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Original Research Article

A prospective cross-sectional study of knowledge, attitude, and perception on the mechanism of action of drugs among 3rd year MBBS students at Kurnool Medical College

Haritha Pulla Reddy, Rajeswaramma Gunampalli*, Venugopal Reddy Madanapalli, Rajesh Pusuloori, Lakshmi Kameswari Venuturu

Department of Pharmacology, Kurnool Medical College, Kurnool, Andhra Pradesh, India

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***Correspondence:**
Rajeswaramma Gunampalli,
Email: rajeswarammagunampalli@gmail.com

ABSTRACT

Background: Recent times have witnessed the emergence of many new drugs and drug combinations due to the technological advances targeting personalized therapeutics. Proper knowledge and understanding on mechanism of action of prescribing drugs is essential to avoid complications like drug-drug interactions, adverse drug effects, antimicrobial resistance, treatment failure and financial burden on the patient and nation as well. It is the need of the hour to impart adequate knowledge to the medical undergraduates on mechanism of action of drug.
Methods: A prospective, cross sectional, observational study was carried out to assess the knowledge, attitude and perception (KAP) on mechanism of action of drug among 3rd MBBS students, Kurnool Medical college, Kurnool. A pre-validated questionnaire was used to assess the KAP using Google forms.
Results: A total of 240 google forms were analyzed. According to Bloom's taxonomy, the mechanism of action of Aspirin and Statins was correctly known to 92.9% and 80.8% of students, respectively. The use of albuterol in the treatment of asthma and use of proton pump inhibitor in the treatment of gastroesophageal reflux disease were known to 65.0% and 76.7% of students respectively. 25.4% students only know the mechanism of action of metformin. 68.8% of the students strongly believe that the mechanism of action of drug is very important to prescribe drugs by the physicians. 45.8% of students strongly agreed that good understanding of mechanism of action of drug would help in future practice for better patient outcomes.
Conclusions: It is essential to revise and have peer group discussions periodically to memorize and update themselves about the mechanism of action of both the established and new drugs. Various teaching methods like small group discussions, self-directed learning (SDL), integrating teaching, OSPE (Objective Structured Practical Examination) and role play can be utilized effectively to make learning interesting, interactive and more productive.

Keywords: Mechanism of action of drugs, Knowledge, Attitude, Perception

INTRODUCTION

The term mechanism of action (MOA) in pharmacology refers to the specific biochemical interaction through which a drug produces its pharmacological effect. It usually includes specific molecular targets to which the drug binds, such as an ion channel/receptor/enzyme/transporter.[1] Understanding of the mechanism of action of drug plays a crucial role in the selection of an appropriate treatment regimen for specific pathophysiological changes and helps in better patient outcome. Most of the time, the action of one drug is influenced by another drug, which leads to drug-drug interactions is also dependent on the mechanism action of drug.[1] Possessing good knowledge about mechanism of action of drug prevents many adverse effects due to fixed dose combinations and polypharmacy, especially in geriatric patients, due to multiple comorbidities. Obtaining proper knowledge on mechanism

of action of drug can decrease the financial burden on patients and can help in the development of good patient physician relationship. The concept of the mechanism of drug action is dealt with in detail during MBBS 2nd year. As today's medical students are tomorrow's physicians, clear understanding and knowledge of this concept is essential for a good physician. Hence the study is undertaken to assess the Knowledge, Attitude and Perception (KAP) of medical students towards MOA of drugs. This can help to make necessary changes in medical education.

Aim and objectives

The aim of the current study was to increase awareness on understanding of MOA of drug among clinicians to aid them in the selection of treatment regimen in prescribing medicines and to enhance the patient's safety and outcomes.

METHODS

This cross-sectional study was conducted over a period of one month from May to June 2024 at Kurnool Medical College, Kurnool. Institutional ethics committee approval was taken before initiating the study. The sample size calculation was performed based on the nominal distribution. A total of 244 MBBS students of 3rd year were selected to participate in the study. 240 students gave consent. To assess the KAP, A pre-validated questionnaire using Google forms was distributed to 3rd MBBS students, Kurnool Medical College, Kurnool. A reminder was given to the non-respondents after the end of one week to increase the response rate.

The Google form contained questions related to demographic data, knowledge, and perception on the mechanism of action of drugs, and attitude towards the interest in learning and understanding of mechanism of action of drugs. The questions asked to assess the knowledge were based on commonly prescribed drugs by physicians.

The questionnaire was divided into four parts: part 1 was the demographic characteristics of 3rd MBBS students. part 2 was the evaluation of knowledge towards MOA of drugs. The given score for a true choice was 1, and for a false choice was 0. Assessment of knowledge was done by Bloom's cut off points into high (80-100%), moderate (60-79%), low (<59%). Part 3 was evaluation of perception of students regarding understanding of mechanism of action of drugs. Assessment of perception was done by 3-point Likert scale. Part 4 was evaluation of attitude towards the interest in learning the mechanism of action of drugs. Assessment of attitude was done by 4-point Likert scale. The data were analysed by using SPSS. Descriptive analysis was used to compute frequencies of responses from all demographic items and questions on knowledge, attitude, and perception.

RESULTS

Among 244 third-year MBBS students, 240 students gave consent to participate in the study. 240 fully completed responses were received. Out of this, 127 were females and 113 were males (Table 1).

Table 1: Demographic details of students.

Students	Number
Female	127
Male	113
Total	240

Table 2: The evaluation of knowledge towards mechanism of action of drugs.

Q. No.	Questions	Correct responses (%)
1.	What is the mechanism of action of aspirin?	92.9
2.	How does metformin exert its primary therapeutic effect in type 2 diabetes mellitus?	25.4
3.	Which of the following best describes the mechanism of action of albuterol in the treatment of asthma?	65.0
4.	How does a PPI exert its therapeutic effect in the treatment of gastroesophageal reflux disease (GERD)?	76.7
5.	Which of the following best describes the mechanism of action of statins?	80.8

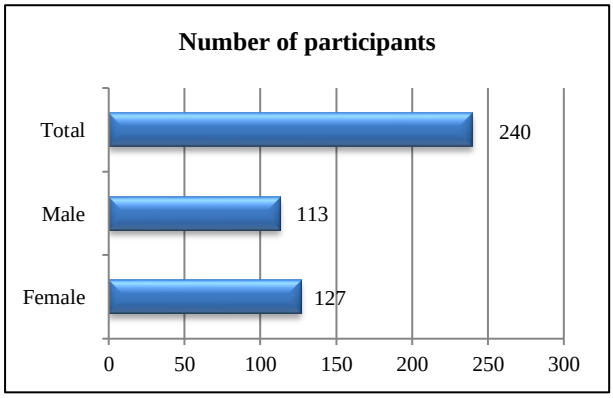

Figure 1: Gender distribution of study participants.

With respect to knowledge on the mechanism of action of Aspirin and Statins, 92.9% and 80.8% of students showed high knowledge, respectively, according to Bloom's cut off points. Whereas concerning the use of albuterol in the treatment of asthma and the use of proton pump inhibitors in the treatment of gastroesophageal reflux disease, 65.0% and 76.7% of students exhibited moderate knowledge,

respectively. Only 25.4% of students had knowledge on MOA of metformin (Table 2).

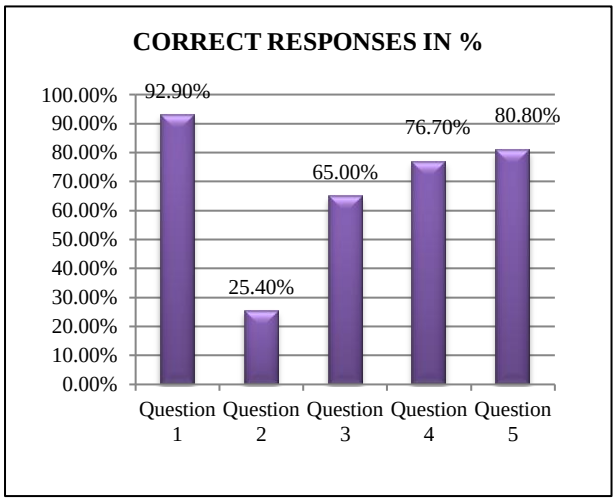

Figure 2: Questions related to assess knowledge-correct responses in percentages.

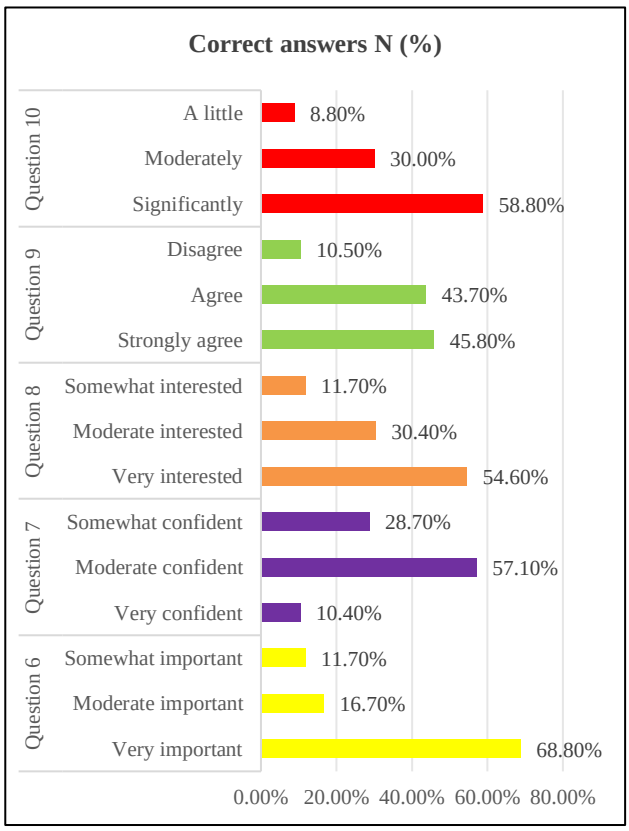

Figure 3: Perception towards understanding the mechanism of action of drugs, responses in %.

68.8% of the students strongly believe that MOA of drug is very important to prescribe drugs by the physicians. Only 10.4 % of the students were very confident, and 57.1% of the students were moderately confident in understanding the mechanism of drug action. The majority of students (54.6%) were interested in learning more about mechanism of drug action. 45.8% of students strongly agreed that deeper understanding of mechanism of action of drug would help in future practice and better patient outcome. Most of the students (58.8%) agreed strongly that understanding of mechanism of action would influence prescription of drugs in future (Table 3).

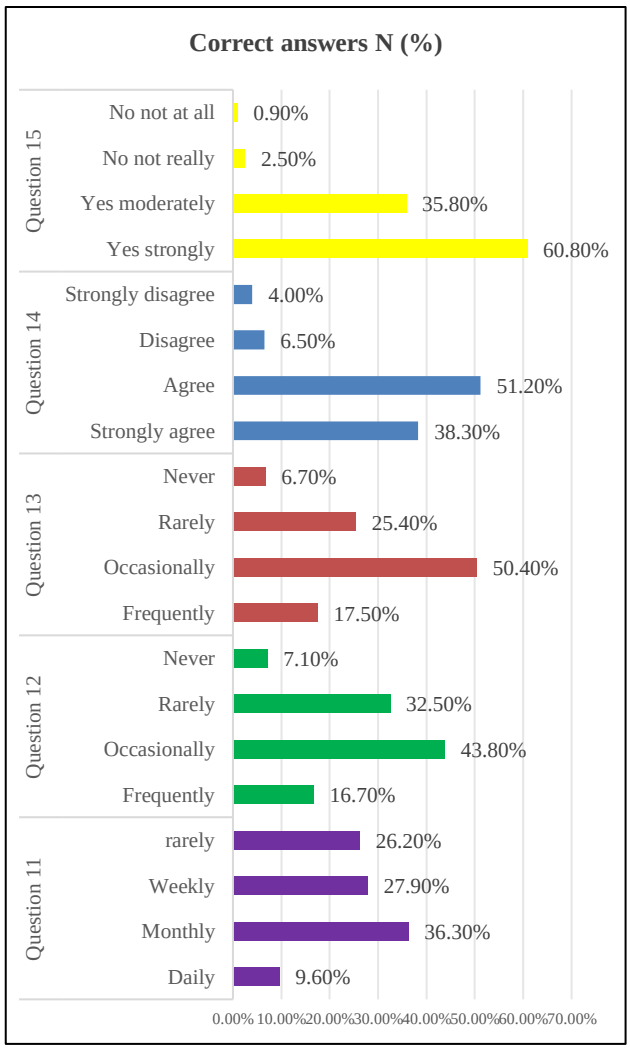

Figure 4: Attitude towards learning the mechanism of action of drugs, responses in %.

Likert scale 4 point was used to assess attitude of student's enthusiasm in learning the mechanism of action of drug. Very few students, 9.6% thought review of mechanism of action, daily. The majority of the students, 36.3% review after month. Few of them 26.2% rarely review the mechanism of action of drug. 43.8% of students thought the necessity of discussion of mechanism of action of drug with patients occasionally. 32.5% of students agreed that rarely discussion of mechanism of action of drug with patients. Only 17.5% of students come across the drugs that mechanism of action of drugs was not sure. The majority of the students 50.4%, occasionally verify drug action if they were unsure. 38.3% students strongly agree the importance mechanism of action of drugs in relation to the adverse drug reactions. 51.2 % just agreed the need of

understanding the mechanism of action of drug to reduce adverse drug reactions. Finally, majority of students 60.8% strongly agreed that more attention should be paid in teaching of mechanism of action of drugs in medical education (Table 4).

Table 3: Perception of students towards understanding the mechanism of action of drugs.

Q. no.	Questions	Options	Responses (%)
1.	According to you, how important is it for the physicians to understand the mechanisms of action of the drugs to prescribe them?	Very important	68.8
		Moderate important	16.7
		Somewhat important	11.7
2.	To what extent do you feel confident in your current understanding of mechanism of action of drugs?	Very confident	10.4
		Moderate confident	57.1
		Somewhat confident	28.7
3.	How interested are you in learning more about the mechanism of action of the drug you might prescribe in future?	Very interested	54.6
		Moderate interested	30.4
		Somewhat interested	11.7
4.	Do you think that a deeper understanding of mechanism of action of drug could lead to better treatment outcomes?	Strongly agree	45.8
		Agree	43.7
		Disagree	10.5
5.	How much do you think your understanding of mechanism of action of drug would influence your decision on drug prescription?	Significantly	58.8
		Moderately	30.0
		A little	8.8

Table 4: Evaluation of attitude towards the interest in learning the mechanism of action of drugs.

Q. no.	Questions	Options	Responses (%)
11	How often do you think to review the mechanism of action of the drug when you come across a prescription?	Daily	9.6
		Monthly	36.3
		Weekly	27.9
		Rarely	26.2
12	How often do you discuss mechanism of action of drug with your patients?	Frequently	16.7
		Occasionally	43.8
		Rarely	32.5
		Never	7.1
13	How often do you encounter drugs for which you are unsure of the mechanism of action?	Frequently	17.5
		Occasionally	50.4
		Rarely	25.4
		Never	6.7
14	Do you think that a better understanding of the mechanism of action of drug could help reduce adverse drug reactions?	Strongly agree	38.3
		Agree	51.2
		Disagree	6.5
		Strongly disagree	4.0
15	Do you believe that there should be more emphasis on teaching the mechanism of action of drug in medical education?	Yes, strongly	60.8
		Yes, moderately	35.8
		No, not really	2.5
		No, not at all	0.9

DISCUSSION

Pharmacology encompasses all aspects of knowledge about drugs, but most importantly those that are relevant to efficacy and safety of drugs used for therapeutic purposes. Unfortunately, pharmacology is a notoriously difficult subject because there are hundreds of drugs and their mechanism of actions, pharmacological actions, therapeutic uses, drug interactions and adverse effects to study about. Mechanism of action of drug is very essential because it affects a specific target in a cell, such as an enzyme, or a cell function, or cell growth. Knowing the mechanism of action of a drug helps to provide information about the safety of the drug and how it affects the body.

Magnesium salt ($MgSO_4$) when given intravenously acts as an anticonvulsant in eclampsia of pregnancy; when given intravenously acts as an anti-arrhythmic; when given orally acts as osmotic purgative also acts as an antacid; when given as a hypertonic solution per rectally reduces intracranial tension and when applied locally to alleviate inflammation due to osmotic effect. A proper

understanding of the mechanism of action of drug at different doses and routes helps to choose the accurate treatment.[1]

It also helps to identify the appropriate dose of a drug and which patients are most likely to respond to treatment. Dopamine, a peripheral Vaso stimulant at Low infusion rates (0.5 to 2 mcg/kg/min), acts on the visceral vasculature to produce vasodilation and increased urinary flow whereas intermediate infusion rates (2 to 10 mcg/kg/min) stimulate myocardial contractility. Higher doses cause vasoconstriction and increased blood pressure via the alpha-1 adrenergic receptors, potentially leading to poor peripheral circulation. So, it is used in infusion rates selective to treat specific conditions like hypovolemic shock, low blood pressure, low heart rate and cardiac arrest.[2,3]

Vane, a researcher, in 1971 observed that aspirin, acts as an antipyretic, analgesic and anti-inflammatory agent. But low dose of aspirin inhibits platelet aggregation and exerts anti thrombotic effect.[4]

In this study the KAP of 3rd year MBBS students on mechanism of action of drugs was assessed. 92.9% of the students had high knowledge on the mechanism of action of commonly used drugs. Only 25.4% students had knowledge on the mechanism of action of Metformin which is a very frequently prescribed drug for type2 diabetes. More than two thirds of the students (68.8%) strongly believe that understanding of mechanism of action is very important for every physician to prescribe the right drug in right dose and at right intervals.

Lidocaine, an amide-class local anaesthetic used clinically to inhibit pain sensations has antinociceptive, antiarrhythmic, anti-inflammatory, and antithrombotic effects on systemic administration. Also, it exerts these effects under both acute and chronic pain conditions and acute respiratory distress syndrome through mechanisms that can be independent of its primary mechanism of action, sodium channel inhibition.[5] Good understanding of how the drug alters various physiological functions in the body is essential for better and safer utilization of drugs.

But most of the study participants were not confident enough regarding the understanding of mechanism of action of drug. More than half of the students (54.6%) were interested in learning more about the same. Most of them agreed that better understanding of mechanism of action of drug would definitely influence the prescription of various drugs leading to better treatment out comes and in turn reduce the adverse drug reactions. Periodic review of the concepts of mechanism of action of drugs should be encouraged.

Discussion of MOA with patients was also accepted by almost half of the students which is very needed to avoid adverse drug reactions and drug interactions. This kind of interactions with the patients also will improve patient doctor relationships and confidence on doctor. More than half of the students strongly believe that more emphasis should be given while teaching MOA in pharmacology during their MBBS course.

In the current competency-based medical education curriculum, integration remains the mainstay to give a learning experience that allows the learner to perceive relationships from isolated blocks of knowledge and establish relationships for its proper application in health care.[6] One of the salient features of this revised curriculum is emphasis on vertical integration of contents that brings together various aspects of the curriculum into meaningful association to focus upon broad areas of study.[7]

CONCLUSION

Pharmacology, being an extensive subject with hundreds of drugs their pharmacological actions, therapeutic uses, MOA, drug interactions and adverse drug effects, students should learn and memorize the same during their MBBS course along with their other subjects. Also, it is very difficult to learn and remember everything. During the course and even after the completion, it is essential to do periodic revisions, peer discussions and to attend medial conferences to update themselves about both the established drugs and new drugs. The current competency based medical curriculum gives ample scope and space within curriculum to integrate contents, derive associations and establish relationships between isolated subject compartments so that the student has better understanding. It also offers a range of options for integration of contents aligned with the concept of Teaching for Understanding, supported by Perkins' approach. Various teaching methods like small group discussions, self-directed learning, integrated teaching, OSPE (Objective Structured Practical Examination) and role play can be utilized to make learning interesting, interactive and more productive. Students should also make use of all these to gain knowledge in all aspects in their journey to be a good physician.

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