Original Article

Drug prescription pattern of outpatients in a tertiary care teaching hospital in Tamil Nadu

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Abstract

Purpose: Drug use prescribing indicators advocated by the World Health Organization (WHO) are important tools for assessing the degree of polypharmacy, use of generic medicines, and to evaluate if there is inappropriate use of antibiotics or parenteral medications besides estimating the adherence to the essential drugs list. This study aimed to assess the WHO prescribing indicators in prescriptions given at the medical outpatient department (OPD) in a private medical college hospital in South India.

Materials and Methods: The study was done prospectively from patients when they presented for consultation at the medical OPD at our tertiary care center. Prescriptions were randomly chosen to be analyzed for the WHO prescribing indicators from September 2016 to April 2017.

Results: A total of 700 prescriptions were analyzed and the average number of drugs per prescription was 2.955 ± 1.32. 32.57% of prescriptions had fixed drug combinations and a similar value of 36% was obtained for prescriptions containing more than one drug for the same indication. Amongst the prescribing indicators, generic prescribing was appallingly low (6.42%). In contrast, antibiotic prescribing and prescription of injections showed an appreciably rational trend with 15.42% and 8.14%, respectively. Furthermore, the prescription of the drugs enlisted in the essential drugs list was determined to be 90.67%.

Discussion: The need for increase in generic prescribing and augmenting the adherence of prescriptions to the essential drugs list has been identified. This can be accomplished by multimodal approach that includes regulatory changes, conducting educational programs directed at attitudinal change among current doctors and imparting modifications in medical curriculum so as to inculcate the culture of abiding by the best prescription practices among budding doctors.

Conclusion: This study has delineated the requisite for pertinent changes in current prescribing trends in a tertiary care teaching private colleges.

Keywords: Generic drugs, polypharmacy, prescribing indicators, rational prescribing

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INTRODUCTION

Evaluation of drug prescription pattern is an important aspect of patient care, which also serves as a measure of the quality of care provided. A recent systematic analysis has ascertained that prescribing quality is a dimension requiring constant evaluation.[1] The rational use of drugs is imperative for an effective and efficient health-care system. However, irrational drug use, considered as a global menace

Access this article online	
Quick Response Code:	Website: www.picronline.org
	DOI: 10.4103/picr.PICR_86_17

How to cite this article: Shanmugapriya S, Saravanan T, Rajee SS, Venkatrajan R, Thomas PM. Drug prescription pattern of outpatients in a tertiary care teaching hospital in Tamil Nadu. Perspect Clin Res 2018;9:133-8.

is especially prevalent in the developing countries due to irrational prescribing, dispensing, and administration of medications.[2] Such irrational prescribing is unethical and greatly decrease the standard of drug therapy in addition to resulting in widespread health hazards such as increased incidence of adverse effects, drug interactions, and emergence of drug resistance, especially with antimicrobial therapy.[3] The World Health Organization (WHO) has reported that more than half of all medicines are prescribed, dispensed, or sold inappropriately.[4]

Prescription pattern monitoring studies are tools for assessing the prescribing, dispensing, and distribution of medicines prevailing in a particular locale. The main aim of such studies is to facilitate rational use of medicines.[5] The drug use indicators have been developed by the WHO in coordination with international network for rational use of drugs as an endeavor to measure the extent of rational prescribing.[5,6] According to the WHO, core drug use indicators are divided into three categories, namely, the prescribing indicators, patient care indicators, and the quality of care indicators. These are highly standardized indicators which do not need national adaptation. Although they do not measure all aspects of drug utilization which require intensive methodologies, extensive and varied sources of data, the core drug use indicators provide a simple tool for quickly and reliably assessing a few critical aspects of pharmaceuticals use in health care.

The drug use indicators collected in a cross-sectional survey or measured at different points in time to assess the change in performance are typically measured within a defined geographic or administrative area, either to describe drug use at a given point in time or to monitor changes over time. This study was designed to assess the drug prescribing practices at the medical outpatient department at our tertiary care center which is a teaching medical college hospital, using the five WHO prescribing indicators which include the average number of drugs per patient encounter, percentage of drugs prescribed by generic name, percentage of encounters with an antibiotic prescribed, percentage of encounters with an injection prescribed, and percentage of drugs prescribed from essential drugs list or formulary.[6] These WHO indicators would be instrumental in identifying the degree of polypharmacy, extent of generic prescribing, whether usage of antibiotics and parenteral medications are appropriate besides estimating the adherence to the essential drugs list.[6,7]

Treatment of diseases by the use of essential drugs, prescribed by their generic names, has been emphasized by the WHO and the National Health Policy of India. It has been highlighted that the prescription monitoring studies are imperative to bridge the areas such as rational use of drugs, pharmacovigilance, pharmacoeconomics, pharmacogenetics, and evidence-based medicine.[5] In India, it is currently essential to conduct studies on prescribing patterns in every state and utilize the data generated by such studies to improve the quality of patient care with the primary aim of promoting rational use of drugs.

Appraisal of the WHO prescribing indicators in a private health facility is less common compared to public sector hospitals. Moreover, the level of health care, wherein this study is undertaken adds to its significance. Unlike most Indian studies, the current study is aimed to analyze the entire list of prescribing indicators advocated by the WHO in a teaching medical college hospital. In such a scenario, not only are the prescribers and patients but also the medical students from one of the stakeholders who imbibe the culture of rational prescribing. Thus, this study would throw light on deficiencies which require appropriate and sustained interventions to avoid being carried onto the next generation.

Noteworthy, most studies encompass prescription monitoring of a particular group of drugs such as antiepileptics, antimicrobials, antiasthmatics, and antihypertensive drugs[5] rather than evaluating all the prescribing indicators irrespective of the diagnosis like our study, which would enable capturing a wider picture of the current trends. Medicine is an ever-evolving science and it is important to understand that conducting such prescription monitoring studies periodically as a measure to ensure rational drug use is imperative.

MATERIALS AND METHODS

The study protocol was approved by the Institutional Ethics Committee (Approval number: 16/261), The research was conducted as a cross-sectional study in the outpatient medical department (OPD) of our tertiary care teaching hospital in South India. Based on the WHO guideline of including at least 600 patient encounters, we chose a sample size of 700. This study was done prospectively from the patients when they presented for consultation at the OPD after obtaining a written informed consent. Prescriptions were randomly chosen to be analyzed for the WHO prescribing indicators over 8 months from September 2016 to April 2017. Two well-trained clinical pharmacists were involved in collecting data on prescribing indicators. Each prescription was regarded as single-patient encounter for calculation of the required parameters. Prescriptions of patients attending medical OPD and treated on outpatient

basis for their ailments were included irrespective of the comorbidities. Data were collected on the demographic details of age, gender, diagnosis, and the treatment prescribed which were mentioned in the prescription. The prescribing indicators were studied in accordance to the standard guideline advocated by the WHO.[6]

1. Average number of drugs per encounter: Average was calculated by dividing the total number of different drug products prescribed, by the number of encounters surveyed. Whether the patient actually received the drugs was not considered relevant in calculating this indicator
2. Percentage of drugs prescribed by generic name: percentage was calculated by dividing the number of drugs prescribed by generic name, by the total number of drugs prescribed and expressed as a percentage
3. Percentage of encounters with an antibiotic prescribed: Percentage was calculated by dividing the number of patient encounters during which an antibiotic was prescribed, by the total number of encounters surveyed and expressed as a percentage
4. Percentage of encounters with an injection prescribed: percentage was calculated by dividing the number of patient encounters during which an injection was prescribed, by the total number of encounters surveyed, multiplied by 100
5. Percentage of drugs prescribed from essential drugs list or formulary: percentage was calculated by dividing the number of products prescribed which were on the essential drugs list or local formulary, by the total number of products prescribed and multiplied by 100.

RESULTS

The data were entered in Microsoft Excel 2007 and analyzed as frequency distributions and percentages to assess the prescribing indicators. A total of 700 prescriptions were analyzed over 8 months from September 2016 to April 2017. The demographic distribution of patients mirrored a rising trend with increasing age as a higher proportion of patients (295) were 60 years and above (42.1%). Among the rest, those aged 40 years and above were 36.7% (257) and 21.2% (148) were <40 years. Both males and females were almost equal in proportion with 357 males and 343 females. Diagnosis were multiple and diverse. Hence, categorization into communicable and non-communicable diseases showed that majority (68.6%) had non-communicable diseases contrary to those with communicable diseases (31.4%). It was found that a total number of 2069 drug products had been prescribed in the 700 patient encounters, and thus, the average number of drugs per prescription was 2.955 and the standard deviation was 1.32. Moreover, the median number of drugs per prescription was 3, which unlike the mean, would not be unduly influenced by the outliers. Overall, the study revealed a higher value for this indicator than the reference standard [Table 1]. Analyzing the patient encounters lacking the data for specified variables, it was found, 647 (92.42%) prescriptions did not have any generic names, whereas only 17 patient encounters lacked at least one drug from essential drugs list. It was evident that 84.57% prescriptions did not have any antibiotics and likewise, a high percentage of 91.85% did not have any injections prescribed.

It was interesting to find that among the 2069 drug products prescribed, the highest percentage (10.95%) of prescribed drugs were supplements which ranked first followed by the antidiabetic, antiplatelet, hypolipidemic, and anti-hypertensive drugs, whereas the overall percentage of antibiotics prescribed was only 15.42%, and hence lower in comparison to the former groups of drugs [Table 2].

The number of prescriptions with fixed drug combinations was 228 accounting for 32.57% [Figure 1]. The most common one being prescribed was analgesic combination (paracetamol with ibuprofen followed by tramadol with paracetamol) for pain relief. A similar value of 36% (252 out of 700) was obtained for prescriptions containing more than one drug for the same indication. Interestingly, prescriptions analyzed showed that patient encounters with two drugs (27.73%) were equal in proportion to those that included three drugs (27.28%) accounting for a total of 55% prescriptions falling under either of these two categories. An analogous high percentage (23.98%) was also recorded for prescriptions with four drugs in the treatment regimen [Figure 2].

With respect to generic prescribing, this study recorded a very low percentage of 6.42% indicating that current prescribing pattern of clinicians favored prescribing by

Table 1: Comparison of the World Health Organization prescribing indicators observed with standard reference range

Indicator	*n*	Average/percentage (SD)	Standard reference range/optimal value
Average number of drugs per patient encounter	2069	2.955 (1.32)	1.6-1.8
Percentage drugs prescribed by generic names	133	6.42% (0.34)	100%
Percentage patient encounters with an antibiotic	108	15.42% (0.38)	20.0%-26.8%
Percentage patient encounters with an injection	57	8.14% (0.27)	13.4%-24.1%
Percentage drugs from essential drugs list	1876	90.67% (1.31)	100%

SD=Standard deviation

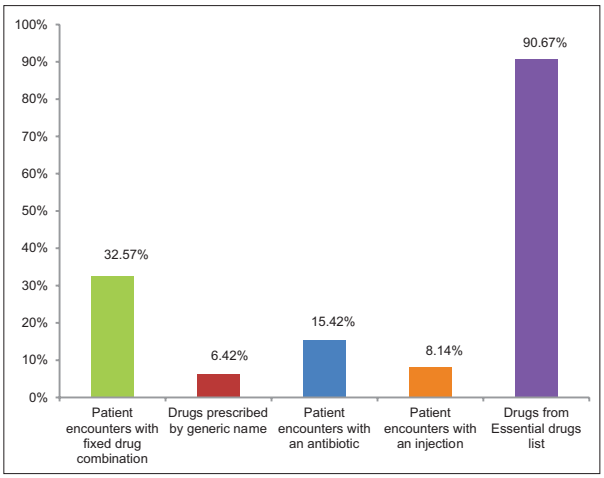

Figure 1: Measured percentages of prescribed fixed-drug combinations and the World Health Organization prescribing indicators

Table 2: Frequency distributions of commonly prescribed drugs

Name of the drug groups commonly prescribed	Name of drugs commonly prescribed	Sum (%)
Antidiabetic drugs	Metformin	161 (7.78)
Antiplatelet drugs	Aspirin	52 (2.51)
NSAIDS	Paracetamol	86 (4.15)
Supplements	Calcium and Vitamin D3	60 (2.89)
	Iron and folic acid	112 (5.41)
	Multivitamins and folic acid	55 (2.65)
Antiulcer drugs	Pantoprazole	99 (4.78)
	Ranitidine	73 (3.52)
Antihypertensive drugs	Amlodipine	36 (1.73)
	Telmisartan	21 (1.01)
Antibiotics	Levofloxacin	10 (0.48)
	Trimethoprim + sulfamethoxazole	8 (0.38)
	Azithromycin	7 (0.33)
	Amoxicillin + clavulanate	7 (0.33)
	Cefpodoxime proxetil	6 (0.28)

NSAIDS=Nonsteroidal anti-inflammatory drugs

brand names rather than using the generic ones. The percentage of patient encounters in which an antibiotic was prescribed was only 108 (15.42%) [Figure 1]. The highest prescribed antibiotic was levofloxacin followed by co-trimoxazole with azithromycin, amoxicillin-clavulanate, and cefpodoxime proxetil being next to the quinolone and the sulfomethoxazole-trimethoprim combination which were widely prescribed at our center during the study period [Table 2]. The most common indication for the antibiotic use was found to be a variety of respiratory infections ranging from pharyngitis, sinusitis to pneumonia.

About 8.14% of patient encounters had an injection being prescribed, and an overall 90.67% of adherence to essential drugs list was evident [Figure 1].

DISCUSSION

It is well known that the indicators of prescribing practices measure the performance of health-care providers in several key dimensions related to rational use of drugs. The indicators were assessed in our study based on a sample of 700 patient encounters that took place at the OPD in our hospital. The data that were collected prospectively by analyzing the prescriptions demonstrated that in our teaching hospital, the average number of drugs prescribed per encounter was 2.955. Comparison to the standard range advocated by the WHO for this indicator which estimates the degree of polypharmacy revealed that the measured average was much higher than the reference range of 1.6–1.8 considered as ideal.[6] This is also reflected in the high percentage of fixed drug combinations prescribed in addition to the use of combination of different drugs for a single indication in one patient encounter. In a similar study done in Goa,[8] the average number of drugs prescribed was 1.8 which was found to be lower than our finding and that obtained in other Indian studies on prescribing indicators by Upadhyay *et al.* (3.76) and Raj *et al.* (4.98).[9,10] In contrast, similar studies of drug use pattern in other countries such as Sudan (1.4), Zimbabwe (1.3), and Ethiopia (1.9)[11] have shown that the average number of drugs per encounter estimated in our study was higher.

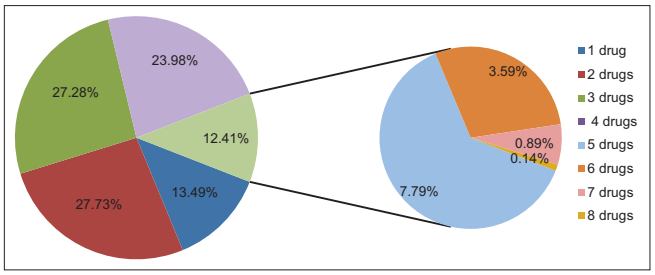

Figure 2: Percentage distribution of number of drugs in the prescriptions

The high average number of drug products per prescription exceeding the WHO reference range is demonstrative of a high degree of polypharmacy prevalent in our study locale. The reasons that could be attributed to this is the change in the epidemiological trend of rampantly increased prevalence of non-communicable diseases such as diabetes, hypertension, dyslipidemia, and coronary artery disease which are often coexistent contributing to the need for treating multiple disease entities in the same patient simultaneously.[12] Concomitance of such cardiometabolic conditions in a single patient further entails the requisite for prescribing more than a single drug for a given clinical indication which is often resistant to treatment in the face of multiple diseases presenting concurrently. Our study also stands testimony to this fact since a high proportion of participants (68.6%) had the diagnosis of non-communicable disease with diabetes ranking highest with 34.4%

Another rationalization for the high percentage of polypharmacy lies in the fact that currently there is a demographic shift with an increase in the aging population in our country.[13] This epidemiological transition is further responsible for perpetuating the current scenario prevailing. About 42.1% of the study population also was aged >60 years signifying that the greater proportion of aged population contributed to the high polypharmacy.

However, the high prescription rates for supplements recorded in our study remain unjustified and arise from two important factors potentially contributing to the irrational prescribing practice. First, the influence of pharmaceutical industries which vigorously promote supplementary products among doctors by providing biased information supporting the need for prescribing such products. Second, patients misconceptions on the health-promoting effects of supplements resulting in their persuasion and demand for such products in their prescriptions. However, the best approach toward such patients is to educate them rather than giving in to their false ideations.[3]

The percentage of drugs prescribed by generic name in our study was 6.42% which is too low compared with the standard derived to serve as ideal, which is 100%.[6] Wang *et al*. found that higher the doctor's education and training experience, the proportion of drugs that they prescribed by generic names showed a decrease.[14] Moreover, attitudinal differences have also been shown to exist among consultants in low- and middle-income countries compared to those in high-income countries.[15]

The likely explanation for the low percentage of generic prescribing could be due to repeated and persuasive promotion of the propriety products by pharmaceutical companies and in certain instances, clinicians are compelled to concede to the insistence of affluent patients demanding innovator drugs for treatment.[16] Another plausible cause for this stems from the presumed belief among a subset of prescribing physicians that the bioavailability differences between generic and brand drugs could adversely affect the therapeutic outcomes.[17] Such prejudices could unfavorably affect the tendency of prescribing generic drugs. Finally, the role played by industries in hindering generic prescribing by offering financial perks to prescribers cannot be underestimated.[18] Literature evidence states that generic prescribing is better in public centers in comparison to that in private sector hospitals.[16]

It is important to increase awareness on generic prescribing considering the high treatment costs incurred by the practice of prescribing by brand names. Nicolosi and Gray investigated the cost impact of generic and proprietary prescribing among chronic disease patients in South Africa and their findings indicated that "all generics were more than 40% cheaper, per defined daily dose per month, than the brand version."[19] An analysis of facility-based medicines price data from 17 countries by Cameron and Laing,[20] found that an average of 9%–89% could be saved by switching from brand to generic equivalents. Shift in the trend favoring generic prescribing is warranted and this can be implemented by an integrated approach of training the medical students who are future prescribers on the pharmacoeconomic significance of this practice in addition to conducting continuing medical education programs for clinicians with the focus of alleviation of their apprehension on bioequivalence regarding the use of generic drugs. Moreover, a variety of strategies have been recommended by experts to overcome the barriers to genetic prescribing and the most vital of these include enforcing statutory obligations, setting clear guidelines for generic prescribing, and legally de-incentivizing prescribing by propriety name.[21]

Interestingly, we found that the number of antibiotics prescribed (15.42%) as well as the number of encounters with an injection (8.14%) was low, indicating a positive trend toward reduction in indiscriminate use of antibiotics and unnecessary injections. An obviously rational prescribing pattern is noted for both these indicators in our tertiary care center. Noteworthy, our study duration was 8 months, and hence, the study would not have comprehensively captured the seasonal variation in antibiotic prescription pattern due to differential incidence rates of infections at different times of the year.

About 90.67% of drugs prescribed conform to the WHO essential drugs list which is lower than that obtained in other studies in India (99.6%), Tanzania (96%), and South Ethiopia (96.6%), whereas higher in comparison to that in countries like Nepal (88%). This could be attributable to the lack of sensitization of the prescribers and lack of rules enforced to mandate prescribing from the essential drugs list. Akin to generic prescribing, this indicator also has been demonstrated to vary between the private and public sectors[22] indicating the need for the practice of prescribing from essential drugs list to be more widely adopted especially in private sector hospitals.

One of the strengths of the study is that it was done prospectively using the patient prescriptions attending the OPD rather than the data being collected retrospectively from case records which is often the design adopted in prescription pattern studies as it is much easier to

collect information from patient records. In addition, the prospective design of this study positively ensures eliminating duplication of data, while retrospective analyses cannot be claimed to be completely devoid of bias such as exclusion of incomplete data from poor record keeping unlike prospective evaluation.

A major limitation of our study is that it was done in a single center which is a private medical college hospital with limited sample size, and hence, the data cannot be extrapolated to other centers lacking similar characteristics like public or government hospitals and health-care centers.

This study implies the need for implementing interventions such as programs, workshops, and symposia to impart awareness on rational prescribing among the medical fraternity. Thus this research has not only identified the pitfalls in current prescription practices, but in addition, has recommended the potential solutions to weed out irrational prescribing trends encountered.

CONCLUSION

Our study on prescribing indicators has clearly delineated that the prescribing practices for antibiotics and injections are appropriate and rational; conformity to essential drugs list is considerably good, though scope for improvising is certainly evident. However, the degree of polypharmacy is higher than the standard. Generic prescribing is also an element that needs to be vastly improved on. Therefore, appropriate measures to reduce polypharmacy and increase generic prescribing by clinicians have to be implemented by the administrative team and policymakers to ensure rational and safe prescribing.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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