

# Comparison of Stress Levels with Online and Offline Mode of Teaching in Medical Undergraduate Students during COVID-19 Pandemic: A Cross-sectional Study

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## ABSTRACT

**Introduction:** Medical education in India being stressful, precipitated further due to the outbreak of Coronavirus Disease-2019 (COVID-19) and hence shifting to the online mode of education. The sudden implementation of online teaching learning methods, lack of communication between teachers and students and further the tedious modes of assessments through online methods created chaos among the students subjecting the students under enormous stress.

**Aim:** To compare the stress levels in online and offline mode of teaching in medical undergraduate students.

**Materials and Methods:** The study was designed as a cross-sectional observational study. It was conducted in two Government Medical Colleges located in Kanyakumari and Thiruvananthapuram of Tamil Nadu, India during April 2021 to December 2021 after the students returned to the conventional teaching method from digital learning (during COVID-19). This study assesses the stress by using Perceived Stress Scale, among young healthy individuals (390 medical graduates of either sex) who were in their preclinical, paraclinical and clinical years of the medical curriculum. The questionnaire comprised of general demographic data and consent form (six items) information on online classes and offline classes (18 items) and Perceived Stress Scale- 10 questionnaire to assess stress during online and offline mode. The obtained results were

tabulated and was statistically analysed by Pearson Chi-square test. Using the software R (Programming Language) version 2021 for used for analysis.

**Results:** Out of the 390 students participated in the study 204 (52.30%) of the students were from Government Kanyakumari Medical College, with 98 (48.04%) male and 106 (51.96%) female students. While the remaining 186 (47.70%) students were from Government Thiruvananthapuram Medical College, with 84 (45.17%) male and 102 (54.83%) were female students. The mean age of the participating students were  $19.6 \pm 2.4$  years. The difference in the number of scheduled hours of classes, duration of each classes were more during offline classes compared to online classes. Whereas the attention span of the students were more during offline classes of >30 minutes compared to online classes with attention span of <20 minutes, in most of the students. Further the study revealed that online mode of teaching was highly stressful to the students compared to offline teaching which was moderately stressful (highly significant), further the students experienced other adverse effects related to stress such as deterioration of vision, lack of concentration, difficulty in sleep etc.

**Conclusion:** The study emphasises that irrespective of the mode of teaching, medical undergraduate students experience stress under any form, however online mode of teaching is much more stressful than offline teaching.

**Keywords:** Attention span, Medical curriculum, Perceived stress scale

## INTRODUCTION

Stress is one of the old warhorses of psychiatry [1]. Stress has been invoked as a cause of major psychopathology, a precipitator or trigger of psychiatric illness and a contributor to considerable mental anguish [1]. Despite having a considerable number of literature and elaborate mechanisms of its pathophysiology about stress, still there remains a confusion as to the full meaning of the term. By stress it means that there is a pattern of psychological, behavioural and physiological response of the individual to meet demands of the physical and social environment that exceed his ability to cope effectively that is to carry out activities, realise goals and experience satisfaction [2].

Learning in any sense is acquisition of knowledge or skills either through self study or being taught or experience. Traditional teaching methods imparts knowledge while being taught in person or through an amicable interface, however knowledge gained while being taught in person includes mentoring, face-to-face contact, and supervision as a part of imparting knowledge, and these attributes play an important role in the development of higher-order cognitive skills. Interaction and discussion are

also currently among the best ways for students to learn these important skills [3].

Medical education in India is stressful affair which starts right with the selection process that has high competition [4] and this continues till the end of the curriculum that includes higher qualifications. Traditional method of teaching was considered the main stay of imparting education to students. However, due to the sudden turn of events during COVID-19, the medical education in the country underwent an enormous change, wherein many innovative modes of teaching and evaluating methods were introduced. During the period, online mode of education became the new norm. After one and half years when the college were open again, the immediate change in the mode of teaching resulted in difficulty to adapt to the original mode of teaching in person. While observing a myriad of changes in the students, the adaptability of the students to the different modes of teaching, and the stress associated with it is noteworthy.

Since the traditional mode of teaching was impossible due to lockdown during COVID-19, online mode of teaching was considered for the most feasible reasons which pushed the students

and the faculties to a newer dimension in medical education. Recent literature has shown contrasting results with respect to online mode of teaching with high perception of stress among the medical students who were not using online digital e-learning approaches [4] to the presence of varying degrees of stress symptoms among those medical students who were engaged in online mode of teaching [5].

Considering the above complexities in the background, this study was framed with the aim to assess the stress levels in both online and offline teaching methods and to compare these stress levels in medical undergraduate students.

## MATERIALS AND METHODS

The intended study was designed as a cross-sectional observational study conducted in two government medical colleges located in Kanyakumari and Thiruvannamalai of Tamil Nadu, India. The study was approved by Institutional Ethical Committee (IEC) of Kanyakumari Government Medical College Ethical Committee number- F-001/IEC/2022. The study was conducted in the month of April 2021 to December 2021. Online classes were conducted for the students for a time period of April 2021 to August 2021. During this period the students were exposed to online method of teaching and assessments. Then the students started to attend the offline teaching method.

**Inclusion criteria:** The study group consisted of young healthy male and female students of both the Government Kanyakumari and Government Thiruvannamalai Medical College, who were pursuing their preclinical, paraclinical and clinical years of MBBS curriculum, during the period of study and those students who were exposed to both the online mode of teaching during the COVID-19 pandemic, and as well as those who continued with offline mode of teaching after returning to their respective colleges.

**Exclusion criteria:** While those students who were not pursuing MBBS curriculum and those who were not exposed to both the online and offline mode of teaching were excluded from the study.

**Sample size calculation:** According to the study by Mahardani PNTY et al., the prevalence of stress levels was found to be 55.4% [6]. Taking this parameter and with alpha error of 0.05 and 80% power the sample size was calculated to be 390. According to the formula:

$$\text{Sample size 'n'} = \frac{\text{DEFF} \cdot Np(1-p)}{\left\{ \left( \frac{d^2}{Z^2} \right) (1 - \alpha/2 \cdot (N-1)) + p \cdot (1-p) \right\}}$$

### Study Procedure

A detailed proforma was used to collect information regarding general demographic data and consent form (six items), information regarding online and offline classes (18 items- 15 items were closed type and three were open ended) and a prevalidated Perceived Stress Scale questionnaire (10 questions) [7,8] which assesses the stress among students. A total scores 0-13 implied low stress, scores 14-26 implied moderate stress and scores 27-40 implied high stress [9].

Consent for voluntary participation of the students was obtained through online survey link created on Google docs that was distributed along with the study. The study link was distributed among 650 students in both the medical colleges and those 390 (60%) responded the questionnaire.

## STATISTICAL ANALYSIS

The obtained results were tabulated and was statistically analysed by the software R (Programming Language) version 2021. Pearson Chi-square test was used to compare the attention span, adverse effects and the stress levels of both the modes of teaching. The same was also used to compare and analyse which mode of teaching was more interesting, satisfactory and understandable.

## RESULTS

This study was an online survey prepared in Google forms and was circulated to MBBS students studying in Government Kanyakumari Medical College and Government Thiruvannamalai Medical College, Tamil Nadu, India. A total of 390 students participated in the study out of which 204 (52.30%) students were from Government Kanyakumari Medical College, with 98 (48.04%) male and 106 (51.96%) female students, while the remaining 186 (47.70%) students were from Government Thiruvannamalai Medical College with 84 (45.17%) male and 102 (54.83%) female students. The participating students were between 17-22 years with a mean age of 19.6±2.4 years. Year-wise distribution of students is shown in [Table/Fig-1].

Year of study	No. of students N (%)
First year	170 (43.59)
Second year	67 (17.18)
Third year	102 (26.15)
Final year	51 (13.08)

**[Table/Fig-1]:** Actual number and percentage of students and their distribution in each year.

Most of the online classes (83.33%) were either <3 hours/day or 3-5 hours/day. Whereas most of the offline classes (71.80%) were 3-7 hours/day. While classes of longer duration >7 hours were handled as offline sessions (4.87%) compared to online sessions (1.03%) [Table/Fig-2].

Number of classes per day (hours)	Online session n (%)	Offline session n (%)
<3	131 (33.59)	91 (23.33)
3-5	194 (49.74)	120 (30.77)
5-7	61 (15.64)	160 (41.03)
>7	4 (1.03)	19 (4.87)

**[Table/Fig-2]:** Average number of hours attended per day by the students during online and offline sessions.

Most of the online classes (81.28%) were either of 45-60 minutes or >60 minutes duration. Similarly most of the offline classes (87.69%) were of the same duration 45-60 minutes or >60 minutes. Either offline or online the duration of each class was around 45-60 minutes or >60 minutes [Table/Fig-3].

Duration of each online class (minutes)	Online session n (%)	Offline session n (%)
<30	3 (0.77)	3 (0.77)
30-45	70 (17.95)	45 (11.54)
46-60	240 (61.54)	240 (62.31)
>60	77 (19.74)	99 (25.38)

**[Table/Fig-3]:** Average duration of each online and offline class.

Attention span during online sessions were usually <20 minutes or 20-30 minutes, which was observed in 84.87% of the study group, with almost 44% of the students had attention span <20 minutes, whereas the attention span during offline sessions were >30 minutes as observed in 61.28% of the students. During the offline sessions, the students had a greater attention span >20 minutes (91.02%) compared to the online sessions where the attention span of the students >20 minutes was (55.90%). The observed difference had a p-value of 0.076 which was not significant but is noteworthy [Table/Fig-4].

The observation revealed that 74.87% of the students were not satisfied with the online mode of teaching while almost 89.74% of the students preferred offline teaching. The above observation had p-value of 0.095 which was though not significant, expresses that most of the students prefer offline teaching compared to online teaching [Table/Fig-5].

Attention span (minutes)	Online session n (%)	Offline session n (%)
<20	172 (44.10)	35 (8.97)
20-30	159 (40.77)	115 (29.74)
31-40	52 (13.33)	178 (46.15)
>40	7 (1.80)	59 (15.13)
p-value	0.076 (Pearson Chi-square test)	

**[Table/Fig-4]:** Attention span of students during online and offline sessions.

Are you satisfied with online mode of teaching	Online session n (%)	Offline session n (%)
Yes	98 (25.13)	350 (89.74)
No	292 (74.87)	40 (10.26)
p-value	0.095 (Pearson Chi-square test)	

**[Table/Fig-5]:** Number of students who were satisfied with online and offline mode of teaching.

[Table/Fig-6] highlights that 87.95% and 88.97% of the students felt offline sessions were more interesting and understandable compared to online sessions. The p-value of the observations was 0.056 and 0.157, respectively. The observed difference in which the students felt offline sessions were interesting is 0.056 which was significant.

Mode of teaching	Interesting n (%)	Understandable n (%)
Online	47 (12.05)	43 (11.03)
Offline	343 (87.95)	347 (88.97)
p-value (Pearson Chi-square test)	0.056*	0.157

**[Table/Fig-6]:** Students' perception on mode of teaching (online versus offline).  
\*Significant

[Table/Fig-7] represents the number of students experiencing various adverse effects of stress during online sessions. A 65.90% of the students experienced tiredness, 46.92% of the students experienced deterioration of vision (p-value=0.014), 42.82% of the students experienced lack of concentration and 38.46% of the students had difficulty in sleeping after their regular online sessions.

Option	Difficulty in sleeping n (%)	Deterioration of vision n (%)	Tiredness n (%)	Lack of concentration n (%)
Yes	150 (38.46)	183 (46.92)	257 (65.90)	167 (42.82)
No	240 (61.54)	207 (53.08)	133 (34.10)	223 (57.18)
p-value (Pearson Chi-square test)	0.449	0.014*	0.143	0.076

**[Table/Fig-7]:** Adverse effects related to online mode of teaching.  
\*Significant

Most of the students 285 (73.26%) while engaging in offline sessions experienced moderate stress, while 267 (68.64%) of the students had moderate stress during online sessions. While 49 (12.60%) of the students had high stress during offline sessions against 87 (22.37%) of the students had high stress during online sessions. The above data conveys that students experienced high stress during online sessions compared to offline sessions where students experienced moderate stress, and this observation had a p-value of <0.001 which was highly significant, across all the academic years of medical curriculum [Table/Fig-8].

Scoring on perceived stress scale	Online n (%)	Offline n (%)
0-13	35 (8.97)	55 (14.10)
14-26	267 (68.46)	286 (73.34)
27-40	88 (22.57)	49 (12.56)
p-value (Pearson Chi-square test)	<0.001**	

**[Table/Fig-8]:** Stress scores of perceived stress scale in both mode of teaching.  
\*\*Highly significant

## DISCUSSION

This study revealed that the students had to spend more time in offline sessions (41.03%) in comparison with online session (15.64%). The study results also proved that the students had a greater attention span of 46.15% during offline sessions than with the online sessions (13.33%). When the students were asked about the reasons for the above as an open-ended question most of them stated that it was due to network issues, lack of face to face interaction, eye strain, less interaction with faculty and get diverted to other social media platforms.

Further observation revealed that the 89.74% of the students were more satisfied with offline teaching mode when compared with that of online mode of teaching (25.13%). It also enlightens that the offline sessions were more interesting and understandable compared to online sessions. In medical profession acquiring knowledge about skills are more important and that can be handled only during practical sessions. All these practical sessions cannot be handled effectively in online classes and having contact with and examining real patients, and be able to identify various symptoms in person, is crucial for students [3].

These processes are crucial for students' success to ensure that they will be good doctors in the future. The same might be the reason why the students prefer offline mode of teaching [3]. According to AlQhtani A et al., the positive aspects of online learning was assignment submission and rapid expansion of online resources for medical students (including lectures, textbooks and tutorials) [3]. He added that mobile technology and online tools for learning are increasingly accessible [3]. He also had quoted the negative side of online learning as the learner's satisfaction tends to decrease with increasing years of study, especially when the practical aspects of teaching are at their peak [3].

Analysing the results of the Perceived Stress Scale, had clearly proved that the majority of the students experienced moderate to high stress while engaging in online sessions, compared to offline sessions where students experienced moderate stress, and this observation has a p-value of <0.001 which was highly significant, across all the academic years of medical curriculum. Less number of students had high stress scores during offline sessions. This study results were in par with the study done by Mahardani PNTY et al., had proved that there is a negative ecorrelation of 0.217 between stress events and medical student's achievement during online learning [6].

Moreover many students experienced not only the variations in psychological components but also the somatic manifestations of stress, such as tiredness, deterioration of vision, lack of concentration and difficulty in sleeping after attending online classes for quite long duration. The p-value 0.014 of the adverse effects- deterioration of vision was quite significant, and these symptoms not only affect the learning process but almost the overall cognitive status of the individual. Motappa R et al., had stated that the newer stressors due to online learning were inability to focus on studies, fear of exams, prolonged stay at home, etc., [10].

Moreover, Motappa R et al., had concluded in his study that moderate perceived stress was observed in approximately 85.3% of students [10]. Some of the key stressors are inability to focus, fear of exams, and difficulty in grasping. The COVID-19 pandemic and subsequent long-term lockdowns have focused medical education to shift entirely online learning, which may exacerbate negative psychological and learning outcomes for students. In a study done by AlQhtani A et al., had concluded that e-learning can be beneficial in certain aspects of medical education it cannot be relied upon as the sole method for teaching in medical schools [3]. Chang WW et al., had told that nearly one-third of medical students survived with varying degrees of depression, anxiety, and stress symptoms during online learning of the COVID-19 pandemic [5].

The crux of this study from the above data throws a light that irrespective of the mode of teaching students of the medical curriculum experience stress under any form that could be due to assessments, assignments even due to the structure of the curriculum itself. However, an already stressful curriculum should aim at reducing or help in counter measures to alleviate the stress involved in the curriculum through appropriate screening and assistance. In spite of having advantages to online teaching as pointed by the students, on deeper analysis of the observed results and the opinion of the students, this study concludes that through online mode of teaching the medical education was kept in pace without break during COVID 19, however it has its own limitations.

### Limitation(s)

The limitation of this study was that the academic performance of the students during online and offline mode of learning might have also been taken into account.

### CONCLUSION(S)

Though online mode of teaching paved a way for continuing the medical education during COVID-19, it was more stressful when compared with offline mode of teaching. Because the practical aspect of learning was more compensated during online mode of teaching. Thus, this study concludes that always the

traditional method of teaching (offline classes) is more interesting, understandable and satisfactory.

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