Section: Biochemistry

Original Research Article

EFFECTIVENESS OF EARLY CLINICAL EXPOSURE THROUGH STANDARDIZED PATIENTS VERSUS REAL PATIENTS IN THE SUBJECT OF BIOCHEMISTRY

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Abstract

Background: Competency based curriculum designed and implemented for MBBS from year 2019 comes with some unique features like Foundation course, Self-directed learning, Small group discussion, Integration and alignment, Family adoption program, AETCOM, Early clinical exposure etc. which starts from the very first year of MBBS course. Early clinical exposure (ECE) is a teaching learning methodology, which fosters exposure of the medical students to the patient as early as first year of medical students. In Biochemistry, ECE helps to recognize importance of subject in diagnosis, patient care and treatment. Standardized patient refer to a person who has been carefully trained to take on the characteristics of a real patient, or other person to provide an opportunity for a student to learn or be evaluated on skills first hand. The aim is to study the effectiveness of early clinical exposure in 1st year students by comparing standardized patients with real patients. The objective is to comparing the learning outcome of two groups of students exposed to real and standardized patients. To get the feedback from the faculties and students about the outcome of the exposure to two categories of patients (real and standardized). **Materials and Methods:** The faculties of the Biochemistry and Medicine departments of Kokrajhar Medical College were sensitized in the beginning about standardized patients. The laboratory attendants were trained as standardized patients. Diabetes Mellitus was taken as a didactic lecture and after the lecture pretest form was given to the volunteered 84 1st year MBBS students to do in 15 minutes. Then on the next day 42 students were exposed to 3 hours ECE sessions with real diabetic patient and the remaining 42 students were exposed to standardized diabetic patient for 3 hours ECE classes. Both the groups were given the posttest forms to fill up within 15 minutes. Finally feedback form was given in google form and measured with 5 point Likert Scale. **Result:** The pretest and post analysis of real diabetic patient: the pretest score was 23.09 +/-2.73 (mean+/-SD) and post test score was 29.3+/-3.51(mean+/-SD). The pretest and posttest analysis of standardized diabetic patient: the pretest score of students was 23.33+/-3.30 (mean +/-SD) and posttest score was 36.86+/-1.96 (mean+/-SD). The paired t test for mean was done and found to be highly significant $P<0.001$. From the responses of the feedback form it is found that the average Likert scale Score was 4.09 which falls in the category of Agree (3.5-4.2) and this suggest that the students agree that ECE classes are better with standardized patients than with real patients. **Conclusion:** The results of this research match with many of the past studies and confirmed that ECE sessions with standardized patients helped the 1st year MBBS students in gaining confidence in themselves and increase communication skills before they interact with real patients in the clinics in the second year.

INTRODUCTION

Competency based undergraduate medical education program is designed with a goal to create an "Indian Medical Graduate" (IMG) possessing requisite knowledge, skills, attitudes, values and responsiveness so that she or he may function appropriately and effectively as a physician of first contact of the community. Focus of medical education is to prepare students for life time patient care.[1] Competency based curriculum designed and implemented for MBBS from year 2019 comes with some unique features like Foundation course, Self-directed learning, Small group discussion, Integration and alignment, Family adoption program, AETCOM, Early clinical exposure etc. which starts from the very first year of MBBS course. Early clinical exposure (ECE) is a teaching learning methodology, which fosters exposure of the medical students to the patient as early as first year of medical students.[2] For generation, medical students have spent the preclinical (phase I) years in class and laboratories. It is a method of vertical integration pattern between preclinical (phase I) and clinical (phase III) subjects with the CBME implemented in 2019. More emphasis was put to ECE modules so that the students become more acquainted with the clinical cases before the start of the phase III clinical classes. Early clinical exposure in Biochemistry which is one of the fundamental basic science subject introduces some aspects of clinical content such as basis and rationale of biochemical tests, then interpretation, their application in the patient care as early as in the first year of undergraduate teaching program. ECE allows students to learn basic science subjects with its application perspective. The ability to learn concepts with emphasis of its future application in patient care generates interest in learning process.[3] More over it provides great tool for retention of knowledge.[1,4] In the traditional teaching methods, the faculties were busy with long didactic theory lectures and practical sessions. The students consider Biochemistry as a subject full of metabolic pathways with enzymes and co-enzymes (vitamins) involved which make them difficult to retain and recall. In fact Biochemistry forms the core subject of laboratory medicine in today's evidence-based treatment era of patient care. Importance of laboratory investigations in screening, diagnosis, treatment or monitoring of responses to the treatment in various clinical conditions could be learned through its clinical application part of knowledge only.[3] ECE will motivate student for active learning through its context and clinical case exposure.[4] Clinical Biochemistry topics are important in learning process as they connect basic science subject with further practical application in medicine.[5] ECE taken up with traditional teaching method is useful for basic science subject to improve understanding with better retention of knowledge due to clinical application part in the teaching methodology.[6] More over in clinical fields, at times students cannot recall important basic science concept, therefore parts of their academic education become impractical. ECE act as a bridge between preclinical and clinical discipline.[6]

ECE planning in real time can be made at different settings with use of appropriate resources such as log book, text books, instruments, learning material, case record sheets and computers. The ECE classes(modules) can be taken in 3 different settings: 1) Classroom setting, 2) Hospital based setting and 3) community setting.

In a typical classroom setting ECE can be used as an educational strategy in the following way.[6-8]

- Direct arrangement of mobile patients/ cases to the classes
- Readymade case scenarios
- Discussion of clinical materials such as patient case record sheets, ECG, x-ray, laboratory biochemical and pathological reports

The hospital setting is most important form of setting and can be arranged in batches of students and with prior permission or collaboration with clinical departments.[7,8] Dedicated faculties from both phase I and phase III can form a team for ECE. The time, place, topic related to cases should be finalized before the hospital visit. The cases should be discussed with students correlating their context with what taught earlier in the classroom should reflect. Five objectives should be incorporated in all the sessions such as making oneself familiar to the environment, awareness to different case presentation, observance to doctor-patient relationship and communication and patient empathy.

The community setting is very interesting in the student's point of view. It focusses on the ECE visits covering points.[9,10]

a) Correlation of the context for basic science learning
b) Integration of basic sciences
c) Observation of community problems
d) Clinical dimensions and societal perspectives
e) Patient empathy etc.

Irrespective of what form of ECE is chosen, it provides a 'spiral integrated model ie. a consistently graduated clinical and preclinical exposure throughout the time a student is in the medical college.[11]

The concept of standardized patients (SP) was introduced in 1963 by a medical educator Dr Howard Barrows of the university of Southern California, Los Angeles. Dr Barrows found that medical students expressed the need for an opportunity to practice medical skills prior to having to perform them on live patients and he referred to these first standardized patients as programmed patients. Standardized patient refer to a person who has been carefully trained to take on the characteristics of a real patient, or other person to provide an opportunity for a student to learn or be evaluated on skills first hand.[12] It allows the learner to have an encounter with a

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living, breathing responding being.[13] A standardized patient is a person who has been briefed to play a patient role. He or she can be people with or without actual disease who have been trained to portray a medical case.[14] One of the areas of concern is the clinical encounter between the patient and the medical students in which both tangible skills (procedural skills, physical examination) and intangible skills (communication skills, professional behavior and interpersonal relationship) can be fostered. But these encounters are decreased in recent years with the rise of standardized patients. More over ethically we cannot train medical students on real patients when ethical considerations are not taken into account.[15] Standardized patients can be trained for a variety of clinical cases to respond more consistently in the training and examination by medical students than real patients. More over assessment of students become easier with repeated interaction with standardized patients in a simulated environment. Students' strength and weaknesses can be found out. The positive feedback of students give confidence in their communication skills and reduce anxiety level.

The health university of Assam, Srimanta Sankara Deva University of Health Science have taken out a universal time table for the phase I students of all the medical colleges of Assam following the CBME curriculum for undergraduates. The Biochemistry subject has eight topics for early clinical exposure classes such as Edema, Atherosclerosis and its complications, In-born errors of amino acid metabolism, Diabetes Mellitus, Thyroid disorders, Acid base disorders, Protein energy malnutrition and Jaundice. In this study Diabetes mellitus is taken into account as it is one of the most common metabolic disorder with a global age-standardized prevalence of 6.1% (July 2023). Diabetes Mellitus management requires investigation and treatment. More over prognosis of the disease depends on the treatment and the complications can be brought to the vision of the clinicians with the help of the laboratory reports. The UG students in the subject of Biochemistry abiding by the CBME Curriculum are exposed to sophisticated machines like the auto-analyzer, high performance liquid chromatography, spectrophotometer, blood gas analyzer etc. The 1st year MBBS students are exposed to get acquainted with the Biochemistry reports to study a clinical case such as Diabetes Mellitus through early clinical exposure.

AIM: To study the effectiveness of early clinical exposure in 1st year students by comparing standardized patients with real patients.

OBJECTIVES:

- To conduct early clinical exposure of students with standardized patients
- To conduct early clinical exposure of students with real patients
- Comparing the learning gain/outcome of two groups of students in real and standardized patients
- To get the feedback from the faculties and students about the outcome of the exposure to two categories of patients (real and standardized.

MATERIALS AND METHODS

Study setting: Department of Biochemistry and Medicine of Kokrajhar Medical College and Hospital, Kokrajhar

Study duration: Six months

Study design: Observational comparative study

Study participants: 1st year MBBS students

Inclusion criteria

First year MBBS students who gave consent for the project

Exclusion criteria

First year MBBS students who did not give consent

Other phases of MBBS students

Sampling Method: Simple random sampling

Sample Size: 84 (16 students did not give consent)

Data Collection tools: a) pretest and posttest forms b) Feedback form

Data Collection procedure/methodology: Our institute's intake capacity is 100 and 84 of them volunteered and gave informed consent for the research. The faculties of the Biochemistry department and Medicine department of Kokrajhar Medical College were sensitized in the beginning. The laboratory attendants were trained as standardized patients and made ready for the students with laboratory reports. Students were primed for the concept of ECE in the foundation course conducted by our institute. Out of the eight topics of ECE included by Health University of Assam, Diabetes Mellitus was taken for the study. Faculties who completed curriculum implementation support program (CISP) were involved in designing the module and questionnaire. For validation of the questionnaire (Pretest and posttest and the feed-back forms) help was taken from professors of Medicine and MEU members. The pretest and posttest included relevant questions related to Diabetes Mellitus such as HbA1c, renal threshold, oral glucose tolerance test, complications of Diabetes Mellitus, bedside tests done for diabetic patient, oral hypoglycemic drugs, hormones influencing blood glucose, criteria for diagnosing Diabetes Mellitus etc. All together 20 questions were prepared comprising of 2marks each. We kept in mind that the students should understand basis, rationale and interpretation of biochemical tests advised in Diabetes Mellitus.

Initially a didactic lecture on disorder of carbohydrate metabolism with emphasis on Diabetes mellitus was taken for the 1st year MBBS students. Right after the lecture on Diabetes Mellitus the pretest form was given comprising 20 questions (2 marks each) to the students. 15 minutes was given to complete the pretest form. The evaluation of the pretest forms was done. Then on the next day, out of the total of 84

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students, 42 were taken to the hospital ward for 3 hours ECE sessions with real diabetic patients. Detailed discussion on diagnosis of Diabetes Mellitus and its complications, monitoring of treatment, gestational diabetes, significance of HbA1c etc. were discussed and during the process help was taken from faculties of Medicine department. simultaneously remaining 42 students were exposed to standardized diabetic patient for 3 hours ECE classes. The standardized patient gave history of a diabetic patient along with the blood reports and urine reports. Similar discussion like the ones with real patients were also made here. The posttest forms were given to both the group of students for 15 minutes to fill up and evaluated. Both pretest and posttest were evaluated in both the categories ie. Real patient and standardized patient and compared using the paired t test for mean. Finally a feedback form after validation from senior medicine professors and MEU members was given to the students in the form of a google form and the students were asked to fill it up. This feedback gave us the idea whether the students are benefitted with the new procedure of ECE with standardized patients. The feedback form has 10 questions related to ECE with standardized patients and these were measured with 5point Likert Scale.

RESULTS

The pretest and posttest data were presented in terms of mean+/-SD. For pretest and posttest comparison performance of students in both categories (real & standardized) paired t test for mean was used. The p value less than 0.001 was considered to be statistically significant.

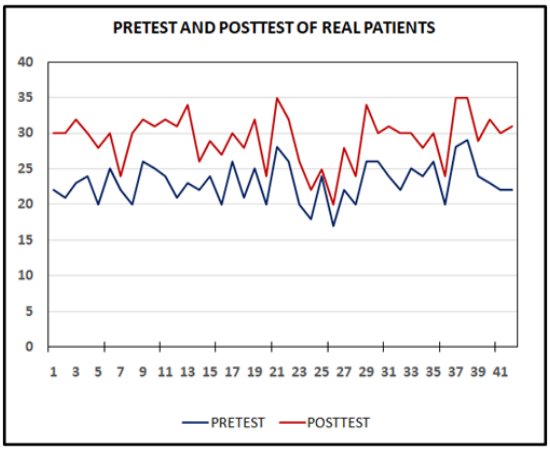

Figure 1: Line diagram of pretest and posttest of real diabetic patients

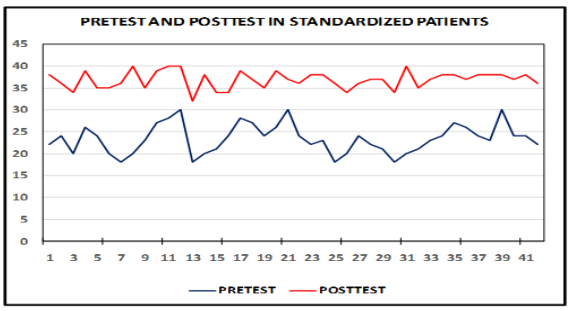

Figure 2: Line diagram of pretest and posttest of standardized diabetic patients

The pretest and post analysis of real diabetic patient was shown in table 1 where the pretest score was 23.09 +/-2.73 (mean+/-SD) and post test score was 29.3+/-3.51(mean+/-SD.) The pretest and posttest analysis of standardized diabetic patient was shown in table 2 where the pretest score of students was 23.33+/-3.30 (mean +/-SD) and posttest score was 36.86+/-1.96 (mean+/-SD). The paired t teat for mean was done and found to be highly significant P<0.001 in both cases.

From the chart 1 and chart 2, it becomes obvious that the students who were exposed to standardized diabetic patient did better in posttest when compared to the students exposed to real patients.

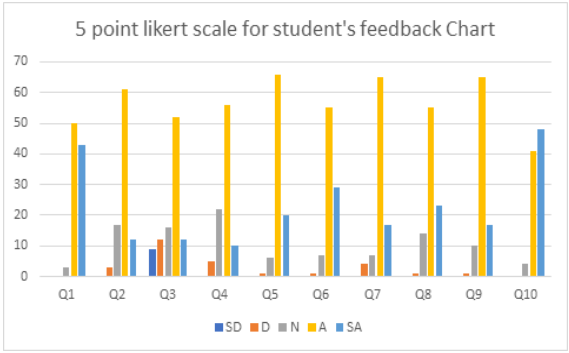

Figure 3: Student's feedback measured by 5point Likert Scale

Table 1: Analysis of pretest and posttest of real patients.

	Mean ±SD	Standard deviation	Standard error of mean
Pretest	23.09±2.73	2.73	0.42
Posttest	29.30±3.51	3.51	0.54
P value	<0.001		
Pearson correlation	0.76		

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Table 2: Analysis of pretest and posttest of standardized patients

	Mean ±SD	Standard deviation	Standard error of mean
Pretest	23.33±3.30	3.30	0.51
Posttest	36.84±1.96	1.96	0.30
P value	<0.001		
Pearson correlation	0.51		

Table 3: feedback taken in 5 point likert scale

Strongly disagree (1)	SD	1-1.8
Disagree (2)	D	1.9=2.6
Neutral (3)	N	2.7-3.4
Agree (4)	A	3.5-4.2
Strongly agree (5)	SA	4.3-5

Table 4: responses of students along with percentages measured in 5 point likert scale

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
SD	0	0	0	0	0	0	0	0	0	0
D	0	(3) 3.2%	(12) 12.9%	(5) 5.4%	(1) 1.1%	(1) 1.1%	(4) 4.3%	(1) 1.1%	(1) 1.1%	0
N	(3) 3.1%	(17) 18.3%	(16) 17.2%	(22) 23.7%	(6) 6.5%	(7) 7.5%	(7) 7.5%	(14) 15.1%	(10) 10.8%	(4) 4.3%
A	(50) 52.1%	(61) 65.6%	(52) 55.9%	(56) 60.2%	(66) 71%	(55) 59.1%	(65) 69.9%	(55) 59.1%	(65) ^9.9%	(41) 44.1%
SA	(43) 44.8%	(12) 12.9%	(12) 12.9%	(10) 10.8%	(20) 21.5%	(29) 31.2%	(17) 18.3%	(23) 24.7%	(17) 18.3%	(48) 51.6%
AVERAGE	4.4	3-9	3.7	3.8	4.2	4.2	4.0	4.1	4.1	4.5

The 5point Likert scale basically depends on 5 points ie:
Strongly disagree…….1 (1-1.8)
Disagree……...2(1.9-2.6)
Neutral……3(2.7=3,4)
Agree…… 4(3.5-4.2)
Strongly agree……5(4.3=5)
Here in this study the responses of the students to the 10 questions in the feedback questionnaire are plotted in the table 4 and shown by bar diagram in the chart 3. From the responses in the table 3 it is found that the average Likert scale Score was 4.09 which falls in the category of Agree (3.5-4.2) and this suggest that the students agree that ECE classes are better with standardized patients than with real patients.

DISCUSSION

Medical Education is evolved from teacher centric to student centric and competency based as active participation in learning process will help them to retain the knowledge and it will also motivate them to read the subject by increasing their interest into it.[1,5-7] Now a days, so many tools are available besides books due to availability of interest and it is very interesting to keep teaching learning methods interesting that will be helpful to the students promoting their learning process, making it easy but at the same time covering all three domains of learning. Because many research data has proven that involvement of students into learning process helps them in understanding of topic rather than just telling or demonstration.[5,6-16] MBBS students have a desire to deal with patients from the very first day of their MBBS course. Though Biochemistry is a basic science subject of MBBS course but its application is required all throughout the clinical course. The application part of this subject is taught in early clinical exposure sessions and thus makes it interesting for the students when they are exposed to the patients. Here in this study we have used both real patient and standardized patient for the early clinical exposure. The posttest performance of students was found better in both the cases and it agrees with the study by Rajni et al (2020) who showed Diabetes mellitus was better understood and retained with importance of biochemical investigations in overall management of disease through ECE. Our finding is also in compliance with that of Amandeep Kaur et al,[5] who showed in their study that ECE improved academic performance of students and motivated the students for self-directed learning by increasing their interest in subject. Tang et al,[17] also found in their study that there is a positive correlation between students' learning achievement in basic medicine and their clinical exposure environment. Nair et al, Surpaneni et al and Joshi et al also showed improved posttest scores in case-based learning tool in biochemistry.[18-20] Rawekar et al,[21] also stated in their study that introduction of ECE in the first year was positively received by medical students through integrated clinical case-oriented teaching of basic science subject. They also said ECE being helpful prospectively in their clinical posting starting in second year.
As we have taken standardized patient to compare with real patient it is seen in the chart 1 and chart 2 that students perform better with standardized patients. Bolken et al (2010) in his study confirmed that students performed well with standardized patients and provided better feedback than real patients to assist the medical students in learning

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medical communication concepts.[22,23] Davies et al reported that clinical performance and student confidence were positively correlated to the use of standardized patient as evidenced by increased scores on clinical evaluations and self-reported confidence scores.[24] According Fortin et al (2002) in qualitative study on medical students reported the use of standardized patients helped them have confidence in their interpersonal communication.[25]

It is seen that through ECE, the students performed better in the posttest assessment. In the topic of Diabetes Mellitus about the clinical scenario of the diabetic case, their investigation reports, bedsides tests that can be done along the complications faced by the untreated diabetic cases. When such real patients were substituted by the standardized patients the students perform better than in with real patients as it provides with a safe environment with known standardized patient which helped them to gain confidence.

CONCLUSION

From this study we conclude that ECE in the subject of Biochemistry is quite helpful as it helps the 1st year students to get acquainted with the clinical cases as applied Biochemistry is required all throughout the clinical phases. The students can use all the three domains of learning and they could easily retain and recall the topics. The knowledge of reasoning is also developed here. In this study standardized patients were used who are already known to the students as they are our staff and this creates a safe environment of learning, to practice clinical skills, feedback, exposure to hidden curriculum in medicine such as professionalism. These standardized patients help the students gain confidence in themselves and also increase their communication skills to face real patients in second year of MBBS and finally produce a confident Indian Medical Graduate.

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