Prescribing patterns among medical practitioners in Pune, India*

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In 1975 the World Health Assembly requested the Director-General to advise Member States on the selection and procurement of essential drugs corresponding to their national health needs. We report here the results of a study of the prescribing patterns and rational drug utilization of medical practitioners of Pune, an industrial city in the west of India, which was undertaken by analysing their prescriptions. The results indicated a lack of rational prescribing practices by a significant number of practitioners. Fixed-dose formulations dominated the prescribing pattern and generic prescriptions were negligible, with prescriptions for essential drugs accounting for less than 60% of the total number of drugs prescribed. More than 30% of prescriptions were irrational, with the probability of such prescriptions increasing significantly with the number of drugs per prescription. A study of sources of drug formulations available for prescription revealed significantly more fixed-dose combinations, many of which were irrational. These results call for intervention strategies to promote rational drug therapy in India.

Introduction

Although drugs alone are not sufficient to provide adequate health care, they do play an important role in protecting, maintaining, and restoring health. In recent years there has been a tremendous increase in the number of pharmaceutical products in the marketplace; however, there has been no proportionate concomitant improvement in health (1). This has increased the cost of health care. In developing countries, the problem is magnified by limited economic resources and a lack of organized drug policy. Clearly, optimal use of these resources means that the drugs that are available in a given setting must be restricted to those proven to be therapeutically effective, have acceptable safety, and satisfy the health needs of the population. Such drugs are termed essential drugs. A large segment of the population needs essential drugs for its health care management. In 1977, WHO published the first Model List of Essential Drugs and subsequently has attempted to improve drug-use practices in developing countries. An essential tool in this respect is an objective and standard method of describing drug-use patterns and prescribing behaviour in health facilities through the use of prescription analysis (2). Recently, health authorities in India have published an exhaustive national essential drug list of 279 items, consisting of 162 universal drugs (24 complimentary agents) and 117 items for secondary health care (3). The present article reports the results of a prescription audit in Pune, India, to quantify any correlation between the prescribing behaviour of medical practitioners and the concept of essential drugs and to identify prescribing errors using WHO indicators (4). The study quantifies the current situation, developmental trends, and time course profile of drug usage and provides guidelines for rational use of drug therapy and of essential drugs.

Materials and methods

Selection of indicators

The following basic drug-use indicators (core indicators) were used in the study.

— average number of drugs prescribed per encounter;

— percentage of drugs prescribed by generic name;

— percentage of encounters when an antibiotic was prescribed;

— percentage of encounters when injections were prescribed;

— percentage of drugs prescribed from essential drug list; and

— percentage of fixed-dose combination versus single agents.

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These indicators are highly standardized in terms of their definition and facilitate the quick and reliable assessment of drug use in health care (4). Use of these indicators facilitates identification of particular drug-use issues that may subsequently need to be examined in more detail.

Sampling frame

Prescriptions written by general practitioners, consulting physicians, and dentists in the Pune region were collected over the period February — November 1996. The prescribing doctors were unaware that their prescriptions were being audited. Prescriptions written by nursing attendants or transcribed verbal prescriptions were not included in the data analysis. A copy of the original prescription was used for analysis of basic drug use and of medication errors (5). Confirmed errors in the medications prescribed by doctors during the study period were reviewed and entered on a data sheet. Errors were defined as medication prescribed at an inappropriate dose, frequency, or duration, prescription of redundant agents, or prescribing drugs that might produce undesirable interactions.

Index of the prescription product

Current index of medical specialities (CIMS). The April 1996 issue of the *Current index of medical specialities* (6), which lists more than 4000 drug formulations, was evaluated to identify the ratio of fixed dose formulations to single agents and irrational formulations based on their ingredients.

Top selling proprietary medicines. Details of India's top selling proprietary medicines by value and volume are published every month in the *Operation research guide* (ORG) (7). We evaluated also these brands based on their ingredients and rational utility.

Statistical analysis

Data generated during the study were analysed statistically using the Minitab software package (Minitab release 8.2). Correlation coefficients, Z-scores, and confidence limit intervals were calculated.

Results

The study sample consisted of 1105 valid prescriptions that met the inclusion criteria. These prescriptions were for a total of 3111 drugs, the average number of drugs per prescription being 2.81 ± 1.22 (range, 1–13). The prescribers' profiles and the number of prescriptions written by them are shown in Table 1. Evaluation of the prescribing indicators (Table 2) suggests polypharmacy, as evidenced by the high proportion of prescriptions for two and three drugs per patient encounter.

As the number of drugs per prescription increased, the proportion of patient encounters that led to prescribing antibiotics, injections, vitamins and fixed-dose formulations also increased. The proportion of encounters that led to prescription of essential drugs remained in the range 25–66%.

The proportion of patient encounters that led to the prescription of generic drugs ranged from 3% to

Table 1: Profile of the prescribers in the study

Prescriber	No. of prescriptions
General practitioner	331 (29.95)[a]
Consultants	440 (39.81)
Allied medicine graduate	224 (20.27)
Dentist	110 (9.95)
Total	1 105 (100)

[a] Figures in parentheses are percentages.

Table 2: Distribution of encounters by type of drugs prescribed

No. of drugs per prescription	Total no. of prescriptions	% of encounters that prescribed:					
		Antibiotics	Generic drugs	Injections	Fixed-dose combination	Vitamins and tonics	Essential drugs
1	121 (10.9)[a]	59	9.9	1.6	38	22	41
2	406 (36.7)	72	7.0	2.0	48	33	25
3	352 (31.8)	71	3	13	49	40	49
4	144 (13.03)	75	4	22	51	66	66
5–7	64 (5.7)	>90	18	30	51	81	60
≥8	18 (1.62)	>90	20	>90	90	90	60

[a] Figures in parentheses are percentages.

20% (Table 2). Analysis of irrational prescriptions (Table 3) indicated that the probability of such prescriptions significantly increased with the number of drugs per prescription. Irrational prescriptions accounted for 30–40% of total prescriptions.

The most frequently prescribed fixed-dose formulations listed in *CIMS* were those for gastrointestinal and central nervous system complaints as well as tonics (Table 4). There were more than 50 irrational prescriptions for tonics. A total of 38 of the top 100 products listed in the *ORG* are anti-infectives, with tonics accounting for the 16 top sellers. Substances listed on WHO's Model List of Essential Drugs were present in only 40% of top-selling drugs, while 42 products were combinations, 64% of which were deemed unnecessary.

Discussion

Drug utilization studies commonly employ prescription analysis, with the average number of drugs per prescription being the most frequently used measure (*8*). Our study found an average of 2.8 drugs per prescription, which is a little high. We recommend that the limit be 2.0 drugs per prescription and that justification for prescribing more drugs than this should be required because of the increased risk of drug interactions (*9*). Antibiotics were the most fre-

quently prescribed drugs in the present study (mean proportion of encounters when they were prescribed, 75%) and similar observations have been made in other developing countries (*10, 11*).

Our study reveals that the prescription of antibiotics increased with the number of drugs per prescription, which could contribute to irrational prescribing (*12*). The frequency with which combinations of antimicrobials were prescribed in our study is high and greater reflection is needed by doctors before writing a prescription for two or more antimicrobials. Prescriptions for tonics and vitamins increased with the number of drugs per prescription, and contributed to the polypharmacy and increased costs. Prescription of generic drugs was conspicuous by its low use, since most of the drugs available were proprietary. Fixed-dose formulations play a limited role in drug therapy, but our findings indicate an increase in the frequency of prescriptions for such formulations that was proportional to the number of drugs per prescription. Prescription of injections increased markedly when the number of drugs per prescription was greater than four. Items on the WHO Model List of Essential Drugs were prescribed on 30–60% of prescriptions. Use of essential drugs offers many advantages including cost, safety, and effectiveness. At present, however, they are not being prescribed sufficiently frequently by doctors and this needs to be improved.

Table 3: **Analysis of irrational prescriptions**

No. of drugs per prescription	No. of prescriptions	% of prescriptions that were irrational	Z score
1	121	30	— (0.2448–0.3832)[a]
2	406	29	0.2810 (0.2551–0.3509)
3	352	39	−1.2916 (0.3549–0.4405)
4	144	29	0.3290 (0.2295–0.3537)
5–7	64	40	−1.0087 (0.3055–0.5069)
≥8	18	55	−1.6150 (0.3634–0.7476)

[a] Figures in parentheses are the 95% confidence interval.

Table 4: **Evaluation of prescription formulations listed in *Current index of medical specialities (CIMS)* (ref. 6)**

Drug category	No. of formulations	Fixed-dose formulations/single agents	No. of irrational formulations
Gastrointestinal	304	216/88	20
Cardiovascular	287	68/219	10
Central nervous system	410	329/281	42
Endocrine	85	15/70	2
Chemotherapy	337	87/250	9
Vitamins and tonics	220	190/30	50

Our findings highlighted also that there was a high incidence of irrational prescribing practices (up to 55% of prescriptions; range, 29–55%) that increased with the total number of drugs per prescription. Analysis of the index of formulations (*CIMS*) indicated that most of the drugs formulations are available in fixed doses, which may prompt prescribers to use them. Irrational formulations need to be identified and weeded out. Critical analysis of the sales of proprietary medicines in India reveals that antibiotics and vitamins occupy the top position and that only 40% of the top sellers contain essential drugs. A large number of unnecessary combination formulations are sold in India, with resources regularly being wasted on prescriptions for tonics, nutrients, and enzymes.

Nonrational prescriptions usually indicate lack of training on the part of the prescriber. The lack of proper training in pharmacotherapeutics is well recognized (*13*). Increased emphasis on and monitoring of therapeutic prescription practice and training programmes may improve rational use of medications and reduce the frequency of prescribing errors (*5*). Because many of today's prescription drugs were approved for use only over the last 10–15 years, doctors who graduated from medical schools before these drugs became available may not have received proper training on their correct use (*14*). In one study, doctors identified as being at risk for inappropriately prescribing antibiotics were randomly assigned either to meet with trained counsellors or to receive only a mailed brochure. The group who met the counsellors significantly reduced their number of inappropriate prescriptions (*15*). There is also evidence that well-designed educational interventions in the form of continued medical education or tutorials are useful in this respect (*16, 17*). University-based educational outreach (academic detailing) is a newer approach that has been evaluated as part of a controlled trial and found to be highly effective for correcting prescribing problems (*18*). Such educational outreach activities by universities, medical centres, and professional associations may go a long way to improving prescribing behaviour and better drug utilization especially in developing countries.

The promotion of optimal drug prescribing and safe drug use needs to become a high national priority in India.

Résumé

Pratiques de prescription médicale à Pune, Inde

En 1975, l'Assemblée mondiale de la Santé a prié le Directeur général de conseiller les Etats Membres sur le choix et l'achat de médicaments essentiels correspondant à leurs besoins nationaux en matière de santé. Cet article rapporte les résultats d'une étude sur les pratiques de prescription et l'utilisation rationnelle des médicaments chez des médecins de Pune (Poona), une ville industrielle de l'ouest de l'Inde. Les résultats de cette étude, basée sur l'examen des ordonnances, montrent une absence de pratiques rationnelles de prescription chez une proportion notable de médecins. Les ordonnances mentionnaient principalement des associations fixes et les produits génériques y occupaient une place négligeable; quant aux prescriptions de médicaments essentiels, elles représentaient moins de 60% du total des médicaments prescrits. Plus de 30% des prescriptions étaient irrationnelles, et ce d'autant plus que le nombre de médicaments inscrits sur l'ordonnance était élevé. Une étude des formulations disponibles pour la prescription a montré une proportion importante d'associations fixes, dont la composition était souvent irrationnelle. Ces résultats montrent la nécessité de stratégies d'intervention destinées à promouvoir l'utilisation rationnelle des médicaments en Inde.

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