

ASSIMILATING AND REPRODUCING CONCEPTS AFTER PHARMACOLOGY LECTURE - A QUESTIONNAIRE-BASED STUDY

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ABSTRACT

Objective: Medical undergraduates learn pharmacology during the second phase of MBBS. Considering the expanding list of drugs and volatility associated with its learning, the objective of this study was to describe the factors that interfere with the assimilation and reproduction of the concepts in pharmacology.

Methods: This was a descriptive study done in the Department of Pharmacology of a Government Medical College in Central Kerala for a period of 2 months. Five short answer questions were chosen to elicit responses from the participants in the form of a surprise test. A Google fill out form elicited the perception of the participants about learning during the pharmacology lecture. The data were sorted and entered into Statistical Package for the Social Sciences (SPSS) software version 16 (SPSS Inc, Chicago, USA). Descriptive data were expressed using frequencies and percentages.

Results: Of the 148 students, 84 (56.75%) participated in the study. For the surprise test, the mean marks scored were 2.24 ± 0.77 (maximum marks 5). Forty-seven (56%) participants claimed that they were attentive in pharmacology lectures only "sometimes." The majority of the participants 82 (97.6%) "sometimes" found it difficult to imbibe the concepts in pharmacology. Seventy (83.3%) agreed that definitions are difficult to learn as such. Only 10 (11.9%) disagreed with the statement that a drug's action cannot be interpreted as its use because sometimes actions can aggravate some diseases. Sixty-one (72.6%) participants had difficulty in understanding the word "rationale." Five minutes break, continuity of topics, separate question-answer session at the end of class, summarization, a video demonstration of the mechanism of action, providing printed lecture notes, simple explanation, mnemonics to learn, clinical correlation, lectures during morning hours, and team-based quizzes were some suggestions to increase the assimilation of the subject.

Conclusion: Participants had a mean score which was <50% of the total score. While the scores for definitions varied the question on uses of drugs fetched similar marks; however, the students had poor performance on the question related to rationale. Ignorance about the meaning of the word "rationale" shows the importance of regular feedback and the use of simple language in understanding the problems faced by the participants in learning the concepts in pharmacology.

Keywords: Pharmacology lectures, Concepts, Rationale, Definitions.

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INTRODUCTION

Pharmacology serves as a foundation stone in the successful development of a competent doctor. The booming pharmaceutical industry adds on an array of drugs in addition to the existing ones which makes learning pharmacotherapeutics a challenge. The students familiarize with therapeutics, namely, classification of drugs, mechanism of action, adverse effects, drug interactions, and medications used in various diseases. They also learn experimental pharmacology vital for understanding drug action as well as clinical pharmacology which is essential for prescribing medicines during their second phase MBBS [1]. With the implementation of Competency-Based Undergraduate curriculum for the Indian Medical Graduate released by Medical Council of India Pharmacology is divided into five major topics with 85 outcomes with 64 competencies in pharmacotherapeutics, four competencies in clinical pharmacy, eight competencies in clinical pharmacology, two competencies in experimental pharmacology, and seven competencies in communication apart from horizontal and vertical integration with other subjects [2]. In feedbacks received following traditional teaching, pharmacology is perceived to be a dry and volatile subject by the medical undergraduates [3]. Aligning assessment to the learning objective is necessary and assessment in pharmacology has developed over years and the choice of the most appropriate instrument is still debated and yet to be accepted [4].

The views of the learner and their educational experiences relate indirectly to the effectiveness of the course offered to them and feedback at regular intervals will help in polishing in chaff from the grain and make the teaching process polished and productive. It is necessary to understand whether students assimilate what is being transferred to them during teaching hours, a vast majority of the teaching method being lectures. Lectures may be active or passive and how much they help in the assimilation of the concepts in pharmacology which can be reproduced needs to be evaluated. Even though many studies evaluated the teaching-learning methods, we need to examine what are the factors that interfere with assimilation and reproduction of the concepts in pharmacology and hence this study was conducted among second phase medical undergraduates.

METHODS

This was a cross-sectional study done in the Department of Pharmacology of a Government Medical College in Central Kerala for a period of 2 months (December 2019–January 2020). Since, there were no ethical issues the clearance from the ethics committee was not sought. The "World Health Organization (WHO) definition of drug," "Definition of Adverse Drug Reactions," "Two uses of adrenaline," "Two uses of atropine," and "Rationale for using Tamsulosin for Benign Hypertrophy of Prostate" were the questions chosen to elicit a response from the participants by the principal investigator. After completing

sessions related to the selected questions, during a pharmacology lecture hour, the study participants were informed about the study by the principal investigator. All students who were willing to participate in the study were included after getting informed consent. After 15 min, the responses were collected. Anonymity was not maintained so as to provide constructive feedback to the students. The answers were reviewed and valued by four independent examiners based on a key and data were entered into an excel sheet. A Google fill out form was circulated through WhatsApp, as a group message among participants to evaluate their attitude about learning during pharmacology lecture. The data were sorted and entered into Statistical Package for the Social Sciences (SPSS) software version 16 (SPSS Inc, Chicago, USA). Descriptive data were expressed using frequencies and percentages.

RESULTS

Of the 148 students, 84 (56.75%) participated in the study. Forty-nine females (58.3%) and 35 males (41.7%) with a mean age of 20.19±1.30 years participated in this study.

The short test consisted of five questions and none of the students could write the definition of drug correctly. Sixty-eight (81%) could write the definition of adverse drug reaction properly. More than half of 46 (54.8%) could write two uses of adrenaline correctly and 34 (40.5%) wrote two uses of atropine correctly. Only nine (10.7%) participants could write the question on the rationale for use of Tamsulosin for Benign Hypertrophy of Prostate. Out of the total marks of five, the mean mark was 2.24±0.77.

Of the 84 participants, 78 (92.9%) liked pharmacology lectures and 6 (7.1%) did not like it. Forty-seven (56%) participants claimed that they were attentive in pharmacology lectures only sometimes and the rest 37 (44%) were always attentive. The majority of the participants 82 (97.6%) "sometimes" found it difficult to imbibe the concepts, 1 (1.2%) "never" found it difficult to imbibe the concepts, and 1 (1.2%) "always" found it difficult to imbibe the concepts taught during pharmacology lectures.

Seventy (83.3%) agreed that definitions are difficult to learn as such and 14 (16.7%) disagreed with the same. However, more than three-quarters of the participants 67 (79.8%) disagreed with the statement that there is no point in studying the definition and 17 (20.2%) agreed to the statement. More than half, 49 (58.3%) thought that definitions could be written in our own words rather than reproducing the standard definition while 35 (41.7%) disagreed with the statement. Even though 22 (26.2%) agreed to the statement that since the use of the drug is based on pharmacological action and hence writing action instead of uses should be awarded marks, only 10 (11.9%) disagreed to the statement that a drug's action cannot be interpreted as its use because sometimes actions can aggravate some diseases. Even though 77 (91.7%) disagreed with the statement that learning rationale is not important, 61 (72.6%) had difficulty in understanding the word "rationale." Forty-eight (57.1%) could not answer the questions on definition because they forgot the definition after learning it and the rest thought that it was not important to learn the definition. Sixty-five (77.45%) were confident that they could answer the questions on the uses of atropine and adrenaline correctly. Even though 76 (90.5%) and 67 (79.8%) replied that the concept regarding, the use of adrenaline and atropine were respectively, well explained in the lecture. Of the 62 who claimed that they could not attend to the question on adrenaline uses, 50 replied that they could not reproduce the concept regarding adrenaline, and 12 were not attentive in the class. Similarly of the 57 participants who claimed that they could not attend question on atropine use, 33 (39.3%) could not reproduce the concept learned in the lecture, 18 (21.4%) were not attentive, and 6 (7.2%) could not understand the concept that was explained. The majority of the students (44%) could not reproduce the rationale for use of tamsulosin in BPH even though they understood the concept and quarter of the students claimed that they were not attentive in the class. The results are summarized as shown in Table 1.

Suggestions to improve the lecture class were collected from the participants and they are summarized and listed as follows

1. Five minutes break for class of 1 h and multiple breaks for continuous 2 h lecture
2. Continuity of topics –Take the leftover portion of one topic in the adjacent days rather than placing them apart
3. Asking questions in between the class distract the students and make them anxious instead of making them more attentive. One student opined that "Question asking section should be kept separately so that we can prepare well and present...helpful for us"
4. Important questions and points should be summarized and previous year's questions should be dealt at the end of the lecture
5. Videos to demonstrate the action of the drug
6. Provide printed lecture notes, during the class student, should be able to make good lecture notes
7. The explanation should be simple knowing the minds of the students, classes should be more interesting, and interactive, include shortcuts and mnemonics to learn and should be taken at a slow pace by decreasing speed of the content delivered
8. "Clinical correlation should be given to every drug otherwise we cannot learn the actual mechanism for the use of the drug. The theory class should be more application based and the active involvement of students is required rather than just reading slides"
9. Lectures during morning hours
10. "Pop quizzes between teams of either side can be added at the end of every class as competitive nature might make us interested to learn and reproduce."

DISCUSSION

This was a cross-sectional study done among the second phase MBBS students in their third semester within 2 months of the beginning of their second phase. Undergraduate pharmacology in the MBBS curriculum is incorporated with the prime intention of sensitizing the students about drugs and to equip them to utilize this knowledge rationally for clinical practice. Feedback from the students helps in the improvement and development of teaching methods adopted.

Based on a previous study, in the same institution the key was prepared for evaluating the surprise short test and it was evaluated based on the facts that definition needs to be a standard definition, uses need to clinical condition for which the drug is used and not actions of the drug [4]. In this study, all the students failed to write the definition of a "drug" while 81% could correctly write the definition of "adverse drug reaction." Even though 83.3% of the participants thought that definitions are difficult to learn, 79.8% disagreed with the statement that there is no point in studying the definition of a drug and 58.3% thought that definitions can be written in their own words. Sreedharan *et al.* stated that questions like writing definitions may be deemed to be non- reliable, and also faculty feedback showed that concept is important than correctness of the WHO definition. They opined that that student may not have studied the definition at all [4]. In line with the findings in the previous study, 43.9% of students claimed that they did not think it was important to learn definitions. Even though concepts are introduced in the class, the teacher needs to emphasize the importance of learning it. Adverse drug reaction reporting is given as a project of the undergraduate students and the relevance attached to the topic may be one of the reasons that the majority of participants could answer the definition of adverse drug reaction. Another reason for the null score for the definition of the drug is that it is taken in the introductory class as compared to adverse drug reaction and a gap of 2 months might have resulted in the minimal retention taken into the fact that it was a surprise test.

More than half and 40.5%, respectively, could write two uses of adrenaline and atropine correctly. Only 10.7% of participants could write the question on the rationale for the use of Tamsulosin for Benign Hypertrophy of Prostate. As expressed by the participants in feedback

Table 1: Response to questionnaire items by the participants

Statement	Response	n (%)
I like pharmacology lectures	No	6 (7.1)
	Yes	78 (92.9)
I try to be attentive during pharmacology lectures	Always	37 (44.0)
	Sometimes	47 (56.0)
I find it difficult to imbibe the concepts taught during pharmacology lectures	Always	1 (1.2)
	Never	1 (1.2)
	Sometimes	82 (97.6)
Definitions are difficult to learn as such	Agree	70 (83.3)
	Disagree	14 (16.7)
I think there is no point in studying the definition of a drug	Agree	17 (20.2)
	Disagree	67 (79.8)
I think definitions can be written in our own words rather than reproducing the standard definitions	Agree	49 (58.3)
	Disagree	35 (41.7)
The use of the drugs is based on the pharmacological action and hence writing action instead of uses should be awarded marks	Agree	22 (26.2)
	Disagree	62 (73.8)
A drug's action cannot be interpreted as its use because sometimes actions can aggravate some diseases	Agree	74 (88.1)
	Disagree	10 (11.9)
I have difficulty in understanding the word rationale	Agree	61 (72.6)
	Disagree	23 (27.4)
I think learning rationale is not important	Agree	7 (8.3)
	Disagree	77 (91.7)
I could not answer the question on definition of a drug properly because	I did not think it was important to learn the definition	36 (43.9)
	I learned the definition but forgot	48 (57.1)
I could answer the question on the uses of adrenaline and atropine	No	19 (22.6)
	Yes	65 (77.4)
I could answer the question on the uses of adrenaline because	The concept was explained properly in the class	76 (90.5)
	I learned the concept myself	6 (7.1)
	My friend(s) explained the concept to me	2 (2.4)
I could answer the uses of atropine because	The concept was explained properly in the class	67 (79.8)
	I learned the concept myself	4 (4.8)
	I understood the concept in the class but could not reproduce	7 (8.3)
	My friend(s) explained the concept to me	6 (7.1)
I could not answer the uses of adrenaline because*	I could not understand the concept even though it was explained	1 (1.2)
	I understood the concept in the class but could not reproduce	50 (59.5)
	I was not attentive in the class	11 (13.1)
I could not answer the question on uses of Atropine*	I could not understand the concept even though it was explained	6 (7.2)
	I understood the concept in the class but could not reproduce	33 (39.3)
	I was not attentive in the class	18 (21.4)
I could not answer the rationale for using Tamsulosin in Benign Hypertrophy of Prostate because	I could not understand the way, in which the concept was explained	18 (21.4)
	I understood the concept in the class but could not reproduce	37 (44.0)
	I was not attentive in the class	21 (25.0)
	I was not interested in learning the concept	8 (9.6)

*Total sample=84, The percentages do not add up to 100 as some respondents left the question unanswered

majority learned the concept related to adrenaline and atropine in the class itself, while some learned it by themselves by reading at home and some learned from peers. The majority of the participants, however, could not reproduce the content learned in the class even though it was well explained and some were not attentive in the class. In this study, the majority of the participants felt that marks should not be awarded if the action of the drug is written and a drug's action cannot be interpreted as its use because actions can aggravate some diseases. In a previous study, some faculty opined that they would award marks if action is written instead of use; however as opined in this study it is not a good practice [4].

The majority of the students failed to write the question on rationale properly as they could not understand the way in which it was explained or were not attentive or not able to reproduce it despite being attentive. The majority of the participants had difficulty in understanding the word rationale. As opined in the previous study, writing the rationale for

the use of a drug elicits higher order of thinking such as understanding and application [4].

Learning is an active process with the mutual exchange of information between the teacher and student which makes sharing knowledge enjoyable and easy for comprehension. Papanna *et al.* stated that for effective learning teaching should facilitate the inculcation of problem-solving potential and address areas that are difficult for students [5]. Participants of this study felt that lectures should be preferably in the morning hours, have adequate breaks in between so as retain their attention with interaction, video displays, summarization, and discussion of questions at the end of the class. Papanna *et al.* found that their participants preferred Socratic lectures as they could improve student's thinking which gives them the freedom to voice their opinion which made the lectures more interactive and helped develop a positive competitive spirit [5]. Manjunath *et al.* found that students wanted more mnemonics to be used frequently for teaching the classification of drugs

and adverse drug reactions and there should be horizontal integration with microbiology and pathology for better understanding [6]. As opined by the participants of a study, lecture classes can be improved by the sharing study materials or handouts and conducting regular tests, tutorials, and viva which help students learn and retain pharmacology in a better way [7].

Augustin opines that in medical school students learn the factual-“what” and the procedural knowledge – “the how and why” information. Acquisition of factual knowledge consumes the majority of time in the medical school and it is acquired by reading, summarizing, testing, and restudying [8]. As time passes memory faded and the knowledge, we acquire is destined to be forgotten unless there is repeated practice, revision, testing, and vertical integration with clinical orientation [8,9]. A study by Sreedharan *et al.* stated that question framing can help in developing better concepts of the subject. In that study, the majority of the participants framed direct short answer questions which reflected factual knowledge indicating their lower-level cognition. Critical thinking and procurement of higher-level cognition can be attained by directing the students to frame questions that address patient-oriented problems [10]. Despite all this factual knowledge do not suffice and the future doctors need to attain competency to choose the preferred drug and prescribe it. Haque, in an article on the readiness of future doctors on prescribing safely and rationally opine that prescribing medicines, is the most common clinical intervention for any medical doctor which is multifaceted, thought-provoking, and demands comprehensive knowledge of medicine and diseases along with empathy and integrity [11]. Balani *et al.* stated that active participation in learning pharmacology establishes a better correlation of knowledge of drugs with therapeutics. In their study, they introduced competition based cocurricular activities that imparted active learning and they suggested repeated exposures to immediate recall exercises, problem-based learning, and research activities, especially in the poor performers [12].

Limitations of this study were that it was conducted in a single center with only 56.75% of the sample population participating in the study. Responses on the problems faced in learning concepts were based on a surprise test that had only short answer questions. More tests need to be conducted with modified essay questions which will help in a deeper understanding of the problems faced by the students in assimilating the concepts.

CONCLUSION

Participants had a mean score which was less than 50% of the total score. While the scores for definitions varied the question on uses of drugs fetched similar marks; however, the students had poor performance on the question related to rationale. The students felt that definitions were important to learn in a standard way but the importance attached to it should be stressed during the class. Uses of the drugs should not be substituted with actions as this can lead to the wrong perception that all actions are representative of their use while some actions result in adverse drug reactions. Many participants were ignorant about the meaning of the word “rationale” and this shows the importance of regular feedback and the use of simple language in understanding the problems faced by the participants in learning the concepts in pharmacology.

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AUTHORS' CONTRIBUTIONS

Syam Sreedharan-Study Idea, Protocol preparation, Study Conducting – Surprise test, and collection of Google Fill out Form, Manuscript Review. Dhanya Sasidharan Palappallil – Project Idea, Study conducting – Preparation of Google Fill out Form, Test evaluation, Literature Review, Data Analysis, Statistical analysis, Manuscript preparation. Laila Kandath Veedu – Test evaluation, Manuscript review. Hari Sankar KN – Test evaluation, Manuscript review. Athira Muthanattu Divakaran – Test Evaluation, Data entry, Manuscript review.

CONFLICTS OF INTEREST

No conflicts of interest to disclose.

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