

Evaluation of teaching methods in pharmacology among MBBS students

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ABSTRACT

Background: Pharmacology is one of the most important subjects in medical curriculum. It is basis of medical science and the foundation of treatment. The applied aspect forms the basis of clinical rational therapeutics.

Methods: A cross-sectional study among 100 undergraduate medical students was undertaken after Institutional Ethics committee permission. Questionnaire was prepared from previous studies and validated by experts. These were administered to the participants after receiving their due consent.

Results: The mean age of students was 21.31±2.93 years. There were 72% females and 28% males. The average rating given for Pharmacology subject was 7.95±1.16. Females (8.38±1.24) rated Pharmacology subject more than males (7.51±1.09). 62% liked combination of LCD and Blackboard for teaching. 34% felt group discussion was the ideal Teaching learning method for learning Pharmacology. The most interesting topic was General Pharmacology (31%) and ANS (45%) was the most difficult subject to understand. The most important topic in practical's was 25% prescription writing and least was experimental graphs (2%). Preferred source to learn Pharmacology was combination of textbook and lecture (42%). 81% students liked integrated teaching of pharmacology with other subjects. 93% felt there should be more use of audiovisual aids, 91% wanted more of clinical pharmacology and 88% wanted more of group discussions. 91% felt calculation of pharmacokinetic parameters is clinically applicable.

Conclusions: There is need to develop innovative teaching learning methods and include more of clinical pharmacology in the undergraduate pharmacology subject.

Keywords: Didactic, Lecture, Practical, PowerPoint, Textbook

INTRODUCTION

Pharmacology is a dynamic subject and one of most evolving branches in medicine. As a subject, included in the second year (III, IV and V semester) of the Bachelor of Medicine and Bachelor of Surgery (MBBS) curriculum in India. It serves as a foundation stone for all the physicians in clinical practice. The subject of Pharmacology embraces pharmacy, experimental and clinical sciences.¹ In the third semester students are acquainted with patients and they begin to understand clinical aspects of diseases.² Teaching pharmacology

during this phase is a challenge.³ The objective of pharmacology teaching is to make undergraduate medical students capable to take rational therapeutic decisions in clinical scenarios.²

Conventionally in medical schools, pharmacology teaching is lecture centered on acquiring theoretical knowledge about drugs, the medical student is not trained adequately for therapeutic pursuits.⁴ The purpose of teaching pharmacology to medical students is to train them on rational and scientific basis of prescribing medicines in therapeutics.⁵

Pharmacology, like any other branch of medical science is a challenging branch. It is ubiquitous subject, required for all medical and surgical faculties. Thus many drugs are added in assemblage of drugs everyday changing the strategies for a given clinical condition.⁶ Due to this, syllabus content is overburden, and students find hard to remember and recall concepts and drug names. Thus there is need of reforms in undergraduate teaching and this can be done by reviewing teaching program and its methodologies at regular intervals.⁷

A curriculum is a vision, a road map to meet the academic objectives. The undergraduate medical curriculum in Pharmacology subject has been a topic of debate, there is an opinion that teaching pharmacology in medical schools has lost track with the rapid changes in medical practice. Thus it is necessity to make pharmacology teaching more interesting and applicable.^{5,8}

Teaching is considered as ever evolving processes especially in medical school. Consequently it needs to be upgraded continuously. Major hurdle for any medical school is to deliver enormous amount of knowledge in narrow schedule and students are expected to retain, remember and effectively interpret.⁹ Today, the teaching of pharmacology has become theoretical based with trivial clinical application.¹⁰

The pharmacology lectures can be made more interesting, understanding and relevant by reviewing the teaching program at periodic intervals.⁶ Teacher can adapt new methods of providing basic knowledge about drugs and drug therapies if they know the learning styles of students. Thus the study was taken to determine the current needs of undergraduate medical students in learning pharmacology.

METHODS

This was a cross-sectional questionnaire based study of 100 undergraduate medical students (50 from Fifth term completed and 50 from Sixth term students) in medical college and tertiary care Hospital.

The questionnaire was prepared from previous studies review of literature and previous studies by Rani, Manjunath, Sawhney, Abdulghani, Jai Krishna, Agarwal and Chavda.^{1,7,11-15} The validity (content and criterion) of the questionnaire was evaluated by three teachers, two from department of pharmacology and one from medical education unit of college.

The questionnaire consisted of two parts, in first part demographic information of the students was noted and in the second part information related to pharmacology teaching learning methods and opinion about pharmacology teaching was administered. Study duration was from 19 September 2016 to 10 March 2017. Study site was department of Pharmacology and Therapeutics.

A pilot study was conducted on 12 students and modifications were made in the questionnaire. Test retest reliability was estimated with 15 students by taking two interviews seven days apart and this were not included in the final analysis. Internal consistency reliability by Cronbach's alfa coefficient was 0.86. Participation was voluntary and students willing to give informed consent were enrolled in study. The objectives of the study were explained to the participants. Demographic information statement and Questionnaire were administered and collected after 20-40 minutes. A written informed consent was obtained from each participant. Students age ≥ 18 years and willing to give informed consent were included. The exclusion criteria were students not willing to participate or returning incompletely filled forms. Total 116 questionnaires were distributed, 112 were collected out of which 100 were selected based on inclusion and exclusion criteria. The identity and data in the present study was kept confidential.

Statistical analysis: Data was expressed as mean \pm standard deviation, frequency and percentage. P value <0.05 was considered to be statistically significant. Chi square test was used to test the association of different variables. Parametric tests (Student's t-test) was used to compare the scores among subgroups of medical students. Statistical analysis was done using GraphPad Prism version 5.0 software for Windows, San Diego.

RESULTS

There were total 100 students, 72 were females (F) and 28 were males (M). 85 were from urban area and 15 from rural area of residence. 74 from English medium, 21 were from Marathi and 5 from Hindi medium of education. 19 students parents were from medical and 81 students parents from nonmedical background. The average age of the participants was 21.31 ± 2.93 years (range 18 to 26). 45 students felt pharmacology is very important, 40 important (F=62, M=23), 10 were neutral and 5 felt subject is not important (F=10, M=05), both males and females felt subject is equally important, there was no statistically significant difference (P=0.75). The average rating given for Pharmacology subject was 7.95 ± 1.16 , males (7.51 ± 1.09) and females (8.38 ± 1.24), the rating was statistically significant for females compared to males (p=0.0016). The average ratings given by students of parents from medical field was 8.45 ± 1.18 and significant (p=0.005) as compared from nonmedical field 7.43 ± 1.12 .

The ideal medium by undergraduate students for learning Pharmacology was combination of Liquid Crystal Display (LCD) and Blackboard (62) (F= 50, M=12), followed by LCD 19, 17 liked black board only, while 2 liked overhead projector (F=22, M=16). Female students felt LCD and blackboard method is more effective than males (p=0.021). The ideal teaching learning methodology for learning Pharmacology by undergraduate students was group discussion (34),

followed by didactic lectures (27), tutorial (23), demonstration (13) and seminars (3).

Table 1: Students opinion about pharmacology subject.

Opinion	Agree	Neutral	Disagree
I find pharmacology lecturers interesting and stimulating	79	0	21
Pharmacology is my favorite subject in 2nd year of MBBS	63	18	19
The Pharmacology subject has helped me to develop my therapeutic rationale reasoning skills	53	35	12
I would like more of problems stimulated learning (PSL) in Pharmacology	72	10	18
The subject will help me immensely in choosing drugs rationally in my future clinical practice	84	5	11
I have come across various dosage forms in clinical postings and has helped me in better understanding of the subject	83	0	17
Mechanism of action of drugs can be better understood with help of charts	76	11	13
Calculation of pharmacokinetic parameters (e.g. Vd, t _{1/2} , Therapeutic index) is relevant and is clinically applicable.	91	0	9
Pharmacovigilance cases in practical pharmacology has helped in better understanding of ADRs and ensures safety of the drugs	86	9	5
I would like to include recent advances in Pharmacology curriculum	67	21	12
I would like MCQs to be continued to be included in the assessment	91	3	6

Table 2: Opinion about changes recommended in pharmacology teaching.

Opinion	Yes	No
Audio-visual support should be increased	93	7
Clinical pharmacology cases of different varieties should be introduced	91	9
Group discussions should be introduced in therapeutics	88	12
Case based learning should be increased	83	17
Case Presentations should be increased	63	37
Number of Pharmacology lectures should be increased	57	43
Student seminars should be increased	11	89

The most Interesting topic according to students in Pharmacology was General Pharmacology (31), followed by 24 for Cardio Vascular System (CVS), Autonomic Nervous System (ANS) for 18, Central Nervous System (CNS) for 16, 5 Endocrine, 2 Gastrointestinal System (GIT) and 4 were other topics. The most difficult system to understand in Pharmacology was ANS 45%, 39 CNS, 11 CVS, 2 Endocrine, 2 Chemotherapy, Antimicrobials 1.

The most important topic in practical pharmacology according to undergraduate medical students was 25 for prescription writing, followed by therapeutic rationale by 21, pharmacodynamics by 16, pharmacokinetics 15, case presentation 13, Adverse drug reaction (ADR) 8 and experimental graphs 2. Source to learn Pharmacology was 42 preferred combination of textbook and lecture, 26 preferred text book, 24 for combination of lecture and internet and 8 for internet only. 81 students liked integrated teaching of Pharmacology with other subjects while 19 did not liked integrated teaching. Study pattern followed by students to learn pharmacology was to read during term exams 39, followed by 31 for tutorial, 15 regularly by interest, 13 for gaining knowledge and 2 for final exams.

DISCUSSION

Pharmacology is subject of epochal in medical curriculum and its applied aspects are the base of rational Therapeutics. The clinical pharmacology exercises sensitize students for rational use of medicines, but these skills are minimally reinforced during clinical posting and so their practical application remains incomplete.¹⁶

In our study there were 72 females and average age was 21.31 years and 19% parents from medical profession. The average rating given was more by females and from students whose parents were from medical profession. Study by Sekhri had 85% females and mean age was 19.6±0.87 years.¹⁷ Study by Abdulghani had 24.7% Males, 75.3% females and 11.3% fathers, 4.70% mothers were from medical field while study by Jai Krishna had 65% parents from nonmedical professionals.^{12,13} The number of students, gender distribution and parents profession in our study match with other studies.

In our study 52% felt group discussion and 21% felt didactic lectures were ideal teaching method. Study by Padmanabha had 98.38% students that liked clinical cases, 90.32% group discussion as it improves understanding.¹⁶ Study by Zaman had 50% students that liked clinically oriented and 25% liked didactic lectures.¹⁸ Study by Abdulghani had 43.3% students that agreed clinical sessions and objectively structured practical examination (OSPE) stimulated learning more than didactic lectures.¹² Thus students feel group discussions and didactic lectures are ideal teaching methods.

In the current study 62% students preferred combination of LCD projector and blackboard. Study by Manjunath had 81% students that felt combination of LCD projector and blackboard ideal teaching media.⁷ Study by Bandopadhyay had 45.98% students that agreed and 50.57% strongly agreed that power point presentation and chalk& talk as combined, was the best teaching-learning method.¹⁹ Similarly study by Amane had 90%, Padmanabha had 59.68% students that liked combination of blackboard and PowerPoint presentations.^{6,16} Study by Desa showed that chalkboard method obtained significantly higher score in MCQ (Multiple Choice Questions) test than power point while study by Seth had majority students that preferred PowerPoint presentations.^{20,21} Our study and other studies has preferred ideal teaching methodology is combination of powerpoint and blackboard.

In our study the most interesting topic was General Pharmacology followed by CNS while ANS was the most difficult system to understand. Study by Tabish found 41.91% interested in General Pharmacology, 13.19% in CVS, 12.31% are interested in CNS while 22.46% felt all the topics in pharmacology are interesting.² In study by Bhosale students liked Endocrinology (53.2%) topic followed by CVS (48.4%) and General pharmacology (37.8%).²² Similarly studies by Zaman had CVS (34%) and Prasad had CNS (60%) as most interesting topic.^{18,23} Study by Manjunath found most difficult system to understand was ANS (53.12%) and CVS (20.31%).⁷ while study by Rani noticed 23% GIT, 19.6% found Endocrinology interesting and General Pharmacology (3.8%) least interesting.¹ Thus there are various topics of interest and disinterest in Pharmacology, it is important to look Pharmacology as a whole subject and accordingly to distribute topics as important and desirable to know.

In our study prescription writing was most important and experimental graphs the least important topic. Study by Rani found prescription writing (33.5%), criticism of prescription (27.8%) and clinical problems (26.7%) interesting and least interesting were experimental graphs (5.6%).¹ Study by Bhosale had prescription writing (64.9%), comments on fixed dose combinations (46.7%) were found most interesting.²² Study by Prasad had 57% students that felt clinical exercises interesting, fixed dose combination (40%) and experimental graphs (11%).²³ Study by Manjunath had 67% of students felt that

calculation of pharmacokinetic parameters and 95% students felt Pharmacovigilance problems in practicals were relevant and helped them in better understanding of ADRs.⁷ Thus there is need to refine practical pharmacology and make them most interesting to utilize knowledge in solving clinical problems.

In our study 42% preferred combination of textbook and lecture as source to learn pharmacology. Study by Rani had 46.2%, by Zaman (37%) and Prasad had (56%) students that preferred text book and lectures to study Pharmacology.^{1,18,23} Jaikrishna study had 76.56% students that felt pharmacology lectures stimulating while 28.12% believed it as their favourite subject.¹³ Till date students heavily depend on lectures and textbooks for learning Pharmacology that are still an important source of information for learning Pharmacology.

In the present study, 39% learned pharmacology for term exams. Study by Zaman had 47% students studied during examinations, 24% for regular tests, 11% to gain knowledge and 10% because of interest.¹⁸ Study by Rani had 56.58% that studied during exams.¹ Similar results by Prasad and Study by Tabish had 37.36% students learned for gaining more knowledge, 23.33% because of interest, 32.97% because of tutorials whereas 1.46% studied for final exams.^{2,23} Thus there is need to make teaching of Pharmacology interesting so that students read it regularly.

In our study students wanted more group discussions, audiovisual aids, case based learning, and fewer seminars. Study by Rani had 25.5% of students that felt of including recent advances in Pharmacology. 29.5% of students found Clinical Pharmacology interesting method, followed by tutorials (18%) audiovisual aided lecture (14%) while the least interesting was student's seminars (3.5%).¹ Study by Manjunath had 82% students that wanted group discussions, 98.43% wanted case based learning, 70% wanted recent advance in curriculum while 80% were in favour of MCQs in assessment of their academic performance.⁷ Garg A et al study showed that students (35%) were not in favor of giving seminars.²⁴ Study by Padmanabha had 69.35% agree to have seminars.¹⁶ According to Jai Krishna (37.66%) students wanted to make more use of audio-visual aids, 31.17% wanted group discussions, while 19.48% wanted decrease in number of lectures.¹³ Study by Badyal, students were satisfied with interactive teaching methods for teaching undergraduate medical students that include tutorials, demonstrations, experimental exercises etc.²⁵ Lecture delivery has impact on students understanding and retention of concept.²

In our study 81% liked integrated teaching of Pharmacology subject with other subjects. Study by Manjunath 89.06% and Jaikrishna had 65% students wanted pharmacology more closely integrated with clinical sciences.^{7,13} 45.42% students wanted integrated teaching to be implemented.² An integrated approach can

have learner centered curriculum that can develop competencies required for today's physician.

Traditionally, Pharmacology has focused more on factual information with little emphasis on clinical and applied aspects. Pharmacy and experimental practicals have still remained foundation of practical pharmacology. The utilization and importance of practical exercises have been the center of academic debate.⁸ It is important that modifying teaching methodologies at timely intervals has become a necessity. Feedbacks enhance learning and provide an opportunity to assess the lacunae in current system.^{1,16}

In Malaysia, pharmacology learning has transformed from laboratory teaching to bedside patient approach.²⁶ While at McMaster University in Canada the problem based learning curriculum is integrated across organ systems, population and behavior.²⁷ The purpose of pharmacology is students are expected to develop skills that will help them in clinical postings and throughout their medical profession. In undergraduate teaching animal experiments can be demonstrated by Computer Aided Education. according to 2009 MCI amendment. Computer Assisted Learning (CAL) is helpful in teaching pharmacology by simulating action of drugs on receptors and animal tissues.^{28,29}

Three visual mode of teaching such as power-point, small group graphical illustration and computer assisted exercises complement learning. Didactic lectures need to be complemented with visual aids and other forms to facilitate learning.³ Problem based learning and OSCE need to be introduced to students.¹ E-Learning is still at infancy in Indian medical curriculum. Introduction of E-learning and CAL provides an opportunity to modify and make teaching easy.³⁰

Modification focuses on processes, approaches and not only on contents. These can be in form of active learning such as thinkpair share, minute papers, concept understanding by use of models, CAL and working on mannequins that can be incorporated.^{20,31} This modification can be achieved by bring about horizontal and vertical integration in pharmacology.³¹

Thus there is need to develop innovative teaching learning modules, which can foster more of interaction between teachers and students, better communication among students thus creating significant learning environments to improve the quality of future medical practitioners.

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