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Analysis of utilization pattern of antimicrobial agents in a tertiary care teaching hospital

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***Abstract*---**Bacteria are being unicellular and prokaryotes came to this earth before us and others. They are able to survive anywhere in this earth including soil, water both saline and normal, in all living creatures, hills, sands, ice of north and south poles, sea and desert. Some are helpful and commensals as they not harm us but many of them produce disease in which they survive, these are harmful bacteria, so called pathogenic or disease producing bacteria. Result showed there is a need for a better AMAs using formulary or clinical guide line, though it is available in CMDT, edited in every year. Role of Drugs and Therapeutic committee should play an important role regard to this, along with Drug utilization study, prescriptions auditing to improve drugs use in general and lifesaving managements. This is again a matter of great regret that the many doctors have a mental tendency to use Newer and more expansive, low available drug(a matter of ego that—DR writing and know much that drug only available at Cuttack) as opposed to cost effective, proven and well established AMAs, in local counters.

***Keywords*---**Bacteria, Antimicrobial agents, Antineoplastic drugs, Antifungal.

Introduction

Bacteria are being unicellular and prokaryotes came to this earth before us and others. They are able to survive anywhere in this earth including soil, water both saline and normal, in all living creatures, hills, sands, ice of north and south poles, sea and desert. Some are helpful and commensals as they not harm us but many of them produce disease in which they survive, these are harmful bacteria, so called pathogenic or disease producing bacteria. Not only bacteria but also a lot of other organism are pathogenic like fungus, virus etc. but here we are limited to bacteria's only. [1] When we collect these substances and use them to kill disease producing offending other bacteria or other microorganisms, we call them Antibiotics. These Antimicrobial agents are many times also synthesized from chemical substances, or modifying structure of original antibiotics-- so all these things in together are called as chemotherapeutic agents or more specifically Antimicrobial agents-- AMAs. [2]

AMAs – Antimicrobial Agents are commonest used medicaments in all type of health faculty and specialty. It will not be trust worthy if one will say that he orshe has not used Antibiotics in his life time or cannot claim that will not use antibiotics in future. [3] .It's used in wide over areas starting from nil infection— prophylaxis, from mild infection to severe life-threatening situations, that often endangers life. [4] Not only used by doctors, but also used by quacks, as OTC drug by medicine shop keeper, often used by patients and relatives without any needor any advice, many times by a layman for his son or daughter and by medical and related staffs, leading in an increment of morbid condition in one hand anddanger divesting drug resistant in other hand. [5,6,2]

In the recent past when people were dying of communicable diseases, the discovery and innovations of AMAs, did a miracle as saved millions of life worldwide, by special toxic and killing effect on infecting microorganisms and not damaging host, thus satisfying own name as MIRACLE MEDICINE or MAGIC BULLETS. Paul Ehlrich of Austria discovered first time chemotherapeutic agent in 1906. Next Domagk of Germany, A. Fleming of England, Walks man of USA discovered sulfonamides, penicillin, Streptomycin and all received NOBEL PRIZE, for their immortal lifesaving work which changed world. [7] Thus we have powerfultools, guns to fight against pathogens and we call them MAGIC BULLETS as in crowd of enemy and friends, they selectively kill enemies but not our friendly cells like that of BELALSEN of MAHABHARAT-Who on asking by LORD KRISHNA, could recognize enemy and friends of his father BHIMSEN, without seeing them earlier by using a single arrow which can gave red vermilion point to enemies head and black vermilion point to friendly party.[5,6]

Material & Methods

This is an Observational and Retrospective survey of AMAs usage. Review of patient's folders, Asses drug availability from stores and pharmacy records, informal interview with prescribers, scrutiny of laboratory records and observations. It is a 3-tier Medical College and Hospital, in eastern Odisha, providing wide variety of Diagnostics and Specialist OPD and IPD Services as well

as Teaching faculty. More than half of Odisha state along with West-Bengal and Bihar, Jharkhand population depend on it.

Data are collected from admitted patient's case sheets from ICUs, surgery, orthopedics and burn indoor wards. Data's are collected by a self-prepared preformed proforma, which is prepared as per study design and includes Age, Sex, Disease, Unit, Ward, AMA or AMAs prescribed, Average no of AMAs, Dose, Frequency, Route of administration, along with Govt. supply or private purchase and supply chain.

Inclusive Criteria

All Adult patients admitted to ICUs, Orthopedic, Surgery and Burn-wards are included. All prescriptions single or combination of AMAs is included. No age, sex, race, residence, addictions and habituations, socio-economic state, co-morbid condition, height, weight not taken into account, except weight, age and co- morbid conditions such as liver and renal failure taken to determine type anddose of AMAs.

Exclusion Criteria

Topical antibiotics, ointments, combination of antibiotics with steroids for local applications, ATT, HAART, Antineoplastic drugs, Antifungal antibiotics are not taken into study.

Data Collection

By a special self-prepared PROFORMA given above and IPC ADR form. (Indian pharmacopeia commission)

Table: 1 Types of ICU Cases

S. No	System	Types of Diseases	Total No
1	CVS	HTN, MI, CCF, CAD ETC	98
2	Metabolic Disorder	DM, THYROID, OBESITY, CUSHING SYNDROME	83
3	Surgical	GI, LIVER, PANCREA SURGERY	78
4	Orthopedic & RTA	----	60
5	Respiratory System	PNEUMONIA, ASTHMA, COPD, LUNGSABSES	48
6	Shock	Due to Many Cause	40
7	Others	Snake Bite, Anemia, Poisoning	42
8	O&G	Eclampsia, Hemorrhage, Post-Operative	31
9	Carcinoma	Different Type, Post-Operative	20
10	Total		500

Table-2: Demographic Patterns

Age	
Below 16 Yrs	77
Above 16Yrs	399
Above 65 Yrs	22
Above 75 Yrs	2

TABLE-3: Sex Distribution of ICU Cases

SEX	Number
MALE	297
FEMALE	203

Table-4: Showing--AMAS used in ICU, Dose, Duration, Frequency, Most Used

SL No.	AMA	Dose & Route	% of Use
1	Inj.PIPTAZ—Piperacillin+Tazobactam	4.5gm/ IV / TID	60%
2	Inj.Cefoperazone+Sulbactum	1gm / IV /BD	10%
3	Inj.Cefotaxime + Sulbactam	1.5gm /IV /BD	10%
4	Inj.Metronidazole	500gm /IV /TID	100%
5	Inj.Mikacin	500mg /I V /IM /BD	56%
6	Inj.Meropenim	1gm /IV/ TDS / in 100ml NS	10%
7	Inj. Linezolid	600mg /IV/BD	88%
8	Inj.Imipenim+ cillastatin	1gm/IV/TDS / In 100ml NS	30%
9	Inj.Teicoplanin	400mg in 100 ml NS / BD / OD	10%
10	Inj.Ofloxacin	200mg /IV /BD	17%
11	Inj.Ciprofloxacin	500mg / IV /BD	11%
12	Inj. Levofloxacin	500mg/ IV/OD/BD	3%
13	Inj.Moxifloxacin	400mg /OD/BD	9%
14	Inj.Ceftrixone + sulbactam	1.5gm /IV/BD	23%
15	Inj.Amoxiclav	1.2gm /IV /TDS in 100ml NS	7%
16	Inj.Vancomycin	1gm /IV /BD	1.7%

Results and Discussion

Out of 1600 patients included in this study—60%--Male and 40% Female. (T-3/C-3,16,24,36). Age—Maximum patients within > 18 yrs. and < 65 yrs.—80%-85%(T-2/C-2,15,23,35). Education-- <HSC and HSC cater maximum patients, maximum number—Cultivators and laborers, (4, 5, 17, 18, 25, 26, 37, 38)

Age is a vital parameter. In old age reduced GFR, Creatinine clearance, kidney size and mass, decreased nephrons warrants reduced dose of AMAs. Amino glycosides—ototoxicity, vertigo, nephrotoxicity is a better example.

Grey baby syndromes of chloramphenicol, Kernicterus of sulfonamides are some example for babies due to immature organ system. Other parameters like Sex,

education, Occupation, Dose, Route, Duration. All have their own importance in own place in medicine. Dose varies with age, weight, body surface area and severity of condition. Eclampsia, PET, uterine rupture is female diseases. Many diseases are there those show sex, male or female preponderance. Ignorance is a serial killer; morbidity and mortality of CANCER, AIDS, TB, DM, APD, INFECTION, and TETANUS are due to ignorance, that's why it is told—KNOWAIDS for NO AIDS. Seeing private nursing homes and hospital who will Swasthya Bima yojona, other Bima cards along with Health and other insurances helping a people a lot. (C-61)

Comorbidity not only affects treatment; AMAs use differently but also influences any study and patient consequences. (C-1,7,40 / T-1). From the jungle of AMAs—Only a few groups of AMA are used to combat multi variety of infections—Amino penicillin's--cloxacillin, Ampicillin, Older penicillin's—penicillin-G, penicillin-V, and procaine and longacillins, sulfonamides, chloramphenicol, tetracycline's, erythromycins, Roxithromycins, cephalexin, cephadroxyl and many other are not in use, whereas 2^{nd} , 3^{rd} , 4^{th} and 5^{th} generations cephalosporin's, piperacillin penicillin's, carbapenims, monobactams, fluoroquinolones, linezolid's along with metronidazole are frequently used. Most used AMA—Beta-lactams. Carbapenim and Fluoroquinolones followed by.(C-9,10,11,2021,30,31,51).

To start with AMAs prescribed empirically in 100% patients, at no response or decreased response, C/S is done in—21% of cases, and AMAs changed later on as per C/S report. Aim of empirical therapy is in a way that—Early intervention will improve outcome. Many studies and trials have shown that early and adequate intervention has improved survival rate in severe sepsis and septic shocks and related conditions, thus In prophylaxis group — Single AMA —100%, Along with oral route. (C-41).Thus, in this study— Maximum patients have used—3 AMAs(C-34,42,45,54)

Higher average number of AMAs here is given in a hope to improve outcome. One for gram+ve, other for gram-ve, other for anaerobes. Some time to cover community acquired infection as well as nosocomial infections. Many times, as alast hope pour all latest; let us see patient living or dying. Also, as a rare occasion, not diagnosing, not identifying pathogen as in Empiric therapy on basisof clinical diagnosis and clinical improvements.

Thus, the higher average number of medicines for prescriptions in this study is a pointer to high level of poly pharmacy and multiplicity of AMAs, which in turn may have serious concerns of negative effects on cost, ADRs, therapeutic outcome of patients. Wards like over-use of AMAs, over-prescriptions, certainly will be applied here along with injudiciousness cannot be ruled out completely.

Although Multiple AMAs COMBINATIONS—Used in many places as boon, as life-saving, as weapon to prevent resistance, as last hope, while waiting to c/s—such as HAART, RNTCP, .MDT, APD KIT, ANTICANCER, ANTI-HTN, ANTIPSYCHOTIC, MULTIPLE INFECTIONS etc., but an injudicious use can reverse all parameters, putting in more hazardous situation, throwing the life to hopeless disaster dustbin. (v)DURATION OF AMAs USED—Minimum duration were --5-- 7 days and

after C/S—AMA changed to another 7days. Maximum duration 10—21 days Common in post-surgery in general surgery and orthopedic—7—10 days.

Whereas IV Injections like Vancomycin, Meropenim, Imipenim+ cilastatin---are supplied most frequently 65%--70% times by GOVT. ware house or central store, still 30%--35% local purchase is there which is not a small figure. Lastly IV injections like Tigecyclines, Teicoplanins, Streptogramins, Clindamicin, Daptomycins and many others, which are used less frequently are usually purchased locally 85%--88% times and only 12%--15% times only supplied from GOVT. store—which needs strong, immediate intervention for continuous supply to all. (C—62)

336 cases out of 1600 were sent to C/S. which is too poor, so our recommendation is to increase it to 100%.36 cases died, --which is a good sign and may be not due to AMA failure, but with co morbidity associated such as RTA, CVA, SNAKE BITE, HANGING, etc.

In maximum cases isolated organisms- E.coli= 52%, Staphylococcal- 19%, Pseudomonas-15%, Klebsilla-12%, Acinobactor and others—2%(C—57)

Staphylococcal--- MRSA—69%, ORSA—24%, VRSA—7%(C—58)

These organisms are susceptible to--- piperacillins, Mikacin, Carbapenims, some 3rd and 4th generation cephalosporin's, such as cefoperazone, ceftazidime, cefipime etc. and many fluroquinolones. , Vancimycin, Clarithromycin, Azithromycin.

Resistant to TC, Ampicillin, Chloramphenicol, cotrim, Erythromycin. Most common organism E.coli--- Resistant to Ciprofloxacin, Ofloxacin, Cefoperazone and Ceftriaxone, Erythromycin, Gentamicin.

Conclusion

Result showed there is a need for a better AMAs using formulary or clinical guide line, though it is available in CMDT, edited in every year. Role of Drugs and Therapeutic committee should play an important role regard to this, along with Drug utilization study, prescriptions auditing to improve drugs use in general and lifesaving managements. This is again a matter of great regret that the manydoctors have a mental tendency to use Newer and more expansive, low available drug(a matter of ego that—DR writing and know much that drug only available at Cuttack) as opposed to cost effective, proven and well established AMAs, in local counters.

Reference

1. Pharma innovation Issue no 2277-7695—www.thepharmajournal.com
2. Antibiotic prescribed in ICU-Krivoy, EL-AHAL,HADDAD
3. ICU drug utilization pattern-Kathmandu university medical journal-2005 Vol.3 no-2 issue 10,130-137
4. Singhapore medical journal-2010—51/1,28

5. Tropical journal of pharmaceutical research-dec 2012,2014,2015,11/6,999-999
6. Asian journal of Medical science-oct-dec 2014,vol.5 issue 4
7. Introduction to drug utilization research-WHO-pharmaceutical science
8. API text book of medicine-10th edition
9. Drug bulletin-Department of Pharmacology-PGIMER,April-2012,vol.37,no-2
10. CMDT-2014
11. CMDT-2015
12. Microbiology-Ananta Narayan And Paniker
13. Microbiology-SARP series-Sinha and Sribastav
14. Medical pharmacology-4th edition-Padmaja Udayakumar
15. Summary of medical pharmacology-1st edition-Sujit.K.choudhuri
16. Pharmacology,Prepratory Manual for under graduates-2nd edition-Shanbag and Shenoy
17. Indo-Americal journal of Pharmaceutical research-2015-issue no 2231-6876
18. International journal of infection control-www.ijic.info-issue no 1996-9783
19. Antibiotic prescription in clinical departments-Paper-Tertiary care teaching hospital-northen India, Kumar Abhijit, Puspabati jain
20. JK science
21. Biomed-Central journal
22. International journal of research in pharmacy science-2014,4/2:40-45
23. PHD thesis AMA in Hungerian hospital-2009
24. Anibiotics and FDA approval
25. Use of antibiotics pattern in SDA hospital-Kumasi,Ghana-may 2014
26. Raveh D, Levy Y, Schlesinger Y, Greenberg A, Rudensky B, Yinnon AM. Longitudinal surveillance of antibiotic use in the hospital. QJM. 2001;94(3):141-52.
27. Buxton IL. Pharmacokinetics and pharmacodynamics: the dynamics of drug absorption, distribution, action, and elimination. In: Brunton LL, Lazo JS, Parker KL, editors. Goodman & Gillman's the pharmacological basis of therapeutics. 12th ed. New Delhi: The McGraw-Hill Companies; 2011. p. 17- 41.
28. Nicolle LE, Bentley D, Garibaldi R, Neuhaus E, Smith P. antimicrobial use in long-term-care facilities. Infect Control Hosp Epidemiol. 1996;17(2):119-28. 16. Harbarth S, Garbino **J,** Pugin **J,** Romand JA, Lew D, Pittet D. Inappropriate initial antimicrobial therapy and its effect on survival in a clinical trial of immunomodulating therapy for severe sepsis. Am **J** Med 2003;115(7):529–35
29. A study of Evaluting appropriates of utilization pattern of antimicrobials in patients admitted in medical intensive care unit of tertiary care teaching rural hospital.-IJPPS-vol.7-issue 5-2015-ISSN-0975-1491
30. WHO- rational use of drugs-1985

31. WHO-Perspective on medicines—http://www.who.int /medicines/ 1985,2007,2012
32. The future of antibiotic and resistance—The N Eng J Med.2013;368/4:299-302
33. Infectious disease society of A. The 10/20 initiative—Infective disease society America
34. Journal of antimicrobial chemotherapy.-1996;37/5:1031—2
35. Presentations of PROF. P. K. KAR oration of IAP-ODISHA state branch conference in 2013—2014—2015.
36. Presentations of PROF. P. K. KAR oration of IAP-ODISHA state branch conference in 2013—2014—2015.
37. 2014—SCB MC&H—by PROF. R.N. Chatopadhyay—PROF. S.C. Lahiri memorial oration
38. 2015—IPS Conference—ODISHA STATE BRANCH---VIMSAR BURLA—by PROF. Suryaprakash Dhaneria—AIIMS Raipur.