

Original Research Article

Investigation of drug use at primary health centres in Nashik, Maharashtra, India

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ABSTRACT

Background: By recognizing the need to promote rational utilization of medicines, the World Health Organization (WHO) in collaboration with the International Network for Rational Use of Drugs (INRUD) developed a set of core indicators. This study aimed to investigate drug use based on it.

Methods: The study was performed in Primary Health Centers (PHC) in Nashik District, Maharashtra, India. Prescriptions data for the last one year from PHCs were sampled out retrospectively. Outpatients from PHCs were selected, observed and interviewed for the patient-care indicators, prospectively. Pharmacy personnel was interviewed for the facility-specific indicators. The data were analyzed; results and conclusions were drawn.

Results: The average number of drugs per prescription was 3.48 (SD=0.36). The percentages of drugs prescribed by generic name and from Essential Drug List or formulary were 83.98% and 68.97% respectively. The percentages of encounters with antibiotics and injections were 60.33% and 50.83% respectively. The average consultation and dispensing times were 3.89 minutes and 58.28 seconds respectively. 98.19% of the prescribed drugs were actually dispensed. 67.27% of the dispensed drugs were labelled. The percentage of patients' knowledge of the correct dosage was 87.78%. The percentage availability of the EDL or formulary was 100% and of the key drugs in the stock was 85.71%.

Conclusions: The need for improvement in prescribing practices can be encouraged by devising strategies such as training to physicians, rewards systems, etc. There should be plans to increase staff members for a particular working period and to educate patients with healthcare, hygiene, medicines' compliance and common diseases.

Keywords: Facility-specific indicators, Patient-care indicators, Prescribing indicators, Prescription (encounter), Rational drug use

INTRODUCTION

According to the World Bank data, India has a population of 1.35 billion; out of it, 65.97% constitutes a rural population in 2018.¹ India has a vast health care system, but there are differences between rural and urban areas and between public and private health care. In India state government provides healthcare services and health education, while the central government offers administrative and technical services. Considering rural areas in India which is having a shortage of medical

professionals and 74% of doctors are in urban areas that serve the 28% of the whole population.² Additionally, there exists a shortage of infrastructure of health services in rural areas.

At the national front, some initiatives were taken by the government to improve healthcare access to a large population of India, includes The Twelfth plan (National Health Mission), Public-Private Partnership (PPP), National Rural Health Mission (NRHM) etc. Drugs and health activist organizations as Medico Friend Circle

(MFC), All India Drug Action Network (AIDAN), and Low-Cost Standard Therapeutics (LOCOST) work constantly for advocacy for rational drug policy.^{3,4}

Most of the Indian population is economically backwards or at mid-level. This population first approaches to Government Health Facilities, District/ Civil Hospital or Primary Health Centre. Irrational prescribing and drug use pattern definitely affect the large population. This study is performed at the primary and government health setup which is outlined further with the 'Zilla Parishad' (ZP). ZP is for every district of each state constituting Community Health Centre (CHC), Primary Health Centre (PHC) and thereafter sub-centre. District Health Officer (DHO) is a head person at ZP of the district. Medical Officers (MO) of health centres at tehsil (taluka) and village level work under DHO. Along with him pharmacy officer, medical team, women health officer, nurses, laboratory technicians are the part of the Healthcare system. Also, Nashik, the region under this study, is the third-largest district in Maharashtra in terms of population.⁵

According to guidelines and previous studies, the following are the consequences of irrational drug use; Overuse of medicines for a patient (poly-pharmacy), failure to prescribe in accordance with clinical guidelines, inappropriate use, self-medication's consequences results in terms of poor patient outcomes and adverse drug reactions. Lack of access to medicines and inadequate doses can result in mortality, serious morbidity and for childhood infections and chronic diseases, like hypertension, diabetes, epilepsy and mental disorders. Overuse of antimicrobials often in non-bacterial infections leads to increased antimicrobial resistance. Overuse of injections when oral formulations would be more appropriate; non-sterile ones leads to blood-borne diseases. Increase inappropriate patient demand, reduction in access and attendance rates because of medicine stock-outs and loss of patient confidence in the health system can be the consequences of irrational overuse of drugs.^{6,7} To overcome this issue of irrational drug use, initially, it is important to identify and measure the factors responsible for irrational drug use. For improving rational drug use it is important to promote the driving factors. 'WHO' in collaboration with 'INRUD' contributed with twelve core drug use indicators specifically in 1993 to measure behavioral aspects of health providers in primary health facilities in a reproducible manner.⁷ They are standardized and can be implemented according to the nature and design of the study, types of Recordkeeping systems available in health facilities.

Investigating drug use at a health facility is an initial step towards the promotion of rational use of medicines. Achieving all optimal core drug use indicators will ultimately contribute to rational drug use. The study of drug utilization provides information about current treatment practices, performances of individual facilities which may be useful in future for comparison of any study of this kind with that of other parts of Maharashtra or India as a whole as a baseline data. The indicators can also serve as simple, efficient tools to identify potential

problems in drug use and to prioritize and focus subsequent efforts to correct these problems. Specific interventions developments and measuring their effectiveness on drug use can be achieved by data collected by such methods.⁸

METHODS

Study design and study site

Retrospective and prospective cross-sectional (basic) observational study design were used in the study based on WHO core drug use indicators. The study was conducted for 3 months from December 2018 to February 2019 at three purposively selected PHCs from Nashik district. viz. PHC A (Amboli, Trimbak); PHC B (Dhondegaon, Girnare); and PHC C (Talegaon, Dindori).

Study variables

Dependent variables: The WHO core drug use indicator values.

Independent variables: Patients' demographics parameters.

Selection criteria

For Retrospective prescribing Data

Inclusion criteria

- OPD case paper/ prescription data from the last twelve months

Exclusion criteria

- Incomplete or missed data
- Referral or vaccination cases

For Prospective patient-care data

Inclusion criteria

- General outpatients of all age groups

Exclusion criteria

- Those who refused to give consent and were not willing to participate

Sample size consideration and sampling techniques

For prescribing indicators

Considering WHO recommendation, 200 prescribing encounters were taken from each PHC. So, a total of 600 prescription papers were investigated in the study. A systemic random sampling technique was used to select

200 outpatients' prescriptions retrospectively from each PHC by considering a time period with the distribution of a number of encounters.

For patient-care indicator

Thirty outpatient attendants were selected from each PHC. So, a total of 90 outpatient attendants and their prescriptions were investigated in the study. They were sampled by convenient sampling technique prospectively.

For health facility indicators

The Model list of key drugs recommended by 'WHO' for assessment of drug availability was selected to analyses facility-specific indicators.^{7,9}

The study was carried out in three PHC's in Nashik, after approval from the local Ethics Committee and permission at the study site. The validated 'data collection forms' according to WHO guidelines were used for data collection of the total twelve core drug use indicators. For assessing the five core prescribing indicators i.e. the average number of medicines prescribed per encounter, Percentage of medicines prescribed by generic name and from a formulary, Percentage of encounters with an antibiotic and injections prescribed were measured and calculated as per 'WHO' guidelines.⁷ For the patient care indicators, patients visiting the PHC for diagnosis and treatment of general health problems were invited to participate in the study. Before enrolment of patients signed, dated and written informed consent was taken from all subjects after providing enough information of study. The stopwatch was used to determine the contact

time of health care providers with patients (consulting and dispensing time). Data regarding patient's knowledge of correct dosage was collected through face to face interview and recorded as 1 or 0 for each patient (all or none principle) along with the use of the patient's prescription as reference. The core patient care indicators were measured and calculated as per the guidelines only.⁷ For assessing the two core facility indicators according to 'WHO', pharmacy personnel who dispensed the medicines at the counter of PHC were interviewed to obtain the required information.⁷

Statistical analysis

The optimal values for the prescribing, patientcare and facility indicators were adopted from previous studies. Zhang and Zhi Index system was used to compare the drug use performance of the PHCs.^{10,11} The Statistical Package for Social Sciences (IBM SPSS Statistics for window, NY: IBM Corp.) and Microsoft Excel 2010 were used for the analysis of data. Descriptive statistics such as Frequency, percentages, average/ mean, standard deviation were measured. Tabulation, charts and diagrams were used to present the data.

RESULTS

In this study, the percentage of generic prescribing and drug dispense are near to optimal. Percentages of antibiotics and injections used were found to be very high. The average times spent for consultation and dispensing were very short in the PHCs involved in the study (Table 1,2).

Table 1: Prescribing indicators values.

PHC	Total patients	Average no. of drugs per encounter	% of drugs prescribed by generic name	% of encounters with antibiotic prescribed	% of encounters with an injection prescribed	% of drugs prescribed from EDL
A	200	3.08	92.68	57.00	47.00	69.92
B	200	3.59	84.28	60.00	43.00	69.12
C	200	3.79	76.65	64.00	62.50	68.07
Mean	600	3.49	83.98	60.33	50.83	68.97
SD		0.37	8.02	3.51	10.29	0.93

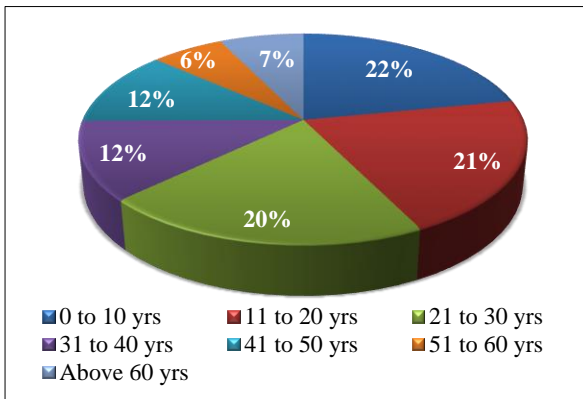
Table 2: Patient- care indicators values.

PHC	Number of patients	Average consulting time(min)	Average dispensing time (sec)	% of drugs dispensed	% of drugs adequately labelled	% of the knowledge of correct dosage
A	30	3.40	60.50	100.00	89.71	93.33
B	30	4.47	69.33	96.59	71.76	86.67
C	30	3.80	45.00	97.96	63.54	83.33
Mean	90	3.89	58.28	98.19	67.28	87.78
SD		0.54	12.32	1.72	13.38	5.09

Table 3: Facility specific indicators.

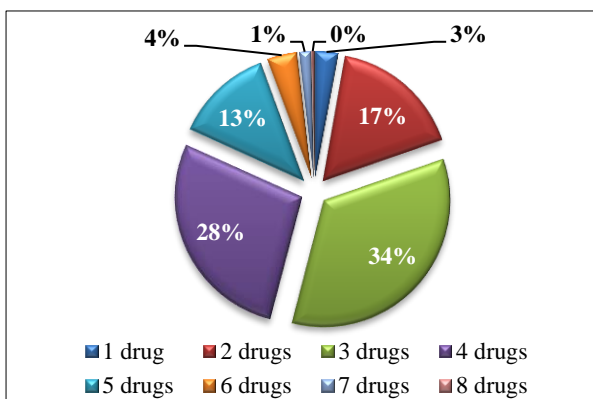
List of drugs for testing drug availability	PHC a-in stock (0/1)	PHC b-in stock (0/1)	PHC c-in stock (0/1) *
Oral rehydration salt	1	1	1
Cotrimoxazole tablets	1	1	1
Procaine penicillin injection	1	0	0
Paediatric paracetamol tablets	0	1	1
Chloroquine tablets	1	1	1
Ferrous salt + folic acid tablets	1	1	1
Mebendazole tablets	1	1	1
Tetracycline eye ointment	0	0	0
Benzoic acid + salicylic acid ointment	1	1	1
Iodine, gentian violet or local alternative	1	1	1
Acetylsalicylic acid or paracetamol tablets	1	1	1
Vitamin a	1	1	1
% Availability	85.71	85.71	85.71
Sd	0.38925	0.38925	0.38925

0= no,1= yes



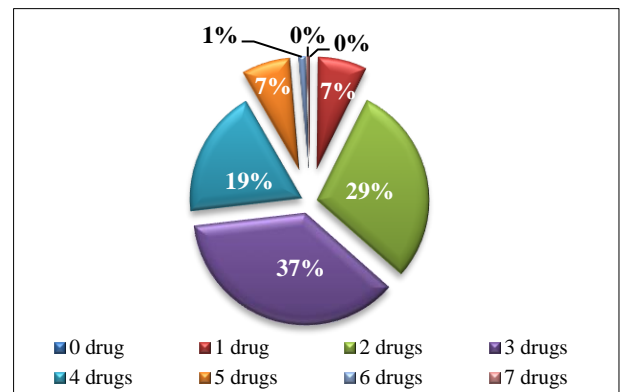
Legends-Each colour indicates the percentage of patients of the respective age group.

Figure 1: Age distribution of total 600 patients.



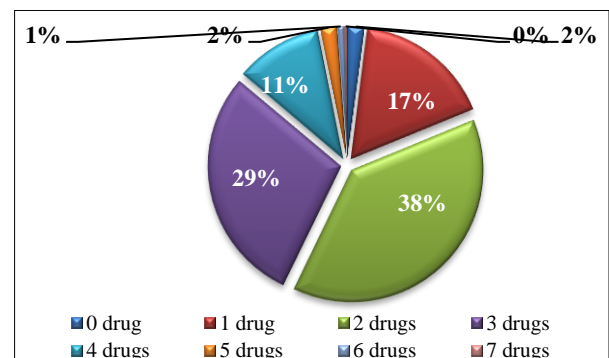
Legends-Every colour indicates percentage of prescriptions containing respective number of drugs out of total 600 prescriptions. Example; red colour indicates 17% of the total prescriptions were having 'two' number of drugs.

Figure 2: Distribution of number of drugs in total prescriptions.



Legends-Every colour indicates percentage of prescriptions containing respective number of drugs prescribed generically out of total 600 prescriptions. Example; red colour indicates 7% of the total prescriptions were having 'one' drug prescribed generically.

Figure 3: Distribution of number of drugs prescribed generically in total prescriptions.



Legends-Every colour indicates percentage of prescriptions containing respective number of drugs from EDL out of total 600 prescriptions. Example; red colour indicates 17% of the total prescriptions were having 'one' drug from EDL.

Figure 4: Distribution of number of drugs from EDL in total prescriptions.

The recording system and stock management in the selected PHCs were found to be efficient and most of the key drugs were in stock. The facility-specific indicators are optimal i.e. the percentage availability of the formulary was 100% (Standard Deviation SD=0.0) and of the key drugs in the stock was 85.71% (SD=0.38) (Table 3). Age distribution of patients in the PHCs showed that 1 to 10 years age interval patients were mostly visited PHC and thereafter 11 to 30 years age groups patients (Figure 1). Greatest numbers of prescriptions were contained 3 numbers of drugs (207 out of 600 prescriptions i.e. 34.5%) (Figure 2).

Similarly, maximum numbers of prescriptions were with 3 numbers of drugs prescribed generically (220 out of 600 prescriptions i.e. 36.67%) (Figure 3) And 2 numbers of drugs from EDL/formulary (230 out of 600 prescriptions i.e.38.33%) (Figure 4).

All three PHCs showed equal results with regard to facility-specific indicators. Overall, the Index of Rational Drug Supply (IRDS) values showed that the PHC A was ranked first amongst all the PHCs according to WHO's core drug use indicators (Table 4).

Table 4: Performance indicators for selected primary health centres of Nashik District, Maharashtra.

Core drug use indicators	Optimal values	PHC A Index	PHC B index	PHC C index
Prescribing indicators				
Avg. no. of drugs prescribed per encounter	1.6-1.8	0.5528	0.4857	0.4485
% of medicines prescribed by generic name	100	0.9268	0.8428	0.7665
% of encounters with an antibiotic prescribed	20.0-26.8	0.4105	0.39	0.3656
% of encounters with an injection prescribed	13.4-24.1	0.3989	0.4360	0.3
% of medicines prescribed from EDL	100	0.6992	0.6912	0.6807
IRDP (average of all prescribing indicators' index value)	1	0.5976	0.5691	0.5122
Rank		1	2	3
Patient-care indicators				
Avg. consultation time (min)	>9	0.34	0.4467	0.38
Avg. dispensing time (secs)	>89	0.6722	0.7703	0.5
% of medicines actually dispensed	100	1	0.9659	0.9796
% of medicines adequately labelled	100	0.8971	0.7176	0.6354
% Patients with knowledge of correct dosage	100	0.9333	0.8667	0.8333
IRPCDU (average of all patient-care indicators' index value)	1	0.7685	0.7535	0.6657
Rank		1	2	3
Facility-specific indicators				
Availability of EDL/ formulary to practitioner	100	1	1	1
% Key medicines available	100	0.8571	0.8571	0.8571
IRFSDU (average of all facility-specific indicators' index value)	1	0.9285	0.9285	0.9285
Rank		1	1	1
IRDS (average of all indicators' index value)	1	0.7240	0.7058	0.6456
Overall rank		1	2	3

DISCUSSION

Drug use is a complex subject influenced by factors such as health budget, prescriber's experience, drug availability, knowledge of dispenser, cultural factors and many more. The main objective of this study was to find out drug use as per the WHO core drug indicators; i.e. prescribing indicators, patient-care indicators and health facility indicators. These WHO indicators were used to investigate drug use that may help to resolve the problem regarding drug therapy. This study reports; a higher number of drugs prescribed per prescription, over-use of antibiotics and injections, moderate rate of prescribing by generic name while short consulting and dispensing

times. Also, the moderate percentage of prescribing from the formulary was there. Nearly 85% of key drugs were available in stock. Patients' knowledge of correct dosage was 87.7%. To note the positive side, all the PHCs had the EDL copy. Mostly all the prescribed drugs were actually dispensed but comparatively fewer drugs were labelled. The implications of these findings are discussed in terms of previous studies, practice and research.

Prescribing indicators

'WHO' has designed core prescribing indicators specifically and purposively. They facilitate to understand prescribers' attitude and prescription pattern

in a primary healthcare system. The results of this study revealed that the average number of drugs per encounter was 3.48. This value is higher than the optimal range of 1.6-1.8 drugs per encounter. This indicator's value for studies in Ethiopia was 2.34, which are less than values in Pakistan (i.e.3.4).^{11,12} This study value is much higher than Ethiopia and it is similar to the result in Pakistan. Indian studies showed that the value in different regions of India was much higher than optimal value and it is similar to this study. They lied between 2.3 to 3.7 for

Arunachal Pradesh, Uttar Pradesh, Delhi, Mumbai and South Indian regions (Table 5). The only exception for them was the study in Goa showed that the value was 1.8 which complied with the optimal range.¹³ Overall, 'this study and most of the studies in India' showed higher average numbers of drugs per encounter, which might be caused by many reasons. For example; the degree of polypharmacy, lack of continuous training to prescribers, patients' attitude and noncompliance. Overuse of drugs may lead to bad implication on the healthcare system.

Table 5: Other study reports on core drug use indicators.

Reference number	[16]	[17]	[15]	[18]	[19]	[14]	[13]	[8]	[11]	[12]
Prescribing indicators										
Number of drugs per encounter	3.7	3.2	3.02	2.91	2.9	2.7	1.84	2.37	3.4	2.34
% of drugs prescribed by generic name	2.5	46.2	85.8	10.0	73.4	9.6	0.05	3.36	71.6	90.6
% of encounters with antibiotics	22	72.8	52.5	19.7	39.6	1.6	31.8	42.4	48.9	57.8
% of encounters with injections	7.2	3.9	10.8	2.2	0.2	42.9	18.0	11.4	27.1	10.9
% of drugs from EDL	99.8	45.7	88.3	22.5	90.3	95.6	99.6	-	93.4	-
Patient-care indicators										
Average consulting time (min)	-	3.7	2.8	-	-	3.7	-	10.0	2.2	4.61
Average dispensing time (min)	-	3.1	1.2	-	-	2.3	-	47.3	0.63	1.02
% of drugs actually dispensed	-	11.6	86.7	-	76.9	96.6	-	46.0	90.9	75.7
% of drugs completely labelled	-	56.2	73.3	-	18.5	99.3	-	-	100	3.3
% of patients' knowledge of correct dosage	-	64.5	51.7	-	80.8	89.3	-	47.7	62.1	75.7
Facility specific indicators										
% Availability of EDL or formulary	-	-	87.5	-	-	100	-	71.2	100	100
% availability of key drugs	-	-	93.3	-	85.0	88	-	69.0	82	66.7

'WHO' recommends the highest possible number of drugs prescribed by generic names and from EDL/formulary. (i.e. optimal value is 100%). The results revealed that the percentage of drugs prescribed by generic name and from EDL was 83.98% and 68.97% respectively. There was much difference in these two indicators' value for private and public i.e. government health setup (according to previous studies). By considering this factor studies in different regions of India showed variable results between 1-99%. Studies in public health setup like Primary Health Centre or Civil Hospital showed more than 50% to 100% drugs were prescribed by generic name, according to non-Indian studies. The factors responding too low or a much higher percentage were also variable. Influence of extensive promotional activities of pharmaceutical companies on prescribers' decisions or lack of legal binding to prescribe generic medicines may lead to variable findings. But in the case for the Primary health centers, the practice with EDL/formulary and generic prescribing was better comparatively. The driving parameters can be prescribers' attitude, Drug availability and supply in PHC.

An antibiotic(s) prescribing pattern, which mostly gets affected by prescribers' behavior, knowledge, attitude,

availability of specific medicines, patients' compliance for proper administration, the spread of infectious diseases and antibiotics resistance. The percentage of encounters with an antibiotic(s) prescribed according to this study was 60.33%. The proposed optimal range is 20.0- 26.8 %. Non-Indian studies are showing similar results to this study, which are much deviated from the optimal range. According to Indian studies in the region of South India, Uttar Pradesh, Mumbai and Goa, the percentages were in optimal range or near to optimal range. While the study in West Bengal, Delhi and Arunachal Pradesh showed much deviation with the optimal range similar to this study (Table 5).

The percentage of encounters with an injection(s) prescribed according to this study was 68.97%. This is much higher and deviated from the optimal range of 13.4-24.1% and also from all other Indian and non-Indian studies (Table 5). The percentage 'near to this study' was in a study in South India i.e. 42.9% which was most deviated from optimal value amongst all other Indian studies. Prescribers' attitude, patients' belief of instant and complete relief, availability of alternative modes of therapy may be the affecting reasons.

Patient-care indicators

Factors such as staffing pattern, geographic location, socioeconomic levels of surrounding communities, may stand out as important. The results of this study revealed that the average consultation time was 3.89 minutes whereas optimal value is >9 minutes. The short consultation time reported in this study could be correlated with the workload of health staff, appropriate interaction between doctor and patient, a number of patients visiting. The optimal range is considered for proper history taking, physical examination, proper health education, interaction with patients. The result of the same by other studies were found that 4.61 min in Ethiopia, 2.2 min in Pakistan. Results in India are similar to this study except for 10.00 minutes in the study in Arunachal Pradesh.

The current study demonstrated that the average dispensing time was 58.28 seconds (optimal range >89 sec). The finding is comparable to the findings from different parts of India (Table 5). The finding in Ethiopia was 61.12 and 38 seconds in Pakistan.^{11,12} Understanding of dispensary personnel about their responsibilities, interaction between dispensers and patients, higher patients load, labelling condition could be the affecting factors.

This study reported the percentage of drugs actually dispensed was 98.19% (optimal value 100%). The study showed comparatively highest value than most of the other Indian and non-Indian studies (table 5). Studies in Pakistan showed that 90.90 % and in India, 96.6% in South India which are similar to this study.^{11,14} The main reason for this could be a good supply/availability of drugs in stock. 67.27% of the dispensed drugs were actually labelled (Optimal Value 100%). Here there is much variation in results in both Indian and non-Indian studies. Studies in Pakistan and South India are showing optimal results of 100% and 99.3% respectively, which are somewhat higher than this study.^{11,14} But results in Delhi, India are similar to this study.¹⁵

Patients' knowledge of correct dosage is an indicator which is highly significant for the correct administration of drugs prescribed, to avoid overuse and prevent an adverse event. This can also be affected by dispensing practices, attitude and interaction with healthcare providers. According to this study, its percentage was 87.78. (Optimal value is 100%). It is comparatively higher than all other Indian as well as non-Indian studies, with the exception of 89.3% in South India.¹⁴ Likely, studies in Ethiopia, Pakistan and Mumbai, India showing more than 60% of patients' knowledge of correct dosage.

Facility-specific indicators

The study revealed that all the PHCs had a copy of EDL or formulary according to proposal norm. (Optimal value is 100%). Availability of EDL copy was 87.5% in Delhi, 100% in South India and 71.20% in Arunachal Pradesh,

according to reporting of other studies in India. In this study percentage of key drugs in stock were 85.71% (optimal value is 100%) whereas 66% and 82% for studies in Ethiopia and in Pakistan respectively. However, for studies in different regions of India ranges between 69-93%. (Table 5) Both the facility-specific indicators of study in South India are similar to this study. Also, all other Indian studies range similar facility indicators which are comparable to this study. Better management, staff contributions; focus on key drugs and supply system could be the drivers for optimal findings.

Limitations of the study was that the study didn't include complementary drug use indicators. In this study quality of treatment can't be determined as 'How was the diagnosis done' and 'why specific drugs were prescribed' is not considered. In order to explain to them, other techniques are needed.

CONCLUSION

Government is providing optimum facility services to PHCs, however the need for improvement in prescribing practices can be encouraged by devising strategies such as training to physicians, rewards system etc. To maximize patientcare, one should come with plans to increase staff members for a particular working period and to educate patients on healthcare, hygiene, medicines' compliance and common diseases for better patient counselling.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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