



## **A comparative study of drug utilisation at different levels of the primary healthcare system in Kaski district, Western Nepal**

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### **Abstract**

**Aims** Studies that compare prescribing patterns at different levels of the primary healthcare system are lacking in Western Nepal. The present study was undertaken to obtain information on age, sex distribution, and morbidity profiles of patients, prescribing patterns and defined daily dose of commonly used drugs.

**Methods** The study was carried out over a three-month period (1 June 2000 to 31 August 2000) at four centres in the Kaski district, Western Nepal. Chi-square test was used to compare differences in morbidity profiles and prescribing patterns ( $p < 0.01$ ).

**Results** There were significant differences in the average number of drugs per prescription across different levels. The morbidity profiles were also different. Vitamins were more commonly prescribed at the primary health centre level. Antibiotics were prescribed in 67% of encounters at the level of primary health centre, but the prescribing decreased at the levels of health post and sub-health post.

**Conclusions** The average number of drugs per prescription and the average cost were higher at the primary health centre level and this may be due to the increased prescribing frequency of vitamins and tonics. Comparisons of prescribing patterns at different levels of healthcare, and between government and private healthcare institutions, are urgently required.

Medical audit is concerned with the observance of standards of medical treatment at all levels of the healthcare delivery system.<sup>1</sup> Drug utilisation studies are a part of medical audit and seek to monitor, evaluate and modify, if necessary, the prescribing habits of practitioners. The goal is to make medical care more rational and cost effective.

The Nepalese primary healthcare system operates at different levels. The primary health centre (PHC), health post (HP) and the sub-health post (SHP) are the three components of the primary healthcare system. For the majority of the rural population, the SHP serves as the first level of contact with the healthcare delivery system. SHPs have been established in the majority of village development committees (VDCs) in Nepal and it is proposed that they be established in the remaining VDCs. The VDC is the basic unit of governance in Nepal. Trained birth attendants and female community health volunteers are mobilised for various outreach programmes from the SHP.<sup>2</sup> Patients from the SHP are referred to the HP and then to the PHC. The next levels of referral are the district hospital, the zonal hospital and finally the tertiary healthcare centres in Kathmandu. Health workers with different levels of experience and training man the SHPs, HPs and PHCs in Nepal. The SHPs are manned by certified medical assistants (CMAs), the HPs are manned by health

assistants (HAs), while MB BS doctors are supposed to be posted in the PHCs. If they are not present, as is often the case, HAs man the PHCs. The qualifications and levels of training of the health personnel are detailed in the discussion section of this paper.

The anatomical therapeutic chemical (ATC) classification system divides drugs into different groups according to the organ or system on which they act and their chemical, pharmacological and therapeutic properties.<sup>3,4</sup> Each drug is assigned a particular combination of letters and numbers. The defined daily dose (DDD) is the assumed average maintenance dose per day for a drug used for its main indication in adults.<sup>3</sup> DDD was developed to overcome objections against traditional units of measurement of drug consumption and to ensure comparability between drug utilisation studies carried out at different locations and different time periods.

Information on prescribing patterns at different levels of the primary healthcare system is lacking in Western Nepal. Also, there have been no studies comparing the prescribing patterns and morbidity profiles at the SHP, HP and PHC, the three levels of the primary healthcare system in Nepal. Use of the DDD concept to measure drug consumption at different levels of the primary healthcare system has not been attempted. Hence, the present study was carried out in two SHPs, one HP and one PHC in the Kaski district of Western Nepal. The objectives of the study were to:

1. collect information on demographic variables and the morbidity profile of patients attending the SHPs, HP and PHC during the study period;
2. obtain information on the prescribing patterns, average number of drugs per prescription and average cost per prescription; and
3. calculate the DDD/1000 inhabitants/day (DID) of the commonly prescribed drugs.

## Methods

The study was carried out at three levels of the Nepalese primary healthcare system in the Kaski district of Western Nepal. The centres chosen for the study were the Bedabari PHC, the Batulechaur HP and the Riban and Armala SHPs. Each SHP serves a population of around 3000; the HP serves a population of around 30 000; and the PHC serves around 100 000. The study was carried out over a three-month period (1 June 2000 to 31 August 2000) at the chosen centres.

Specially designed prescription forms in duplicate were supplied to the prescribers at the study centres. The original was handed over to the patient while the duplicate prescription was retained by the prescribers. The investigators collected the duplicate prescriptions at a time period of 15 days.

The information in the prescription was entered into a prescription indicator form (PIF) for analysis. The age and sex of the patient were noted. The names, dose, frequency and duration of the drugs prescribed were entered into the PIF. The total number of drugs prescribed, and the number of parenteral preparations and topical preparations were determined at the PHC, HP and SHP level. Data from the two SHPs were combined for further analysis.

The number of drugs prescribed from the Nepal essential drug list<sup>5</sup> and the WHO model list of essential drugs<sup>6</sup> was calculated. The WHO standard drug-use indicators were used to evaluate drug-use practices in the different health centres.<sup>7</sup> The mean  $\pm$  SD number of drugs prescribed per encounter and the mean  $\pm$  SD cost per prescription were calculated. The percentage of drugs prescribed by generic name was determined.

The six most commonly prescribed drugs at the three levels of primary healthcare delivery were noted. The DDD/1000 inhabitants/day (DID) of these drugs were calculated. Differences in the morbidity profiles and prescribing patterns between the different centres were analysed using the chi-square test. A p value  $<0.01$  was taken as statistically significant. The institutional review board of the Manipal College of Medical Sciences, Pokhara, Nepal, approved the study.

## Results

The study sample included 775 patients from the Bedabari PHC, 485 patients from the Batulechaur HP and 501 patients from the two SHPs of Riban and Armala. The total number of drugs prescribed was 2454 at the PHC, 518 at the HP, and 606 drugs at the SHP.

Individuals below the age of 20 years constituted 256 out of the 775 patients (33%) at the Bedabari PHC. At the HP and SHP level individuals below the age of 20 years constituted 47.6% and 45.9% of the total patients, respectively. Individuals aged 60 years or above constituted 5.3% of patients at the PHC level, 10.5% of patients at the HP level, and 10.4% of patients at the SHP level.

The number of drugs per prescription showed a significant difference across different levels of the primary healthcare system. Table 1 shows the incidence of polypharmacy. More drugs were prescribed at the PHC level and the number of drugs per prescription progressively decreased at the HP and SHP level. A significant number of prescriptions contained four or more drugs at the PHC level.

**Table 1. Incidence of polypharmacy\* at different levels of the primary healthcare system (PHC = primary health centre; HP = health post; SHP = sub-health post)**

No of drugs per prescription	Number of patients		
	PHC (775 patients)	HP (485 patients)	SHP (501 patients)
0	18	83	74
1	167	242	243
2	147	147	165
3	200	13	17
4	156	0	2
5 or more	87	0	0
Total	775	485	501

\* $\chi^2 = 678.2$ ,  $df = 10$ ,  $p < 0.01$

**Table 2. Morbidity profiles of patients at different levels of the primary healthcare system (PHC = primary health centre; HP = health post; SHP = sub-health post)**

Disease condition	Number of cases (%)		
	PHC (775 patients)	HP (485 patients)	SHP (501 patients)
Acute respiratory infection*	63 (8.1)	77 (15.9)	63 (12.6)
Skin disease	58 (7.5)	21 (4.3)	18 (3.6)
Wounds and wound infection†	43 (5.5)	80 (16.5)	89 (17.8)
Diarrhoea/dysentery	42 (5.4)	18 (3.7)	31 (6.2)
Dental caries‡	41 (5.3)	32 (6.6)	6 (1.2)
Anaemia	39 (5.0)	7 (1.4)	2 (4.0)
Fever for investigation	28 (3.6)	25 (5.1)	21 (4.2)
Worm infestation§	29 (3.7)	35 (7.2)	52 (10.4)

\* $\chi^2 = 18$ ,  $df = 2$ ,  $p < 0.01$ ; † $\chi^2 = 56.2$ ,  $df = 2$ ,  $p < 0.01$ ; ‡ $\chi^2 = 18$ ,  $df = 2$ ,  $p < 0.01$ ; § $\chi^2 = 21.2$ ,  $df = 2$ ,  $p < 0.01$

The morbidity profile of patients is shown in Table 2. Acute respiratory infection was significantly more common at the HP level ( $\chi^2 = 17.9$ ,  $df = 2$ ,  $p < 0.01$ ). Cases of dental caries were fewer at the SHP level. Frequency of wounds and wound infection ( $\chi^2 = 56.2$ ,  $df = 2$ ,  $p < 0.01$ ), and of worm infestation ( $\chi^2 = 21.2$ ,  $df = 2$ ,  $p < 0.01$ ), also differed at different levels of the primary healthcare system.

The frequency of prescribing of individual drugs is shown in Table 3. The prescribing frequency of the ten most commonly prescribed drugs was analysed. Vitamins were most commonly prescribed at the PHC level ( $\chi^2 = 45.3$ ,  $df = 2$ ,  $p < 0.01$ ). Paracetamol ( $\chi^2 = 181.5$ ,  $df = 2$ ,  $p < 0.01$ ), co-trimoxazole ( $\chi^2 = 152.8$ ,  $df = 2$ ,  $p < 0.01$ ) and mebendazole ( $\chi^2 = 192.5$ ,  $df = 2$ ,  $p < 0.01$ ) were more frequently prescribed at the SHP level. Amoxicillin was more frequently prescribed at the HP level but the difference was not statistically significant.

**Table 3. Frequency of prescribing of individual drugs at different levels of the primary healthcare system (PHC = primary health centre; HP = health post; SHP = sub-health post)**

Drugs	Number of drugs (% of total drugs prescribed at a particular level of primary health care)		
	PHC (n = 2454)	HP (n = 518)	SHP (n = 606)
Vitamins*	301 (12.3)	29 (5.6)	28 (4.6)
Paracetamol <sup>†</sup>	215 (8.8)	134 (25.9)	154 (25.4)
Procaine penicillin	142 (5.8)	12 (2.3)	4 (0.7)
Amoxicillin	133 (5.4)	39 (7.5)	22 (3.6)
Pheniramine maleate	117 (4.8)	1 (0.2)	13 (2.1)
Metronidazole	115 (4.7)	26 (5.0)	41 (6.8)
Antacids	112 (4.6)	13 (2.5)	38 (6.3)
Ibuprofen	106 (4.3)	0	4 (0.7)
Co-trimoxazole <sup>‡</sup>	87 (3.5)	63 (12.2)	102 (16.8)
Mebendazole <sup>§</sup>	5 (0.2)	36 (6.9)	56 (9.2)

\* $\chi^2 = 45.3$ ,  $df = 2$ ,  $p < 0.01$ ; <sup>†</sup> $\chi^2 = 181.5$ ,  $df = 2$ ,  $p < 0.01$ ; <sup>‡</sup> $\chi^2 = 152.8$ ,  $df = 2$ ,  $p < 0.01$ ; <sup>§</sup> $\chi^2 = 192.5$ ,  $df = 2$ ,  $p < 0.01$ ; n = number of drugs prescribed at the particular level of primary healthcare

The mean  $\pm$  SD cost of drugs per prescription was 30.6  $\pm$  25.8 Nepalese rupees (0.39  $\pm$  0.33 US\$) at the PHC level, 18.8  $\pm$  15.7 Nepalese rupees (0.24  $\pm$  0.2 US\$) at the HP level, and 16.8  $\pm$  14.3 Nepalese rupees (0.21  $\pm$  0.18 US\$) at the SHP level. At the PHC level, 74% of the drugs were prescribed from the essential drug list of Nepal<sup>5</sup> and 67.3% were prescribed from the WHO list of essential drugs.<sup>6</sup> The corresponding figures at the HP level were 72.6% and 81.3%. At the SHP level the percentages prescribed from the Nepalese<sup>5</sup> and the WHO essential drug lists<sup>6</sup> were 70.9 and 77.5 respectively.

Antibiotics were prescribed in 67.2% of encounters at the PHC level, 52.6% at the HP level, and 52.7% at the SHP level ( $\chi^2 = 115.6$ ,  $df = 2$ ,  $p < 0.01$ ). Injections were prescribed in 20.2% of encounters at the PHC level, 3.1% of encounters at the HP level and 3% of encounters at the SHP level ( $\chi^2 = 135.7$ ,  $df = 2$ ,  $p < 0.01$ ).

At the PHC level 28.8% of drugs were prescribed by brand name. At the HP and SHP level the corresponding percentages were 31.1% and 58.4%. The total numbers of prescriptions for individual drugs at the three levels of the primary healthcare system were calculated to determine the six most commonly prescribed drugs. Table 4 shows the DID of the six most commonly prescribed drugs.

**Table 4: Defined daily dose per thousand inhabitants per day (DID) of the six most commonly prescribed drugs at different levels of the primary healthcare system (PHC = primary health centre; HP = health post; SHP = sub-health post)**

Drugs	ATC Code	DID		
		PHC	HP	SHP
Paracetamol	N02BE01	0.4	0.1	0.29
Co-trimoxazole	J01EE01	0.9	0.03	2
Amoxicillin	J01CA04	0.38	0.12	0.15
Mebendazole	P02CA01	0.4	0.28	0.17
Metronidazole	P01AB01	0.28	0.3	0.25
Antacids	A02AD01	0.04	0.08	0.06

At the Bedabari PHC during the study period, the health assistant (HA) filled in 96% of the prescriptions. The HA was on leave for a period of five days during the period of study and during this period the staff nurse was in charge. She treated the patients and filled in the prescriptions. At the HP level, the HA filled in the prescriptions. He had a certified medical assistant (CMA) and an auxiliary nurse midwife (ANM) to assist him but they did not fill any prescriptions. At the SHPs the CMAs filled the prescriptions. In the health facilities in Nepal, in general, only the most senior member of staff sees the patients and fills the prescriptions. The other members of staff assist the senior staff member but do not fill the prescriptions on their own.

## Discussion

In Nepal, public expenditure in the health sector has increased from 3.2% in the financial year 1993/94 to 5.7% in the financial year 1999/2000. In view of the immense human cost of disease in Nepal, primary healthcare receives the highest allocation in national health spending and about three quarters of the total health budget.<sup>8</sup>

The training of the health personnel manning the different levels of the primary healthcare system differs. SHPs are manned by a certified medical assistant (CMA). CMAs undergo a one-year course after schooling followed by a three-month internship. HPs are manned by health assistants (HAs) who complete a two-year course after schooling followed by six months of internship. Medical officers are posted to man the PHCs but if they are not present, as is often the case, HAs take their place.

The Bedabari PHC was manned by an HA, a staff nurse, an ANM, a family planning assistant, two maternal and child health workers, a pharmacist, an accountant, an administrative assistant and two peons (attendants). The staff nurse is in charge of the PHC when the HA is absent. The staff nurse had completed a three-year course of BSc Nursing while the ANM had completed a 15-month course.

The Batulechaur HP was manned by an HA, a CMA, a maternal and child health worker, a pharmacist, an accountant and a peon. In the absence of the HA, the CMA runs the HP.

SHPs are staffed by a CMA, an ANM, a maternal and child health worker and a peon. In the absence of the CMA, the ANM is in charge of the SHP.

The procedure for taking leave for the most senior member of the health facility is that they must communicate their intention in writing to the district public health office at least one week in advance. The office will send a suitably qualified person to man the health facility during the period of absence; alternatively, the next most senior member of staff in the facility may be put in charge.

The health facilities conduct outpatient departments (OPDs) from 10am to 2pm from Sunday to Thursday. On Fridays the OPD functions from 10am to 1pm. Inpatient beds are available at the Bedabari PHC but are not being used and the patients are referred to the Western Regional Hospital in Pokhara.

The average number of drugs per prescription is an important index in drug utilisation studies. A high value may call for educational intervention in prescribing practices. In a study in Bangalore district, South India,<sup>9</sup> the average number of drugs was 1.99 at the primary level, 2.16 at the tertiary level and 2.41 at the general practice level. Bapna et al found that a prescription on average contained 2.71 drugs.<sup>10</sup> The increased number of drugs prescribed at the PHC level in our study is a matter of concern. A greater percentage of tonics, vitamins and parenteral preparations were prescribed and this may partly account for the increase in the average number of drugs per prescription. The increased number needs to be justified in view of the increased risk of drug interactions, errors of prescribing and non-compliance seen with polypharmacy.

In Nepal in the last 15 years SHPs have been established in most village development committees. Lack of medicines and staff inadequacies were major reasons for dissatisfaction with the healthcare services.<sup>11</sup> If standard procedures like the ATC-DDD methodology<sup>3,4</sup> are employed by all researchers in drug utilisation, there can be meaningful comparison of the results. Gaitonde suggested an important role for pharmacologists in the monitoring of prescribing patterns at different levels of healthcare delivery.<sup>12</sup>

Acute respiratory infection, wounds, dental caries, skin disease and worm infestation were the five most commonly observed illnesses in our study. These are diseases of poverty that are common in developing countries with poor standards of socioeconomic development. In a study in Taiwan the most common illnesses were acute respiratory infection, skeletal and joint disease, hypertension, and acid peptic disease.<sup>13</sup>

Sulfonamides were the most commonly prescribed antibiotics at the HP and SHP level but not at the PHC level. Our findings are similar to those observed by Srishyla et al and Bapna et al.<sup>9,10</sup> In contrast to the previous results<sup>9</sup> there were differences in the prescribing patterns of drugs at different levels. Differences in the morbidity profiles may partly explain the differences in prescribing patterns. Analgesics and vitamins were prescribed in amounts similar to those in a study in Saudi Arabia.<sup>14</sup>

The average cost per prescription varied from 0.39 US\$ at the PHC level to 0.21 US\$ at the SHP level. In a previous study in India<sup>15</sup> the mean  $\pm$  SD cost per prescription was 0.18  $\pm$  0.17 US\$. Direct comparison of the results is difficult because of the increase in cost of drugs since the Indian study was carried out. The cost was higher at the PHC level and this could be due to the increased prescribing of antibiotics, parenteral preparations and vitamins.

Variations were seen in the DID of the six most commonly prescribed drugs. In contrast to a Spanish study,<sup>16</sup> cephalosporins were not commonly used in our study. In another previous study<sup>17</sup> penicillins and macrolides were the most commonly prescribed antibiotics, but macrolides were not commonly used in our study. Our DID for antibiotics was lower than that observed in the previous two studies.<sup>16,17</sup> Culture and sensitivity testing is not carried out at the primary healthcare level. Older antibiotics were commonly used; these were generally cheaper.

We have compared prescribing patterns at one PHC, one HP and two SHPs in Kaski district, Western Nepal. At the PHC level two individuals completed the prescriptions while at the HP and the SHP level only one individual completed the prescriptions. The levels of training and experience of these individuals were different. The low number of health facilities included in the study raises the possibility that the different individuals involved were responsible for the noted differences in prescribing. In order to conclude that the differences in prescribing may be due to the different levels of training of the staff involved and their site of practice, a larger study involving more health facilities would need to be undertaken.

Comparisons of morbidity and prescribing patterns at the primary, secondary and tertiary healthcare levels in Nepal are required. Comparisons are also required between the prescribing patterns of government and private healthcare institutions. These studies are being planned in association with the Department of Community Medicine of the Manipal College of Medical Sciences and the western regional health directorate, His Majesty's Government of Nepal.

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