision in selecting a prophylactic antimicrobial agent(s) was based on information taken from either textbooks or standard guidelines, which have been adopted in practice by the hospitals. According to ASHP guidelines, antibiotics are not indicated for clean procedures. Despite this, study shows that there were inconsistencies between ASHP guidelines and current practice. Optimal timing of antibiotic administration is considered an important factor for effective prophylaxis. Inappropriate timing may result in low plasma concentration of the antimicrobial agent at the time of incision and throughout the procedure , contributing to higher infection rates. (Am J Resp Crit Care Med. 2001,163:1730-1754)

Problem Statement :

"In a multispecialty tertiary care hospital continuation of using the previous antibiotic policy which is focusing on a single speciality has shown its inefficiency for the other speciality, so new and upgraded antibiotic policy requirement comes into picture"

OBJECTIVE :

1. To assess the rational use of antibiotics in the hospital.
2. To create an awareness among the hospital consultant and to save uses of powerful antibiotics for later treatment.

METHODOLOGY :

Duration of study –The study was conducted for 3 month, from date of 8-02-16 to 8-05-16.

Type of study –Retrospective study done on the entire year data 2014-15.

Data collection- Data was collected through patient file, doctor Interview, and antibiogram report. The data was collected only for those patient, samples were sent to microbiology department for study.

Data requirement- List of patient all 131 patient whose samples showed a positive result, and Culture report of above mention patient.

Method- Analysing antibiogram report which involve following point

a. Blood sample sent for testing antibiotics in last 1 year (2014-15).
b. Culture report available suggesting for prescribed antibiotics.
c. Patient prescription as per list mention above.

Inclusion criteria- Blood sample of all surgical patient in gastroenterology department.

Exclusion criteria- Pus sample

Wound swab

Drain discharge

Data collection tool:- An excel antibiogram used to capture patient data.

Sample size- 131 patients sample

Limitations of the study

The results of the present study needs to be further supported by taking a more representative sample size, for which 2-3 year back retrospective data need to be studied.

The hospital antibiogram cannot be used alone to select the optimal empiric therapy in an individual patient, as specific patient factors need to be considered, including the type and severity of infection, the infecting organism, and the patient's medical history and past antibiotic use.

FINDINGS:

Global hospital antibiotic policy is a comprehensive document which is based on following parameter-

a. Antibiogram
b. Current literature Review
c. International &NABH guidelines

Recommended Prophylaxis antibiotics:-

1.	Gastric/duodenal/Oesophageal (Bypass,Resection,Oesophagectomy)	Cephazolin 1gm IV , children <12 yr age (25mg/kg)
2.	Biliary (Cholecystectomy)	Metronidaole 500 mg IV, Children < 12 yr age (12mg/kg)
3.	Colorectal	Metronidaole 500 mg IV, Children < 12 yr age (12.5mg/kg) + Cephazolin 1gm IV , children <12 yr age (25mg/kg) or gentamicin 2mg/kg IV, children <12 yr age (25mg/kg)
4.	Pancreatic /Whipple	Metronidaole 500 mg IV, Children < 12 yr age (12.5mg/kg) + Cephazolin 1gm IV , children <12 yr age (25mg/kg) or gentamicin 2mg/kg IV, children <12 yr age (25mg/kg)
5.	Liver Resection	Metronidaole 500 mg IV, Children < 12 yr age (12.5mg/kg) + Cephazolin 1gm IV , children <12 yr age (25mg/kg) or gentamicin 2mg/kg IV, children <12 yr age (25mg/kg)
6.	Exploratory Laprotomy	Metronidaole 500 mg IV, Children < 12 yr age (12.5mg/kg) + Cephazolin 1gm IV , children <12 yr age (25mg/kg)

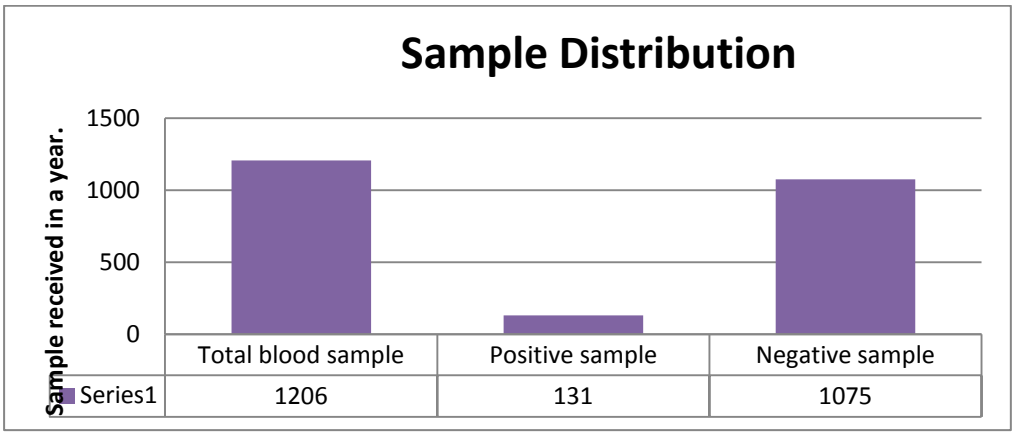
		or gentamicin 2mg/kg IV, children <12 yr age (25mg/kg)
7.	Hernia repair	Cephazolin 1 g I.V

Table:1 International guideline for antibiotic prophylaxis

Results based on Analysis of entire year data which suggested the antibiotic policy:

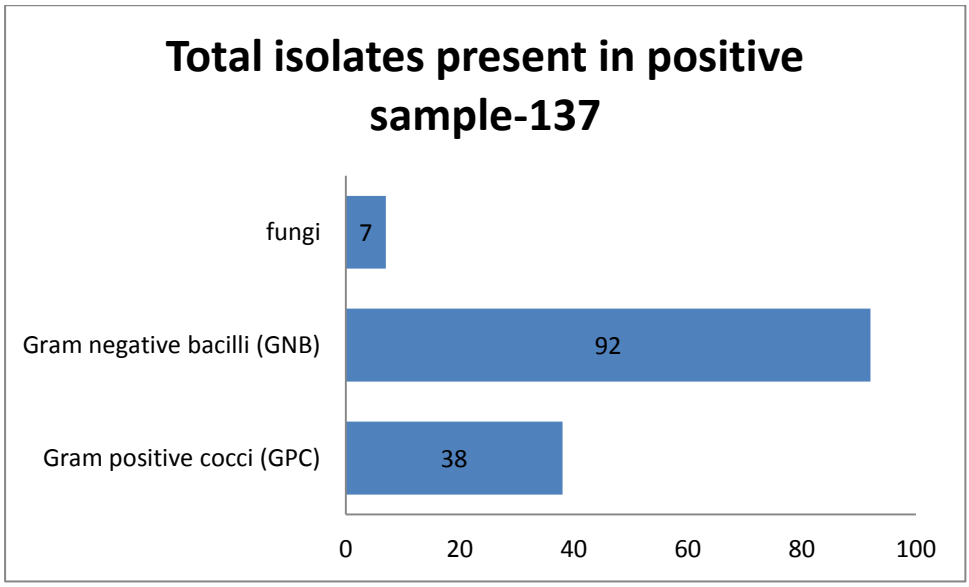
In the year 2014-2015 a total of 1206 blood culture specimens were received in the microbiology department, of which there were 131 blood culture positives. The demographic details and microbiology susceptibility data of the patients with positive blood cultures were recorded and this data was subsequently analysed. As per (CLSI M39-A2 guidelines) Antibiograms were prepared for species with minimum 30 isolates are present and expressed as percentage susceptible. Only routinely used drugs in our hospital were included in the antibiogram. A particular antibiotic was considered for inclusion in the antibiotic policy only if it has a percentage susceptibility of ≥ 50%.

Graph :1 Total sample received for entire year and its distribution



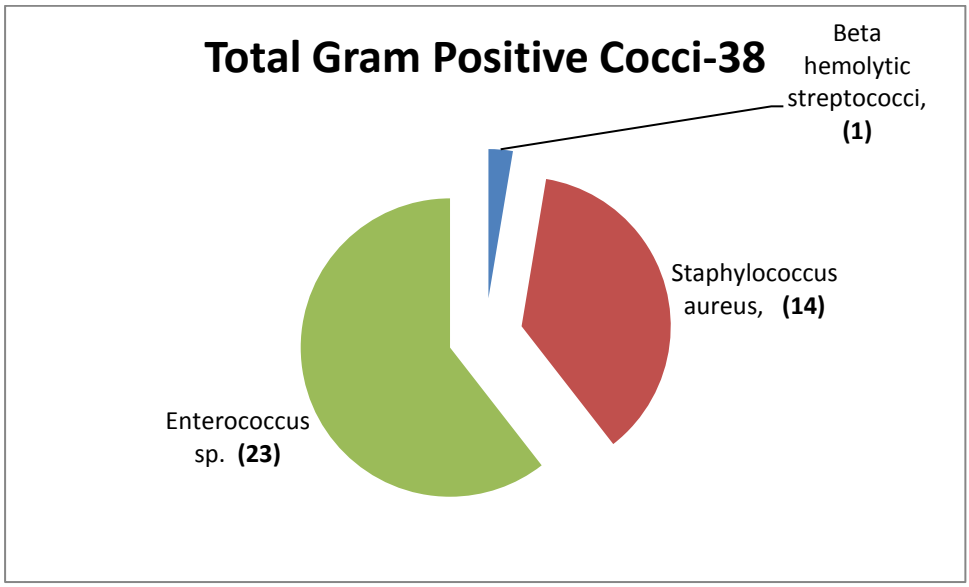
(Total sample received for the entire year is 1206,out of which positive samples are 131and 1075 are negative sample.)

Graph:2 shows the total no. of isolates present in the sample



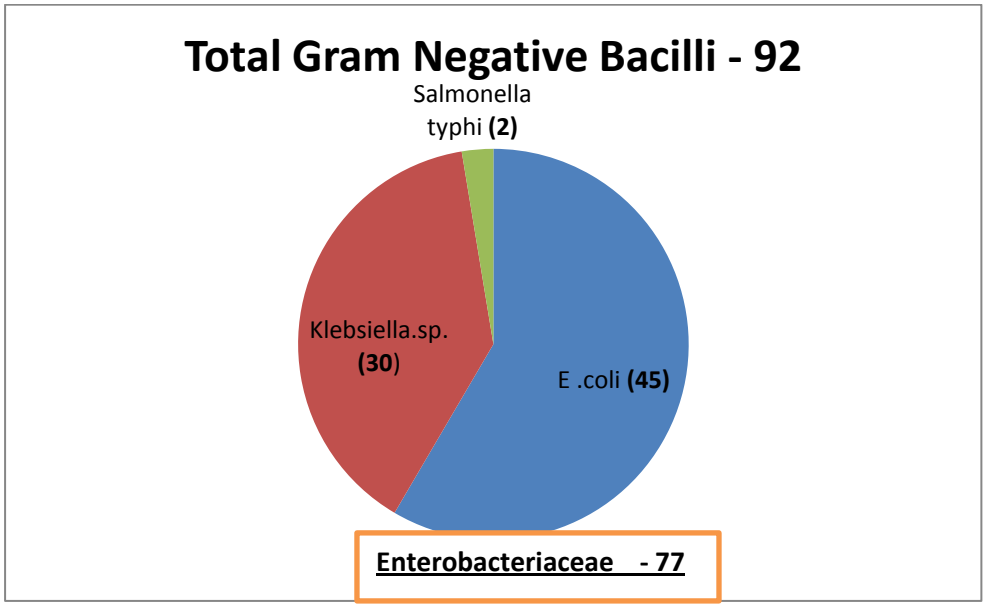
Out of total 137 isolates , 38 are the gram (+ve) cocci, 92 are the gram(-ve) bacilli ,and 7 are the fungal growth .So data shows the majority of the gram (-ve) infections.

Graph:3 shows the distribution pattern of Gram (+ve) cocci



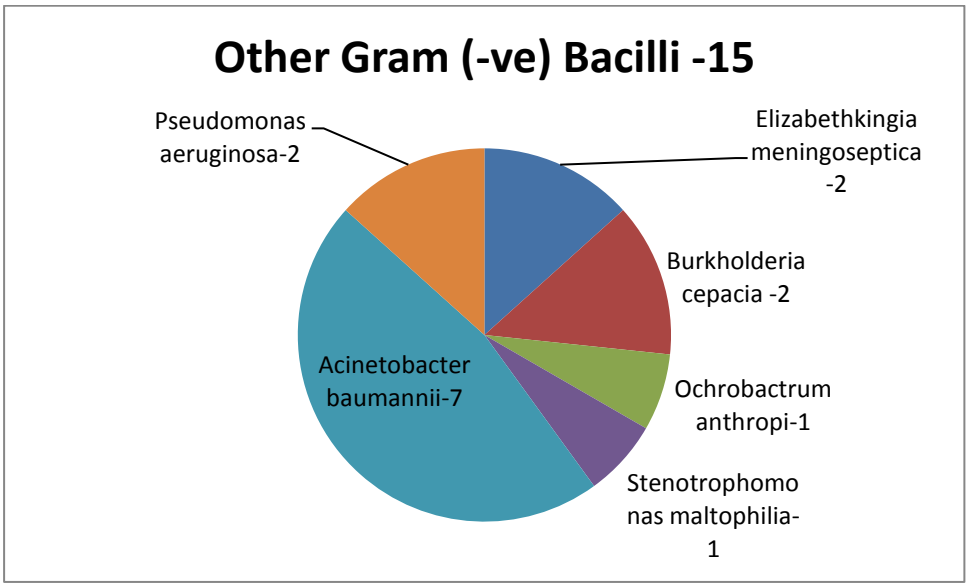
Out of 38 gram(+ve) cocci ,1 is beta haemolytic streptococci, 14 is staphylococcus aureus, 23 is enterococcus, but no. of each isolates is <30 individually. Antibiotic test on these isolates shows 12 are MRSA, 10 are HLAR, and 3 are VRE.

Graph:3 shows the distribution of gram(-ve)bacilli



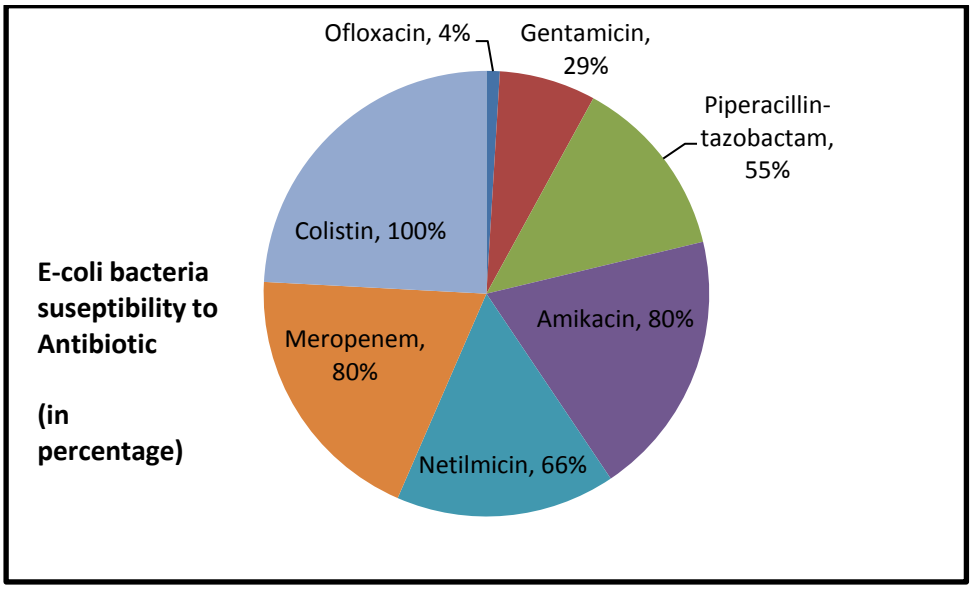
Total no. of gram (-ve) bacilli present are 92 out of which 77 are Enterobacteriaceae and 15 are other species. Out of 77 Enterobacteriaceae, 45 are E.coli, 30 are Klebsiella and 2 are salmonella typhi. It shows the no. of infection are more with E.coli and Klebsiella (>30) each individual. Antibiotic test on these isolates shows 44 are ESBL and 19 are CRE.

Graph:4 Distribution of other Gram(-ve) bacilli



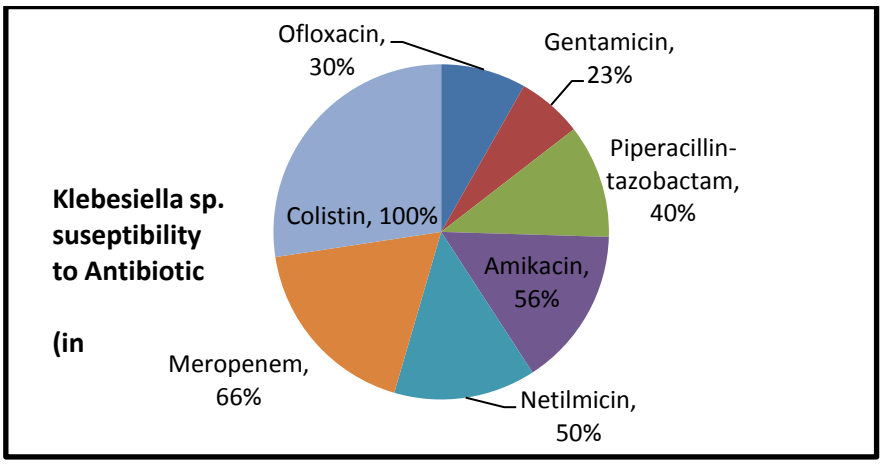
Other Gram Negative Bacilli	**15**
Elizabethkingia meningoseptica	2
Burkholderia cepacia	2
Ochrobactrum anthropi	1
Stenotrophomonas maltophilia	1
Acinetobacter baumannii	7
Pseudomonas aeruginosa	2

Graph:5 Shows percentage susceptibility of E.coli to Antibiotics



Drugs for which bacteria is susceptible more than >50% is mostly effective against it, so drugs like Piperacillin-tazobactum, Netilmicin , Meropenum, Colistin comes under it ,whereas Ofloxacin and Gentamicin are showing less sensitivity for them.

Graph:6 Shows percentage susceptibility of Klebesiella to Antibiotics



Drugs for which bacteria is susceptible mostly effective against it, so drugs like Piperacillin-tazobactum, Netilmicin , Meropenum, Colistin comes under it ,whereas Ofloxacin and Gentamicin are showing less sensitivity for them.

Hospital prescription of Antibiotic – Based on surgery type drugs are prescribed.

1. Laparoscopic surgery -Ofloxacin
2. Bowel surgery -Cefoperazone salbactum
3. Hepato-Pancreato-Biliary -Piperacillin+tazobactum
4. Hernia surgery - Amoxycillin+clavulanic acid
5.

As per the new policy: are as follows:

1. Antibiotics
    - Class
    - Generic name
    - Brand name
    - Dose
2. List of restricted drug
3. Hospital formulary for antibiotics
4. Surgical prophylaxis policy
   Pre operative Consideration:-
    a. Consider individual risk factor –Drug choice and dose may alter based on patient condition (ex-immuno suppression, any allergy, diabetes, malignancy etc.)
    b. Pre-existing infection- If present, use appropriate Tt. regimen instead of prophylactic regimen, and allow for re-dosing just prior to skin incision.

Peri operative:-

I.V bolus –timed <60 min before incision

I.V infusion –timed to end <30 minutes before incision

MRSA risk– replace Cephazolin or Penicillin with vancomycin at the rate of 1gm/hr.

A single preoperative dose is sufficient for most procedure (however intraoperative doses are advisible) if a prolong surgery >4 hrs, or extensive amount of blood lose.

Post operative:- post operative antibiotics are not indicated unless infection is confirmed or suspected. If infection is suspected, consider modification of antibiotic regimen according to microbiology test report.

Conclusion:

As per the study it is evident that there is a gap in prescription of antibiotics by the consultant and as per the antibiogram recommendation. In hospital mostly antibiotic was prescribed on the bases of type of surgeries performed, whereas according to the guideline it should be prescribed on the bases of type of infection. Above data analysis shows the bacteria which are isolated from the hospital culture report has a very low sensitivity for ofloxacin and gentamicine which is prescribed by consultant in most of the laproscopic surgery.

One observation also came into picture, rather than sending blood sample of all the surgical patient only those patient samples where infection is more or patient condition is deteriorating were sent to the microbiology lab by the consultant, and very few of consultant discuss with microbiologist for any change regarding the treatment plan, rather then they prefer to give broad spectrum antibiotic at the very beginning.

Suggestions:

The cumulative antibiograms were presented and discussed on 27th April 2016 in a Hospital "infection control meeting" attended by Consultant, hospital administrator, Microbiologist, Infection control nurse and Nursing superintendent ,and an antibiotic policy was formulated for initial empiric therapy of bloodstream infections. The results of the present study helped in planning an empiric antibiotic policy for bloodstream infections and can also be used for monitoring of antimicrobial resistance trends over a period of time.

Initial empirical treatment of bloodstream infections:

Isolates	Antibiotic	%Suseptibility	Type of Action
Gram (-ve) bacteria (E-coli, Klebsiella)	I. Piperacillin-tazobactam II. amikacin/netilmicin	55% 80%	Bactericidal Bacteriostatic
Gram (+ve) bacteria Chain Cluster	Ampicillin-Gentamycin Vancomycin	87% 90%	Bactericidal Bactericidal

- Gram negative bacilli: Piperacillin-tazobactam with a combination of amikacin/netilmicin
- Gram positive cocci in clusters: Vancomycin
- Gram positive cocci in chains: Ampicllin with a combination of gentamicin/amikacin
- Escalate or de-escalate antimicrobial therapy based on the final antimicrobial susceptibility testing report.
- If a consultant is prescribing a higher antibiotic (ex-Meropenum) should submit a justification form addressing the reason for prescribing it .
- Pharmacist based on the frequency of the uses of higher antibiotic, should also give a report to hospital infection control committee.

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List of Abbreviations:

AMR	Anti microbial resistance
AMT	Anti microbial team
ARIMA	Auto-regressive integrated moving average
ATC	Anatomic therapeutic chemical
ATS	American thoracic society
BSAC	British society for antimicrobial chemotherapy
CAP	Community- acquired pneumonia
CDC	Centre for disease control and prevention
CLSI	Clinical and laboratory standards institute
CWA	Community wide antibiogram
DDD	Defined daily dose
EPOC	Effective practise and organization of care
STRAMA	Swedish strategic programme against antibiotic resistance
STG	Standard treatment guideline
HAI	Hospital acquired infection
ICU	Intensive care unit
IDSA	Infectious disease society of America
WHO	World health organisation
MIC	Minimum inhibitory concentration
MRSA	Methicillin resistant staph.aureus
NABH	National accreditation board for hospital
NABL	National accreditation board for laboratories
PDD	Prescribed daily dose
CLSI	Clinical and Laboratory Standards Institute
GPC	Gram positive cocci
LLCR	Low level carbapenem resistance
GNB	Gram negative bacilli

CRE	Carbapenem resistant Enterobacteriaceae
MSSA	Methicillin susceptible *Staphylocccus aureus*
HLAR	High level aminoglycoside resistance
VRE	Vancomycin resistant Enterococcus
SBL	Extended spectrum beta-lactamase producer