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RESEARCH ARTICLE

Effectiveness of case-based learning, task-based learning, and didactic lectures on teaching personal drug concept among medical undergraduates

Dhanya Sasidharan Palappallil[1], Hari K N Sankar[1], Aparna Retnayyan[1], Sajithkumar Radhakrishnan[2]

[1]Department of Pharmacology, Government Medical College, Kottayam, Kerala, India, [2]Department of Infectious Disease, Convenor, MCI Nodal Centre for Faculty Development, Government Medical College, Kottayam, Kerala, India

Correspondence to: Dhanya Sasidharan Palappallil, E-mail: drspdhanya@gmail.com

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ABSTRACT

Background: P (personal) drug selection is an important competency. The knowledge of how and why a drug is selected for a condition is a gap which can lead to incompetence. **Aims and Objectives:** This study was conducted to compare the effectiveness of teaching P-drug concept using case-based learning (CBL), task-based learning (TBL), and didactic lectures (DL) among 4th semester medical undergraduates. **Materials and Methods:** This was a quasi-experimental study conducted in the Department of Pharmacology, Government Medical College, Kottayam, for 2 months. After obtaining ethical clearance and informed consent, the participants (n = 145) were divided into three groups – TBL, CBL, and DL and each received 6 sessions on P-drug concept at the end of which a feedback was collected and an examination was conducted. The data were analyzed with SPSS 16 using ANOVA and Kruskal–Wallis test. **Results:** The participants of CBL compared to TBL and DL ($P < 0.001$) agreed that the sessions were interesting, beneficial, and would be a welcome change in curriculum and they would prepare a P list for future use. The TBL participants compared to CBL and DL agreed ($P < 0.01$) that these sessions imparted skills to select P-drug, gave an idea of the cost of different drugs and different sources of information, and promoted interaction with facilitators. The TBL and DL participants had a greater mean score in post-session assessment compared to those of CBL ($P < 0.001$). **Conclusion:** TBL and CBL are innovative methods, well accepted by the participants. A combination of DL, TBL, and CBL will reduce misconception and confusion, curbing future irrational prescriptions.

KEY WORDS: P-drug Concept; Task-based Learning; Case-based Learning; Didactic Lectures

INTRODUCTION

P-drugs are personal drugs also known as priority drugs or preferred drugs which are given for a disease.[1,2] They are the personal drug choice of the doctor from those available in the market. P-drug of a doctor is defined as "the drugs you have chosen to prescribe regularly, and with which you have become familiar. They are your priority choice for given indications".[3] The P-drug concept is more than just the name of a pharmacological substance, it also includes the dosage form, dosage schedule, and duration of treatment, and hence, P-drug is a drug ready for action. It varies from physician to physician and country to country as the choice depends on availability, individual preference, and cost.[3] The ideal choice of P-drug should be done logically by combining problem-solving, therapeutic basis, and practical aspects.

The primary objective of teaching pharmacotherapeutics is to impart knowledge about suitable prescriptions for

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clinical conditions.[4] Actual treatment of patients requires cognitive skills to apply general pharmacological principles, communication skills to inform and instruct the patients as well as practical skills to administer the drugs. Prescribing is a core competency and incompetence can lead to medication errors.[5] Each practicing doctor should have a regularly updated set of P-drugs at hand. The P-drug list which is condition tailored and not patient tailored covers 80% of all cases without any adjustment being made. Medical students need to understand the process of drug selection from an inventory of the effective group of drugs using the criteria of safety, efficacy, cost, and availability.[6] The medical undergraduates need training in cognitive and communication skills to be a good doctor who prescribes rationally. Linking clinical training with the theoretical knowledge and assigning shared responsibility of actual drug therapy can enhance enthusiasm, interaction, learning curve, and therapeutic insight and immunize the students against irrational prescribing. The Guide to Good Prescribing quotes that there are only three solutions to teach a student rational prescribing – "Practice, practice, and practice."[3]

The new competency-based medical education rolled out by the Medical Council of India identifies preparation and explanation of a P-drug list as a core competency to be achieved under clinical pharmacology.[7] Usually, the session is taken as didactic lecture without giving due importance to how and why a drug is selected for that condition. This gap continues to exist in the interns and as practicing junior doctors due to the absence of understanding the P-drug concept or having a P-list. There is a scarcity of studies comparing different methodologies for sensitizing the students to the P-drug concept in the Indian scenario. Hence, this study was undertaken to find out the effective methodology for teaching P-drug concept among didactic lectures (DL), task-based learning (TBL), and case-based learning (CBL).

MATERIALS AND METHODS

This was a quasi-experimental study conducted in the Department of Pharmacology of a Government Medical in Central Kerala for 2 months (June 1, 2018–July 31, 2018) after receiving ethical clearance from the Institutional Review Board (IRB No.68/2018 dated 31/05/2018). The students of 4th semester MBBS formed the sample and they were divided into three Groups – A, B, and C with 50, 46, and 49, students, respectively, based on convenient sampling after obtaining informed consent from each willing participant. P-drug was taught to each group by different methodologies – Group A – TBL, Group B – CBL, and Group C – DL. Each group received six independent sessions on the same topics of P-drug selection which were bronchial asthma, type 2 diabetes mellitus, angina pectoris, grand mal epilepsy, gestational hypertension, and left atrial clot following atrial fibrillation.

Group A – TBL of P-drug Concept

The participants were further divided into six working groups (n = 8–10). They selected the P-drug based on a given clinical scenario as a task referring to printouts of reference materials provided and standard textbooks which were facilitated by the faculties. After selecting the P-drug, each randomly chosen group representative presented the P drug selected as a part of task. This was followed by discussion which was facilitated by the faculty. The topics for the tasks were intimated 1 week before the sessions for all except the first introductory session. Each session lasted for 1½ h.

Group B – CBL of P-drug Concept

The principles of choice of P-drug concept was taught by role-plays involving the faculties and students followed by discussion by a clinician. The concept for role-play included a 5–7 minutes conversation between patient and doctor regarding the disease condition finally ending in prescription of the drugs. The topics were intimated 1 week before the session except the introductory session where the faculties performed the role-play. Each session lasted around 40 minutes.

Group C – DL on P-drug Concept

This group received powerpoint-aided sessions on the P-drug concept. There was no prior intimation of the topic. Each session lasted around 30 minutes.

Feedbacks on the sessions were collected using pre-validated structured proforma at the end of the sixth session. The response was measured on Likert scale 1 (strongly disagree) to 5 (strongly agree). The questionnaire was prepared after extensive literature review and had items related to teaching, satisfaction, and value of the sessions with 18 closed and 2 open-ended questions.[1,5,8-11] Content validity was checked by subject experts. Time validity was assessed by piloting the questionnaire among supplementary batch students (n = 10). Before conducting the analysis, the internal consistency of instrument was assessed for reliability using Cronbach's coefficient alpha (0.69). The response to each question was presumed to be the score of that question. The scores were reversed for negative questions. The exclusion criterion was participants returning incompletely filled closed-end questionnaire. After the completion of six sessions in all the three groups, a common test of 45-minutes duration involving fill in the blanks, multiple choice question, and clinical case-based task to find out the P-drug was conducted among the study participants without prior intimation of the test. Methodolgy is summarized as shown in Figure 1.

The data were entered into Excel and analyzed using SPSS for Windows Version 16 (SPSS Inc., Chicago, USA). Quantitative data were expressed as mean ± standard

deviation and compared using ANOVA and *post hoc* analysis with Bonferroni test. Qualitative data were analyzed using Kruskal–Wallis test.

RESULTS

In all, 145 students participated in the study with a mean age of 20.74 ± 1.09 years. There were 81 (55.9%) females and 64 (44.1%) males. All the participants returned the filled feedback proforma (response rate = 100%). As shown in Table 1, the participants of CBL found their sessions to be more interesting, beneficial, and agreed to prepare a P-list for future use. They opined that these sessions would be a welcome change in curriculum, they would like to attend such sessions in future, and they were not waste of effort and time. The TBL participants agreed to statements that these sessions were interactive, imparted skills to select P-drug. They agreed that comparing cost was the most difficult step in P drug selection and they got an idea of cost of different drugs and different sources of information

Around 133 among the 145 participants attended the common examination on P-drug concept conducted after completion of six sessions in all the groups. The maximum mark scored was 24 of 25 (by a DL participant) and the minimum 5 (by a participant of CBL). The participants of TBL had a mean score of 15.02 ± 3.51 (n = 44) closely followed by those of DL with 14.56 ± 3.74 (n = 45) and 11.71± 2.85 in CBL group (n = 44) with F =12.40, p<0.001 on doing

Table 1: Feedback of participants on TBL, CBL, and DL

Dependent variable	TBL (n=50)		CBL (n=46)		DL (n=49)		Chi-square	P value
	Median (IQR)	Mean rank	Median (IQR)	Mean rank	Median (IQR)	Mean rank		
Concept was taught in an interesting way	4 (3–4)	60.44	4 (4–5)	93.39	4 (3–4)	66.67	19.39	<0.001
Imparted knowledge about P-drug	4 (4–4)	65.82	4 (4–5)	77.35	4 (4–4)	76.24	3.292	0.193
Imparted skills to select P-drug	4 (3–5)	89.74	4 (3–4)	69.32	3 (3–4)	61.04	13.26	0.001
Taught to prescribe for clinical conditions	3.5 (3–4)	67.33	4 (3–4)	81.35	4 (3–4)	70.95	3.19	0.203
I am aware of steps in P-drug selection	4 (4–5)	80.71	4 (2.75–4)	54.92	4 (4–5)	82.10	14.61	0.001
Comparing efficacy is most difficult step	3 (3–4)	80.19	3 (2–4)	67.37	3 (2–4)	70.95	2.58	0.275
Comparing safety is most difficult step	3 (2–4)	70.77	4 (2–4)	80.51	3 (2–4)	68.22	2.40	0.301
Comparing cost is most difficult step	3 (2–4)	86.52	2 (2–3)	69.05	2 (2–2.5)	62.91	9.37	0.009
The P-drug concept was beneficial to me	4 (3–4)	59.91	4 (4–4)	81.90	4 (4–4)	78.00	9.82	0.007
I will prepare a P-drug list for future use	4 (3–4)	64.57	4 (3–4)	87.36	3 (3–4)	68.12	8.77	0.012
There was clarity in selecting P-drug	4 (3–4)	75.77	4 (3–4)	76.62	4 (3–4)	66.78	2.04	0.36
Got an idea of cost of different drugs	4 (3–4)	97.62	2 (2–3)	63.75	2 (2–3)	56.56	29.51	<0.001
Helped identify sources of information	4 (3–4)	99.36	2 (2–4)	59.16	3 (2–4)	59.09	33.09	<0.001
Will be welcome change in curriculum	3 (2–4)	55.41	4 (4–5)	103.71	3 (2–4)	62.12	39.89	<0.001
I like to attend such sessions in future	3 (2–3.25)	53.27	4 (4–5)	106.34	3 (2–4)	61.84	46.07	<0.001
These sessions are waste of effort and time	3 (2–3)	89.42	2 (1–2)	49.43	2 (2–3)	78.37	25.91	<0.001
The time of session is adequate	3 (2–4)	70.32	4 (3–4)	74.91	4 (3–4)	73.94	0.37	0.832
Promotes interaction with facilitators	4 (4–5)	91.20	3 (3–4)	83.72	3 (2–4)	44.98	39.87	<0.001

TBL: Task-based learning, CBL: Case-based learning, DL: Didactic lectures, IQR: Interquartile range

ANOVA. *Post hoc* Bonferroni analysis revealed that mean marks scored among the participants of TBL ($P < 0.001$, 95% confidence interval [CI]: 1.56–5.07) and DL ($P < 0.001$, 95% CI: 1.11–4.59) were significantly higher than that of CBL. There was a statistically significant difference in the responses of the TBL participants for questions such as listing steps of P-drug selection ($P < 0.001$), p-drug selection for peptic ulcer ($P < 0.001$), and prescription for peptic ulcer patient ($P < 0.001$) compared to CBL and DL.

As shown in Figure 2 (correct responses of participants), more than 80% of the participants in the TBL could properly select definition of P-drug and prescribe correctly for the problem-based question of peptic ulcer patient. More than 90% in TBL responded correctly to the statement that P-drug is not always the drug of action and wrote the full forms of "P" in P-drug. It is notable that 100% of participants correctly wrote the expanded forms of P-drug in the didactic lecture group and majority in the same group came out with the answer that availability of the drug is yet another important factor apart from efficacy, safety, cost, and suitability for the selection of P-drug. Even though majority of the participants of CBL correctly identified that P-drug is for a disease and not for the patient unlike the other 2 groups, there was severe drop in

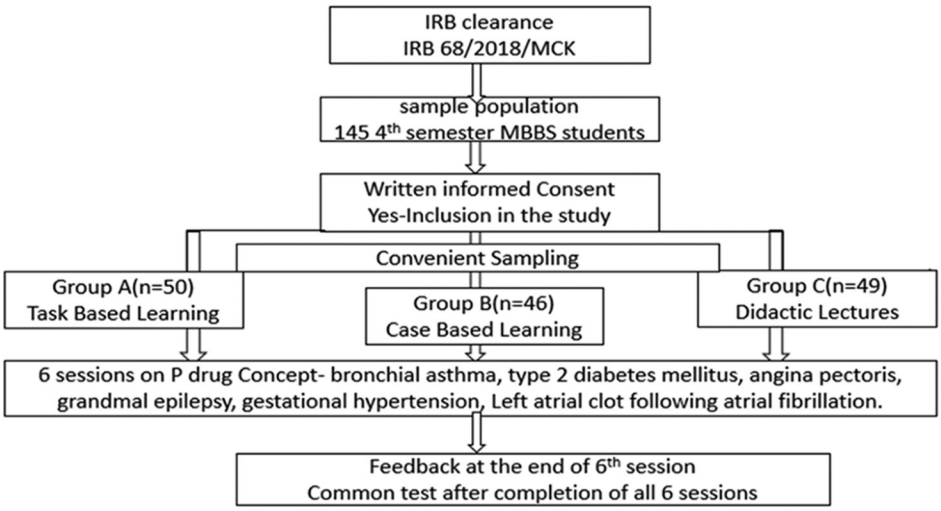

Figure 1: Schematic representation of methodology

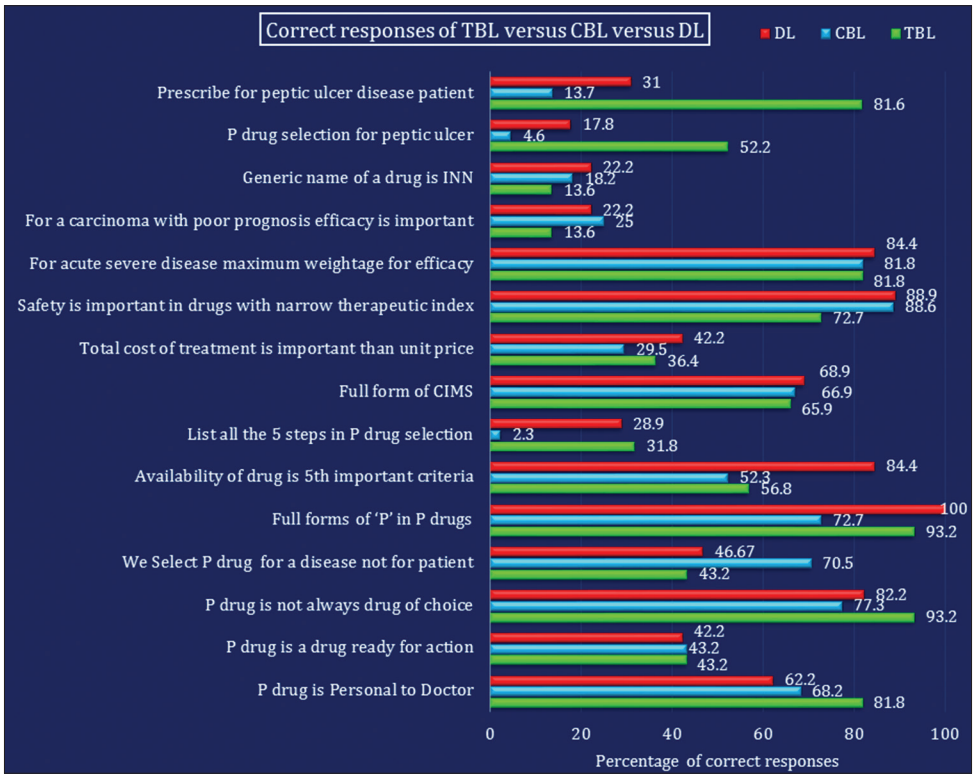

Figure 2: Correct responses among TBL, CBL, and DL participants in the final test

correct responses to list the steps in P-drug selection (2.3%) and problem-based question for selecting P-drug for peptic ulcer using the sequential steps (4.6%).

In response to the open-ended questions on advantages, disadvantages, and suggestions to improve the sessions, there were variable responses. These responses were coded and classified under a few main themes. As evident from Figure 3, majority of participants of TBL opined that they got an idea of P-drug selection process, the CBL participants felt that the sessions were more clinically oriented, and majority of DL participants conveyed that they were sensitized to a new concept.

As shown in Table 2, most of the disadvantages among TBL participants were concept, time, and session related, while the CBL participants opined that improper setting and lack of audiovisual aids such as microphone related to role-plays were the important disadvantages. The participants of DL mainly complained of session-related problems such as inadequate teacher-student interactions and concept-related issues. The suggestions from participants of each intervention sessions were different as summarized in Table 3. Five among TBL, eight in the CBL, and two in the DL group offered no suggestions to improve the sessions. Figure 4 shows a word cloud of the open-ended questions generated for coding non-quantitative data.

DISCUSSION

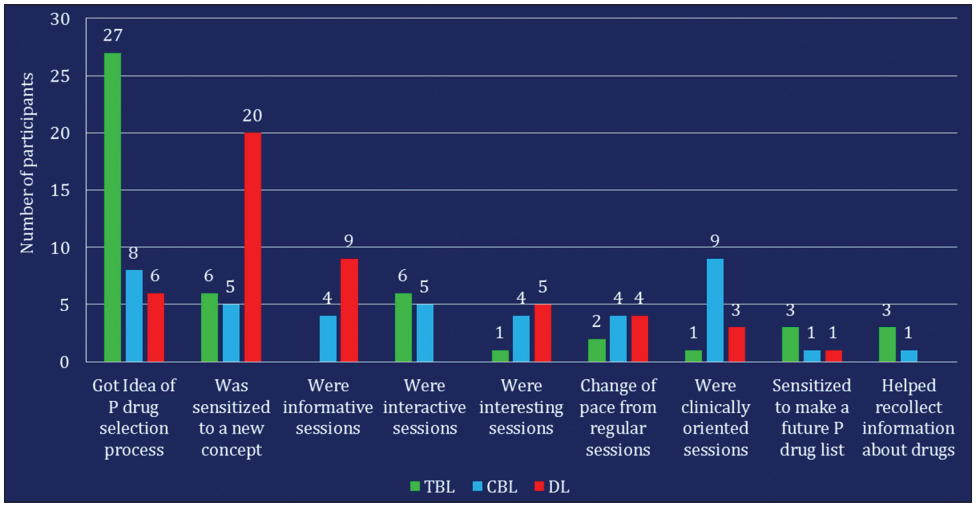

Figure 3: Most important advantages of the sessions

Table 2: Most important disadvantages of the sessions

Disadvantages	TBL (50), *n* (%)	CBL (46), *n* (%)	DL (49), *n* (%)
Concept related			
Comparisons of drugs were difficult	7 (14)	1 (2.2)	6 (12.2)
Concept was not clear	4 (8)	3 (6.5)	5 (10.2)
Concept was less interesting	1 (2)	1 (2.2)	6 (12.2)
Session related			
Inadequate interaction and discussions	2 (4)	3 (6.5)	12 (24.5)
Too much knowledge delivered	0	1 (2.2)	0
Came unprepared for sessions	9 (18)	3 (6.5)	1 (2)
Time related			
Time of sessions were inadequate	4 (8)	3 (6.5)	5 (10.2)
Time Consuming sessions	9 (18)	5 (10.9)	7 (14.3)
Sessions were conducted at inappropriate time	3 (6)	0	0
Role play related			
Inaudible	–	2 (4.3)	–
Not properly enacted	–	2 (4.3)	–
Setting was not adequate	–	6 (13)	–
Unanswered	11 (22)	16 (34.8)	7 (14.3)

TBL: Task-based learning, CBL: Case-based learning, DL: Didactic lectures

Table 3: Suggestions to improve the sessions

Interventions	Suggestions to improve the sessions
TBL (*n*=50)	Sincere student participation (12), prior intimation of topics to students (10), Make sessions more interactive (10), better time management (5) conduct during internship (3), make available more sources of information (3), use of power points (2), no suggestions (5)
CBL (*n*=46)	Involvement of more students in role-plays (13), providing audio aids to role players (8), more teacher-student interactions (6), start from basics of topic (5), improving setting for role-play (4), conducting more sessions (1), clarity on cost of drugs (1), no suggestions (8)
DL (*n*=49)	More student participation (19), Better time management (8), Better use of power points by making slides colorful and interesting (8), more clinically oriented teaching (5), more teacher-student interactions (4), start from basics of the topic (3), no suggestions (2)

TBL: Task-based learning, CBL: Case-based learning, DL: Didactic lectures

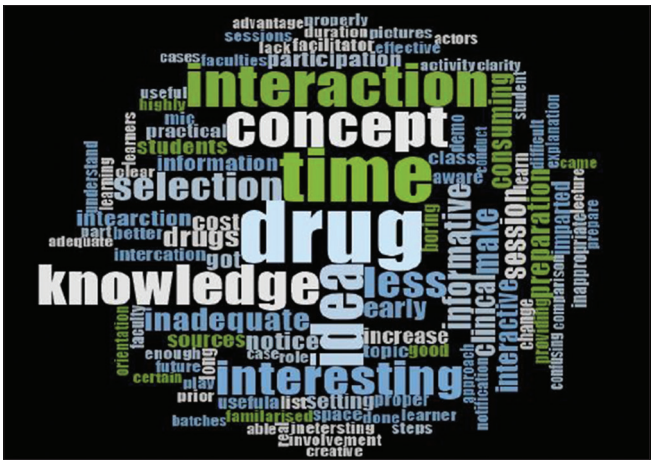

Figure 4: Word cloud of feedback on the sessions

We studied the effectiveness of CBL, TBL, and DL for teaching P-drug concept. We found that participants of CBL liked the innovative sessions the best as they expressed that sessions were interesting and beneficial; however, contrary to their perception, they scored the least in the final assessment conducted. The participants of TBL scored the highest in the assessment and gave feedback that, with their hands on training on selecting P-drug, they got a practical idea on the selection process, cost of different drugs, and source of drug information. The participants of DL though complained of the lack of interaction in the sessions gave the most positive feedback on the awareness on steps of P-drug selection and also scored significantly higher than those of the CBL.

Literature review shows that problem-based learning of P-drug concept has been successfully incorporated in several institutions worldwide.[9] Set inductions like patient-oriented problem-solving exercises, case reports, or clinical exposures which are used for training the concept of P-drug, stimulate students to critically analyse the problems and find answers.[2,4,8] Indla *et al*. approached teaching P-drug concept with clinical problems along with P-list preparation.[4] Khan and Bagewadi proposed that TBL of P-drug selection showed better comprehension of the concept.[1] They opined that TBL is resource intensive and the amount of time and effort required is a major drawback; however, facilitation of self-directed learning skills and active learning justifies the use of the same as an educational tool which is consistent with our study. Khilnani opined that the advice of clinical teachers and experts while compiling P-drug list is integral.[10] In several studies, the participants opined that P-drug selection exercises need to be incorporated in undergraduate pharmacology practical curriculum.[11,12] The CBL participants agreed that such clinically oriented sessions would be a welcome change if incorporated in the curriculum and they would like to attend such sessions in future. Despite this, they scored less which may be owed to the less teacher–student interaction as pointed out in the feedback. Rahman *et al*. stated that, after providing tutorials, reading materials and method of the selection of P-drug concept, the performance of intervention group was significantly improved as compared to the non-intervention group.[2] However, in this study, the didactic lecture participants performed significantly well. Similar to the studies done elsewhere which found lacunae in imbibing the concept of P-drug, some participants in the TBL and DL group presumed that P-drug selection is for patient and not disease and also found difficulty in comparing cost.[9,13] The participants in a study by Devi *et al.* opined that such sessions should be introduced from the beginning of the second phase unlike a few of ours who opined that these sessions should be conducted during internship which in line with that by Shankar *et al*.[9,14] In this study, majority of participants answered correctly to questions related to the efficacy and safety of the drug, but as explained by Singh *et al*., the concept that cost should include the total cost of treatment and not the unit price was wrongly answered in all the three groups by majority.[15] In carcinomas where the prognosis of the disease is very poor, we have to prescribe the highly efficacious drugs so that the patients can live in a better way.[16] This concept was also incorrectly answered by majority of the participants in all the three groups. Prescribing is a fundamental skill in medical practice, and worldwide, concerns have been expressed on the preparedness of medical students for entry into thought-provoking milieu of prescribing rationally.[17,18] P-drug concept can help in sensitization and development of the skill of rational prescribing.

The main strength of this study was that simultaneously three different methodologies for teaching P-drug concept which is a core competency were compared. This main limitation of the study was that the participants were of a single semester of a single institution. Lack of interest, preparedness, sincerity, and cooperation among some participants caused variability in the scores in some aspects.

CONCLUSION

TBL and DL are effective teaching method for P-drug Concept. CBL was the most popular method as per the perception of the students. A combination of all the three methods – an introductory didactic lecture session followed by CBL and TBL – will reduce misconception and confusion and thus curb the chance of irrational prescribing in future doctors.

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