Insights of Medical Students and Faculty on e-learning Biochemistry in MBBS during COVID-19 Pandemic

Murugan S[1], Vishal Babu GN[2], Deepak KS[3]

[1]Associate Professor, Dept of Biochemistry, Govt. Medical College, Palakkad, Kerala, India.
[2]Professor & Head, Dept of Biochemistry, Govt. Medical College, Palakkad, Kerala, India.
[3]Statistician cum Lecturer, Dept of Community Medicine, Govt. Medical College, Palakkad, Kerala.

Abstract:

Background: Studying Biochemistry is most important in MBBS course because of its play a vital role in diagnosis and treatment of human diseases. Due to covid-19, all institutions instructed the students to go to their houses and all classes were shifted to online learning mode. In order to fulfil the educational needs of the medical students, teachers adopted using online teaching platforms. Previous published articles showed the positive and negative perception of online learning medical subjects but not in any particular subjects. So, this study was done to determine the strength and weakness of online learning of biochemistry among the medical students and faculties.

Methods: After getting approval from the Institutional Research Committee, the study was carried out among the undergraduate MBBS students and faculty members. Study was based on MCQ based questionnaire and distributed to both students, faculty members and was asked to answer with a single most appropriate response and any suggestion if present.

Results: Totally 175 medical students and 20 faculty members participated in questionnaire survey. A majority of students opined that the lectures class were informative, interesting, but 90% of the students and faculty felt was not effective (p<0.005) and expecting offline class. Many problems such as technical issues, no interaction with faculties and friends, unable to clarify the doubts, not satisfied with practical class (p<0.001) and more involvement in social media activities during online class was seen by students. So, they were having additional stress on their examination results and future is maybe affected.

Conclusion: From the study it was observed that majority of the students and faculties had negative perception and felt that e-learning of biochemistry subject was not useful.

Keywords: e-learning, Biochemistry, COVID-19.

Introduction

Biochemistry is one of the basic fundamental subjects in medical education and students feels that needs lot of memorizations. Because it has highly complex chemical reactions to study and difficult to remember it, but we forget that the biochemical parameters play a crucial role in diagnostic and treatment of all medical diseases. So, to enhance the student's interest and understand the importance of biochemistry in Phase I MBBS, the Medical Council of India (MCI) implemented Competency based medical education (CBME) in 2019. Such as Early Clinical Exposure (ECE), small group discussions (SGD), self-directed learning (SDL), demonstrations, seminars, AETCOM module, case-based charts discussions etc, understand the importance of biochemistry in various disease processes [1]. To see the effectiveness and feasibility of implementing CBME curriculum in teaching biochemistry subject to Phase I MBBS students, there was the problem of

corona virus. Initially, both teachers and the students were quite tangled and didn't know how to tackle technology for online learning in any subject. Teachers of Biochemistry often found it extremely challenging to get students interested in subject and make them learning in a satisfactory way. Likely, previous studies documented that many issues like uploading all teaching materials on google classrooms or zoom meet for lecture class faced network issues, audio clarity, electricity shut down etc[2]. So, it is important to analyze the strength and weakness of online class to use in future.

According to few studies reported in Kerala the students had positive impacts of online classes in the pandemic crisis was noted[3,4]. On the contrary, few studies were of the opinion that offline teaching mode was better and satisfied compared with online mode, it looked like one way communication[5,6]. There were various studies done during COVID

times; however, all these studies mainly focused only on students perception. But no study was done to show the effect of online learning biochemistry subject as per CBME curriculum. Hence, assessing the both students and faculty perception would be of paramount importance. Therefore, we made an attempt to evaluate the perception of online learning biochemistry among MBBS students and teachers through a questionnaire based survey in GMC, Palakkad. This study determines the current modern student's intentions, like quality of biochemistry learning, behaviours, habits and would be to improve in future.

Materials and Methods

Study totally had 175 students (batches 2019-20, 2020-21 and 2021- 2022 year) from Integrated Institute of Medical Sciences (Govt. Medical College), Palakkad, Kerala and 20 faculties from Kerala, India. The study was conducted after obtaining the clearance from the Institutional Research Committee approval (GMC/IRC/Dec/2022/12). The questionnaire was given to 175 students and faculties, all of whom were studying now in the 2nd, 3rd year and supplementary batch. The students were asked to comment on the online class if any for which they could willing to comment. The study was conducted using pre-designed multiple-choice questionnaires according to validated and published by Pradeep et al., Karthik et al., [7,9]. Some of the questions here were Likert scale questions, the answers ranging like strongly disagree to strongly agree etc. The MBBS students of our medical college were approached and explained about the study protocol. Informed consent was taken from the willing participants and collected the data.

Inclusion Criteria: First year MBBS students, who underwent both classroom and online teaching batch from 2019-20, 2020-21 and 2021- 2022.

Exclusion Criteria: The students who did not give consent or did not attend the respective classroom and online teaching sessions.

Statistical analysis

Data was entered in Microsoft excel worksheet and analysed using statistical software SPSS-28. Demographic variables were expressed in terms of frequencies and percentages. Data analysis was performed using the Chi square test and Mann Whitney U test. The feedback forms had closed and open-ended questions, with responses on a 5-point Likert scale. P value of < 0.05 was considered statistically significant.

Results

According to the obtained results we found that 80% of students said that online learning was not effective compared to offline learning (Table1). Out of 175 students, 125 were female and 61 students were male and most of them used of device is mobile phone (n=170), Zoom meet (n=160), 9 used Google classroom, attending class (hostel room n=118, Home n=57), all faculties were using laptops for conducting online class. Further it was observed that student felt that less concentration was due to network problems (n=110), audio clarity (n=35) visual clarity (n=20), sharing issues (n=10) (p<0.005) and this was the main challenges that troubled particularly for other state students during the online class. The other issues, most of them were not always (n=96) present for entire online class. But the Students (n=141) and faculty (n=16) responded the utility of online class via zoom meet was useful during lockdown.

Table 1: Teachers and students general perceptions (%)

		Students	Faculty	Chi-Square value	P value
1	**The device used for the class:** Mobile phone Laptop Tablet Desktop	170 5 0 0	0 16 4	124.8	<0.001 (Significant)
2	**What is your preferred e-learning method?** Zoom Meet Google Meet Google classroom	160 6 9	14 6	9.835	<0.007 (Significant)
3	**Where did you attend the Zoom Meet?** Home Hostel room College	57 118 0	4 16	154.3	<0.001 (Significant)

4	**Common technical errors during classes** Network issues Audio clarity Visual clarity Sharing issues	110 35 20 10	 20	11.14	 <0.011 (Significant)
5	**Are you present for entire class for all the online classes?** Yes No Not always	65 14 96	 20	28.8	 <0.001 (Significant)
6	**Motivation to attend the online classes:** Self Parents Attendance and exams Others	20 0 155 0	 20	86.35	 <0.001 (Significant)
7	**How do you rate the utility of online classes during the lockdown period?** Very useful Quite useful Useful Rarely useful Not useful	5 10 138 15 7	 4 14 2	8.435	 0.077 (Not Significant)
8	**Discomfort experienced because the online classes:** Eye pain/visual disturb Headache Neck pain Back pain	47 55 43 30	 16 2 2	12.98	 0.005 (Significant)
9	**Rate your satisfaction with using Zoom Meet classroom as a tool for receiving medical education?** Extremely satisfied Quite satisfied Somewhat satisfied Not so satisfied Not at all satisfied	 12 141 11 11	 6 14	7.638	 0.054 (Not Significant)
10	**Other activities during the online class -** Playing games Doing online shopping Blogging Social media (FB, Instagram, WeChat, Snapchat, Telegram)	 12 15 3 137 8	 0 0 0 0 0	NA	 NA

*p < 0.001 is highly significant; (p < 0.05) considered statistically significant; NA-Not applicable.

During the theory class it was observed that most of the students were involved in social media activities (n=172) such as playing games, online shopping, face book, Instagram, WhatsApp etc. Most of the students feel that used PPT material was quite useful (n=137), but unable to make notes (n=156) during class hours. In addition, Students felt that understanding of the subject concepts was less than regular class (n=151), no clarification of doubts (n=136) and attention in class was <50%. But students said that somewhat satisfied (n=132) for online exams and faculties responded that we were unable to monitor the students during the online exams (n=10). From the response it was observed that ninety percent of the students and faculties did not like the online learning in biochemistry (Table 2).

Table 2: Teachers and students perceptions (%) on theory class

		Students	Faculty	Chi-Square value	P value
1	**How did you feel for class lecture PPT material?** Extremely useful Quite useful Somewhat useful Not so useful	 12 137 19 7	 20	5.394	 0.145 (Not Significant)
2	**Are you able to make notes during class?** Yes No	 19 156	 20(Not monitorable)	2.40	 0.121 (Not Significant)
3	**Are you able to follow with the material presented in the power point presentation without presence of teacher?** Follow 25% 50% 75% 100%	 20 145 10 0	 20 (Not monitorable)	4.052	 0.132 (Not Significant)
4	**Are you understanding of the subject concepts and pathways explanation in online class:** Understanding Less than regular class Not understanding	 5 151 19	 20 (Not monitorable)	3.128	 0.209 (Not Significant)
5	**Are you able to clarifying your doubts during online class:** Yes No Not always	 15 136 24	 20	5.571	 0.062 (Not Significant)
6	**Are you satisfied with conducting exams in online:** Somewhat satisfied Not satisfied Not at all satisfied	 132 17 26	 20	72.186	 <0.001 (Significant)

*$p < 0.001$ is highly significant; ($p < 0.05$) considered statistically significant.

In the Practical classes, most of the students (n=140) and faculties (n=16) said that they were not satisfied (p<0.001) with online mode and suggested need of wet lab practice (Table3). Regarding feedback of CBME curriculum based classes conducted like ECE, SDL, SGD etc - Out of 175 students, feedback was given by 133 (76%) and it was observed that it is not satisfied in ECE (n=133), SGD (n=84), somewhat satisfied in SDL (n=70), AETCOM module (n=78), not at all satisfied writing logbook (n=141) and somewhat satisfied competency sheet based practical class (n=78) (p<0.005) (Table 4). From the above data it is indicated that the majority of students and faculty either disagreed or were not satisfied with conducting ECE, SGD, SDL AETCOM module etc. The results overall showed students had negative perception and attitude towards online learning biochemistry.

Table 3: Teachers and students perception on Practical class (%) of responses (n = 175+20)

		Students	Faculty	Chi-Square value	P value
1	**Are you understanding/ satisfied of the practical class in online:**			16.23	
	understanding	10			0.001
	Not understanding/ satisfied	140	16		(Significant)
	Wet lab practical need	25	18		
2	**Students Understanding the subject without practical classes:**			24.87	
	understanding	11			<0.001
	Not understanding	147	20		(Significant)
	Wet lab practical need	17	20		
3	**Are students able to follow the online Demonstration class:**			5.45	
	Yes	12			0.066
	No	112	4		(Not Significant)
	Not always	51	16		
4	**What you feel about writing practical record:**			10.29	
	Somewhat satisfied	9			0.006
	Not satisfied	83	4		(Significant)
	Not at all satisfied	83	16		
5	**What you feel about writing log book:**			36.73	
	Somewhat satisfied	12	4		<0.001
	Not satisfied	22	16		(Significant)
	Not at all satisfied	141			

*p < 0.001 is highly significant; (p < 0.05) considered statistically significant.

Table 4: Teachers and students feedback of CBME Curriculum based class

		Students	Faculty	Chi-Square value	P value
1	**Are you satisfied with conducting ECE in online:**	17	4		0.298
	Somewhat satisfied	133	16	2.42	(Not
	Not satisfied	25			Significant)
	Not at all satisfied				
2	**Are you satisfied with conducting SGD in online:**				0.163
	Somewhat satisfied	74			(Not
	Not satisfied	87	4	3.633	Significant)
	Not at all satisfied	14	16		
3	**Are you satisfied with conducting SDL in online:**				0.042
	Somewhat satisfied	91			(Significant)
	Not satisfied	70	4		
	Not at all satisfied	14	16	6.32	
4	**Are you satisfied with conducting AETCOM Module in online:**				0.084
	Somewhat satisfied	78			(Not
	Not satisfied	78	4		Significant)
	Not at all satisfied	19	16	4.96	
5	**What you feel about writing log book:**				<0.001
	Somewhat satisfied	12			(Significant)
	Not satisfied	22	4		
	Not at all satisfied	141	16	36.738	
6	**What you feel about competency sheet based practical:**				<0.001
	Somewhat satisfied	78			(Significant)
	Not satisfied	19			
	Not at all satisfied	78	20	22.05	

*p < 0.001 is highly significant; (p < 0.05) considered statistically significant.

Discussion

Due to COVID-19 pandemic, the students were sent home and all classes continued on online learning basis without appropriate infrastructural support. Due to online classes everyone started using smart phones and this also was responsible for more involvements of social media activities between the students. However current trend is everyone using WhatsApp for quick communications of academic activities because of comfortable use for all purposes and also it has some advantage and disadvantages. The current usage of mobiles showed influence in the attitude of student and lead to less concentration in the studies which had reflected in poor academic results which made parents worries about children's future. So now days the real challenge with all faculties and parents are struggling in adapting the students to concentrate in studies and avoiding them from other activities in social media. This put the burden on medical field to discover newer innovative ways to deliver knowledge to the learners. Therefore, it is of paramount importance for seeking feedback of online learning biochemistry in future.

General perceptions

According to previous study reports almost all the students widely used the e-resources like Zoom meet, Google classroom, whattsapp communication etc[9]. In the study majority of students (96%) felt that no interact between the teachers, classmates, lowering students' enthusiasms which lead to less interest in learning, but not in the particular subject. But few studies reported that there were positive aspects to online learning medical subjects[10,11]. Similar results were obtained in our study that 79% students somewhat satisfied and had negative perception (p<0.001) towards online learning due to network, audio issues, many of them involving social media activities (78%), 70% students said that had eye pain, headache, back pain etc (p<0.005). Similar observation was seen by Gismalla et al., Bhagyajyothi et al.,[12,13]. Most of the students responded that they attended the class only for attendance percentage and eligibility for writing university exams (Table1). From the above evidence we observe that online class was less effective and lead to poor gain in knowledge in clinical practice skills for future. This is in congruence with the previous study carried out by Abbasi et al., Martinez et al.,[14,15].

Perception towards online learning Theory class

According to CBME curriculum the Early clinical exposure (ECE) and case based (CBL) studies were very useful in motivating students to understand the importance of biochemistry parameters to solve the clinical problem and diagnosis diseases. According to previous study reports the ECE, SGD, SDL and AETCOM module had influenced student confidence in solving problems, for better understanding of topic to acquisition of more knowledge, skills and changes in the attitudes[16,17]. Likely one old study reported that Health professionals need to be self-directed learners so as to increase their independence, self-confidence, self-discipline and exponentially increasing medical knowledge[18]. But according to few studies, majority of students were not satisfied in SDL and needed to standardise it[19,20].

In our study both faculty and students responded somewhat satisfied with ECE, SGD, SDL, neutral satisfactions with AETCOM module via online mode, not at all satisfied with logbook writing and they suggested that need offline teaching method was for required understanding, clarifying the doubts (Table-4). This finding was also supported by Meyer and Jones, Kukreja et al.,[21,22]. But some studies findings reported positive response on ECE and CBL effective for Phase I MBBS students and faculty members wanted to hold this session more in future[23,24]. Therefore it is recommended and further studies needed to conform. During lectures class taking the notes is common and it very useful strategy to many students for learning purposes. But in our study the students felt that it is a major disadvantage and often difficult to listen to the lecturer and take the notes at the same time in the online class (Table-2). We found that 86% of students said that their notes taking time during lectures had decreased and faculty said they were unable to monitor the students.

Assessment is essential process to measure knowledge, skills and attitude, progress of students; it can either be formative or summative form. Some studies have shown that e-learning improved performance of students when compared to traditional teaching methods[25]. This observation is similar to the finding of Khalil et al.,[26]. In our study, we found that the 65 % students somewhat satisfied, 15% students are not satisfied while 20 % not at all satisfied of online examination and online viva voce. Likely faculty responded that difficult to monitor the students and unable to stop the malpractice. However, the level of satisfaction differed between countries too. Similar result found study done by Varghese et al Michal Baczek et al [27,28]. So from these data we should consider that online teaching of biochemistry subject is only a supplemental aid in pandemic situation and offline should remain the primary sources of knowledge.

Experience of online learning Practical class

In case of practical class the students should perform the various chemical tests with quantitative, qualitative methods and followed by discussion of normal and abnormal levels biochemical parameters present in the body fluids and its importance in disease conditions. In addition, that there they have

demonstration class, and competency-based practical's as per CBME curriculum. And part of practical class clinical case charts discussion with lab reports to diagnose the disease was associated and assess interpretation skills. Previous studies reports on the practical class very limited. Even though, few studies noted that more than 80% of the students felt that biochemistry practical are some useful in lockdown and many said that online learning cannot replace the wet lab practice[12,29]. Because they had additional stress due to treat the diseases without wet lab practice. Our studies also observed same results and the statistically significant given in the table1 $p < 0.01$ is highly significant; ($p < 0.05$) was considered to be statistically significant. In addition, they suggested that need for hands on practice to understand and the importance of subject which useful for treat the disease in patients in future.

Conclusion

Based on the above results the online learning of Biochemistry in MBBS course is still questionable because it indicates the fear to face the real patients to treat the disease. In our study we found that 90 % of the students and faculties were dissatisfied and did not prefer online teaching and learning of Biochemistry. So, we conclude that they were expecting current PPT presentation along with chalk and board teaching method in MBBS course. There is a need for more studies for better understanding of Biochemistry and consideration of online class in future.

Reference

1. UG Curriculum MCI India, 2019. Available from: ttps://www.mciindia.org/CMS/ information -desk/for-colleges/ug-curriculum

2. Alsoufi. A, Alsuyihili. A, Msherghi. A et al. Impact of the COVID-19 pandemic on medical education: Medical students' knowledge, attitudes, and practices regarding electronic learning; PLoS One. 2020, 25; 15(11):1-20.

3. Rafi AM, Pulikkottil Raphael Varghese, and Praveenlal Kuttichira. The Pedagogical Shift During COVID-19 Pandemic: Online Medical Education, Barriers and Perceptions in Central Kerala. J Med Edu and Currr Dev, 2020; 7: 1–4.

4. Viswambharan P, Adhershitha AR, Rodrigues SV. Perception of online classes during COVID-19 pandemic: A cross-sectional study among the students of a rural tertiary care centre and dental college in Kerala, India. Int J Oral Care Res. 2021; 9:14-7.

5. Amir LR, Tanti I, Maharani DA et al. Student perspective of classroom and distance learning during COVID-19 pandemic in the undergraduate dental study program Universitas Indonesia. BMC Med Educ, 2020; 20: 392.

6. Atchley W, Wingenbach G, Akers C. Comparison of course completion and student performance through online and traditional courses. Int. Rev. Res. Open Dist. Learn. 2013; 14: 104–116.

7. Pradeep PG, Nikos P, Jose MB, Wei W, Petra AW et al. Online eLearning for undergraduates in health professions: A systematic review of the impact on knowledge, skills, attitudes and satisfaction. Journal of global health, 2014; 4(1): 1-17.

8. Karthik Vishwanathan, Patel GM, Patel DJ. Impact and perception about distant online medical education (tele-education) on the educational environment during the COVID-19 pandemic: Experiences of medical undergraduate students from India. J Family Med Prim Care, 2021; 10:2216-24.

9. Akande ON, Badmus TA, Akindele AT, et al. Dataset to support the adoption of social media and emerging technologies for students' continuous engagement. Data in Brief. 2020; 31: 105926.

10. Guiter GE, Sapia S, Wright AI, Hutchins GGA, Arayssi T. Development of a remote online collaborative medical school pathology curriculum with clinical correlations, across several international sites, through the Covid-19 pandemic. Med Sci Educ. 2021; 31(2):549 - 56.

11. Yang Q, Qu C, Zhang H, Ding L, Shen B. Opening a new pattern of medical education under the background of covid-19. Acta Univ Ersitatis Medicinalis Nanjing (Social Sciences). 2021; 21(2):181–4.

12. Bhagyajyothi M B, Niranjan PK, Mamatha BV, Keerthana, Preeval SC, Vivian DS. Online learning during COVID-19 pandemic- Medical students' perception. Biomedicine, 2022; 42(5): 999-1004.

13. Gismalla MDA, Mohamed Soud Mohamed, Omaima Salah O Ibrahim, Moawia Mohammed Ali Elhassan3 and Mohamed Naser Eldeen Mohamed1. BMC Medical Education, 2021; 21:377.

14. Abbasi S, Ayoob T, Malik A, Memon SI. Perceptions of students regarding E-learning during Covid-19 at a private medical college. Pak J Med Sci. 2020; 36: 57-61.

15. Martinez IG, Sanchiz DC, Batanero JMF, Rosa ALDL. Using Mobile Devices for Improving Learning Outcomes and Teachers' Professionalization. Sustainability. 2019; 11:69-71.

16. Arthi TS. Small group case discussions help increase first year MBBS students' interest in Biochemistry. Univ J Pre and Para Clin Sci, 2020; 6(5):1-3.

17. Wilma D, Suresh DR, Chandrakala MV. Evaluation of Small Group Discussion as a Teaching-Learning Method in Biochemistry for First Year MBBS Students: A Pilot Study. South East Asian J. Med. Educ. 2014; 8:41- 43.

18. Davis J. Education through self-directed learning. Aust Nurs Midwifery J. 2015; 23:26-7.
19. Murad MH, Varkey P. Self-directed learning in health professions education. Ann Acad Med Singapore. 2008; 37(7):580-90.
20. Lade K, Gaglani H, Khare S, Muley S. (2022). Perception of student's towards online learning during COVID-19 pandemic. Int J Health Sci, 2022; 6(S2), 473-480.
21. Meyer CS, Jones TB. Case studies. Promoting active learning: strategies for the College classroom. San Francisco, CA: Jossey Bass, 1993; 103-119.
22. Kukreja S, Kaur A, Gill M, Chhabra N. Introduction of Case-based Learning as a Teaching/Learning Tool to enhance Students' Knowledge in Biochemistry. Curr Trends Diagn Treat, 2017;1(2):96-99.
23. Kaur N, Dwivedi D, Arora J, Gandhi A. Study of the effectiveness of e-learning to conventional teaching in medical undergraduates amid COVID-19 pandemic. Natl J Physiol Pharm Pharmacol. 2020; 10(7):563-567.
24. Rebeca J, Jomy PT, Sruthi MC. Problem based mobile learning in biochemistry: An interventional study in phase I MBBS students. Asian J Pharm Clin Res, 2022;15(8): 193-196.
25. Shachar M, Neumann Y. Differences between traditional and distance education academic performances: A meta-analytic approach. Int Rev Res in Open and Dist Learn. 2003;4:(2).1-5.
26. Khalil R, Mansour AE, Fadda WA, Almisnid K, et al. The sudden transition to synchronized online learning during the COVID-19 pandemic in Saudi Arabia: a qualitative study exploring medical students' perspectives. BMC Med Educ, 2020; 20: 285-90.
27. Varghese et al: Impact of e-resources on learning in biochemistry: first-year medical students' perceptions. BMC Medical Education, 2012; 12:21-25.
28. Baczek M, Zaganczyk B M, Szpringer M, Jaroszynski A, Wozakowska B. Students' perception of online learning during the COVID-19 pandemic: A survey study of Polish medical students. Medicine (Baltimore), 2021; 100(7): e24821.
29. Karanth M, Basti AR, Jayamala AK. Virtual classes conducted during COVID-19 pandemic. Medical students perspective. Ind J Physiol Pharmacol, 2021; 65(2):132-137.