



PROFILE OF ANTIBIOTIC USE AT THE HEALTH CENTRE

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- ❖ **Abstract** :-Anti-biotic resistance may be a developing open wellbeing concern, to a great extent driven by improper anti-biotic utilize.This study aims to evaluate the antibiotic prescription model in a main medical center for a period of six months.A rescue assessment of medical records has been carried out to analyze antibiotics on frequency, antibiotics used, indicated and members of standard handling indicators. The results showed that the ratio of wide spectrum antibiotics, penicillin and cephalosporin was the most common prescription. A significant proportion of unclear prescription prescriptions or microbiological justification. The results emphasize the necessity of antibiotic and continuing education management programs for health care providers to promote the use of reasonable antibiotics and slow down anti -bacterial drug resistance.
- ❖ **Keyword** :-Antibiotic use,Antimicrobial resistance,Prescription patterns,Primary health care,Drug utilization,Rational drug use,Antibiotic stewardship, Health center ,Broad-spectrum antibiotics,Prescribing practices.
- ❖ **Introduction**:-The use of antibiotics plays an crucial role in the management and treatment of contagious diseases in health care provision. However, inappropriate prescriptions and abuse have contributed significantly to the global increase of antibiotic resistance (AMR), constituting a serious threat to public health. It is necessary to understand antibiotic models and files in a medical center to encourage sensible drug utilization ,successfully develop antibiotic management programs and improve patient results. This report aims to analyze current trends, to practice prescription and use antibiotic models. By assess factors such as antibiotics prescribed, showing that the use of users, demographic data of patients and membership status of handling indicators, this file will provide valuable information in improved areas and support evidence -based evidence to optimize the use of antibiotics.

❖ Antibiotic Usage Data:-
[January-December 2024]:-

Antibiotic Name	Number of Prescriptions	Percentage of Total	Common Indications	Route of Administration
Amoxicillin	320	25%	Upper respiratory infections, otitis	Oral
Ciprofloxacin	180	14%	Urinary tract infections, diarrhea	Oral / IV
Ceftriaxone	150	12%	Pneumonia, sepsis	IV
Azithromycin	140	11%	Respiratory infections	Oral
Metronidazole	130	10%	Gastrointestinal, gynecologic infections	Oral / IV
Others	350	28%	Various	Various

Antibiotic Name	Number of Prescriptions	Percentage of Total	Common Indications	Route of Administration
Total	1270	100%		

❖ Most Commonly Used Antibiotics (By Class and Drug):-

1. Penicillin :-

- **Examples:** Amoxicillin, Ampicillin
- **Common Uses:** Respiratory infections, ear infections, urinary tract infections (UTIs)
- **Note:** Often used in children and as first-line therapy.

2. Cephalosporin:-

- **Examples:** Cefixime, Ceftriaxone, Cefuroxime
- **Common Uses:** Pneumonia, skin infections, UTIs
- **Usage in India:** Cephalosporin are the most consumed antibiotic class (~30% of total usage).

3. Macrolides:-

- **Examples:** Azithromycin, Erythromycin, Clarithromycin
- **Common Uses:** Respiratory tract infections, skin infections, sexually transmitted infections
- **COVID-19 Impact:** Azithromycin use spiked during the pandemic.

4. Fluoroquinolones:-

- **Examples:** Ciprofloxacin, Levofloxacin, Ofloxacin
- **Common Uses:** UTIs, gastrointestinal infections
- **Caution:** Increasing resistance, especially in South Asia.

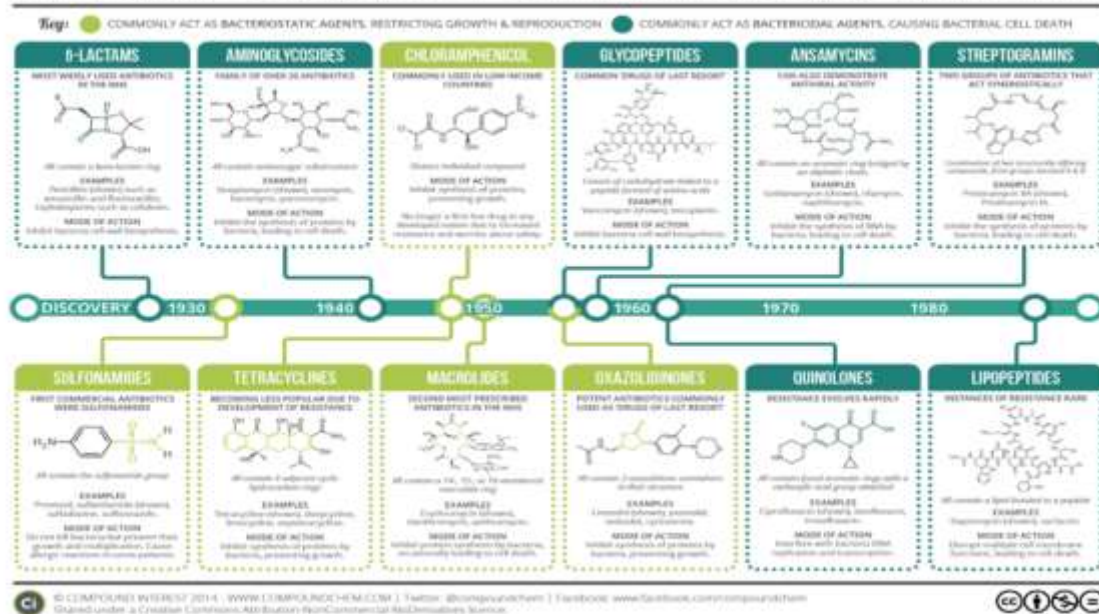
5. Tetracycline:-

- **Examples:** Doxycycline, Tetracycline
- **Common Uses:** Acne, malaria prophylaxis, respiratory infections

6. Sulfonamides:-

- **Examples:** Sulfamethoxazole-trimethoprim (Co-trimoxazole).
- **Common Uses:** UTIs, bronchitis, certain types of pneumonia

DIFFERENT CLASSES OF ANTIBIOTICS - AN OVERVIEW



❖ Antibiotics and Their Common Indications:-

Antibiotic Class	Common Drugs	Typical Indications (Diseases Treated)
Penicillin	Amoxicillin, Ampicillin	Ear infections (otitis media) Strep throat (pharyngitis) Sinus infections Skin infections
Cephalosporin	Cefixime, Ceftriaxone, Cefuroxime	Pneumonia UTIs Gonorrhea Meningitis Post-surgical infections
Macrolides	Azithromycin, Erythromycin	Respiratory infections (e.g., bronchitis, pneumonia) Skin infections (e.g., chlamydia) STIs Whooping cough
Fluoroquinolones	Ciprofloxacin, Levofloxacin	Gastrointestinal infections (e.g., traveler's diarrhea) Bone/joint infections Respiratory infections (in adults) UTIs
Tetracycline	Doxycycline, Tetracycline	Acne Lyme disease Malaria Rickettsia infections disease prevention
Sulfonamides	Co-trimoxazole (TMP-SMX)	UTIs Bronchitis Pneumocystis pneumonia (in HIV patients) Traveler's diarrhea

❖ Key Findings on Antibiotic Prescribing Patterns in India:-

1. High Prevalence of Antibiotic Use:-

- A study conducted across 20 tertiary care institutes found that 71.9% of patients were prescribed antibiotics, with 4.6% receiving four or more types. Notably, 55% were prescribed antibiotics for prophylactic purposes, and only 45% for active infection treatment. Alarming, just 6% of these prescriptions were based on identified pathogens.

2. Dominance of 'Watch' Group Antibiotics:-

- According to the WHO's AWaRe classifying, 57% of prescribed antibiotics belonged to the 'Watch' categorization, which includes broad-spectrum antibiotics with a higher possible for AMR. In contrast, only 38% were from the 'Access' group, recommended for empiric treatment of common infection .

3. Polypharmacy and Multiple Antibiotic Use:-

- In depth Care Units (ICUs), 58% of patients were prescribed multiple antibiotics. The most regularly used were from the 'Watch' group, including Ceftriaxone, Meropenem, and Cefoperazone-Sulbactam. In spite of this, only 28.7% of patients undergo culture reactivity testing .

4. Over-the-Counter (OTC) Dispensing Concerns:-

- Community pharmacies often dispense antibiotics without prescriptions. A study in South-Central India reveal that 54.1% of azithromycin and 47.5% of amoxicillin were sold OTC, with many pharmacists ignorant of AMR implication .

❖ Antimicrobial Resistance Trends:-

A. Resistance Patterns Observed:- 1. E. coli:-

- **Resistance to Fluoroquinolones:** Resistance rates for ciprofloxacin and levofloxacin have increased from 26% and 31.3% in 2017 to 38.5% and 34.5% in 2023, individually.
- **Resistance to Carbapenem :** Imipenem resistance rose from 26% in 2017 to 38.5% in 2023, while meropenem resistance increased from 31.3% to 34.5% over the same period. Down To Earth.

2. Klebsiella pneumoniae:-

- **Resistance to Third-Generation Cephalosporin:** Significant resistance observed, with sensitivity to ciprofloxacin dropping from 32% to 17.1% over seven years.
- **Resistance to Carbapenems:** Imipenem vulnerability decreased from 58.5% to 35.6%, and meropenem from 48% to 37.6%. Down To Earth.

3. Pseudomonas aeruginosa:-

- **Resistance to Carbapenems:** Imipenem resistance increased from 26% in 2017 to 38.5% in 2023, and meropenem resistance rose from 31.3% to 34.5%.
- **Resistance to Fluoroquinolones:** Ciprofloxacin resistance increased from 26% to 38.5%, and levofloxacin from 31.3% to 34.5% over the same period. Down To Earth.

4. Acinetobacter baumannii:-

- **Resistance to Carbapenems:** Resistance remained high at 88% in 2023, with the highest resistance observed in ICU patients (approximately 72%).
- **Colistin as a Last Resort:** Colistin remains the most effective treatment option, with a susceptibility rate of 72% in ICU setting.

5. Salmonella Typhi:-

- **Resistance to Fluoroquinolones:** Over 95% resistance observed, complicate treatment options for typhoid fever. Down To Earth.

B. Notable Resistant Organisms:-

1. World Health Organization (WHO):-

- **Role:** Leads global efforts against AMR.
- **Key Programs:**
 - Global Antimicrobial Resistance Surveillance System (GLASS)
 - One Health Global Leaders Group on AMR
 - AWaRe Classification of Antibiotic

2. United Nations Interagency Coordination Group on AMR (IACG):-

- **Role:** Coordinates AMR-related efforts among WHO, FAO, OIE, and UNEP.
- **Goal:** Advise global actions on AMR in a "One Health" context.

3. Centers for Disease Control and Prevention (CDC, USA):-

- **Key Programs:**
 - Antibiotic Resistance Threats Report
 - Global AR Laboratory Network

4. European Centre for Disease Prevention and Control (ECDC):-

- **Focus:** Monitoring AMR in Europe.
- **Initiatives:** European Antimicrobial Resistance Surveillance Network (EARS-Net)

C. IN Indian Organizations and Programs:-

1. Indian Council of Medical Research (ICMR):-

- **Key Initiatives:**
 - Antimicrobial Resistance Surveillance and Research Network (AMRSN)
 - National Action Plan on AMR implementation support

2. National Centre for Disease Control (NCDC):-

- **Lead agency** for India's **National Action Plan on AMR (2017-2021).**
- Promotes hospital infection control and antimicrobial stewardship.

3. Rect – Action on Antibiotic Resistance:-

- **International network**, with a South Asia hub based in India.
- Works on policy, awareness, and grassroots AMR solutions.

4. Global Antibiotic Research & Development Partnership (GARDP):-

- **Focus:** R&D of new antibiotics, especially for drug-resistant infections.
- Works closely with WHO and Indian partners like ICMR.

❖ Challenge Identification:-

- **Overprescription and Inappropriate Use:-**

What Is Overprescription and Inappropriate Use?

➤ Overprescription:-

- Prescribing antibiotics when not needed, such as for viral septicaemia like the common cold or flu.
- Using broad-spectrum antibiotics where narrow-spectrum options would suffice.

➤ Inappropriate Use:-

- Incorrect dosing, duration, or route of administration.
- Self-medication without proper diagnosis.
- Incomplete antibiotic courses by patients.
- Use of antibiotics in livestock for growth promotion or disease prohibition.

Extent of the Problem in India:-**Key Statistics:**

- According to ICMR, over 70% of hospitalized patients receive antibiotics; many are unrequired or not culture-based.
- A 2022 nationwide survey found that 57% of prescribed antibiotics belonged to the WHO "Watch" category — intended for restricted use due to high resistance potential.
- OTC sales remain common — nearly 50% of antibiotics sold in some states are without prescriptions.

Common Examples of Inappropriate Use

Scenario	Issue
Treating viral infections (e.g., flu) with antibiotics	Antibiotics have no effect on viruses
Using azithromycin for COVID-19 without bacterial co-infection	Promotes resistance in macrolides
Empiric use of carbapenem without culture testing	Leads to resistance in last-resort drugs
Incomplete prescription course due to early symptom relief	Encourages survival of resistant bacteria

- **Lack of Diagnostic Tools:-**

1. Empiric Prescribing Without Lab Confirmation:-

- In the absence of rapid diagnostic tests, doctors often prescribe antibiotics empirically—based on symptoms rather than confirmed bacterial septicaemia.
- This leads to:
 - Antibiotics being used for viral illnesses.
 - Broad-spectrum antibiotics being used unnecessarily.

2. Delayed or Inaccessible Culture Testing:-

- Blood, urine, or sputum cultures—which help identify the bacteria and its susceptibility—are often:
 - Not available in rural or small clinics.
 - Too costly or time-consuming for patients.
 - Ignored even when available (only 6–30% of patients in Indian hospitals underwent culture testing).

3. Limited Point-of-Care Tests (POCT):-

- Few clinics have access to rapid tests (e.g., for strep throat, influenza, CRP/ESR for lump).
- That delays targeted treatment and encourages blanket antibiotic use.

Why Is This a Problem?

Problem	Impact on AMR
No distinction between bacterial and viral infections	Leads to antibiotic use when not needed
No identification of the causative bacteria	Promotes use of broad-spectrum drugs
No resistance profile available	Results in use of ineffective antibiotics

Impact in Numbers:-

- show that **antibiotics are prescribed in 60–70%** of outpatient visits in India, but **<10% have lab confirmation** of bacterial infection.
- In ICU settings, **<30% of antibiotic prescriptions** are backed by culture reports.

Solutions Needed:-**Short-Term:-**

- Expand access to **basic diagnostic labs** at district level.
- Introduce **allowance or free culture tests** in public hospitals.
- Implement **clinical decision support tools**.

Long-Term:-

- Invest in **point-of-care characteristic** (like rapid CRP tests).
- Train clinicians in **diagnostic-based prescribing**.
- Develop **AI-based tools** for infection pattern prediction.

Stocks out or Limited antibiotic selections:-**Impact of Stockouts on Antibiotic Use:-****1. Unavailability of Essential Antibiotics**

- **Frequent stockouts** occur in public hospitals and healthcare centers, especially in rural areas, due to **supply chain inefficiencies, poor infrastructure, and insufficient funding**.
- When first-line antibiotics are isolated, doctors often resort to **second- or third-line antibiotics**, which may be:
 - **More expensive**
 - **Broad-spectrum**, promoting unnecessary resistance

2. Substitution with Less Effective Alternatives

- When standard antibiotics (like amoxicillin, ciprofloxacin, or penicillin) are inaccessible, healthcare providers may prescribe **less effective or inappropriate antibiotics**.
 - For example, **broad-spectrum cephalosporin** or **carbapenems** might be used for contamination that could be treated with narrow-spectrum antibiotics.
 - **Self-medication** becomes more common when patients can't access prescribed antibiotics, leading to incorrect dosages or prolonged use.

3. Delayed Treatment

- Stockout in critical conditions (e.g., sepsis, pneumonia) lead to delays in **timely administration of suitable antibiotics**, increasing mortality risk and treatment complexity.

Limited Antibiotic Selection:-**1. Restricted Availability of Newer Antibiotics**

- In many hospitals, particularly in **low-resource settings**, access to **newer antibiotics** or **advanced formulations** (e.g., newer fluoroquinolones, carbapenems) is limited.
 - **Older antibiotics** (such as ampicillin, penicillin, or tetracycline) may be prescribed more often, but **preservation levels** to these have risen.

- **First-line antibiotics** might not be available for the treatment of drug-defence infections, encouraging the use of last-resort antibiotics like **colistin** and **carbapenems**.

2. Insufficient Formulations for Specific Patient Groups

- Deficient availability of **pediatric formulations** of antibiotics (e.g., liquid antibiotics for children) and **implant forms** in outpatient or rural areas also limits treatment options.

3. Rural and Remote Area Disparities:

- **Access to a broad range of antibiotics** is particularly limited in **rural or remote areas**, leading to reliance on **local or traditional treatments**, or even self-prescribed antibiotics bought without prescriptions.

Impact on AMR and Public Health

Problem	Effect on AMR and Health Outcomes
Stockouts of first-line antibiotics	Leads to the use of second- or third-line antibiotics, increasing resistance
Lack of access to effective antibiotics	Treatment failures and prolonged infections
Limited availability of pediatric formulations	Increases the risk of inappropriate dosing in children
Substitution of antibiotics	Encourages resistance by promoting broad-spectrum use

Strategies to Address Stockouts and Limited Selection:-

1. Improving Supply Chain Management:-

- Strengthen **logistics and distribution** systems to ensure timely delivery of essential antibiotics to hospitals, crucial in rural areas.
- Implement **inventory management systems** that track stock levels and prevent shortages.

2. Improved Procurement Systems:-

- **Increase public sector procurement** of essential antibiotics through **government-funded initiatives**.
- Create **bulk-buying agreements** and **donor partnerships** to improve inexpensive and access.

3. Expanding Access to Newer Antibiotics:-

- Increase access to **new-generation antibiotics** in hospitals and healthcare provision.
- Ensure **accessible pricing** for newer antibiotics through cooperation between governments, global health organizations, and pharmaceutical companies.

4. Public Awareness and Education:-

- Educate the public on the dangers of self-prescribing and the importance of completing prescribed courses of antibiotics, extremely when **stockouts** occur.

5. Investment in Local Manufacturing:-

- Inspire **local pharmaceutical production** of antibiotics, including crucial generics, to improve accessibility and reduce dependence on imports.

Example of Stockout Data in India:-

- A 2021 study indicated that **43% of primary health centers** in India reported frequent stockouts of crucial antibiotics, including **amoxicillin** and **cephalosporin**.
- ICMR research suggests that **nearly 20% of tertiary care hospitals** in India lack access to **third-line antibiotics** needed for protection infections.

❖ Recommendations:-

Policy and Governance Recommendations:-

1. Strengthen National AMR Action Plans:-

- **National AMR Surveillance:** Expand surveillance programs like ICMR's AMRSN to monitor antibiotic use and defiance patterns across healthcare provision in both urban and rural areas.
- **AMR Policy Enforcement:** Ensure strict regulations around antibiotic prescriptions and sales, encouragement the use of guidelines for appropriate antibiotic use.
- **Public-Private Partnerships:** Governments should cooperation with pharmaceutical companies to secure consistent supplies and affordable access to crucial antibiotics.

2. Improve Regulation of Antibiotic Sales:-

- **Tighter Regulations on OTC Sales:** Restrict the sale of antibiotics over-the-counter (OTC) by enforcing laws requiring prescriptions for all antibiotics.
- **Monitoring Distribution:** Strengthen the oversight of pharmaceutical sales and distribution channels to secure antibiotics are not being over-supplied or misused.

Healthcare System Recommendations:-

1. Strengthen Antibiotic Stewardship Programs (ASP):-

- **Implement Hospital-based ASPs:** Hospitals and clinics should begin programs to optimize antibiotic use by providing proof-based guidelines and training healthcare workers on appropriate prescribing.
- **Audit and Feedback:** Regular audits of prescribing practices and feedback to clinicians can help reduce overuse and misuse of antibiotics.
- **Antibiotic Prescriber Education:** Educate healthcare professionals, especially in rural and remote areas, about the importance of diagnostic testing and appropriate prescribing.

2. Improved Diagnostic Facilities:-

- **Expand Access to Rapid Diagnostic Tools:** Increase the availability of point-of-care diagnostic tests (POCT) in rural and peripheral healthcare centers to quickly determine the presence of bacterial infections and avoid unnecessary antibiotic prescriptions.
- **Culture and Sensitivity Testing:** Ensure more widespread use of blood cultures and sensitivity testing in hospitals to tailor antibiotic therapy based on bacterial resistance profiles.
- **Telemedicine for Diagnosis:** Promote telemedicine services to provide remote consultations and reduce unnecessary prescriptions through proper diagnosis.

Improving Access to Essential Antibiotics:-

1. Address Antibiotic Stockouts:-

- **Improved Inventory Management:** Hospitals and clinics should implement advanced inventory management systems to prevent stockouts by keeping track of antibiotic utilization and ensuring timely reordering.
- **Increase Stockpile of Essential Antibiotics:** Government health departments should create strategic stockpiles of essential antibiotics, particularly first-line treatments for common infections, to address stockouts in public hospitals.
- **Optimize Procurement:** builds up centralized procurement systems to ensure bulk buying of essential antibiotics at affordable prices and distribution to smaller healthcare provision.

2. Promote Local Antibiotic Production:-

- **Support Local Manufacturers:** Inspire domestic pharmaceutical companies to produce crucialantibiotics, reducing protectorate on imports and diminish the risks associated with global supply chain disturbance.

- **Reduce Cost Barriers:** Provide inducement for local manufacturers to produce generic antibiotics to increase the availability of cost-effective medicines.

1. Public Education Campaigns:-

- **Awareness on Antibiotic Resistance:** Launch public awareness campaigns to educate the general population about the dangers of misuse and overuse of antibiotics, and the importance of adhering to prescribed treatment regimens.
- **Antibiotic Stewardship in Communities:** Inspire proper hygiene practices and the correct use of antibiotics through community health workers who can educate people on the risks of self-medication and incomplete courses of treatment.

2. Involve the Private Sector:-

- **Cooperation with Pharmaceutical Companies:** Inspire private sector involvement in AMR awareness and make antibiotics accessible to the in need populations through discounted pricing or subsidies.

- **Global Cooperation:-**

Global Health Partnerships:-

- **Collaboration with WHO, FAO, and OIE:** Build up international cooperation and adhesion to global AMR frameworks such as the WHO Global Action Plan.
- **Promote Global Surveillance Networks:** Enhance cooperation with global health bodies for AMR surveillance and research into new antibiotics and alternative treatments.
- **Access to Novel Antibiotics:** Support initiatives like the Global Antibiotic Research and Development Partnership (GARDP), which focuses on developing new antibiotics for multidrug-resistant infections, especially for LMICs.

❖ Conclusion:-

Antibiotic records in medical centers play a central role in training treatment results, guide appropriate prescription practices and reduce the growing warning of antibiotic resistance (RAM). A full understanding of antibiotic usage models, stock available, diagnostic practice and prescription behavior at the medical center is crucial to optimize the use of antibiotics.

main results of this file highlighted the important issues of unexpectedly, stocks and limited access to diagnostic tools, significantly contributing to the use of inappropriate antibiotics. The absence of fast diagnostic tools and normal culture tests makes it difficult to distinguish between bacterial and virus infections, which often leads to the use of unnecessary antibiotics. Additionally, frequent stockouts and limited selection of antibiotics, especially in remote areas, exacerbate the problem, resulting in the use of broader-spectrum or last-resort antibiotics.

Moreover, antibiotic stewardship remains a crucial component for improving patient outcomes and reducing the development of resistance. By implementing robust stewardship programs, healthcare workers can ensure that antibiotics are prescribed based on evidence and guidelines, reducing the chances of inappropriate use.

To address these challenges, a multi-prolonged approach is necessary:

- **Strengthening the supply chain** to prevent stockouts and ensuring the availability of essential antibiotics.
- **Expanding access to diagnostic tools** that can confirm bacterial infections and guide targeted treatments.
- **Educating healthcare providers and the community** on the importance of appropriate antibiotic use and resistance prevention.

- Promoting local manufacturing of antibiotics to ensure continuous availability at an affordable cost.

- **In conclusion, effectual management of antibiotics at health centers, along with improving access to crucial resources and strengthening healthcare policies, will be key to combating the growing warning of AMR and ensuring better health outcomes for the community. Addressing these issues will not only improve the efficiency of treatment but also protect the effectiveness of antibiotics for future generations.**

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