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ASSESSMENT OF PRESCRIPTION ERRORS OF PRECLINICAL MEDICAL AND DENTAL UNDERGRADUATE STUDENTS IN A TEACHING COLLEGE

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ABSTRACT

Background: Prescription errors are common findings in both academics and clinical settings. **Methods:** Three hundred thirty six (336) preclinical first and second year medical and dental students (medical= 270 and dental= 66) were enrolled in the study. Clinical cases were provided to the students as a part of final practical examination and hand-written prescriptions were collected and subject to analysis. Data for prescription errors were analyzed by Microsoft Office Excel and EpiInfo. Data were presented in the form of percentage and mean ± standard deviation (SD). Chi square test (Yates corrected) was applied to test the level of significance at 0.05 wherever applicable. **Results:** Prescription errors were more frequent for drug related components. The common prescription errors for first year medical students were strength (66%), frequency (62%), route (62%), total amount/refill (52%) and symbol ℞ (51%), and for second year medical students the common errors were amount/refill (52%), total amount (23%), strength (19%), duration (18%) and advice (17%). Similarly, the more frequent errors for first and second year dental students were strength of medicine (74%) followed by symbol ℞ (71%), frequency (56%), route (56%), dosage form and duration (44%), and strength of the medicine (69%) followed by frequency (63%), route/ duration (59%), total amount (59%) and follow-up/refill (38%) respectively. The second year students committed less frequent errors than the first year error. Out of 21 prescription elements assessed for prescription errors, the average number of errors per prescription among the different years ranges from 5.9 ± 2.7 (highest- first year dental students) to 2.3 ± 1.9 (lowest- second year medical students). The difference in the prescription errors between second year and first year dental students was $P<0.05$ (5.9 ± 2.7 vs. 4.4 ± 2.2). **Conclusion:** Drug related factors are more common areas of prescription errors for preclinical medical and dental students. Second year students commit less prescription errors than first year students.

KEYWORDS: Dental, education, errors, medical, prescription.

INTRODUCTION

A prescription is a physician's or a prescribing doctor's written order to a pharmacist to dispense a drug or drugs that contains the information for a dispenser and a patient for an effective pharmacotherapeutic care of a medical condition.[1, 2] A 'prescription error' can be defined as 'a failure in the prescription writing process that results in a wrong instruction about one or more of the normal features of a prescription'. The 'normal features' can be defines as 'the identity of the recipient, the identity of the drug, the formulation and dose, and the route, timing, frequency and duration of administration'.[3]

Prescription errors are common having negative impact on a number of clinical situations [4] that may lead to 'adverse drug events'. 'Adverse drug events' are the health related harms due to improper prescription-writing skill which can be avoided by a proper prescription writing.[3] Improper prescription is explained by presence of prescription errors.[4] Medical and dental students at early stage of their training are more susceptible to make prescription errors.[5] As prescription writing requires proper knowledge of pharmacotherapeutics and rational prescribing,[1, 2] proper training of undergraduate students on prescription writing during their graduation is required[6] to improve their prescription writing skills.[7, 8]

Bachelor of Medicine and Bachelor of Surgery (MBBS), and Bachelor of Dental Sciences (BDS) consist of five and half years of course including one year's compulsory internship in the hospitals in Nepal. Students are enrolled in MBBS and BDS courses after completion of their school level education and a two-year course in biology, physics and chemistry. Medical and dental students study basic medical sciences in initial two years (pre-clinical years) followed by clinical sciences in third, and fourth and half years. They spend another one year for compulsory internship in hospitals. Medical and dental

interns are directly involved in prescription writing during their internship. Medical and dental students are taught basics of prescription writing during their first year of preclinical years in the teaching college where this study was conducted.

This study aimed on an assessment of prescription errors of first and second year medical and dental students. Prescription errors were evaluated by the factors instructed by 'WHO guide to good prescribing',[1] and physician and drug related factors based on Lofholm and Katzung, 2015.[9] The physician related factors are as follows; prescriber's name, prescriber's qualification, prescriber's registration number, prescriber's contact number, date of prescription, patient's name, patient's age/gender, patient's contact number, diagnosis, symbol ℞ (Take Thou; Symbol for Jupiter- God of healing; recipe), follow-up/refill information and prescriber's signature. Similarly, the drug related factors are as follows; names of a medicine selected (appropriateness), strength of medicines, dosage forms of medicines, route of administration, frequency of administration, total amount to be dispensed and direction for use.

METHODS

Institutional ethical clearance was obtained from the Institutional Review Committee-Chitwan Medical College, Bharatpur, Nepal before commencing the study. A total number of 336 students (first year MBBS=131, second year MBBS= 139, first year BDS= 34, second year BDS= 32) were enrolled in the study based on their eligibility to sit for first and second year final examinations. Students were given medical cases to be prescribed as a part of their final practical examination and hand written prescriptions were collected and assessed for both physician and drug related factors such as prescriber's name, educational degree, medical council registration number, date of prescription, prescriber's contact number, patient's name, age, sex, address/contact, diagnosis, symbol ℞, dosage form, name of the medicine, strength, frequency of administration, route of administration, total amount/quantity to be dispensed, advice/instructions/ warnings, follow up/ refill information and prescriber's name or signature.[2, 9] Errors were categorized as errors of omission (absence) and errors of commission (incorrect information) [10] and these errors were combined during analysis. Data were compiled and analyzed using Microsoft Office Excel 2015 and Chi square test (Yates corrected) was applied (using EpiInfo) to compare the findings. Level of significance (P value) was considered at 0.05.

RESULTS

Table 1 and 2 show the prescribing errors of medical and dental students respectively. Top five errors on prescription by first year medical students are strength (66%), frequency (62%), route (62%), total amount/refill (52%) and symbol ℞ (51%). Similarly, total amount/refill (52%) was the most frequent error for second medical students followed by total amount (23%), strength, duration and advice (Figure 1). Likewise, strength of medicine (74%) was the most frequent prescription error for first year dental students followed by symbol, frequency, route, dosage form and duration. Second year dental students committed highest error on strength of the medicine (69%) followed by frequency, route/ duration, total amount and follow-up/refill (Figure 2). Figure 3 shows the top errors committed by medical and dental students which shows that number of errors committed by dental students is more than the medical students. Average number of errors per prescription committed by medical students are less than that of first year medical students (4.4 ± 2.6 vs. 2.3 ± 1.9), and average number of errors per prescription for second year dental students was 4.4 ± 2.2 vs. 5.9 ± 2.7 ($P<0.05$) for first year dental students (Table 3).

Table 1: Performance of pre-clinical medical students on prescription writing skills

Elements	MBBS first year N=131			MBBS second year N=139		
	CR (1) N (%)	OR (2) N (%)	Error N (%)	CR (1) N (%)	OR (2) N (%)	Error N (%)
Prescriber's name	0 (0)	1 (1)	1 (1)	0 (0)	0 (0)	0 (0)
Prescriber's qualification	0 (0)	6 (5)	6 (5)	0 (0)	0 (0)	0 (0)
Prescriber's registration no	0 (0)	5 (4)	5 (4)	0 (0)	0 (0)	0 (0)
Prescriber's contact no	0 (0)	15 (11)	15 (11)	0 (0)	20 (14)	20 (14)
Date of prescription	0 (0)	17 (13)	17 (13)	0 (0)	0 (0)	0 (0)
Patient's name	0 (0)	1 (1)	1 (1)	0 (0)	0 (0)	0 (0)
Patient's age and gender	0 (0)	3 (2)	3 (2)	0 (0)	0 (0)	0 (0)
Patient's address/contact no	0 (0)	16 (12)	16 (12)	0 (0)	1 (1)	1 (1)
Diagnosis	0 (0)	6 (5)	6 (5)	0 (0)	5 (4)	5 (4)
Symbol ℞	48 (37)	3 (2)	51 (39)	7 (5)	0 (0)	7 95)
Dosage form of medicine	9 (7)	25 (19)	34 (26)	2 (1)	11 (8)	13 (9)
Name of medicine	32 (24)	3 (2)	35 (27)	9 (6)	3 (2)	12 (9)
Strength of medicine	58 (44)	8 (6)	66 (50)	14 (10)	5 (4)	19 (14)
Frequency of administration	44 (34)	18 (14)	62 (47)	6 (4)	7 (5)	13 (9)

Route of administration	8 (6)	54 (41)	62 (47)	2 (1)	25 (18)	27 (19)
Duration of administration	22 (17)	19 (15)	41 (31)	13 (9)	5 (4)	18 (13)
Total amount to be dispensed	16 (12)	36 (27)	52 (40)	9 (6)	14 (10)	23 (17)
Direction for use	0 (0)	25 (19)	25 (19)	0 (0)	13 (9)	13 (9)
Advice/ warning/instruction	15 (11)	21 (16)	36 (27)	10 (7)	7 (5)	17 (12)
Follow-up/refill instruction	18 (14)	44 (34)	52 (40)	25 (18)	26 (19)	51 (37)
Prescriber's signature	0 (0)	17 (13)	17 (13)	0 (0)	4 (3)	4 (3)

CR: commission error; OR: omission error; E: Error (1+2).

Table 2: Performance of pre-clinical dental students on prescription writing skills

Elements	BDS first year N=34			BDS second year N=32		
	CR (1) N (%)	OR (2) N (%)	Error N (%)	CR (1) N (%)	OR (2) N (%)	Error N (%)
Prescriber's name	0 (0)	1 (3)	1 (3)	0 (0)	0 (0)	0 (0)
Prescriber's qualification	0 (0)	6 (18)	6 (18)	0 (0)	4 (13)	4 (13)
Prescriber's registration no	0 (0)	3 (9)	3 (9)	0 (0)	0 (0)	0 (0)
Prescriber's contact no	0 (0)	9 (26)	9 (26)	0 (0)	8 (25)	8 (25)
Date of prescription	0 (0)	10 (29)	10 (29)	0 (0)	11 (32)	11 (32)
Patient's name	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Patient's age and gender	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Patient's address/contact no	0 (0)	1(3)	1(3)	0 (0)	11 (34)	11 (34)
Diagnosis	3 (9)	0 (0)	3 (9)	2 (6)	0 (0)	2 (6)
Symbol ℞	23 (68)	1 (3)	24 (71)	3 (9)	1 (3)	4 (13)
Dosage form of medicine	5 (15)	10 (29)	15 (44)	3 (9)	7 (22)	10 (31)
Name of medicine	7 (21)	3 (9)	10 (29)	8 (25)	0 (0)	8 (25)
Strength of medicine	14 (41)	11 (32)	25 (74)	12 (38)	10 (31)	22 (69)
Frequency of administration	8 (24)	11 (32)	19 (56)	11 (34)	9 (22)	20 (63)
Route of administration	2 (6)	17 (50)	19 (56)	15 (47)	4 (13)	19 (59)
Duration of administration	10 (29)	5 (15)	15 (44)	13 (41)	6 (19)	19 (59)
Total amount to be dispensed	2 (6)	10 (29)	12 (35)	3 (9)	14 (44)	17 (53)
Direction for use	0 (0)	4 (12)	4 (12)	0 (0)	3 (9)	3 (9)
Advice/ warning/instruction	3 (9)	5 (15)	8 (24)	5 (16)	5 (16)	10 (31)
Follow-up/refill instruction	3 (9)	18 (53)	21 (62)	3 (9)	9 (28)	12 (38)
Prescriber's signature	0 (0)	8 (24)	8 (24)	0 (0)	1 (3)	1 (3)

CR: commission error; OR: omission error; E: Error (1+2).

Table 3: Average number of prescribing errors of preclinical medical and dental students

MBBS I N=131 Mean ± SD	MBBS II N=139 Mean ± SD	Unpaired 't' test *P value- two tail*	BDS I N=34 Mean ± SD	BDS II N=32 Mean ± SD	Unpaired 't' test *P value- two tail*
4.4 ± 2.6	2.3 ± 1.9	1.97 *1.76*	5.9 ± 2.7	4.4 ± 2.2	1.99 *0.023**

*P<0.05.

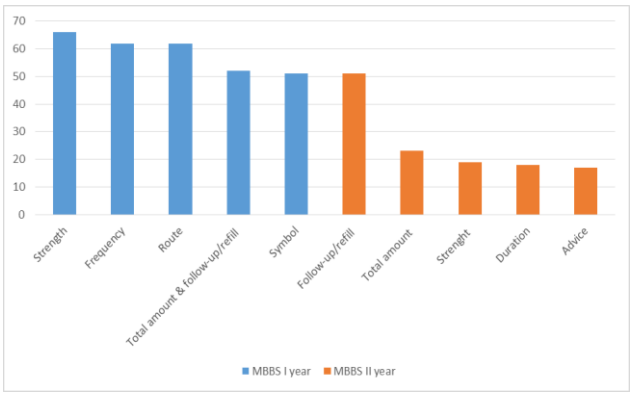

Fig 1: Top five prescription errors observed in the prescriptions of pre-clinical medical students

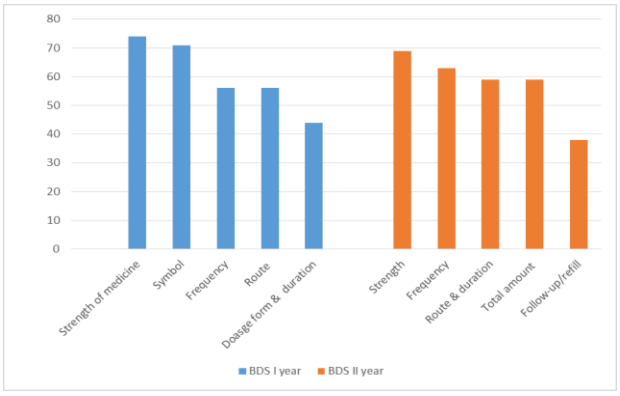

Fig 2: Top five prescription errors observed in the prescriptions of pre-clinical dental students

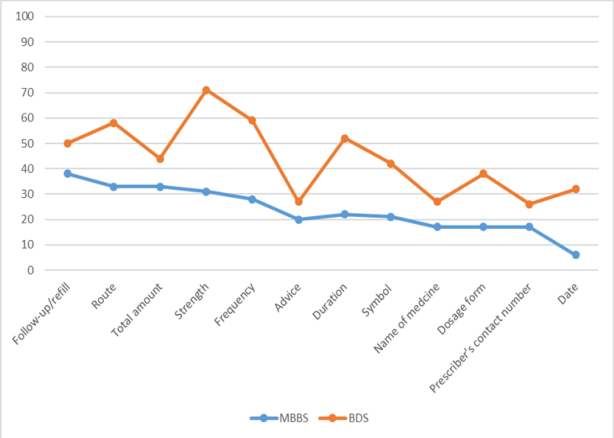

Fig 3: Percentages of frequently encountered errors in the prescriptions of pre-clinical medical and dental students

DISCUSSION

Present study evaluated the prescription errors of preclinical medical and dental students. Results showed that dental students committed more errors than medical students. However, the number of dental students might have affected the results (medical students 270 vs. dental students 66). Both first year and second year medical students showed error of omission (absence) which may due to lack of proper knowledge of elements of prescription (Table 1). Similarly, dental students also showed many errors of omission (absence) on different prescription elements (table 2). Though errors of commission (incorrect information) and error of omission (absence of information) may have similar practical consequences, it can be postulated that error of omission is more serious than error of commission academically. Miller's academic pyramid of assessment shows that 'knowledge of something' comes at the bottom of the pyramid.[11] However, there is no space for the lack of knowledge which signifies error of omission in this study. Data in the literature has shown increased duration of hospital stay and mortality associated with omitted error.[12] Findings in this study showed that the percentage of prescription error on drug related factors vary from 17% to 50%. Clinical findings on different studies have shown the drug related medication errors vary from 19.5% 9 (on admission), 9.9% (on discharge)[13] to 25% (on emergency room).[14] So, both errors of commission and omission have similar negative clinical impact and should be avoided as far as possible.

Errors were more frequent for drug related factors such as strength, dosage form, frequency, route, total amount/refill, duration and advice. In line with these findings, a study on evaluation of prescription errors on patients has shown more errors on drug related factors.[10] Both errors of commission and omission were present in drug related components. Proper training on prescription writing skills and relevant pharmacotherapeutic knowledge are required to avoid these errors.

Areas of difference in the errors for medical and dental students were strength, dosage form, frequency, route, total amount/refill, duration, advice, symbol ℞, name of medicine, prescriber's contact number, date of prescription. The fact that these findings are in concordance with similar studies in the literature[8, 15-17] emphasizes the areas of concentration during the training of undergraduate medical and dental students. All the prescription errors were higher for dental students than for the medical students. However, Sample size and other confounding factors such as over-all intellectual status, coverage and depth of pharmacology in academic training and way and duration of training on prescription might have affected the results which were not considered in this study.

Present data showed that second year students made less mistakes on prescription writing than first year students. These findings are consistent with similar previous studies.[15,17] Nevertheless, one similar study has shown the mixed results.[16] However based on these different findings, it can be hypothesized that second year students perform better on prescription writing skills which is due to more subject knowledge, repeated exposure to prescription writing tests, student-student interactions and application of academic knowledge. However, these factors have not been explored and considered in the study as these are complex to explore and were not the objectives of present study.

Limitations of the study include limited number of sample size of dental students, and different clinical cases given to the medical and dental students which might have affected the difficulty level of prescription writing in their exams.

CONCLUSION

Students commit higher errors on drug related factors. Second year medical and dental students make less mistakes than the first year students.

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