Pharmacology and Toxicology Teaching Patterns for Undergraduate Students in Pharmacy and Medical College at Umm Al-Qura University, Makkah, Saudi Arabi: A Survey

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Abstract

Background: Pharmacology and toxicology is the field of biomedical sciences that cares with the study of medication and the drug action, where a drug can be defined as any chemical substance, that, when taken by a living organism, produces a therapeutic effect and promote well-being.

Objective : The Aim of this study was to assess the students' attitudes toward, perceptions of and feedback surrounding pharmacology and toxicology teaching methods.

Method : This was a cross-sectional study involved a survey given to 3rd years and 4th years pharmacy (Pharm D + B Pharm) students and medical students with a total number of (108) participants. The study was administered through a pre-validated questionnaire containing questions based on the internationally accepted "Likert Scale".

Results : The study showed that students favored many changes in pharmacology and toxicology, including the trend of teaching them to third year and fourth year students (48%), instruction on how to choose drugs rationally in future practice (48%), distribution of handouts before lectures (43%), clinical pharmacology (49%), teaching certain topics during pre-final or final year (35%), and a combination of multiple choice questions (MCQs) and written and oral rating evaluation methods for examination (40%). Students were in favour of that pharmacology should be integrated horizontally with other paraclinical subjects and emphasis on problem solving exercises rather than on didactic (teaching) lectures.

Conclusion : It is evident that there is an imperative need to implement radical changes in the teaching of pharmacology and toxicology, changes that would allow the pharmacist and/or doctor of tomorrow to render better health services**.**

Keywords: *Pharmacology; toxicology; Likert scale; questionnaire; teaching; undergraduate students.*

Background

Pharmacology and toxicology is a field of biomedical sciences that cares with the study of medication and the drug action,[1] where a drug can be defined as any chemical substance, that, when taken by a living organism, produces a therapeutic effect and promote well-being. More specific definition, it is the study of the mechanism of interactions between a human body and chemical substance which affect the biochemical function. Moreover, it describes two mean subjects: pharmacodynamic which discuss the mechanism of action of drugs and pharmacokinetic that is related to areas of absorption, distribution, metabolism and excretion within the body.

The pharmacology discipline can be classified into different sub- branches each with a certain interest, such

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as

a- According to Systems of the body [2]

• Neuropharmacology: the study of neurons of the central and peripheral nervous systems.

• Immunopharmacology: the study of the immune system.

• Cardiovascular: thee study of the heart and blood vessels.

• Renal pharmacology: deal with kidney function.

• Endocrine pharmacology: the study of the endocrine glands.

• Psychopharmacology: is the study of the effects of drugs on the psyche and behavior. [3]

b- According to clinical practice and drug discovery [4]

· Clinical pharmacology: the branch of pharmacology that focus on the application of principles of pharmacology in caring of patient.

For example, posology that is concerned with how medicines are dosed.

c- Experimentation and analysis

• Theoretical pharmacology is a branch of research uses computational techniques. It aims to interpret the association between the experiential efficacy of a certain drug to its structural composition. which results to know the structure activity relationship. [5, 14]

d- Wider contexts

• Pharmacology branches which deal with wider contexts than the body physiology. For example pharmacoepidemiology that deal with the efficacy of drugs in large population and associated with the broader fields of epidemiology and human health.[6, 7]

The drugs studying requires high knowledge of the nature of biological system. The field of pharmacology has also changed substantially upon the knowledge of cell structure and cell biology. It has become easier due to the molecular analysis of biological receptors that is considered an important step for drug design as understanding the structure of receptors help to determine the cellular signaling. [7, 10, 11]

The story of synthetic organic chemistry started in 1828, when Friedrich Wohler synthesized urea from inorganic substances and therefore demolished the vital force theory. The birth date of pharmacology is not as clear-cut. In the early 19th century, physiologists performed many pharmacologic studies. Oswald Schmiedeberg (1838–1921) is generally recognized as the founder of modern pharmacology. In 1878, he published a classic text, Outline of Pharmacology, and in 1885, he introduced urethane as a hypnotic. [8, 12, 13]

University of Umm Al-Qura is teaching students pharmacology that includes the main classes of drugs in universal clinical department such as drugs effecting the autonomic nervous system, drugs effecting the central nervous system, drugs effecting the cardiovascular system, drugs effecting the endocrine system, drugs for respiratory disorder, drugs for anemia, drugs for gastrointestinal disorder, analgesic, and antibiotics. Therefore, these are the basic important classes of drugs, in which can have beneficial and harmful.

Pharmacology and toxicology is taught as a basic science to students to know how a drug works and what is the desirable effect we want to treat a patient, for this reason we discuss pharmacology and start this research to ensure that students favourable of the patterns technique teaching of pharmacology in Umm Al-Qura University.

Needless, to mention that undergraduate students should have an excellent foundation of pharmacology to using their knowledge of drug class, mechanism of action, pharmacokinetic, adverse effect, route of administration, dose, frequency, and the duration of the treatment to make the right decisions and choosing the desirable and effective drugs for each specific condition for each patient in clinical practice.The Aim of this study was to assess the students' attitudes toward, perceptions of and feedback surrounding pharmacology and toxicology teaching methods.

Methods

This was a cross-sectional study involved a survey given to 3rd year and 4th years pharmacy (Pharm D + B Pharm) students and medical students with a total

number of (108) participants.

The study was administered through a pre-validated questionnaire containing questions based on the internationally accepted "Likert Scale". the trend of teaching pharmacology and toxicology to 3rd and 4th years pharmacy and medical students, instructions on how to choose drugs rationally in future practice, distribution of handouts before lectures, clinical pharmacology, and a combination of multiple-choice questions (MCQs) and written and oral rating evaluation methods for examination.

Results

From the survey the total number of participants were 108 students, in which 81% were females and 19% were males . Table 1 shows the median scores and percentage distribution of individual statements (Questions 1-8). Participants strongly agreed (28%) with the statement that pharmacology and toxicology is one of the favorite subjects during their studying years. Moreover, participants agreed (48%) that studying pharmacology and toxicology in the third and fourth years would help in rationally choosing the right drugs in future of their practice. Our results demonstrated a preference for horizontal integration of pharmacology with other paraclinical subjects (49%). However, participants agreed that there should be more emphasis on problem-solving exercises rather than on lectures (41%). Participants (43%) agreed on the importance of prior distribution of handouts due to its crucial benefit in providing road maps for upcoming lectures. Students agreed (43%) that problems based on learning and prescriptions would be extremely useful in clinics or hospital settings. The response was very good (46%) with regards to correlating drugs with a specific disease unless pharmacology and toxicology is simultaneously learnt along with clinical conditions.

Table 1. Percentage wise distribution and median score of various parameters

N= 108 Item no	Percentage wise distribution	Median score
1	SDA - 6.0 (5.00 %); DA – 17.0 (14.0 %); NS – 36.0 (31.0 %);	3
	A – 26.0 (22.4 %); SA – 33.0 (27.8 %)	
2	SDA – 12.0 (15.8 %); DA - 1.0 (2.00 %); NS – 2.0 (3.6 %);	4
	A – 22.0 (48.0 %); SA – 9.0 (19.8 %)	
3	SDA – 8.0 (7.1 %); DA – 11.0 (10.1 %); NS – 21.0 (20.3 %);	4
	A – 53.0 (49.0 %); SA – 15.0 (14.3 %)	
4	SDA – 18.0 (16.0 %); DA – 11.0 (10.7 %); NS – 18.0 (17.3 %);	4
	A – 44.0 (41.3 %); SA – 17.0 (16.3 %)	
5	SDA – 11.0 (20.1 %); DA – 11.0 (7.3 %); NS – 16.0 (17.1 %);	4
	A – 26.0 (34.2 %); SA – 6.0 (13.3 %)	
6	SDA – 19.0 (17.1%); DA – 3.0 (3.3 %); NS – 22.0 (21.4 %);	4
	A – 46.0 (42.9 %); SA – 17.0 (16.3 %)	
7	SDA – 7.0 (7.2 %); DA – 4.0 (4.0 %); NS – 17.0 (16.5 %);	4
	A – 48.0 (46.0 %); SA – 18.0 (17.4 %)	
8	SDA – 8.0 (8.0 %); DA – 11.0 (10.0 %); NS – 43.0 (40.0 %);	3
	A – 37.0 (35.0 %); SA – 8.0 (8.0 %);	

Note: SDA Strongly Disagree; DA Disagree; NS notsure; A Agree; and SA Strongly Agree

Table 2 shows the response rate and percentage distribution of statements (9 to 12). Around half the participants (50%) preferred using multiple choice questions [MCQs] only, written questions (3%) and oral questions (7%) as evaluation techniques for examination purposes. When students were asked to state the best tool through which to study pharmacology and toxicology, their responses varied between preferring to use a combination of studymethods (35%) and preferring lecturing as their primary study tool (37%), 17% of the participants preferred textbooks. Around (44%) of the students in this survey study preferred the understanding method when learning pharmacology. When asked whether they wished to become pharmacologists, the answers were varied: 11% said they did not know, 39% selected maybe, 31% said no and 19% answered yes.

Table 2. Percentage wise distribution and median score of different parameters

Item in questionnaire	Responses %			
	MCQs only	Written only	Oral only	Combination
Q09	57.0 (50.00 %)	8.0 (7.00 %)	3.0 (3.00 %)	49.0 (40.00 %)
	Text Book Only	Teaching Class	Self-Prepared	Combination
Q10	24.0 (17.00 %)	35.0 (37.00 %)	16.0 (11.00 %)	51.0 (35.00 %)
	Cramming	Understanding	Grasping	Combination
Q11	11.0 (7.00 %)	46.0 (44.00 %)	19.0 (13.00 %)	52.0 (37.00 %)
	Don't know	May be	No	Yes
Q12	14.0 (11.00 %)	47.0 (39.00 %)	37.0 (31.00 %)	23.0 (19.00 %)

9 = Rating evaluation methods for examinations: Choose only one option using tick (√).

10 = Study material to learn pharmacology: Can choose more than one option using tick (√)

11 = Pharmacology learning methods: Can choose more than one option using tick (√).

12 = Wish to be a pharmacologist: Choose more than one option using tick (√)

Discussion

This survey was set out to investigate the impact of pharmacology and toxicology teaching patterns and gather students' recommendations. An "Likert Scale" based questions was used to collect data for the study, as mentioned in the methods. From the results, it is clear that first question showed that although 31 percent of students were not sure that pharmacology and toxicology is their favorite subject among the basic sciences and 19 percent did not support that, 50% on the other hand prefered it, this result appears in some way to explain why only 19% of students wished to become pharmacologists in the future and around 39 percent of them placed the profession of pharmacologist among the options that are not excluded.

Another promising finding that only 28 percent of students did not find studying pharmacology and toxicology in third and fourth year of medical faculty helpful in choosing drugs rationally in their future practice.

About two-thirds of respondents stated that pharmacology should be horizontal integrated with other paraclinical subjects this is vital as it lead to understand the reason to see more than half that said it would be difficult to correlate the drugs with the disease unless pharmacology and toxicology is simultaneously learnt along with clinical conditions that covered in other approaches, such as Therapeutics. A survey of Italian physicians by Furlanut determined the pharmacology and toxicology teaching they had received was mainly theoretical and suggested that more time and attention

should be devoted to issues more closely related to clinical practice [16, 17,18]

Our results also was in agreements with other similar surveys that concluded that more than 50% of medical students want more clinically-oriented lectures. [15, 16, 17]

Those who preferred to receive lectures in a didactic (teaching) method were below average compared to the 57% who nominated focusing on problem-solving exercises, this yields a negligible impact increase in results on the answer of question six, which appeared as a 59 percent of reply-ers went to noted that problems based on learning and prescriptions are extremely useful in clinics.

Our research explored that 56 percent of pharmacy students see that lecturers should distribute handouts giving the outline of the topic before the lecture classes, perhaps the reason for this is that it will increase their awareness of the general framework of the subject.

While 42% students agreed with teaching some topics during the pre-final or final year, forty percent aren't sure about that. Late results casts a new light on rating evaluation for examinations in which half of the percent favor multiple choice question methods and 40% in side of combination, but only 7% for short essay questions.

The (teaching class notes) were the most common study material to learn pharmacology with 37 percent , combination study material come next with 35% , however 17% used textbook only for memorizing their lessons and 11% depended on self-prepared notes. Overall, these results are in line with the oenions on the methods used for learning pharmacology which were divided into the followings: 44% for understanding, 36% for combinations, 13% for grasp thinking and 7% of cramming/mugging.

Although our study survey was widely accepted, our implementation suffers from some limitations due to obstacles to accessing pharmacology and toxicology marks for students.

It would be good if future researchers consider investigating more deeply of positive outcomes of distribute handouts giving the outline of the topic before the lecture classes.

Conclusion

The results obtained from the present study revealed that pharmacology and toxicolgy is a corner stone of the medical sciences subjects. More specifically, this exploration of the students' preferences regarding pharmacology and toxicology teaching and its outcomes could potentially modify undergraduate teaching patterns in them. It is accepted that reviewing the teaching and evaluation methods through feedback from students, then modifying methodologies accordingly, is vital to cooperate with the undergraduate teaching adapt to changes in the profession . It is evident that there is an imperative need to implement radical changes in the teaching of pharmacology, changes that would allow the pharmacist and/or doctor of tomorrow to render better health services.

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