

Early Clinical Exposure: A Tool To Learn Biochemistry: A Small Group Study

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Abstracts: Background: Didactic lectures occur as passive transmission of knowledge to 1st MBBS students. Biochemistry studied by such lectures becomes difficult to remember and recall. Retention rate is more when learner is actually involved in the learning process by doing. To bridge the gap between the existing teaching methodology and that required for competency based approach, we thought about early clinical exposure as an active learning method. Methodology: Total 50 students visited hospital for active learning, to observe and note down the information about his history, laboratory investigations, and treatment from physician's interaction with patient. Diabetes mellitus - the clinical condition related to topic 'Carbohydrate metabolism' was selected for this activity. Nonparticipating students considered as control group. Pre & post test results were compared in control as well as in study groups. Post test results of both groups were compared to evaluate the effectiveness of new teaching – learning method over the traditional one. Results: Difference between pre and post test results of control group was nonsignificant, while those of the study group were highly significant ($p < 0.0001$). Post test results of study group were improved with high significance ($p < 0.0001$). Conclusion: In 'container –dispenser' type of didactic lectures students were not able to retain sufficient knowledge only by passive transmission. Hence there was no improvement in the performance of control group. Hospital scenario and the observation of physician and patient interaction provides, stimulus rich environment for learning. This stimulus may help them to correlate the knowledge acquired in the didactic lectures to clinical context. So there was significant improvement in the post test score of study group than pre test score, and also than post test score of control group. This active learning method, presented herein has proved to be an attractive and useful approach to facilitate the teaching –learning biochemistry. [Dhonde S NJIRM 2015; 6(5): 76-80]

Key Words: Clinical exposure, Active learning, 1st MBBS, Biochemistry

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Introduction: Transmission of education from higher secondary to first year MBBS can be difficult to students because of the increase in the volume and content of the syllabus. New terminology, vast curriculum of all the three subjects of basic science, too busy academic schedule.... all these conditions, to which student cannot cope up easily. Through the didactic lectures teacher would metaphorically pour knowledge into students' head with expectation that students would retain what necessary, and apply these concepts effectively in practice. For Biochemistry lots of metabolic pathways, number of reactions, enzymes; and correlation of all these to clinical context; when studied through such type of didactic lectures, becomes very difficult to remember and recall. Therefore most of the students become less attentive in the classrooms; consequently their performance may not be up to the mark.

Teaching and learning methods play a major role to make learning more easy and fruitful. There is a

proverb "Tell me I forget. Show me I may remember. But involve me I understand" Average retention rate for lectures is only 5%, for demonstration is 30%, while learning by doing is 75%.¹ Undergraduate students are adults; according to andragogy, adult learners are independent & self-directed, Humans learn through the continual exploration and interaction with the environment through activity and learn by doing². So to interact students with clinical environment and as per the theoretical aspect of andragogy; we planned about an early clinical exposure (ECE) activity for first year MBBS students at our institute – Bharati Vidyapeeth Deemed University Medical College and Hospital, Sangli. (BVDUMC&H). This activity is to bridge the gap between the existing passive teaching methodologies and, methodology required for competency based approach.

Study Design – Intervention study – 'Early clinical exposure is the intervention.'

- Before and after comparison of the performance of the control and study group students.

Intervention – Visit of students to hospital (early clinical exposure - ECE), to gather the information about patient's history, laboratory investigations, and treatment; from physician's interaction with the patient. The disorder selected was 'Diabetes Mellitus' (DM) for the exposure, as a clinical condition related to the topic 'Carbohydrate chemistry and metabolism'.

Study Duration and workplace – This project was completed in 3 Months. April 2014 - June 2014, in the Department of Biochemistry, Bharati Vidyapeeth Deemed University Medical College & Hospital, Sangli. Maharashtra.

Material and Methods: Total 50 students from first year MBBS, for the academic year 2013-2014, were selected for this project on systemic random sampling basis. The present study was approved by institutional ethical committee. Proper guidelines for observation of the physician and patient interaction were given to the students in the beginning. Written consent was obtained from the students at this time. Pretest was conducted for all first MBBS students (control & study group), 2 days after the completion of the didactic lecture on 'Carbohydrate chemistry and Metabolism.'

All the faculty members from the department of biochemistry were involved in the entire project. Participating students visited medicine OPD/IPD along with the faculty from biochemistry, to observe the interaction between the physician and patient suffering from Diabetes. This interaction involves observation regarding sign, symptoms, family history, life style, laboratory investigations and treatment strategy, with convincing the patient for change in dietary habits, regular exercise. Physician explained the treatment strategy which was based on biochemical basis and laboratory reports along with clinical finding.

For study group students ECE visit was arranged 2 days after the completion of the didactic lecture on 'Carbohydrate chemistry and metabolism.' Post test of control group and study group was

conducted simultaneously, which was 8 days after the pre test.

Evaluation Plan – Pretest of all students was conducted after the routine didactic lecture on 'carbohydrate chemistry and metabolism' to assess the baseline performance of all the students. Post test of the control group was conducted one week after the pre test to assess the stimulation in learning by pre test. Post test of the study group was conducted 4 days after their hospital visit; to evaluate the usefulness of this method in recalling the acquired knowledge, and its effective application in clinical context. Pre and post test MCQs questionnaire includes recall type questions, and questions based on case studies. Results of pre & post test of control group were compared to find out the stimulation if any, in the learning by pre test. Results of pre and post test of study group were compared to find out the stimulation in learning by early clinical exposure. Post test results of control and study group were compared to find out the effective T-L method between the conventional and new ECE method. With the help of pre and post tests, cognitive domain can also be assessed. All the components of cognitive domain as per the Bloom's Taxonomy, -Knowledge, comprehension, application, analysis, synthesis and evaluation, can also be assessed with this. Acceptance of students for this method was assessed by feedback questionnaire.

Statistical Analysis – Statistical analysis was done by calculating mean and S.D. of scores, standard error of difference between two means, and paired, 't' test for the comparison between the pre and post test scores of each group; as well as between post test scores of control and study group.

Result: The pretest score of control group was 9.62 ± 4.319 (Mean \pm S.D.), Std. Error of mean was 0.453. The post test score was 9.92 ± 3.659 (Mean \pm S.D.), Std. Error of mean was 0.384. Paired 't' test value for this comparison was -0.898. $p = 0.371$. The difference between the pre & post test score of control group was not significant.

The pretest score of study group was 10.37 ± 4.207 (Mean \pm S.D.), Std. Error of mean was 0.595. The post test score was 14.3 ± 3.684 (Mean \pm S.D.), Std. Error of mean was 0.521. Paired 't' test value for

this comparison was -0.107 . $p < 0.0001$ This indicates that there is highly significant increase in the performance of students in the post test than in the pre test.

The p value is less than 0.0001 for the comparison between the post test results of the control and study group. The difference between the post test results of both groups differ significantly.

Discussion - Teaching Biochemistry which is a complex, constantly evolving subject, for the 1st year MBBS is not a simple task. Teaching styles in medicine are still remained fairly pedantic with traditional classroom lectures only, which are structured around teacher authority and visual learning. Recently there is a shift in medical education from 'teacher centred' to 'student centred' and from student to 'patient centered'³. Current teaching method cannot foster the principles of this patient centred education. According to andragogy theory, adults are eager to become competent and require active participation. And it was stated that learning and participation are inseparable.⁴ So involving learning, along with active participation, we exposed these students to clinical environment for learning Biochemistry in clinical context.

Table No. 1 represented the comparison between the pre and post test scores of Control group. This suggests that the difference between the pre and post test score was not significant. In present study, the control group was not involved in active learning. This group is only exposed to 'container – dispenser'² type of didactic lectures with the expectation that they have to retain, recall all the metabolic reactions, enzymes, regulations and its correlation with clinical context. Retention rate is more when learner is actually involved in the learning process by doing.¹ Learning & reading without exposure to active learning may be the cause for failure to reproduce the sufficient amount of knowledge, when required. With this customary educational paradigm students may fail to dispense their knowledge in tests. Hence there was no significant difference between the pre and post test scores of control group.

Table No 1: Comparison between pre & post test scores of Control Group

	Mean	Std. Deviation	Std. Error of mean
Pre	9.62	4.319	0.453
Post	9.92	3.659	0.384

The paired 't' value for the comparison of pre and post test results of the control group was -0.898 This difference is not significant. $P = 0.371$

Table No. 2 speculated the comparison between the pre and post test scores of Study group. The post test scores were improved with high significance than pre test scores.

Table No 2: Pre & post test scores of Study Group

	Mean	Std. Deviation	Std. Error of mean
Pre	10.37	4.207	0.595
Post	14.3	3.684	0.521

The paired 't' value for the comparison of pre and post test results of the study group was -0.107 This difference is highly significant. $P < 0.0001$

With the active participation, students are physically involved in learning and they remember best through their experience. It was stated that optimal learning environment should be multidimensional experience². Hospital scenario and the exposure to patients while observing physician – patient interaction, provided such type of environment. According to researcher from neuroscience, stimulus rich environment promotes brain functioning and learning⁵. As a result of this, students may be stimulated for the studies; which may help them to correlate the knowledge acquired to clinical context. This may be the reason for the highly significant post test scores from the study group, than the pretest scores.

Our results were in line with those of McCarthy and Anderson, who compared active versus traditional teaching styles; and discovered² that the students who participated in active learning scored higher on standard evaluations than who received traditional teaching.⁶

During their visit to patient, the case details were discussed with the students by faculty and clinician. Discussion involved details of patient's symptoms, family history, life style, complications and

laboratory investigation results. This discussion was nearly one to one teaching which clears students' concepts and strengthens their learning ability. Such type of teaching is essential for active learning in clinical settings. This is the opportunity to adjust what we teach to the learner's needs⁷. This may promote self directed learning & may help to link prior knowledge with new clinical experience.

Table No. 3 showed the comparison between the post test scores of Study & Control group. The post test score of study group was increased with high significance ($p < 0.0001$) than those of the control group.

Table No 3: Results of Post test scores of Control & Study Group

	N	Mean	Std. Deviation	Std. Error of mean
Control	91	9.92	3.659	0.384
Study	50	14.3	3.684	0.521

The unpaired 't' value for the comparison of post test scores of control and study group was - 6.765 This difference is highly significant. $P < 0.0001$

During the early clinical exposure, students interacted with patient. In this active learning instead of just doing, students have to think about the things they are doing. Therefore this active learning may also enhance the development of independent learning skills and the practical application of information⁸.

Silberman and Stalhein – Smith assert that active learning is an approach that can truly lead to meaningful learning^{9,10} Students engaged in active learning construct meaning by relating new information to that which they are already familiar. When meaningful learning takes place students are able to apply acquired information to solve novel problems. As well as this helped to assess the knowledge, comprehension, application, analysis, synthesis & evaluation. These changes in students' attitude may be the cause for the highly significant difference between the post test scores of control & study group.

Concerning the effectiveness of ECE, used as teaching – learning tool; the integrative and

multidimensional character of the project allowed transposing Biochemical concepts from theory to an immediate and practical application. Thus here ECE may facilitate the comprehension of new information related to the problem and enhance its long term memorability.

Table no.4 explores the students' feedback to different type of questions. The feedback from students about the approach used was excellent and overwhelming. Majority of students reported positive results and that the ECE well helped them to learn with interest, retain the content what they learnt and to apply it in clinical context.

Table no 4: Students' feedback

Sr. No.	Question	Yes		No	
1	The early clinical exposure was more useful as a trigger for recalling the subject than by didactic lectures.	97.9 %		1.9%	
2	Did the ECE help you to understand the biochemical alterations in carbohydrate metabolism related to DM?	91.8 %		8.2 %	
3	The ECE helped me in correlating the patient's history with status of DM.	93.8 %		6.2 %	
4	I learned application of knowledge acquired in the classroom, while exposed to patient.	Much 52.9%	Some what 40.9%	Little 4.1%	Never 2.1%
5	ECE supported for creating interest in the study of Biochemistry	57%	37%	2.0%	4.0%

Students' expressions –

- 1) ECE create much more interest in topic than any other activity can do
- 2) It was a great experience, for the first time we did this exercise and that helped in better understanding.
- 3) Frequent visits should be done for all clinical problems so that interest is created in the subject.

Conclusion: Active learning by early clinical exposure enables first year MBBS students to understand the relevance of underlying scientific knowledge & principles of clinical practice. Self directed learning & understanding by this method may be helpful in recalling their knowledge. In summary, active learning by early clinical exposure, our new teaching- learning methodology produced good learning outcomes. The T-L method presented herein has proved to be an attractive and useful approach to facilitate the Biochemistry teaching –learning process. Though time

consuming, this was an accessible and relatively easy way to foster meaningful learning.

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