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Original Research Article

## Assessment of prescription completeness and antibiotic consumption at a rural health and training centre, Delhi

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### ABSTRACT

**Background:** The prescription audit is a useful method to assess the doctors' contribution to the rational use of drugs in a country. A prescription is considered complete when it covers all the parts of the prescription. The polypharmacy increased the risk of drug interaction, dispensing errors and confused the patients for dosage schedules. A prescription with the minimum number of drugs per prescription helps in rational pharmacotherapeutics. The objectives of this study were to describe the pattern and completeness of prescription at rural health and training center and to estimate antibiotic consumption at rural health and training center.

**Methods:** A descriptive cross-sectional study was conducted to determine the current prescribing practice at RHTC. Data were collected in the two pharmacies of the rural hospital. A total of 612 prescriptions with the last refill were considered for the assessment.

**Results:** The average number of drugs prescribed per prescription 3.53. The percentage of prescriptions in which an antibiotic was prescribed was 20%. The percentage of drugs prescribed by generic name and from an essential drug list was 71.5% and 98.7% respectively. The most commonly prescribed form of antibiotics was extended-spectrum penicillin.

**Conclusions:** All the prescriptions were complete covered parts of prescriptions. The dosing errors were present in maximum prescriptions. The WHO prescribing indicators were within the limits, an average number of drugs per prescription suggests a practice of polypharmacy. The peak of the use of antibiotics was observed in September followed by January and November. The least use of antibiotics was in December followed by June.

**Keywords:** Antibiotic consumption, ATC/DDD, Polypharmacy, Prescription audit, Prescription practice

### INTRODUCTION

A medical prescription comprises of the following parts; prescriber information, patient information, superscription, inscription, subscription, transcription or signa, and signature.<sup>1,2</sup> The desired therapeutic outcome

for each drug should be expressed when the drug is prescribed. Prescribers should review all the prescriptions for accuracy and legibility immediately after they have prescribed them.<sup>3</sup> Globally, more than half of all medicines are not prescribed, dispensed, or sold properly as per guidelines, while half of the patients usually fail to take the

drugs correctly as prescribed and one-third of the world population lacks access to essential medicines.<sup>4</sup> The average number of drugs per prescription is going up to 7.4 per visit to the health facility.<sup>5</sup> This number is much higher than the WHO recommended limit of 1.6 to 1.8. This inappropriate practice should be minimized by reducing the number of drugs per prescription and this can help in rational pharmacotherapeutics. Usually, drugs are prescribed by their generic names in the range from 0.05% to 89.8% per encounter as against the standard of 100%.<sup>6,7</sup> In most of the developing countries, 15-25% of prescriptions with antibiotics are expected where the prevalence of infectious diseases is from 34.4% to 50%.<sup>8,9</sup> Appropriate use of antibiotics is necessary to prevent the emergence of drug resistance and antibiotics should preferably be prescribed after culture sensitivity testing. Polypharmacy is a very common practice nowadays as reported by various studies.<sup>10</sup> It is of concern in patients with various co-morbidities as it increases the chances of drug interactions and adverse effects. The study reported 62.4% of prescriptions had three or more drugs prescribed which increases the risk of drug interactions, dispensing errors, and the parent/caregiver not knowing the dosage schedules.<sup>11</sup> In April 2013, WHO had released the 18th model essential drug list containing 353 formulations and 26 fixed-dose combinations (FDC's), and the National List of Essential Medicines (NLEM) of India has 348 essential drugs, including 16 fixed-dose combinations.<sup>12,13</sup> The copy of EDL is available at centers and the percentage of key drugs available was 88%.<sup>14</sup> Rational drug use is possible only to follow the good prescribing practice. A prescription audit, therefore, is a useful method to assess the doctors' contribution to the rational use of drugs in a country. There was limited data available about inappropriate prescription practices such as polypharmacy and consumption of antibiotics in the present and similar settings. The objectives of this study were aimed to describe the pattern and completeness of prescription at rural health and training center and to estimate antibiotic consumption at rural health and training center in a calendar year.

## METHODS

### Study design

The present study was a prospective cross-sectional descriptive study.

### Study setting

#### General setting

The present study was conducted at the Rural Health Training Center (RHTC) at Najafgarh, New Delhi. As of the 2011 India census, Najafgarh block was the most populous block under the southwest district of Delhi with a population of 1,365,152.<sup>15</sup> RHTC Najafgarh has been providing health services to the low socio-economic group of people of 39 villages and 11 towns of Najafgarh through

its three primary health centres and 16 sub-centres including 24×7 emergency services in PHC, Najafgarh.

### Specific setting

The training center is a subordinate office of the Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India. The RHTC, Najafgarh was set up as a health unit in 1937 and evolved for the next 50 years to become a national scientific institute. Several training activities are going on RHTC, Najafgarh i.e.; training of Medical Interns under Reorientation of Medical Education (ROME) scheme; training of ANM students with an intake capacity of 40 students per academic session and Community Health Nursing training to BSc/MSc/GNM students of various Nursing institutions like College of Nursing, Safdarjung Hospital, RML Hospital, Lady Hardinge Medical College, Holy Family Hospital, Batra Hospital, Apollo Hospital, and various other Govt./State Govt./Private institutions. The center conducts field studies aspects of Health and Family Welfare, Reproductive and Child Health, Nutrition, Health Education, and Communicable Diseases and also provides field services for research work to the various health institutions like the National Institute of Health and Family Welfare (NIHFW) and All India Institute of Medical Sciences in public health (AIIMS) in public health. OPD load per day is around 1000 patients.

### Study participants

For the present study, prescriptions of patients attending the RHTC were considered. According to the WHO document "How to investigate drug use in health facilities," at least 600 encounters should be included in a cross-sectional survey to describe the current prescribing practices, with a greater number, if possible. Following the WHO guidelines and the time constraint, the sample size was 612 prescriptions.

### Inclusion criteria

#### Prescription audit

The daily OPD prescription was included in the study. In the case of multiple refill orders, the latest refill was considered for the assessment of the prescription.

#### Antibiotic consumption

The antibiotics consumption in a year was included for tablets and capsules only.

### Exclusion criteria

#### Prescription audit

The prescription of the referred and admissible patients were excluded from the study.

### *Antibiotic consumption*

Antibiotics for local use, like creams and drops, were not included in calculating the DDDs consumed.

### **Data variables, sources of data, and data collection**

#### *Prescription audit*

The study was carried out prospectively for two months (January and February 2018). Data was collected from the pharmacy in the compound of RHTC after the medicines were dispensed. The patient interview was not conducted and only information like patients' profiles (identifiers like name, the address was not taken), parts of prescription, drug details, and dosing errors were recorded for assessment of prescription.

The prescription data were collected five days a week amid OPD working hours i.e.; between 9 am to 1 pm using a pre-tested structured questionnaire. The data collection proforma was prepared based on WHO guidelines about the investigation of drug use in a health facility, the Medical Council of India's format of a prescription order, and literature search.

### *Antibiotic consumption*

The antibiotic consumption data from January 2016 to December 2016 were extracted from the purchase bills (records) maintained by the facility and collected on a proforma, designed to contain the names of all antibiotics, the different strengths available, and the quantity procured for each antibiotic. Consumption of antibiotics was calculated using the WHO ATC-DDD tool and presented in terms of DDDs per 1000 population per day for the facility.

### **Data entry and statistical analysis**

#### *Prescription audit*

Double data was entered and validated to ensure the quality on EpiData version 3.1 and analyzed using EpiData analysis V2.2.2.182 (EpiData Association, Odense, Denmark). The continuous variable was expressed as mean (SD) and the categorical variable was expressed as frequency and percentage.

### *Antibiotic consumption*

AMC tool version 1.9.0 was used for data entry and calculation of antibiotic consumption from packages data into Defined Daily Doses (DDD). Indicator DDD per 1000 inhabitants per day (DID for consumption in the community) generated by AMC tool. Ethics approval was obtained from the National Centre of Disease Control Ethics Review Committee, Delhi, India. Identifiers such as the name and address of the patient and the name and address of the prescribing doctor were not recorded.

## **RESULTS**

### **Prescription audit**

A total of 612 prescriptions were analyzed. The median (IQR) age of patients was 25.5 (15-42) years. Out of the total, 58.3% of prescriptions analyzed from the OPD during the study period were of male patients. Most of the prescriptions (91.7%) belonged to patients who came the first time in OPD. The prescriptions generated in general, pediatrics and orthopedic OPDs were 41.8%, 22.7%, and 19.1% respectively, other prescriptions generated were from chest clinic, ophthalmology, etc.

### **Pattern and completeness of prescription**

The date of the prescription writing was mentioned in 98.7% of the prescriptions. The inscription including name, concentration, and type of medicine was written in 92.0%, 48.5%, and 93.1% respectively. The subscription part of the prescription including the direction to the dispenser and the patients was observed in 62.6% and 82.7% respectively. The signature with the date of the prescriber was mentioned in 69.9% and 12.8% respectively (Table 1). Other important information like name, age, the address was observed in 99.8%, 99.2%, and 0.5% respectively. Only 0.3% of prescriptions had mention of a history of drug allergy. Follow-up advice to the patients was not mentioned in 97.4% of the prescriptions. None of the prescriptions had any diagnosis (probable, differential, or confirmed) mentioned on them. Table 2 describes dosing errors in prescription writing. The interval between doses was mentioned in 35.6% of the prescriptions. The other important information like the route of drug administration, warning for medication, non-pharmacological measures, follow-up date, and errors of formulation of drugs were almost nil. The comparison between WHO core prescribing indicators and the findings of our study is depicted in Table 3. The average number of drugs per prescription was double that of the WHO standards. The percentage of antibiotics and drugs prescribed from the essential list was close to the WHO standards.

### **Drug profile of the prescriptions at RHTC**

Antibiotics were prescribed nearly in one-fifth of the prescriptions (19.9%). Nearly two-thirds (71.5%) of the medicines as prescribed by generic name. Fixed-dose combinations were prescribed in 28.1% of prescriptions. Most of the medicines were prescribed from the essential drug list (98.7%). The analgesic, multivitamins, and FDCs were prescribed in 52.3%, 37.1%, and 28.1% of the prescription respectively. A total of 2160 drug products and an average (mean±SD) 3.5±1.6 medicines were prescribed per prescription. Out of that, the average 1.3 medicines per prescription was with a generic name. Most of the prescriptions (82.4%) had 2-5 medicines per prescription. Most of the antibiotics (60.6%) were prescribed for 3-5 days.

**Table 1: Distributions of completeness of parts of prescriptions at Rural Health Training Centre, Najafgarh, Delhi (N=612).**

Parts of prescription	Frequency (%)
Date on the prescription mentioned	604 (98.7)
Appropriate Name of medicine mentioned	563 (92.0)
Appropriate concentration/strength mentioned	297 (48.5)
Type of medicine (tablet, capsule, etc.) mentioned	570 (93.1)
Abbreviation of medicine mentioned	75 (12.3)
Instruction to the pharmacist (No. of capsules/tablets and size of bottle) mentioned	383 (62.6)
Instruction to the patient mentioned	506 (82.7)
Follow up advice to the patients mentioned	16 (2.6)
Use of Latin abbreviation	466 (76.1)
Doctors signature present	428 (69.9)
Date below signature	78 (12.8)

**Table 2: Dosing/therapeutics errors in prescription writing at Rural Health Training Centre, Najafgarh, Delhi (N=612).**

Characteristics	Frequency (%)
Route of administration mentioned in the prescription	29 (4.7)
The interval between doses mentioned	218 (35.6)
Instructions/warning for medication use mentioned	7 (1.1)
Non-pharmacological measure mentioned	20 (3.3)
Follow update mentioned	8 (1.3)
Wrong strength present	11 (1.8)
An error of formulation of a drug (tablet instead of syrup injection or vice versa)	4 (0.7)

**Table 3: Comparison of WHO core prescribing indicators between the study result and WHO standard (N=612).**

WHO indicators	Findings	WHO standard
The average number of drugs per prescription	3.53	1.6-1.8
Percentage of drugs prescribed by generic name	71.5%	100%
Percentage of prescription with an antibiotic prescribed	19.9%	20.0-26.8%
Percentage of prescription with an injection prescribed	2.9%	13.4-24.1%
Percentage of drugs prescribed from essential drug list	98.7%	100%

Note: Average one generic medicine per prescription.

### Antibiotic consumption

The distribution of antibiotics based on ATC classification and DDD per 1000 population per day (DID) is given in Table 4. The antibiotics prescribed for systemic use by the RHTC were mainly beta-lactam and macrolides. Among the antibiotics used, beta-lactam antibiotics with enzyme

inhibitors were most (89.3%) commonly used. Figure 1 shows maximum consumption of antibiotics was in September followed by January and November. December and June were the lowest in the consumption pattern. Figure 2 shows the proportion consumption of the different formulations. Ampicillin with cloxacillin and augmentin was the most commonly used formulation.

**Table 4: Distribution of antibiotics consumption based on ATC classification prescribed at Rural Health Training Centre, Najafgarh, Delhi in a calendar year.**

Antibiotics	ATC code	DDD	Proportion of all DDD (%)	DDD/1000 population/day
Ampicillin	J01CA01	4000	3.6	0.03652968
Amoxicillin	J01CA02	5641	5.0	0.051515982
Amoxicillin and enzyme inhibitor	J01CR02	100229.7	89.3	0.915340155
Azithromycin	J01FA10	2371.5	2.1	0.021657534
Antibacterial for systemic use	J01	112242.2	100	1.025043352

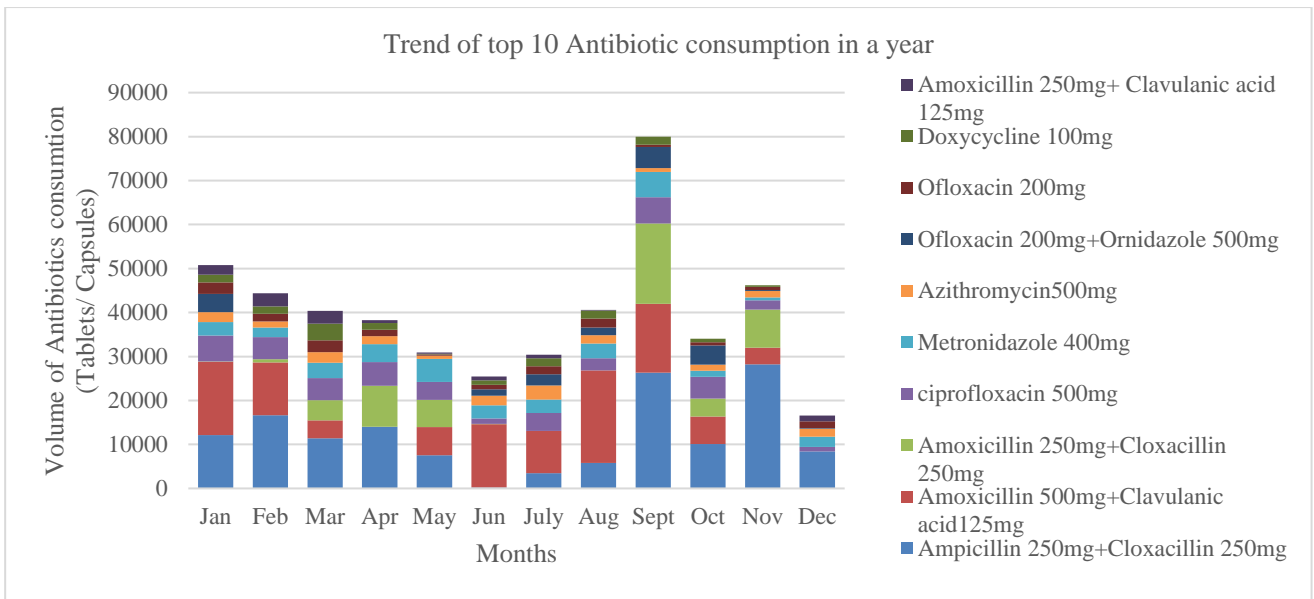


Figure 1: Top 10 antibiotics consumption trend.

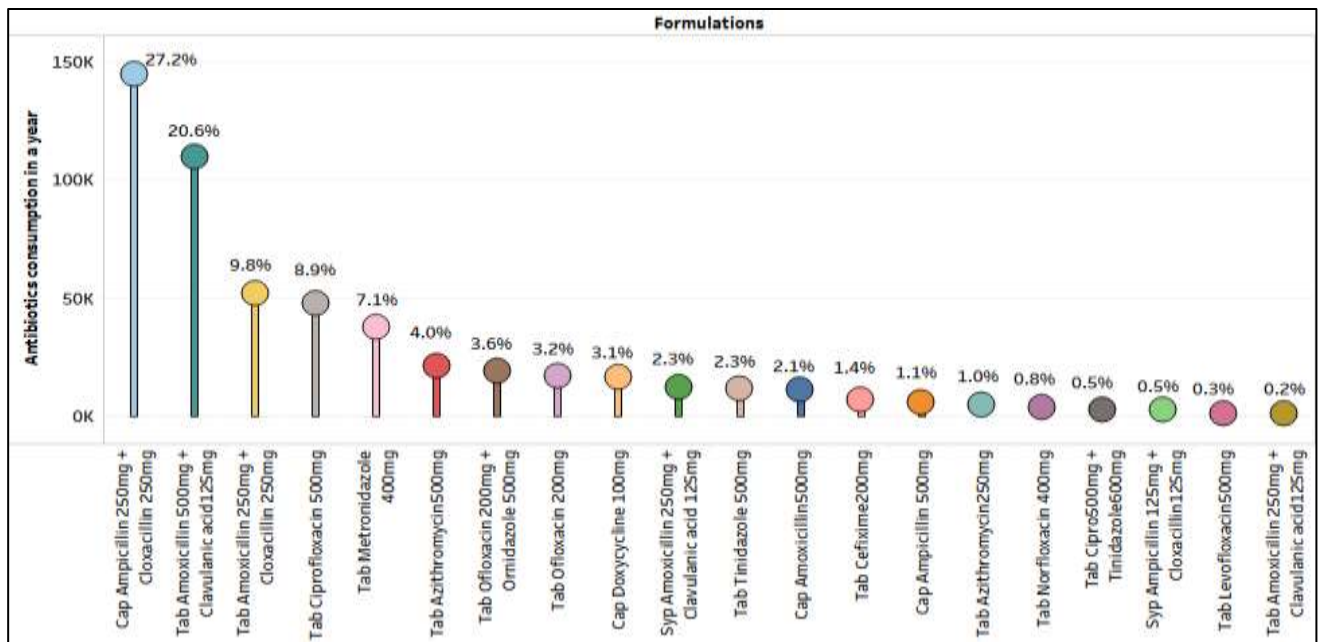


Figure 2: Percentage of the antibiotic's consumption in a year.

## DISCUSSION

The present study was conducted to focus on the completeness of prescription and pattern of antibiotics use at the rural health training center. The prescriptions were in printed form with the details of RHTC. The anatomy of prescriptions consists of several important parts includes; date and information about patients, superscription, inscription, subscription, signa, and signature. The RHTC is a training center for undergraduate medical interns and this kind of negligence in practice may affect the quality of future medical practitioners. Some interesting findings in the study are discussed below. The basic information of the patient like name and age and date of the prescription

was observed in almost all of the prescriptions. This was also observed in a study conducted by Sharif et.al in Dubai.<sup>16</sup> The address of the patient, diagnosis, and history of allergy was almost nil. Similar findings were also noticed in other studies conducted in Jammu, rural medical college in Maharashtra, and Ranchi.<sup>17-19</sup> The address is important to understand the pattern of disease in a specific area. Without a diagnosis, on prescription, it will be difficult to understand the treatment for a specific disease. Sharif et.al also noticed a similar observation.<sup>16</sup>

The important information like date, appropriate name of medicines, and type of medicine was mentioned in almost all the prescriptions (>90%). Instruction to the pharmacist,

to the patients, and prescribers' signatures were used in 63%, 83%, and 70% respectively. In contrary to our findings, Saurabh et al found opposite results in a study, conducted at a primary health center, Jhalawar, Rajasthan. This could be because RHTC is a training center and the interns are working closely with a regular staff of the rural hospital.<sup>17</sup> Follow-up advice was almost absent from the prescription.

Dose-related errors, route of administration, warning for medication, non-pharmacological measures, and follow-up data were absent in almost all the prescriptions. The prescribers were well aware of errors of formulation and wrong strength, but instruction mentioning intervals between doses found in 37% of the prescriptions. These observations coincide with the finding of Kaur et al in Ambala, Haryana.<sup>20</sup> Saghafi et al in Isfahan, Iran also observed similar results, where more than two-thirds of prescriptions had errors.<sup>21</sup>

The average number of drugs prescribed in the present study was 3.53, which is double the WHO standards and indicates the practice of polypharmacy. The studies from different parts of India suggest the average number of drugs per prescription was from 2.2 to 8.8.<sup>18,20,22-24</sup> This indicates that polypharmacy is quite common in India. It is recommended to prescribe the drugs by a generic name instead of the proprietary name, the present study indicates the 71.5% of the drugs were prescribed by a generic name. Other studies from different parts of India also support our finding of prescribing medicine with generic name.<sup>7,24-26</sup> But, some studies show that practicing generic medicine is not common and the proportion of generic medicine practice was observed in up to 25% of the prescriptions.<sup>6,20,27</sup>

The prescriptions with antibiotics were within the limit of standards recommended by WHO and this was also observed in studies from urban and rural health centers across India.<sup>18,22-24,28</sup> There were few prescriptions with injections. In other studies also, the practice of prescribing injectables in OPD is low and within the range of the WHO standards.<sup>18,19,21,22,25</sup> The prescription from the essential drug list indicator was following the standard recommended by WHO. There are some studies reported similar finding whereas studies from the tertiary hospital reported half of the prescription were from EDL and less than 50% also.<sup>6,20,27</sup> Analgesics (NSAIDs) and multivitamins were the most commonly prescribed medicines. Among the antibiotics, extended-spectrum penicillin was prescribed most frequently. The tendency of prescribing analgesics, vitamins, and extended-spectrum penicillin is also common in other studies also.<sup>16,23,25</sup> The measurement units assigned to the data were according to the ATC classification and the DDD. Extended-spectrum penicillin was more consumed than other antibiotics at the rural health training facility. The more frequent usages of extended-spectrum penicillin over other antibiotics are also suggested from studies on pharmacy records in Delhi,

India, and from the secondary level hospital in the United Kingdom and Lebanon.<sup>29-31</sup>

## CONCLUSION

Writing diagnosis, follow-up advice, doses, non-pharmacological instruction, and date of the signature by prescriber was not common. The proportion of the antibiotics and all medicines were mostly from the essential drug list of the center. The DID of the extended-spectrum penicillin and proportion was higher than the other medicines. The study explained the prescription practice and antibiotic consumption at the peripheral training center. The sample size of auditing of the prescription was following WHO standard and DID calculate by authentic AMC tool. The interns were working under different faculty and we couldn't identify the prescription written by them exclusively. The study was limited to a public sector rural health training center and the result may differ from secondary or tertiary health centers as well as an inpatient. The study highlighted the poor or deficient prescription writing practice. There is a need for capacity building of the interns and staff to improve the quality of prescription writing. There is a need to analyze the antibiotics consumption with microbiological data to identify the sensitivity of the medicine.

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