

Original Article

Assessment of current treatment practices by general practitioners in Pune city, India

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Many studies are carried out to measure pattern of drug use in specified health facilities, eg Government dispensaries, Primary Health Centers, Tertiary Health Care Centers etc, but not many studies are carried out to measure the drug use pattern in general practice. Most of the common ailments are managed by medical practitioners or general practitioners (GPs). GPs prescribe major bulk of the drugs sold in the market. Naturally, irrational use of drugs at this level could lead to disastrous consequences. To determine the WHO Drug use indicators and Appropriateness of treatment we divided Pune city into 5 zones. MBBS, BAMS and BHMS GPs doing Allopathic practice were selected randomly. In 2 GPs of each specialty per zone were selected; this gave us 10 GPs of each degree – so total 30 GPs. 30 Prescriptions at each GP were collected – total 900 prescriptions. WHO core drug use indicators, patient care indicators, complementary indicators like average cost per prescription, average cost of Antimicrobials (AMA), patients treated without drugs and prescription in accordance with standard treatment guidelines. Some important results are as follows-Average drugs/prescription MBBS-3.95, BAMS-4.98 and BHMS-4.64. Percentage of prescription with AMAs MBBS-78.33%, BAMS-77.33% and BHMS-76.66%. Percentage of prescriptions with Injections MBBS-35.66%, BAMS-56.00%, and BHMS-50.66%. Average consulting time MBBS-5.99mins, BAMS-5.80mins and BHMS-4.94mins. Percentage of drugs dispensed MBBS-36.95%, BAMS-54.90% and BHMS-61.48%. Average cost per prescription MBBS-215.73Rs, BAMS-183.13Rs and BHMS-159.40Rs. There are deficiencies in prescription practices among all GPs ie, MBBS, BAMS and BHMS. Not only are GPs prescribing the highest number of drugs, antibiotics and injections per prescription anywhere, their prescription practices for common health problems like Acute Respiratory Infections, Acute Gastroenteritis and Fever are highly inappropriate. High level of irrational use of drugs by BAMS and BHMS GPs are cause of concern.

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Key words : WHO Drug use indicators, general practitioners, Irrational, Antibiotics, Injections.

The concept of rational drug use is very old, as is evident by the statement made by the Aleandrian physician Herophilus 300 B.C that “Medicines are nothing in themselves but are the very hands of God if employed with reason and prudence”¹.

It has been estimated that fifty percent of medicines being used in India, either on prescription or in over-the-counter sales, are inappropriately or irrationally used². Recently there has been an alarming concern over the injudicious use of many drugs worldwide. Amongst them, important ones are –AMAs (Antimicrobials), Corticosteroids, Analgesics, Antacids, Acid reducing agents, Vitamins and use of many irrational drug combinations³. The practice of indiscriminate prescribing of AMAs is posing a major problem of ineffective and unsafe treatment, exacerbation or prolongation of illness, distress and harm to the patient as well as an additional burden of an expensive

medical cost for the patient and importantly development of drug resistance⁴.

“Doctors and patients believe injections are more effective and act faster than oral drugs. “An unsafe injection practice includes injections administered with poor indication or when oral alternatives are available; improper methods of injection administration; faulty method of sterilizing injections; re-use of syringes and incorrect disposal procedures. This has rung alarm bells and the danger of unsafe injection practices is increasing day by day⁵.

Various reasons for Irrational use of Drugs have been stated such as lack of information; faulty & inadequate training & education of medical graduates; poor communication between health professional and patient; lack of diagnostic facilities and uncertainty of diagnosis; demand from patient; defective drug supply system and ineffective drug regulation; promotional activities of pharmaceutical companies¹.

In 1985, WHO convened a major conference in Nairobi on Rational Use of Drugs⁶. Since that time efforts have increased to improve drug use practices. First step in this

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direction is to assess the pattern of drug use at a given time to determine the rationality of treatment. WHO formulated core drug use indicators to broadly measure drug use in health facilities that would describe drug use pattern and prescribing behavior of health care providers. These are highly standardized, do not need national adaptation and are recommended for inclusion in any drug use study. These work as simple tool for quick and reliable assessment of a few critical aspects of drug use⁷.

Many studies are carried out to measure pattern of drug use in specified health facilities, eg, Government dispensaries, Primary Health Centers, Tertiary Health Care Centers etc, but not many studies are carried out to measure the drug use pattern in general practice⁸. Most of the common ailments are managed by medical practitioners or general practitioners (GPs). GPs prescribe major bulk of the drugs sold in the market. Naturally, irrational use of drugs at this level could lead to disastrous consequences.

Patients with fever, loose motions, and upper respiratory infections generally are treated by General Practitioners, who are also called as Family Doctors. GP is a practitioner who treats acute and chronic illnesses and provides preventive care and health education. GPs in Pune city are mainly of MBBS, BAMS, and BHMS qualifications though people with other qualifications (diploma holders) also are found in small numbers. So present study was planned to study the prescribing behavior and pattern of drug use by general practitioners in Pune city.

MATERIAL AND METHODS

After the approval of Institutional Ethics Committee this cross sectional comparative study was conducted for the period of 3 months (From July 2012 to September 2012) in Pune city. MBBS, BAMS and BHMS GPs doing Allopathic practice in Pune city who were listed with Indian Medical Association, Pune Branch were selected. Pune city was divided into five zones – North, South, East, West and Central zone. GPs were divided zone wise. Two practitioners of each specialty per zone were selected randomly using online software (www.randomiser.org). This gave us ten practitioners of each degree spread over Pune city – so total 30 practitioners. Selected GPs were approached and informed consent was obtained. Detailed indicators encounter form developed by WHO was used for data collection. We included all patients of any age and either sex getting treated on OPD basis. Data was collected of 30 patients per prescriber. So, data of 900 prescriptions was collected.

After taking informed consent from practitioners, investigator sat in OPD of GPs after their due permission. Diagnosis and Prescription of patient was noted down on detailed indicators encounter form. Average consulting and dispensing time were noted down on patient care form for

individual patient. The recording of time was calculated as beginning and ending times for individual consultations. If patients are seen one by one in a consultation room, this would mean measuring the time between entering and leaving the room. Drugs prescribed, dispensed and prescribing indicator forms were filled after completing 30 patients and not in presence of doctors.

Indicators Studied - WHO drug-use indicators for outpatient facilities:

Core Drug-use Indicators :

Prescribing indicators :

1. Average number of drugs per encounter
2. Percentage of drugs prescribed by generic name
3. Percentage of encounters with an antibiotic prescribed
4. Percentage of encounters with an injection prescribed
5. Percentage of drugs prescribed from an Essential Drugs List (EDL)

Patient care indicators :

6. Average consultation time
7. Average dispensing time
8. Percentage of drugs actually dispensed
10. Percentage of drugs adequately labelled

Complementary Drug-use Indicators :

11. Percentage of patients treated without drugs
12. Average drug cost per encounter
13. Percentage of drug costs spent on antibiotics
14. Prescription in accordance with treatment guidelines
15. Availability of emergency drug tray

Percentages were calculated for core prescribing indicators. For Generics and Essential drug list, WHO and Indian Essential Drug List 2011 were considered as standard. Data was analyzed in detail about use of various AMAs, percentage of Injections, Average consulting time, number of drugs prescribed and dispensed. Assessment of cost of therapy was done by using commercially available drug formularies (CIMS July-Oct 2012 and Drug Today July-Sep 2012). Drug use indicators of MBBS, BAMS and BHMS practitioners were compared. Averages, Percentages were calculated using - Microsoft Excel. For comparison between groups following test were used- Chi-square (χ^2) test for percentages, One-way ANOVA and Kruskal-Wallis test. Tests were performed using Graph Pad Prism version 6.00 for Windows, GraphPad Software, La Jolla California USA, www.graphpad.com.

OBSERVATIONS

Distribution of patients based on diagnosis (Fig 1) was similar across MBBS, BAMS and BHMS GPs. More than 75% patients coming to GPs were suffering from commu-

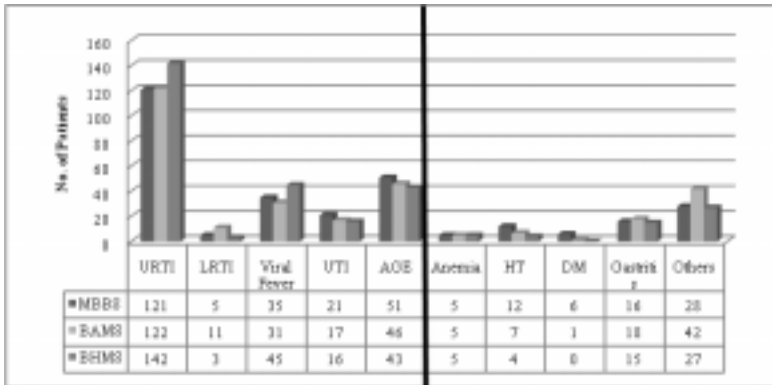


Fig 1— Distribution of patients based on Diagnosis

nicable diseases.

β-lactam, Quinolones and Macrolides were important group of AMAs used in the treatment of infections (Table 4). Other AMAs include Tetracyclines, Antivirals, Antimalarial, Antifungal, etc.

DISCUSSION

Primary health care system is managed by graduates of medical field and is considered to be the first contact persons for medical care. Such health care professionals in private sector are called as General Practitioners (GPs)⁹. They not only treat minor ailments and many acute conditions like respiratory tract infections, diarrhea, etc. but also render initial treatment before referring the patient for higher medical services. GPs, therefore, prescribe major chunk of drugs sold in the market. Naturally, inappropriate or irrational use of drugs at this level could lead to disastrous consequences¹⁰.

2 MBBS, 5 BAMS and 4BHMS GPs refused to participate in the study. These numbers of GPs were randomly selected again from the original list, zone wise. So, finally 10 Practitioners per specialty spread over Pune city were included in the study. 30 prescriptions were collected from each practitioner to get total 900 prescriptions. This was a cross-sectional study carried out by directly observing the practices and prescriptions of GPs by sitting inside the OPDs of GPs.

Distribution of patients based on diagnosis was also comparable across all practitioners (Fig 1). In Diagnosis wise distribution of patients, communicable diseases were most commonly encountered

like Upper Respiratory Tract Infections (URTI), Acute Gastroenteritis(AGE), Viral fever, Urinary Tract infections(UTI) followed by Lower Respiratory Tract Infections (LRTI).

The WHO indicators have been widely field-tested, including in India. The core indicators are highly standardized and do not require adaptation to the specific health facility being investigated¹¹. According to the reports, the average number of drugs per prescription in 12 developing countries is 2.2-3.8. This average is 1.3-2.2 in developed countries¹². In Indian studies, average number of

drugs per prescription was reported to be-, 2.8 by Khirsagar *et al*¹³ and 3.6 by lalan *et al*¹⁴. In the present study, for MBBS practitioners it was 3.95, for BAMS practitioners it was 4.98 whereas for BHMS practitioners it was 4.64. The difference was not statistically significant. The average number of drugs per encounter is an important index of the scope for educational intervention in prescribing practices. Our figure of >3 drugs per encounter in all GPs is much higher than the recommended limit of 2.0¹⁵. In BAMS and BHMS GPs, average number of drugs per prescription is >4, this may be due to treatment based on symp-

Table 1 — Comparison of Core Prescribing Indicators

Core Drug Indicators	MBBS	BAMS	BHMS	p value
Average no. of drugs Per Prescription ¹ (95% confidence Interval)	3.95(±0.92)* (3.38- 4.52)	4.98(±0.78)* (4.49- 5.47)	4.64(±0.83) (4.12-5.16)	p=0.053
Percentage of Drugs in Generics	9.59%	14.42%	11.80%	p=0.03*
Percentage of prescription with Antibiotics	78.33%	77.33%	76.66%	p=0.99
Percentage of Prescription with Injections	35.66%	56.00%	50.66%	p=0.02*
Percentage of Drugs from EDL	80.30%	82.36%	86.39%	p=0.46

¹Data is expressed as mean + one standard deviation. Kruskal-Wallis test followed by post hoc Dunn's multiple comparisons test. MBBS *versus* BAMS is significant (p<0.05). Percentages were compared using Chi-square test.

Table 2 — Comparison of Core Patient Care Indicators

Patient Care Indicators	MBBS	BAMS	BHMS	p value
Average Consultation Time ¹ (mins) (95% confidence Interval)	5.99(± 2.12) (4.68-7.31)	5.80(± 1.01) (5.17-6.42)	4.94(± 0.81) (4.44-5.45)	p= 0.25
Average Dispensing Time ² (Secs) (95% confidence Interval)	21.57 (± 11.60) (14.4-28.8)	34.75(± 19.61) (22.5-46.9)	35.14(± 21.31) (21.9-48.4)	p= 0.30
Percentage of Drugs Dispensed	36.95%	54.90%	61.48%	p<0.0001****
Percentage of Drugs Adequately Labeled	3.53%	5.74%	1.72%	p=0.0002***

^{1,2}Data is expressed as mean + one standard deviation. Kruskal-Wallis test followed by post hoc Dunn's multiple comparisons test. Percentages were compared using Chi-square test

Table 3 — Complementary Indicators

Complementary Indicators	MBBS	BAMS	BHMS	P value
Average Cost per Prescription	215.73Rs	183.13Rs	159.40Rs	¹ p=0.19
Average Cost spent on Antibiotics	86.92Rs	71.40Rs	63.30Rs	² p=0.16
Availability of Emergency Drug Tray	8(80.00)	3(30.00)	2(20.00)	p=0.28
Percentage of Patients Treated without Drugs	0.00	0.00	0.00	

^{1,2}One way ANOVA. Values in parentheses are in percentages (%)

Table 4 — Use of Antimicrobials agents (AMAs)

AMAs	MBBS (n=250)	BAMS (n=237)	BHMS (n=232)	p-value
Fluoroquinolones	48(19.20)	33(13.93)	38(16.37)	p=0.59
Penicillins	43(17.20)	36(15.19)	37(16.37)	p=0.92
Cephalosporins	38(15.20)	68(28.69)	72(31.03)	p=0.02*
Macrolides	59(23.60)	55(23.20)	41(17.67)	p=0.53
Others	62(24.80)	45(18.98)	44(18.96)	p=0.49

Values in parentheses are in percentages (%). *P<0.05

Table 5 — Use of Non-Steroidal Anti-inflammatory Drugs (NSAIDs)

NSAIDs	MBBS	BAMS	BHMS	p value
Paracetamol	85	43	58	p=0.0009***
Nimesulide	2	24	8	p=0.0098**
Diclofenac+ Paracetamol	34	77	44	p=0.0067**
Nimesulide+Paracetamol	17	41	59	p=0.023*
Ibuprofen+ Paracetamol	19	15	20	p=0.54
Others	11	22	25	p=0.52
Total	168(56.00)	222(74.00)	215(71.66)	p=0.026*
Wrong Dose	0	2	0	
Wrong Duration	0	20	21	
Wrong Dose and Duration	7	19	23	
Total Errors (% of Total)	7(4.16)	41(18.46)	44(20.46)	p=0.0014**

toms rather than the diagnosis. Such irrational polypharmacy leads to the risk of drug interactions, dispensing errors, emergence of resistance, increased cost of therapy and increased adverse reactions.

As per WHO, percentage of encounters with an antibiotic prescribed ranges between 40-50% and is showing little upward trend. In India, percentage of encounters with an antibiotic was reported to be 75% by Kshirsagar *et al*¹³, 34.4% by Hazra *et al*¹¹. In the present study, percentage of prescriptions with antibiotic was 78.33% with MBBS, 77.33% with BAMS and 76.66% with BHMS GPs, the difference is not statistically significant (p=0.053). Antibiotic use in our study was high in comparison to all above studies.

Studies on Injections done in private practitioners in India show different results from state to state - Bhartiya *et al*¹⁶ reported 13.6% encounters with injections in part of Madhya Pradesh whereas it was 25.00% in Jhalawar city of Rajasthan as reported by Manoj kumar *et al*¹⁷.

In our study, MBBS GPs gave injections to 35.66% patients; BAMS GPs gave to 56.00% of patients while BHMS GPs gave to 50.66% patients. The difference was statistically significant (p=0.02) indicating that BAMS and BHMS used injections more frequently. The injections were mainly dispensed and it was seen that most were demanded by patients.

Percentage of drugs prescribed in generics were 9.59% with MBBS, 14.42% with BAMS while 11.80% with BHMS GPs, the difference was statistically significant (p=0.03). It was observed that BAMS and BHMS practitioners used generic drugs for dispensing rather than pre-

scribing. In our study, low generic prescription of the drugs, probably reflects the dominating influence of pharmaceutical companies.

Essential drugs list published by WHO and Government of India was considered standard to determine the drugs in generics and EDL. According to WHO, percentage of drugs from essential drugs list (EDL) is 70-90%. In our study, 80.30% of drugs by MBBS, 82.36% of drugs by BAMS and 86.39% drugs by BHMS GPs were from Essential Drug List (EDL).

The patient care indicators address key aspects of what patients experience at health facilities, and how well they have been prepared to deal with the pharmaceuticals that have been prescribed and dispensed⁷. We were not able to evaluate Patient's knowledge of correct dosage as it would have required atleast 2 investigators and we were apprehensive that GPs may doubt aim of our study and may refuse to participate in it.

In our study, the average consulting time, which is the time patient spends with a doctor, was 5.99minutes for MBBS, 5.80minutes for BAMS and 4.94minutes for BHMS GPs. The difference was not statistically significant (p=0.25). The consultation time is a subjective phenomenon which varies from one GP to the other, varies within city, states and countries. In Indian studies, however, this value was at the lower side like Hazra

Table 6 — Use of Acid Reducing and Antiemetic Agents

	MBBS	BAMS	BHMS	p value
H2 blockers	93	134	124	p=0.88
Proton Pump Inhibitor	30	31	27	p=0.68
H2 + Antiemetic	4	3	4	p=0.86
PPI +Antiemetic	20	10	9	p=0.11
>2 agents in single prescription	5	23	13	p=0.17
Total (n=300)	147(49.00)	200(66.66)	178(59.33)	p=0.08
Wrong Dose	0	0	0	
Wrong Duration	0	15	14	
Wrong Dose &Duration	12	42	26	
Total Errors (% of Total)	12(8.16)	57(28.50)	40(22.47)	p=0.0046**

Table 7 — Use of Injections

	MBBS (n=300)	BAMS (n=300)	BHMS (n=300)	p value
Diclofenac	65	112	102	p=0.89
Gentamicin	16	28	18	p=0.70
Ranitidine	9	3	7	p=0.25
Multivitamin	5	17	7	p=0.34
Antihistaminic	3	2	15	p=0.02*
Others	9	6	3	p=0.32
Total(% of n)	107(35.66)	168(56.00)	152(50.66)	p=0.02*

Table 8 – Overall Prescription

Appropriate	213(71.00)	119(39.66)	104(34.66)	p<0.0001****
Inappropriate	87(29.00)	181(60.34)	196(65.34)	p<0.0001****

Values in parentheses are in percentages (%)

al¹¹(3.7mins) and Dutta *et al*¹⁸(2.43mins). In comparison to Indian studies, average consulting time in our study was higher.

The average dispensing time shows very wide variation in the literature from as short as to 14.17seconds by Sutharson *et al*¹⁹, medium dispensing time like 41.7 seconds by Dutta *et al*¹⁸ and as long as 181 seconds by Hazra *et al*¹¹. In our study the average dispensing time was 21.57seconds in MBBS, 34.75seconds in BAMS and 35.14seconds in BHMS GPs, the difference was not statistically significant. This time difference between the GPs could be due to dispensing of more number of drugs by BAMS and BHMS GPs.

Percentage of drugs actually dispensed showed significant statistical difference ($p < 0.0001$) in all three GPs. MBBS dispensing 36.95% drugs, BAMS dispensing 54.90% drugs and BHMS dispensing 61.48% drugs. The dispensing practice is surely more in BAMS and BHMS GPs as compared to MBBS GPs who preferred prescribing drugs. Percentage of drugs adequately labelled is the indicator in which dispensers record essential information on the drug packages they dispense. In our study MBBS GPs labelled 3.53% drugs, BAMS labelled 5.74% drugs and BHMS labelled only 1.72% drugs, the difference was statistically significant ($p = 0.0002$).

In average cost per prescription, we calculated the price of medicines which patient has to purchase from medical store and the fees of doctor which includes consultation fees, dispensed drugs and injections. Patients visiting MBBS GPs had to pay average Rs 215.73, whereas at BAMS Rs 183.13 and at BHMS Rs 159.40, the difference was not statistically significant. Further analysis of prescriptions for average money spent on antibiotics was done. Patients had to spend Rs 86.92 on antibiotics at MBBS GPs, Rs 71.40 at BAMS GPs and Rs 63.30 at BHMS GPs, the difference was not statistically significant. Percentage of patients treated without drugs measures the degree to which primary care prescribers treat patients seeking curative care with non-pharmaceutical therapies. In our study, not a single patient was treated without drugs by any of the three MBBS, BAMS and BHMS GPs. This could be because most of the patients presented with acute infective condition or chronic ailment requiring drug treatment. Availability of emergency drug tray – this particular indicator although not a part of WHO complementary indicators, was included by us to know, whether GPs are ready to handle emergency situation particularly because all GPs were giving injections and there always is a chance of getting severe hypersensitivity reaction after injections. In our study, 8 out of 10 MBBS doctors had emergency drug tray as compared to only 3 BAMS and 2 BHMS GPs out of 10 had it.

β lactams, Fluoroquinolones and Macrolides were important groups of AMAs used in treatment of infectious diseases (Table 4). In β lactam AMAs both Penicillins and Cephalosporins were used. Penicillins were more frequently used by MBBS GPs as against Cephalosporins were more commonly used by BHMS GPs, the difference was statistically significant ($p = 0.02$). Macrolides were used equally by all GPs. Other AMAs included Tetracyclines, Antimalarials, Antivirals and Antifungals.

Paracetamol was most frequently used NSAID by MBBS GPs (Table 5). Nimesulide and combination of Diclofenac with Paracetamol was used by BAMS GPs whereas BHMS GPs preferred combination of Nimesulide with Paracetamol. Total use of NSAIDs was significantly more by BAMS as compared to MBBS and BHMS GPs ($p = 0.026$). MBBS prescribed 56% NSAIDs, BAMS prescribed 76% NSAIDs whereas BHMS prescribed 71.66%. Total errors in prescribing NSAIDs were more by BHMS followed by BAMS GPs ($p = 0.0014$). 23 patients were given wrong dose and duration of NSAIDs by BHMS GPs. We considered NSAIDs use as inappropriate if it was used in wrong dose and/or duration.

H2 blockers and proton pump inhibitors (PPIs) were prescribed for large number of patients. 49% of prescriptions of MBBS GPs included acid reducing agent, whereas 66.66% of BAMS prescriptions and 59.33% of BHMS prescriptions had acid reducing agents. These were probably prescribed prophylactically to reduce gastric irritation caused by NSAIDs and AMAs. Total errors in prescribing acid reducing agents was more by BAMS GPs followed by BHMS GPs. 57 patients were given wrong dose and duration of acid reducing agents by BAMS GPs, which was statistically significant ($p = 0.0046$). Only wrong dose, duration or use of more than 2 agents in single prescription was considered inappropriate.

Diclofenac injection was the most common drug used by all the three GPs. These were given to patients who were also prescribed NSAIDs. Action of NSAIDs starts in half an hour and so, administration of single injection of Diclofenac had no advantage and was considered irrational. Single injection of Gentamicin in acute gastroenteritis was absolutely irrational. BHMS GPs gave Chlorpheniramine maleate injection to patients for placebo effect which is totally irrational.

For overall prescription, individual drugs prescribed were evaluated as described above. Prescriptions with inappropriate use of drugs were rated as inappropriate prescription. Appropriate- 71% of prescriptions of MBBS GPs were appropriate as compared to BAMS with 39.66% and BHMS with 34.66%, the difference was statistical significant ($p < 0.0001$). Inappropriate- 65.34% prescriptions of BHMS GPs were inappropriate as compared to BAMS

with 60.34% and MBBS with 29%, the difference was statistically significant ($p < 0.0001$). Appropriateness of prescriptions of MBBS GPs also evaluated by Dutta *et al*¹⁸, 63.51% prescriptions were found inappropriate. In comparison to these results, only 29% prescriptions of MBBS GPs were inappropriate in our study. But > 60% of prescriptions of BAMS and BHMS GPs were inappropriate.

To conclude, our study has highlighted the current status of treatment practices of general practitioners in Pune city. There are deficiencies in prescription practices among BAMS and BHMS general practitioners as well as MBBS practitioners. The results indicate a considerable scope for improvement in prescribing pattern of general practitioners in their out-patient department. There is some evidence that interventions like short problem based training course in pharmacotherapy²⁰ and rational use focused workshops²¹ can improve prescribing pattern.

This study has a limitation that the total number of general practitioners was only thirty and more studies are needed to be carried out in order to confirm these findings.

REFERENCES

- Ambwani S, Mathur A K — Rational drug Use. *Health Administrator* XIX (1): 5-7.
- Chaudhury RR — Rational Use of Drugs. *The Journal of Family Welfare* 2004; **50**: 92-4.
- Das BP, Sethi A, Rauniar GP, Sharma SK — Antimicrobial utilization pattern in outpatient services of ENT department of tertiary care hospital of Eastern Nepal. *Kathmandu University Medical Journal* 2005; **3**: 370-75.
- World Health Organization — Guide to Good Prescribing. Geneva: World Health Organization; 1994.
- Dutta R — Medicos campaign against unsafe injection practices: Healthcare management express; 1st to 15th June 2005.
- World Health Organization — The Rational Use of Drugs. Report of the Conference of Experts. Geneva: World Health Organization; 1985.
- World Health Organization — How to investigate drug use in health facilities: Selected drug use indicators EDM Research series No. 7. Department of Essential drugs & medicines policy, Geneva: WHO1993 (reprint2006):3-16.
- Figueiras A, Caamano F — Drug Utilization Studies in Primary Health Care. *PubMed* 2000; **14**: 7-19.
- Health care delivery. Available at http://en.wikipedia.org/wiki/Health_care (accessed on Nov 23, 2013).
- Rao PH — Profile and Practice of Private Medical Practitioner in Rural India. *Health and Population: Perspectives And Issues*: 2005; **28**: 40-9.
- Hazra A, Tripathi SK, Alam MS — Prescribing and dispensing Activities at the Health Facilities of a Non-Governmental Organization. *The National Medical Journal of India* 2000; **13**: 177-82.
- Mosleh A, Ansari SK — Evaluation of the drug prescription status based on the WHO indices in pharmacies of health care centers affiliated to Tehran University of Medical Sciences *Medical Journal of Islamic Republic of Iran* 2011; **25**: 222-5.
- Kshirsagar MJ, Langade D, Patil S and PatkiPS — Prescribing patterns among medical practitioners in Pune, India. *Bulletin of the World Health Organization* 1998; **76**: 271-5.
- Lalan B, Hiray R, Ghongane B — Drug Prescription Pattern of Outpatients in a Tertiary Care teaching Hospital In Maharashtra. *Int J Pharm Bio Sci* 2012; **3**: 225-9.
- Sharif SI, M Al-Shaqra, Hajjar H, Shamout A, and Wess L — Patterns of Drug Prescribing In a Hospital In Dubai, United Arab Emirates. *Libyan J Med* 2008; **3**: 10-2.
- Bhartiya SS, Shinde M, Nandeshwar S, Tiwari SC — Pattern of prescribing practices in the Madhya Pradesh, India. *Kathmandu University Medical Journal* 2008; **6**: 55-9.
- Manoj K S — Comparative study of prescribing behaviours of government doctors of teaching hospital and private practitioners in Jhalawar City (Rajasthan) *J Pharm Sci & Res* 2010; **2**: 208-15.
- Dutta A, Chakraborty S — Practice of rational drug uses in a rural area of 24 pgs(s) in West Bengal. *J Adv Pharm Tech Res* 2010; **1**: 358-64.
- Sutharson L, Hariharan RS, Vamsadhara C — Drug utilization study in diabetology outpatient setting of a tertiary hospital. *Ind J of Pharm* 2003; **35**: 237-40.
- Akici A, Kalaça S, Ugurlu MU, Karaalp A, Cali S, Oktay S — Impact of a short postgraduate course in rational pharmacotherapy for general practitioners. *Br J ClinPharmacol* 2004; **57**: 310-21.
- Thomas M, Cherian AM, Mathai D — Measuring the impact of focused workshops on rational drug use. *Trop Doct* 1997; **27**: 206-10.