

# Developing, Implementing and Evaluating Early Clinical Exposure Module in Biochemistry: A Cross-sectional Study

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## ABSTRACT

**Introduction:** The introduction of curriculum based medical education by National Medical Commission (NMC) aims to produce graduates of global standard through curricular reforms. Early Clinical Exposure (ECE) is one of the proposed reforms in the new curriculum, which when designed and integrated into the teaching programmes will enhance the attitude and communication skills of the students.

**Aim:** To develop, implement and evaluate the ECE module in biochemistry and also evaluate the faculty and student feedback for ECE as teaching module and ways to improve them.

**Materials and Methods:** The cross-sectional study, was conducted from June 2020 to August 2020, in the Department of Biochemistry, CMC and hospital Ludhiana, Punjab, India. Study was conducted on 70 phase 1 Bachelor of Medicine and Bachelor of Surgery (MBBS) students admitted in year 2020. The faculty along with the students were sensitised to the ECE teaching module. The ECE module pertaining to the two selected topics (Type 2 Diabetes Mellitus (T2DM) and Jaundice) was

developed and discussed under case-based sessions and clinical implementation sessions. After these sessions the feedback was taken from the faculty and the students. The results were collected, analysed and expressed in percentages and charts.

**Results:** In present study, out of total 75 students (a batch of 75 out of which five students were absent) 29 (38.67%) were boys and 46 (61.33%) were girls. Majority of the students 35 (50%) strongly agreed that ECE increased their attention in class, and helped them to understand the topic in a better manner- 36 (51.4%) agreed, with a better correlation of the topic- 31 (44.3%) agreed. whereas the majority 3 (75%) of the faculty agreed that ECE is important for understanding the clinical relevance of the topic and 3 (75%) agreed that its more time consuming. All the faculty agreed 4 (100%) that it is better teaching method as compared to the traditional method.

**Conclusion:** ECE is better and acceptable way of teaching and learning than traditional. It motivates students to read and helps them understand the clinical relevance in a better way. It increases their attention in the class and helps to retain the topic for long.

**Keywords:** Attitude, Communication skills, Curriculum based medical education, Traditional education

## INTRODUCTION

Biochemistry is considered to be a less interesting subject which is often taught in the conventional method with no emphasis on the clinical relevance. Thus, students often find it difficult to understand the biochemistry concepts with the practical and clinical aspect. It occurs, as the students are often attending the long lectures including lab teaching without a relevant clinical correlation, which is accompanied by lack of exposure and intense competition [1]. Recently there has been a need for the change in the curriculum, along with the integration (both horizontal and vertical). The learning, following these changes should be based upon competency and should cover the reforms [2]. In the recent times the NMC of India has developed the competency-based curriculum with the aim to produce medical graduates of global standards through curricular reforms. The proposed curricular changes begin early, in the form of a foundation course, which has ECE along with other designed and integrated teaching and learning programmes to develop the positive attitude and communication skills in medical students [3]. ECE focuses on the introduction of clinically relevant material in the class, observation of patient handling and doctor-patient communication in actual out-patient department setting at the very 1<sup>st</sup> phase of their carrier [3].

Several studies were conducted to explore the impact of ECE among the medical students, and they indicate that it is an effective technique to supplement the traditional teaching method [4-7]. The introduction of ECE in new curriculum has positive impacts among fresh medical entrants, which include, improving performance in

basic sciences [4], relieving the patient handling stress. It also helps in developing clinical reasoning skill, which results in good learning outcomes [5-7]. Although there is argument that ECE consumes more time and effort [4], but the inclusion of ECE as a teaching-learning method will augment the effect of conventional teaching, for the benefit of all. Hence present study was conducted to develop, implement the ECE module in biochemistry and also to evaluate the faculty and student feedback for ECE as teaching module and ways to improve them.

## MATERIALS AND METHODS

This cross-sectional study was conducted from June 2020 to August 2020 in the Department of Biochemistry, CMC and hospital Ludhiana, Punjab, India, after taking the Institutional Research Committee approval (IRC no.CMC/3521).

**Inclusion criteria:** All the phase 1 MBBS students admitted in 2020 batch and who were willing to attend the ECE sessions were included.

**Exclusion criteria:** Students who were not willing for the ECE session and did not attend the sessions were excluded from the study.

**Sample size:** Total 70 students of MBBS first professional were enrolled in present study by purposive sampling and four faculty members from Department of Biochemistry participated in the project (The total number of faculty in the department was 5. As one of the faculty left in between (although this faculty member took participation to conduct the sessions), so four faculty responses were taken into consideration.

The faculty and students were sensitised about the ECE in different sessions before the start of the project. The faculty session was for one hour. They were sensitised about the ECE and its importance as a teaching and learning method in the new curriculum. There were two separate sessions conducted for students, which included introduction and sensitisation to ECE as a teaching learning method, along with briefing about the project in the one-hour session each. The study was conducted in the two ECE sessions as part of the regular timetable for phase 1 students.

## Execution of the Project

**Developing and implementing ECE module:** A protocol on ECE modules for T2DM and Jaundice was prepared under the guidance of faculty from the Department of Biochemistry. The protocol was peer reviewed and validated by subject experts. The protocol included brief introduction of Diabetes and Jaundice, its various types and their differentiating features, along with the diagnostic tests performed and the management of the disease and its complications. The students were also exposed to various case scenarios of diabetes and were asked to deduce the provisional diagnosis.

The ECE sessions were planned as two modules under the following headings:

1. T2DM
2. Jaundice

### Module 1:

#### Topic: Type 2 Diabetes mellitus (T2DM)

##### Core learning points

1. Discuss and interpret laboratory results of analytes associated with metabolism of carbohydrates.
2. Discuss the mechanism and significance of blood glucose regulation in health and disease.
3. Interpret the results of blood glucose levels and other laboratory investigations related to disorders of carbohydrate metabolism.

### Implementation of Basic sciences correlation session

The basic sciences session of the ECE was conducted by giving students a clinical situation (case study) of the related competency. The students were divided into five small groups with a Faculty as a facilitator. The total strength of students was 70 and four faculty. Each group had 14 students and a faculty member. The students followed group dynamics and discussed the ECE topic (competency and learning objectives) with their faculty, following which the discussion on the topic was done by faculty. Two sessions were conducted with the duration of one hour for each session. The students assembled back in the classroom, which was followed by session of summary and conclusion. The reflections were taken in the last. Total time distribution for a module was three hours (one-hour Introduction to ECE + 45 minutes of two session for two batches + last half hour for reflections and feedback).

### Module 2

#### Topic: Jaundice

##### Core learning points

1. Describe the functions of the liver
2. Describe the tests that are commonly done in clinical practice, to assess the functions of the liver.

**Implementation of clinical skill session:** The introduction of the session was done by faculty, followed by the instruction pertaining to session. The case pertaining to the developed Jaundice module was discussed with the Department of Medicine with the help of designated consultant from the department. Prior to the hospital

visit the consultant was sensitised to the ECE module. The relevance of introduction of ECE module in the new curriculum, along with its aims and objectives were also emphasised.

The batch of 70 students was divided into two batches of 35 each. Two groups of students were taken to medicine wards and the identified Jaundice patient (Live patient) demonstration was given to the students at the bed side by the faculty as per the learning objectives of the jaundice module. The students assembled back in the classroom, which was followed by session on summary and conclusion. Towards the end suggestions were taken from the faculty and students.

Total time distribution for a module was three hours (one-hour Introduction to ECE + 45 minutes of two session for two batches + last half hour for reflections and feedback).

## Evaluation

Post implementation the evaluation of the module was carried out under the following headings:

1. Feedback from the faculty and students on validated questionnaire.
2. Thematic evaluation of ECE by faculty by questionnaire.

The students' and the faculties' perceptions of the effectiveness of the program were sought by a validated questionnaire [Annexure-1]. The questionnaire was devised by the faculty member and was validated by the experts. The feedback of the students was taken by questionnaire on six items and the feedback of faculty was taken for seven items on the 5-point Likert scale after completion of ECE modules. These 5 points were: 1= Strongly Disagree; 2= Disagree; 3= Neutral; 4= Agree; 5=Strongly agree. All the closed ended questions were MCQs type and were expressed in number and percentages.

There were five open ended questions for the faculty in the questionnaire. These five open-ended questions were screened and analysed by the faculty. The recorded responses were analysed and used for thematic evaluation.

## STATISTICAL ANALYSIS

The data was analysed using the Statistical Package for the Social Sciences (SPSS) (version 16.0) & Microsoft office excels 2007 and expressed in percentages.

## RESULTS

In present study, out of total 75 students 29 (38.6%) were boys and 46 (61.33%) were girls. All the students aged between 18-21 years. Four faculty members from Department of Biochemistry also participated.

Majority of the students, 43 (61.4%) strongly agreed, 25 (35.7%) agreed that ECE was more interesting method of teaching as compared to traditional. About 22 (31.4%) strongly agreed and 35 (50%) agreed that ECE module increased their attention in the class, while 2 (2.9%) disagreed. In response to the understanding of topic 27 (38.7%) strongly agreed and 36 (51.4%) agreed to it, whereas for the question regarding better retention of the topic, was strongly agreed by 31 (44.3%) and 32 (45.7%) of students agreed. About 31 (44.3%) strongly agreed and 29 (41.4%) agreed that they were able to correlate the biochemistry topics with clinical significance in a better manner than earlier [Table/Fig-1].

The faculty's response to the closed ended questions showed that 3 (75%) faculty strongly agreed on the importance of ECE in studying biochemistry with clinical reference and 3 (75%) agreed that it motivated them to read the topic. ECE as an extra burden to faculty was disagreed upon by majority 3 (75%), while 1 (25%) remained neutral to this question. Majority of the faculty 3 (75%) agreed that ECE is more time consuming and no body disagreed to it [Table/Fig-2].

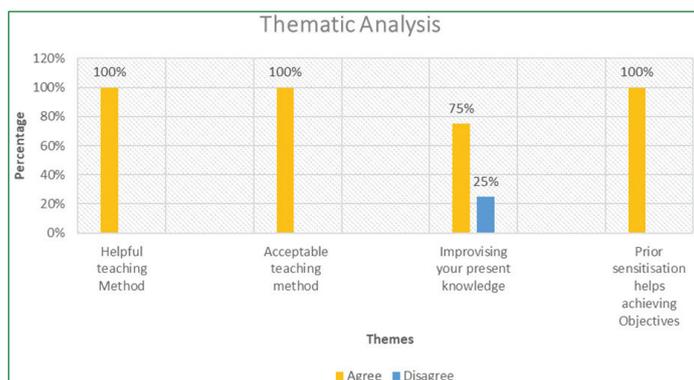
Questions	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1 ECE is a more interesting method of teaching and learning as compared to traditional method	---	1 (1.4)	1 (1.4)	25 (35.7%)	43 (61.4%)
2. ECE has increased my attention in class	2 (2.9%)	2 (2.9%)	9 (12.88%)	35 (50.0%)	22 (31.4%)
3. ECE motivated me to read more on the topic	2 (2.9%)	2 (2.9%)	7 (10%)	29 (41.4%)	30 (42.8%)
4. ECE helped me to understand the topic better	---	1 (1.4%)	6 (8.5%)	36 (51.4%)	27 (38.7%)
5. ECE helped me in better retention of the topic.	1 (1.4)	---	6 (8.6%)	32 (45.7%)	31 (44.3%)
6. ECE helped me in correlating biochemistry topics with their applied aspects.	---	2 (2.9%)	8 (11.4%)	29 (41.4%)	31 (44.3%)

[Table/Fig-1]: Students perception of ECE as teaching module (n=70).

Questions	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1 ECE has made understanding the importance of learning biochemistry with clinical reference.	--	---	--	1 (25%)	3 (75%)
2. ECE motivated to read the students to read the topic	---	--	1 (25%)	3 (75%)	---
3. ECE helped the students to have better insight of the topic	--	--	---	3 (75%)	1 (25%)
4. ECE has helped in better retention of the biochemistry topic among students	---	---	1 (25%)	2 (50%)	1 (25%)
5. ECE is an extra burden to the Faculty along with the regular teaching	---	3 (75%)	1 (25%)	---	---
6. ECE is more time consuming	---	---	1 (25%)	3 (75%)	---
7. ECE has covered well the Learning objectives enlisted for the topic.	---	---	--	3 (75%)	1 (25%)

[Table/Fig-2]: Faculty's perception on a 5-point likert scale with percentage (n=4).

The thematic evaluation was done in response to the open ended questions followed by the screening and identification of the themes. Four main themes pertaining to the conducted ECE session were identified from the faculty's response's (Helpful and acceptable teaching method, improvising upon the present knowledge and prior sensitisation helps in achieving the objectives). Majority of the faculty agreed 4 (100%) with the themes, while on improvising knowledge theme, one of the faculty disagreed 1 (25%) [Table/Fig-3]. In the open-ended questions, the entire faculty 4 (100%) agreed that ECE is better method of teaching when compared to the traditional.



[Table/Fig-3]: Thematic analysis based on the faculty perceptions on the ECE sessions. Interview was conducted by structured and validated questionnaire.

The suggestions by students included more of ECE sessions, with smaller groups and on the clinically relevant topics should be conducted [Table/Fig-4].

1	"Small batches of students (5-8) at one time, so that everyone can appreciate teaching.
2	"We should have more ECE every month"
3	"ECE should be conducted with the topic of clinical relevance"
4	"We should be informed prior about ECE so as to revise the topic thoroughly"

[Table/Fig-4]: Suggestion by students to make learning more effective.

The faculty suggested that more of ECE sessions be planned and more faculties be involved, with more time allotted to revise the topic. Faculty also suggested conducting pre and post test to assess the impact of programme [Table/Fig-5].

1.	"Conduct Pre and Post-test to assess the impact of Program me"
2.	"More Sessions / Modules should be planned"
3.	"Should be given time to revise the topic thoroughly"
4.	"More of the Faculty be involved"

[Table/Fig-5]: Suggestions by faculty for the improvement.

## DISCUSSION

NMC wants to have an integrated approach (horizontal and vertical), so as to provide students with a holistic learning perspective [8]. The hospital-based educational system (teaching-learning methods) are based on the variety of places, which include wards, OPD's, ICU's for bedside teaching, learning skills and for the academic work in terms of clinical context [9]. Health professionals face the challenge of improving the ways of clinical teaching and learning methods, so as to improve the quality of clinical education. This can be executed in view of students' knowledge and can be improvised upon thereafter under the prevailing medical educational system [9]. Present study suggests that ECE is an interesting form of teaching. It motivates the students to read more on the topic and helps correlate Biochemistry to clinical sciences.

A number of studies have been undertaken to explore the efficacy of ECE [5,10]. Their findings are corroborative with respect to students' satisfaction and acceptance of ECE. The positive response of the students was observed in the present study toward ECE. ECE promotes clinical reasoning skill along with factual learning. Rawekar A et al., reported that ECE increased the student's attention in class, improvised their knowledge, with motivation to read and have better retention of the topic. The study reports that ECE has helped students in better correlation of the applied aspects of biochemistry within clinical setup, and it should be used as teaching-learning method, along with regular lectures in biochemistry [11]. These observations were in accordance with Das P et al., who stated that ECE is an effective technique to supplement didactic lectures to improve performance of students in the subject physiology [4].

The correlation of the applied aspect of biochemistry by ECE will enable students to understand the relevance of studying biochemistry along with clinical set-up. ECE and Self-directed learning will help them to recall the knowledge and practical application of information and lead to the formation of a better clinician in future [12]. Deolalikar S et al., reported that ECE protocol was perceived satisfactory by the students. It helped in improving knowledge, along with understanding the relevance of studying the preclinical subject in clinical set-up, which was consistent with findings of the present study [13]. The findings of the present study were in accordance to Chari S et al., [14] which states that students were positive about ECE and were full of enthusiasm. Increased motivation of the students with ECE was also seen in the study conducted by Baheti SN and Maheshgauri D, [15]. From faculty's feedback, majority of them agreed (75%; n=3) upon that ECE motivated students to read, to have a better insight of the topic and

helps in better retention of the topic, which was in accordance with Gupta K et al., [16]. The thematic evaluation done for open ended questions among faculty reflected that ECE helped in improvising the present knowledge and is a more helpful and acceptable teaching method to the faculty also. In the open ended questionnaire, faculty agreed that ECE is a better teaching method when compared to the traditional. All the faculty 4 (100%), opined that it helps in longer retention of knowledge gained, better correlation of the topic along with reasoning ability, which was in accordance to the Kaur A et al., [17]. Thus, present study concluded that better understanding and retention of the topic in biochemistry can be enhanced by the ECE, along with motivation to read.

### Limitation(s)

The major limitations of the present study were, arranging the clinical session with the clinical faculty from their busy schedule and time management.

### CONCLUSION(S)

The study concluded that ECE is better teaching learning method as compared to the traditional. It motivated the students to read and correlate the applied aspect of biochemistry in better way. It helped in developing reasoning skills along with better clinical correlation of the topic. ECE is thought to be better teaching-learning method as per the new curriculum. Planning of such sessions was well appreciated and the importance of teaching biochemistry with clinical relevance was well taken by the students also. The study recommends that more of such sessions be incorporated into the new curriculum, authentic human contact to be included in ECE's along with case studies / videos wherever possible, along with induction of pre and post-test to assess the impact of programmer, wherever applicable.

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**Annexure 1: Students Feedback Performa****Students Feedback form on a 5-point Likert scale**

Please select the number below that best represents your response to the ECE session.

Questions	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. ECE is a more interesting method of teaching and learning as compared to traditional method					
2. ECE has increased my attention in class					
3. ECE motivated me to read more on the topic					
4. ECE helped me to understand the topic better					
5. ECE helped me in better retention of the topic.					
6. ECE helped me in correlating biochemistry topics with their applied aspects.					

**Annexure 2, Faculty Feedback form on 5-point Likert scale**

Please select the number below that best represents your response to the ECEs.

Questions	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. ECE has made the understanding the importance of learning biochemistry with clinical reference.					
2. ECE motivated to read the students to read the topic					
3. ECE helped the students to have better insight of the topic					
4. ECE has helped in better retention of the biochemistry topic among students					
5. ECE is an extra burden to the faculty along with the regular teaching					
6. ECE is more time consuming					
7. ECE has covered well the Learning objectives enlisted for the topic.					

**Faculty Interview Questioner on various themes of ECE**

Q1. Do you find the ECE as teaching and learning method helpful?

Q2. Do you find the ECE as teaching and learning method acceptable?

Q3. Do you find the ECE teaching method improving your present knowledge on the subject?

Q4. What are advantages of the ECE as teaching and learning method as compared to traditional teaching methods?

Q5. Any suggestions for improvement?