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Review Article

A Review Study on Coherent Uses of Antibiotics

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Abstract
Due to predominance of infectious diseases and willing to quick recovery of patients, prescribing antibiotics by physicians are increasing rapidly in worldwide. Except this, unscheduled uses of antibiotics by patients and selling by druggist, are now becomes most frequently used drug group in the health sector. Microbial resistance in human bodies is now created global phenomenon due to mishandling of antibiotics. Now a day, inappropriate use of antibiotics has dominated sever pressures, which is highly impervious concerns. The unharmonious use of antibiotics exposes patient's adverse effects unnecessarily and raises the cost of health care services. Before choosing an antibiotic, it is very much essential to consider whether an antibiotic is necessary or not. The choice of an antibiotic would depend on the etiological agent, antibiotic factors as well as patient's history. An early assessment of a patient's response to the initial stage needs to be extremely important to a physician in antibiotics drug uses. Switching from parenteral to oral agents, Availability of oral antibiotic with good pharmacokinetic properties is encouraging to switching from parental to oral agent. Situation permits to oral therapy, is too much less expensive than parenteral. The led time of treatment for many infections is stillun known, but minimum period of treatment has been recommended for some infections. Although no antibiotics is resistance-proof but the judicious use will extend its useful life.
Keywords: *Antibiotic, Etiological, Pharmacokinetic, Coherent, Antimicrobial chemotherapy.*

Introduction

The dynamic changes of modern treatments as well as the availability and advent uses of antibiotics, human life time has almost become double in the last century. The mortality and morbidity diseases such as cholera, plague, tuberculosis, syphilis, have radically reduced. Infectious diseases are now replacing as killer number one by lifestyle disorders in developing country like Bangladesh. But unfortunately like other categories of drugs, the antibiotics are also often overused and misused. It is mandatory upon all physicians to prescribe medicines rationally, particularly in respect of antibiotics. For right medicine in the right manner for right patients, everyone should follow the "Rules of Right" while using antibiotics. Irrational use of antibiotics in clinical practice leads to several problems such as, failure of treatment, adverse drug reactions, super infections, prolongation of treatment, and increase in cost of treatment. Insufficient medical training, unavailability of diagnosis facilities, ignoring drug combinations, basic principles of antibiotics selection is the

reasons of ridiculous uses of antibiotics. Selecting the right antibiotics, one must consider the age and immune status of patient, genetic variations, history of allergies, pregnancy and lactation, severity of infection and presence of other diseases. The right choice of an antibiotic is important but it is more important how to use. For limiting the range of irrational use of antibiotics- it is includes adequate training of a physicians during foundation stage, using authentic sources of information, continuing medical education, practicing evidence-based medicine, conviction about the rational use of medicines, following standard treatment guidelines and right antibiotic use policies. However, other measures such as proper aseptic and antiseptic practice, frequent washing of hands and reducing antibiotic use are also important in rational uses of antibiotics drugs. Above all, there should be a genuine concern for the suffering patient. The bottom line is, rational use of antibiotics will not ensure good of the patient only, it will also ensure the same for us, the physicians. Antibiotics are one among the foremost commonly prescription drugs today. It has been estimated that up to a third of hospitalized patients receive a course of antibiotics and antibiotics can account for up to 40% of the hospital's drug budget. Coherent use of antibiotics is therefore extremely important as injudicious use can adversely affect the patient, cause emergence of antibiotic resistance and increase the value of health care. Numerous studies from both developed and developing countries, including Malaysia, have shown that usage of antibiotics is still far from satisfactory.[1-4]

When prescribing an antibiotic the following issues need to be addressed:

 i)   Is an antibiotic necessary?
 ii)   What is the most appropriate antibiotic?
 iii) What dose, route, frequency and duration are needed?
 iv)   Is the treatment effective?

The resistance of microbes due to overuse of antibiotics, is a global phenomenon. It concerns both the planet World Health Organization (WHO) and individual countries.[5] There are documented studies that support, beyond doubt, that restricting the misuse of antibiotics reduces resistance[6]. In order to reduce the overuse of antibiotics simultaneous training is needed for physicians, patients, druggist & others stakeholders. Studies showed that unilateral intervention either by patients themselves or physicians, have substantial results. So, it is now clear that the only way for the proper use of antibiotics is through intervention programs by both physicians and patients [7]. To improve the problem of irrational uses of antibiotics and to limiting the risk of antimicrobial resistance gradually, proper educational intervention both physicians' patients by right person with right tools are crying needs in health sector. Today antimicrobial resistance is gradually leads to a major medical and social problem. Yet, times have changed and we now need to retrain patients and physicians about the proper use of antibiotics for the health of their children and their own [8]. Etymologically, the word comes from the anti-biotic and means anti-against and biotic- used for life [9]. Antibiotics are either natural substances that are produced in nature by microorganisms or synthetic substances, which are prepared within the laboratory.

Material and Methods
The history of antibiotics uses in the health sector of Bangladesh and world scenario, extensive review of the recent literature on rational uses of antibiotics in electronic database have considered in this review study. Following key words: antibiotics, rational use, Impact of misuse and proper guide line of antibiotics uses are the major focusing areas of the study.

Discussion
The 18th November observed as **"Awareness Day for Rational Use of Antibiotics"** from

2008 at European level. Aim to campaigns of rationalizing and reducing the over-consumption of antimicrobial agents. Recipients of the message of the day are the general public, physicians and other concerned stake holders. It is to raise the awareness and to reduce the consumption of antimicrobials agents at all level of using [12]. The correct diagnosis, patient's condition, location of the infection, the severity of the microbial cause sensitivities to antibiotics, the pharmacokinetics and pharmacodynamics of antimicrobials, the side effects and price are the main elements which must be supported in every decision for their use[13]. The strategy of the administration of antibiotics should be taken into account [14, 15] as follows:

- Patients with serious bacterial infections, the number of white cells are usually increased and even excel granulocytes.
- Based on identified the location of the infection by clinical laboratory tests, like fever, burning on urination, and increased urinalysis indicates infection. [16]
- Patients who develop an infection during their hospital stay (e.g., ICU, surgery, clinical pathology) which developed the infection[17].
- Older people absorb antibiotics at a slower step. Therefore, there should be longer intervals between the doses of antibiotics like aminoglycosides (nephrotoxicity and ototoxicity) should be avoided[18, 19].
- Health professionals also got to bear in mind the subsequent basic rules for the rational management of antibiotics[20]

More than oneantibiotic atsame may act synergistically rather than competitively. The majority of infections can be treated with an antibiotic. But in some cases it is necessary to combine multiple antibiotics at a time. This is the case where a polymicrobial infection, i.e. examples intraventricular brain abscesses and infections of the lower limbs of diabetic patients [21]. Excessive use of antibiotics my increases the risk of infection with resistant micro-organisms. When many antibiotics are administered to a patient, the spectrum of microorganisms killed is increased. The destruction of the flora of the oropharynx and gastrointestinal tract are harmful to humans. The elimination of the normal flora of the indiscriminate use of antibiotics has resulted in the development of multiresistant pathogenic microorganisms.[22]

Traditionally parenteral treatment has been preferred for severe sepsis. This is probably true within the past when effective oral antibiotics with good bioavailability weren't readily available. Oral agents that are dependably absorbed and able to attain high levels in blood and tissues are now available. The use of those agents to treat serious infections deserves serious consideration. There have been studies showing that oral antibiotics are as good as parenteral antibiotics in specific infections. Oral treatment has several advantages. Oral treatment reduces the length of hospitalization and the cost of treatment. Ancillary costs associated with intravenous reconstitution, dilution fluids, syringes and needles also are avoided when oral treatment is given. It is important to remember that all fevers are not causes of infections. Infections are caused by bacteria. The majority of infections seen generally practice is of viral origin and antibiotics can neither treat viral infections nor prevent secondary bacterial infections in these patients. Even where a bacterial etiology is established, an antibiotic may not be always necessary. Many bacterial infections resolve spontaneously. Minor superficial skin infections could also be more suitably treated with an area antiseptic. Collections of pus should be drained surgically and if drainage is adequate, antibiotics are often not required. The clinician should have adequate knowledge of the pharmacokinetic properties of the antibiotic he uses. Antibiotics vary in their oral absorption or their ability to cross the blood brain barrier and these factors will affect their routes of administration. The ability of the antibiotic to realize therapeutic concentrations at the location

of infection is another important consideration thus antibiotics used for treating urinary infections should ideally be concentrated in urine. Some antibiotics have very severe toxic effects and are best avoided in certain conditions. The physicians should even be conscious of drug-drug interactions since many antibiotics can interact with other non-antibiotic drugs. Finally the value of the antibiotic is additionally of major concern. In calculating costs it's perhaps more reasonable to require under consideration the entire cost of treatment instead of just the cost of antibiotic per dose. The cost of disposables necessary for its administration, the need for monitoring antibiotic levels and therefore the expected patient's length of stay in hospital must even be taken under consideration. The patient's compliance to medication is a crucial factor for consideration within the choice of antibiotics. Patients are more likely to comply with shorter durations of treatment and a once daily dosing regimen. The successful outcome of treatment would depend considerably on the selection of the antibacterial agent. In the process of choosing an antibiotic, three main factors got to be considered; the etiological agent, the patient and therefore the antibiotic. Determination of the etiological agent depends on a mixture of clinical acumen and laboratory support. In many instances an antibiotic prescription has got to be made supported the clinical diagnosis. Clinical skill and knowledge of both universal and local sensitivity patterns alone often enables physicians to choose the correct antibiotic. Even where a bacteriology report is out there it's necessary to interpret the report. Normal flora, colonizers or contaminants must be distinguished from true pathogens. Particular attention should be paid to the way the specimen was collected and transported to the laboratory. Sensitivity results when available are at the best only a guide to treatment. Laboratory reports should be viewed within the light of clinical findings. Patients with serious bacterial infections, the amount of white cells are usually increased and even excel granulocytes. Several patient factors need to be considered in selecting an antibiotic. Age is an important factor. The very young and therefore the very old tend to be more susceptible to the adverse effects of the antibiotics. Neonates have immature liver and renal functions which affect their ability to metabolize or excrete antibiotics. Antibiotics may adversely affect growing tissues and organs in children. Elderly patients are more likely to suffer from nephrotoxicity and allergic reactions. Dosage modifications would also have to be made in those patients with hepatic or renal impairment. Genetic factors can affect the way patients metabolize the drug (eg the acerylation of isoniazid) or the risk of suffering an adverse reaction (eg glucose-6-phosphate dehydrogenase and hemolytic anemia). Antibiotics should as far as possible be avoided in pregnancy and when it's necessary to use an antibiotic, beta lactam antibiotics and erythromycin are probably the safest. A history of allergy to antibiotics should be sought before administration. Routine intradermal test doses for penicillin allergy are of little value and may even be dangerous. However, in patients unable to require oral treatment reliably parenteral therapy is clearly indicated and when doubt exist it's probably safer to commence intravenous treatment and review the treatment daily.

Duration of treatment of infections

The optimum duration of treatment of infections are considering as follows:

Infection	Minimum duration of treatment
Bone Tuberculosis(Extra Pulmonary)	18-24 months
Empyema and lung abscess	4-6 weeks
Osteomyelitis	4 weeks
Endocarditis	4 weeks
Typical pneumonia	2-3 weeks
Pneumococcal meningitis	7 days
Pneumococcal pneumonia	5 days
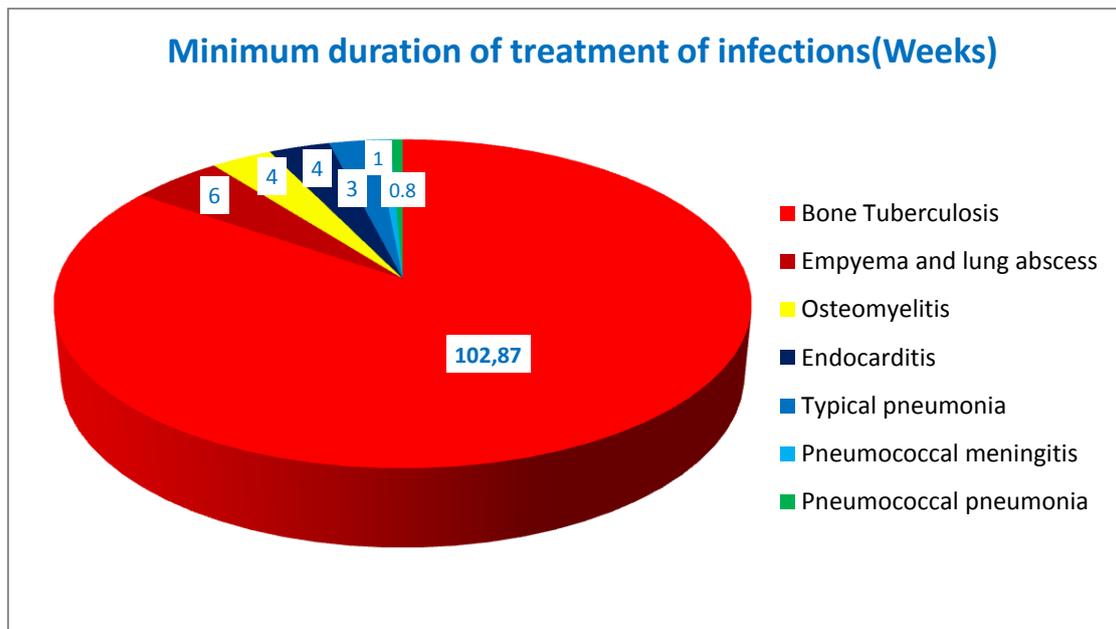
Figer-1: Minimum duration of treatment of infections

Monitoring Efficacy

A routine review of the patient's response after commencing 3 days treatment is important, in order to ensure that the patient is receiving appropriate treatment. After this review the doctor will have to decide whether to:

- Continue with the present treatment
- Changing treatment from oral to parenteral; increasing the broader spectrum antibiotic
- Increase/Decrease the level of treatment by changing doses from parenteral to oral, stopping the antibiotic if the infection has resolved; the objective of treatment is achieved or the diagnosis has been changed.

Inconsistent Microbiology Reports

If the patient is responding there is no necessity to change antibiotic even when the laboratory reports a resistant organism. The isolate in question could have been a colonizer or a contaminant. Infections may resolve spontaneously and the antibiotic could have affected the bacteria in a way that makes it more susceptible to the host's immune defenses.

If the patient's condition fails to improve, a change in antibiotic may be necessary even when the laboratory reports a sensitive organism.

Causes of non-response to antibiotics

A patient may fail to respond to an antibiotic for a number of reasons which include:

i. Etiological agent is resistant to the antibiotic
ii. Diagnosis is incorrect
iii. Dose and/ or route of administration is wrong
iv. Antibiotic cannot influence the site of infection
v. there is a collection of pus that should be drained surgically or a foreign body/ devitalized tissue that should be removed
vi. there is secondary infection
vii. antibiotic fever
viii. non-compliance of the host

Changing from intravenous to oral

The oral antibiotic should be select based on clinical and laboratory findings. Four terms have been used to describe the change from intravenous to oral treatment [23]they are:

- **Streamlining**– where the antibiotic regimen is changed specifically targeted offending pathogen. This is often commenced upon the culture and sensitivity reports like a 3rd generation cephalosporin to cloxacillin when the infection is confirmed to be staphylococcal in nature.

- **Sequential** –where the oral formulation to intravenous without loss in potency like changing from intravenous to oral ciprofloxacin

- **Step-down**- wherethe intravenous antibiotic is changed to an oral agent of the same or different class with a reduction in potency like changing from intravenous cefuroxime to oral cefuroxime axetil.

- **Switch** - where the intravenous antibiotic is changed to an oral formulation of another antibiotic without any loss in potency like changing from intravenous ceftazidime to oral ciprofloxacin

Conclusion

Antibiotic resistance may be a major clinical problem everywhere the world. It's an important tool of medical use in common medical procedures, like transplantation and chemotherapy. However, over the years, bacteria have acquired resistance to antibiotics. Resistant bacteria are often transmitted from animals to humans through the organic phenomenon or by direct contact. Many bacterial infections are getting immune to the treatments most ordinarily prescribed antibiotics. [24] The resistance of pathogenic microorganisms to antibiotics not only a drag for the patient, but also for the environment because the members of the household are populated by an equivalent pathogen and are more likely to become ill. There are now clinically significant isolates that are immune to virtually all available antibiotics. It's pertinent to notice that over the past 20 years no major new class of antibiotics has been introduced for clinical use. No antibiotic is resistant-proof. How long an antibiotic will remain to be useful depends to an outsized extent on how it's been used. So physicians should prescribe antibiotics following necessity through proper guidelines.

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