Evaluation of Case Based Learning (CBL) as a Teaching-Learning tool (T-L) in Pharmacology

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ABSTRACT

Introduction: Concepts of pharmacology are the prerequisite for good clinical practice. Minimal active participation from the students in a teacher-centred conventional system (didactic lecture) and Case Based Learning (CBL) is a student-centred teaching method that facilitates students learning and teaches them by means of case studies. The objectives of the study were to evaluate the effectiveness and acceptance of CBL among the students of 2nd M.B.B.S. (Bachelor of Medicine & Bachelor of Surgery).

Methods: It is an educational interventional study conducted online using google classroom. Thirty (30) students of the 2nd M.B.B.S. of batch (2020-2021) were enrolled for the study, divided into three equal groups (10 each): Group A, Group B, and Group C. Three different links were created twice. Three topics were selected for teaching through both methods. Topics were decided from their upcoming syllabus and from core areas.

Results: There was a significant improvement in performance scores with the CBL method in all three groups when compared with the conventional method using the “paired t-test”. The majority of the students agreed positively with various aspects of CBL.

Conclusions: The CBL as teaching-Learning (T-L) tool in pharmacology is a learner-centred teaching approach. The results of the study show effectiveness and acceptability of CBL among students. So, it is concluded that CBL can be used with conventional methods to strengthen the topic and will play a major role in Competency-Based Medical Education (CBME), especially in pharmacology.

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INTRODUCTION:
Pharmacology is a basic and applied science.[1] Concepts of pharmacology are prerequisites for good clinical practice. Hence Knowledge of pharmacological concepts is important with continued learning for better understanding, application, and performance in clinical settings.[2] Lectures, practicals, and tutorials like conventional methods and Case Based Learning (CBL) are the methods used for teaching in medical colleges. Conventional/traditional lectures are still the more frequently adopted-method for teaching. Minimal active participation from the students in a teacher-centred conventional system. So, Implementation of knowledge of pharmacology in actual clinical practice is difficult.[1] Case Based Learning (CBL) is a student-centred teaching method that facilitates students’ learning and teaches them by means of case studies.[1] Case problems are used in CBL, as the starting point which motivates the students to identify the “conceptual gaps” and help in formulating the learning objectives for themselves. Improvement in comprehension, recalling and problem-solving abilities encourage them to become self-directed lifelong learners. To bridge the gap between theory and clinical application, to introduce active learning habits CBL could be the ideal teaching and learning methodology tool.[2]
Many studies have found that the clinical, problem-solving, and analytical skills of medical students can be enhanced by CBL.[3] But CBL also has some limitations, in this method, more time is required by the teachers to prepare cases to support clinical teaching. In CBL teachers prepare a set of questions for students to discuss, this leads to a lack of proactive involvement and general enthusiasm for the learning experience by students.[4] The objectives of the present study were to introduce and study the effectiveness of CBL as a teaching-learning tool and to check the acceptance of CBL among 2nd M.B.B.S. students in pharmacology.

MATERIALS & METHODS:
Study design and Sample size: It is an educational interventional study conducted online using google class room after taking permission from Human Research Ethics Committee (HREC). Thirty (30) students of 2nd MBBS batch of 2020-2021 were enrolled for the study after they showed willingness and divided into three groups, which group will receive which method that was decided by lottery method first then cross over done for next method. Three different links were created for each group. Three equal groups (10 students in each): Group A, Group B, and Group C as given in the following table 1.

<table>
<thead>
<tr>
<th>GROUP -A Roll nos.</th>
<th>GROUP-B Roll nos.</th>
<th>GROUP -C Roll nos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,4,7, 10,13,16, 19,22, 25,28</td>
<td>2,5,8, 11,14,17, 20,23, 26,29</td>
<td>3,6,9, 12,15,18, 21,24, 27,30</td>
</tr>
</tbody>
</table>

For each group, a faculty member was allotted as a facilitator. Three topics were selected for teaching through both methods. Topics were decided from their upcoming syllabus and from the core areas. They were: Diabetic Ketoacidosis (DKA), Myocardial infarction (MI), and Status Epilepticus (SE). Group-wise topic distribution with Teaching-learning method and cross-over is given in table 2.
Table 2: Group wise topic distribution with TL method and cross-over

<table>
<thead>
<tr>
<th>Diabetic Ketoacidosis</th>
<th>Myocardial Infarction</th>
<th>Status Epilepticus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A (Conventional)</td>
<td>Group B (CBL)</td>
<td>Group C (Conventional)</td>
</tr>
<tr>
<td>Group B (CBL)</td>
<td>Group C (CBL)</td>
<td>Group A (CBL)</td>
</tr>
</tbody>
</table>

The conventional method was a didactic lecture with ppt slides for one hour as we do routinely. For CBL sensitization to students and faculties (facilitators) was done. Two sessions were conducted for CBL (one hour each). In the first session, the group was facilitated to discuss clinical case scenarios like problem identification, and encouraged to formulate learning issues and their management. At the end of the first sitting, the facilitators summarized the key points and learning objectives to the group for the second sitting along with instructions regarding reference resources and learning materials for encouraging self-study habits before appearing in the second sitting of the same module.[2] The second session was conducted three days after the first session due to a shortage of time. During the second sitting the same module was started by the facilitator and the group was allowed to discuss the management of co-morbid conditions, complications, and drug-related updates for an hour.[2] Twenty (20) Multiple choice questions (MCQs) were given to test scores to both the groups for 30 minutes, immediately after completion of the topic each time, and feedback regarding both teaching methods was taken (15 mins) after completion of both the sessions. Case scenarios and MCQ questionnaires were developed and pre-validated by experts from our institute.

Inclusion criteria:
1. All students from one batch who have given consent to participate in the study.

Exclusion criteria:
1. Absent students & students not willing to give consent.
2. Students who have been previously exposed to CBL methodology.

RESULTS:
Multiple choice questions (MCQs) were given to all the groups for 30 minutes, immediately after completion of the topic each time. In Table 3. In Diabetic ketoacidosis, By the CBL method in group B, 40 % of students received marks above 15. In myocardial infarction, 50 % of students with CBL received marks above 15. In status epilepticus, 10 % of students got marks above 15 with the CBL method. By conventional teaching method, no one received marks above 15 in all three cases. In diabetic ketoacidosis and myocardial infarction, 80 % of students received marks between 8-14. So, it shows that there was an improvement in performance scores with CBL compared to the conventional method in all three groups.
Table 3: Assessment Scores

<table>
<thead>
<tr>
<th>MCQ Scores</th>
<th>Diabetic ketoacidosis</th>
<th>Myocardial infarction</th>
<th>Status epilepticus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group A (Conventional)</td>
<td>Group B (CBL)</td>
<td>Group B (Conventional)</td>
</tr>
<tr>
<td>15-20</td>
<td>0</td>
<td>40%</td>
<td>0</td>
</tr>
<tr>
<td>8-14</td>
<td>80%</td>
<td>50%</td>
<td>80%</td>
</tr>
<tr>
<td>0-7</td>
<td>20%</td>
<td>10%</td>
<td>20%</td>
</tr>
</tbody>
</table>

There was improvement in performance scores with CBL in all three groups. In Table 4 Statistical analysis of students’ performance scores was done by using paired t-test. In diabetic ketoacidosis statistically significant (P value 0.00) improvement in performance, and score was observed in CBL compared to the conventional method. In myocardial infarction also significant (P value 0.04) improvement in test score was observed. Similarly in status epilepticus, performance score was significantly (0.02) improved with the CBL method compared to the conventional method.

Table 4: Group wise P value

<table>
<thead>
<tr>
<th></th>
<th>Diabetic ketoacidosis</th>
<th>Myocardial infarction</th>
<th>Status epilepticus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group A (Conventional)</td>
<td>Group B (CBL)</td>
<td>Group B (Conventional)</td>
</tr>
<tr>
<td>P value</td>
<td>0.00</td>
<td>0.04</td>
<td>0.02</td>
</tr>
</tbody>
</table>

There was statistically significant improvement in scores of CBL group for all the three topics. Feedback regarding both teaching methods was taken (15 mins) after completion of both sessions by using five points Likert scale feedback questionnaires given in table 5. 23.3 % strongly agreed and 53.3% of students agreed that CBL improves communication skills. 23.3 % of students strongly agreed and 50 % of students agreed that problem-solving and analytical skills were improved by CBL. 16.7% of students strongly believed that learning is more interesting by CBL than the conventional method. 26.7 % of students strongly recommended CBL for forthcoming M.B.B.S. batches. 20 % of students strongly agreed and 53.3% agreed that role of a facilitator is required but 6.7% of students disagreed with this. 13.3 % strongly agreed and 63.3 % agreed that interaction with the facilitator was comfortable however, 10 % of students disagreed.
Table 5: Study participants’ feedback on CBL (Five Point Likert Scale feedback questionnaire)

<table>
<thead>
<tr>
<th>Five Point Likert Scale feedback questionnaire</th>
<th>Responses (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper introduction was given on clinical case-based teaching and expected benefits</td>
<td>33.3 53.3 13.3 3.3 0</td>
</tr>
<tr>
<td>CBL provides more time to understand the concepts by self</td>
<td>20 53.3 10 16.7 0</td>
</tr>
<tr>
<td>CBL in groups improves communication skills</td>
<td>23.3 53.3 13.3 10 0</td>
</tr>
<tr>
<td>Role of facilitator is required</td>
<td>20 53.3 16.7 3.3 6.7</td>
</tr>
<tr>
<td>CBL creates interest to participate in group discussion</td>
<td>23.3 53.3 23.3 0 0</td>
</tr>
<tr>
<td>CBL is more interesting than didactic lectures</td>
<td>16.7 46.7 16.7 16.7 6.7</td>
</tr>
<tr>
<td>CBL provides opportunity to discuss more comfortably with facilitator</td>
<td>13.3 63.3 10 3.3 10</td>
</tr>
<tr>
<td>CBL method of learning is beneficial at clinical settings</td>
<td>26.7 30 36.7 6.7 0</td>
</tr>
<tr>
<td>Analytical and problem-solving skills were improved by CBL</td>
<td>23.3 50 20 3.3 6.7</td>
</tr>
<tr>
<td>Recommend CBL for forthcoming M.B.B.S. batches</td>
<td>26.7 50 16.7 0 6.7</td>
</tr>
</tbody>
</table>

DISCUSSION:
Pharmacology is a constantly growing subject with new drugs and new biological targets every year. so, modern research contributions in pharmacology led to the development of better drugs with diverse mechanisms of action and minimal side effects.[2] Classic CBL as the method of teaching-learning was originally described by Barrows et al.[5] Learning by CBL helps students to expand prior knowledge, integrate knowledge and consider an application to future situations.[1] Inclusion of clinical case studies, clinical pharmacology sessions, and multiple choice questions into lectures will be more interesting and helpful for better understanding of the students in Pharmacology.[6] In India, as per CBME, many medical colleges have incorporated such type of teaching-learning methods and achieved optimistic results. The present study was done with the aim to introduce and study the effectiveness of CBL as a teaching-learning tool and check the acceptance of CBL among 2nd M.B.B.S. students in pharmacology. In this study, students actively participated and provided feedback which helps in the implementation of better teaching-learning methods to improve students’ performance.
In this study, 33.3% of students strongly agreed and 53.3% of students agreed that a proper introduction with examples was given to understand the concept of case-based learning. 20% of the students strongly believed that CBL provides more time to understand the concepts by themselves. Among the total participants, 23.3% of students strongly agreed and 53.3% of students agreed that CBL in a group improves communication skills. While 20% strongly felt that the role of the facilitator is required in the discussion. 23.3% of students strongly believe that CBL creates interest to participate in group discussions. 16.7% strongly agreed and 46.7% of students agreed that CBL is more interesting than didactic lectures.

In the present study, 13.3% strongly agreed and 63.3% agreed that interaction with the facilitator was comfortable. 26.7% strongly agreed that learning through CBL is beneficial in clinical settings. 23.3% strongly agreed and 50% of students agreed that their analytical and problem-solving skills were improved by CBL. Here, 20% of students strongly believe that learning through CBL is more joyful. While 26.7% of students strongly recommended CBL for forthcoming M.B.B.S. batches. In a study by G. Francis Britto et al. and Mukeshkumar B Vora et al. majority of students strongly agreed with a similar feedback questionnaire. In his study, Berkson et al. argued that PBL and traditional curricula are different concepts, and the two will gradually merge. Praveen R Singh et al. also concluded that CBL/PBL is a very good approach for student-centred learning & incorporates integration and practical application of the knowledge of basic science. It can be a very useful method if taken up as a hybrid approach with the traditional method.

Diana et al. found that problem-based curricula with many indications and directions help the students to decide what to study, such as reference literature, course objectives, lectures, and tests. In addition, students become better self-directed learners over the curriculum years. This can help them to become lifelong learners. The disadvantage of the CBL system is the requirement for more staff in the teaching process. But this should not be a reason to discourage the adoption of the CBL method which is important for active student learning. It has also been suggested that the hybrid CBL whereby a case-based problem-solving approach is combined with traditional lectures, tutorials, and clinical supervision can be adopted by institutions with limited resources.
Various new interventions should be included in the teaching-learning process as it helps all teachers and students to develop an integrative approach toward patients, which will be reflected in the health of the community in upcoming years.\textsuperscript{[9]}

CONCLUSIONS:
The CBL as TL tool in pharmacology is a learner centred teaching approach. The results of the study showing effectiveness in the form of improvement in performance score and majority of the students agree positively (followed by strongly agree) with various aspects of CBL compared to conventional method which they found useful in clinical real life scenario and better understanding regarding subject. That shows acceptability of CBL among students. So, it is concluded that CBL can be used with conventional methods to strengthen the topic and will play the major role in CBME specially in pharmacology.

ACKNOWLEDGEMENTS:
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REFERENCES:


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