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RESEARCH ARTICLE

Perception of stress among medical undergraduate during coronavirus disease-19 pandemic on exposure to online teaching

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ABSTRACT

Background: Stress is the physiological and psychological state which could overwhelmed an individual's capacity to adequately respond to it. The coronavirus disease (COVID 19) outbreak in India had created a sudden shutdown of conventionally designed medical teaching, because of which the medical students were in a stage of dilemma. The new digital e-learning methods psychologically affected these students invariably. **Aim and Objective:** We hypothesized that significant stress was associated with non-use of digital online e-learning as well as lack of communication between teachers and students. **Materials and Methods:** After the institutional ethical clearance, this online survey study was done on medical students. A total of 924 students participated in the study. All the students voluntarily participated in the survey based on perceived stress scale (PSS) (ten items). The PSS-10 is used to compare the stress level in between Group I who was using digital e-learning methods and Group II who was not using digital e-learning methods. **Results:** The PSS-10 score was significantly high in the group who was not using digital online e-learning methods during this COVID 19 pandemic lockdown. **Conclusion:** The perception of perceived stress is high among the medical students who were not using online digital e-learning approaches. More research is needed to identify potential confounders.

KEY WORDS: Perceived Stress Score; Learning, Stressors

INTRODUCTION

Stress can be defined as "a condition or feeling experienced when a person perceives that the demands placed on them exceed the resources the individual has available.[1] Stress can therefore be understood as a perceived non coordination between the demands required in day to day living and a individual's capability to respond.[2,3] Traditional medical learning starts with class room teaching along with bedside clinical teaching. Coronavirus disease (COVID-19) pandemic has led to our whole country going into lockdown. As a consequence all the colleges are shut hence classroom and clinical bedside teaching has come to halt. Some institutions have resorted to other forms of teaching which largely include digital platforms. Although these are available in India as well, its utilization has not been widespread, especially in areas which have less internet penetration.

Medical education in India is stressful affair which starts with higher competitiveness in selection process. Medical students have reported to experience a significantly higher level of stress compared to the age-matched population.[4-6] The larger duration and vastness of course makes it more stressful. Medical students are further stressed by the increasing need of doing specialization courses. Hence, it has been seemed that delays in this learning procedure

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due to lockdown adds to the uncertainty they fore see of the future.

Our study entitled "to study the variation in perception of stress among medical undergraduate during COVID 19 pandemic on exposure to online teaching" was intended to be undertaken based on an online survey following which the information would be anonymized and randomly coded. Approval was accorded by institutional ethics committee for waiver of informed consent.

It has been seen that similar stressors with different approach of handling can affect the individual stress response. The COVID 19 lockdown causing shutdown of conventional classes was the apparent stressor. Question which arose; is there an interplay between COVID 19 pandemic lockdown associated psychological stress and online digital e-learning approaches among medical student.

We hypothesized that significant stress was associated with non-use of digital e-learning as well as lack of communication between teacher and students.

The focus of our study was on perceived stress when the major source of stress is shutting of medical college due to COVID 19 outbreak induced lockdown, and learning approaches among medical students. Specifically, our research questions were as follows:

1. Is the lockdown, predominant sources of stress in our student cohort?
2. Is there any relationship between digital e-learning approaches and perceived stress?
3. How do the medical studies associated with the adoption of a digital e-learning approach?

MATERIALS AND METHODS

After the institutional ethical clearance, this online survey study was done on medical students. A total of 924 students participated in the study. All the students voluntarily participated. This is a cross-sectional survey based study for the measurement of subjective stress assessed by perceived stress questionnaire named perceived stress score (ten items) including 18–30 years old medical students from medical colleges. Voluntary participation of all students was taken through online survey link created by researcher on Google form. The study group consisted of young healthy individuals (males and females). The questionnaire comprised four sections: Are they in lockdown, demographics, using digital learning program, and perceived stress score questionnaire.

Experimental Design

It is a cross-sectional survey-based study performed on two groups at the same duration of time. One group had access to digital e-learning methods such as online classes and online course materials, which was provided by their respective colleges. As colleges had shutdown due to COVID 19 pandemic which led to nationwide lockdown as a measure of containment of its spread. Some colleges had not yet started (till the time of this study) digital learning process. The students of these colleges constituted the second group of this study [Figure 1].

Medical students from different medical colleges were requested to take part in the survey designed on the basis of perceived stress score scale (perceived stress scale [PSS]-10). A comparison of perceived stress score in both the groups was done to evaluate the burden of stress in both groups. In both the groups, the same perceived stress questionnaire of ten questions was given to students and at the same time their stress was scored and compared. The PSS-10 was used to assess perceived stress. This is validated psychometric instrument widely used in various studies.[7,8]

Basic demographic questions gathered information on gender, age, and sex and are they in a lockdown. Age and gender were surveyed as socio-demographic characteristics of the study participants and as control variables. All surveys were conducted using the web-based application Google form

Statistical Analysis

Continuous data were summarized as mean ± standard deviation (SD) and discrete data in no. and percentage. The student's statistically highly significant while $P > 0.05$ is considered non-significant. Statistical significance was set at the conventional 5% threshold ($\alpha = 0.05$). Effect sizes were estimated with 95% confidence intervals (CIs)

RESULTS

The data of 924 participants were analyzed. According to the results, 95.56% of the students were <25 years of age in total sample. The 445 were males and 478 were females. The mean score of PSS of Group I is 10.70±3.65, indicating a low stress level. The 95.5% responders were of age <25 years,

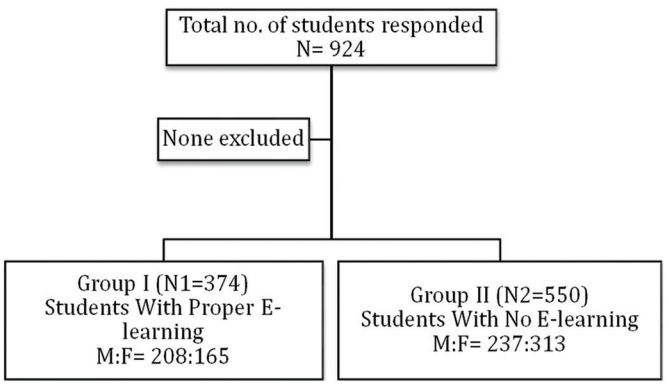

Figure 1: The study design

the mean score of PSS of Group II is 21.02±4.90, indicating a high stress level. The 95.27% responders were of age <25 years [Tables 1 and 2].

The two groups were analyzed statistically, the Z test is applied between two groups and it was found that the difference between the mean was found to be statistically highly significant with $P < 0.0001$. The CI was kept at 95%, the mean±SD value of PSS-10 for Group I 10.70±3.65 and for Group II 21.02±4.90. Both Group I and Group II were divided into the four subgroups on the basis of the age group they belong to see the variation in response of students. The response of male and female students was also compared. The mean score of PSS of Group I is 10.70±3.65, indicating a low stress level. In detail, 20.05% of the students reported their stress at a very low level, 28.60% at a low level, and 51.35% at a average level of stress. Further the 12.30% male and 7.75% female were in very low stress, 18.98% male and 9.63% female were in low stress, and 24.60% male and 26.74% female were in average stress. In second group, the students the PSS mean±SD is 21.02±4.90, the total 253 students were in very high stress, i.e., PSS >21. In detail, 9.63% of the students reported their stress at a average level, 44.37% at a high level, and 46% at very high level of stress. Further 4% males and 5.64% females were in average stress, 20.9% males and 23.46% females were in high stress, and 17.64% males and 28.36% females were in very high stress. Among male and female, no. of females in higher stress is approximately double in comparison to males of same age group [Tables 3 and 4].

Table 1: Group I (students with proper e-learning) n_1=374

Age (years)	Males (n=208)	Females (n=165)	Total (n=374)	(PSS-10) Mean±SD
<20	78	75	153	10.70±3.65
21–25	118	88	206	
26–30	9	2	11	
>30	3	0	3	

SD: Standard deviation, PSS: Perceived stress scale

Table 2: Group II (students with no e-learning) n_2=550

Age (years)	Males (n=237)	Females (n=313)	Total (n=550)	(PSS-10) Mean±SD
<20	79	180	259	21.02±4.90
21–25	142	123	265	
26–30	12	10	22	
>30	04	0	04	

SD: Standard deviation, PSS: Perceived stress scale

In Group I, the response of students was more variable in comparison to Group II the maximum percentage students responded with sometimes in answer [Table 5].

DISCUSSION

In this study, we aimed to answer whether the nationwide lockdown has caused major stress[9] among the medical

Table 3: PSS 10 score comparison between male and female of same age group

Age	Group I (students with proper e-learning), n_1=374 (%)									
	Very low stress (PSS: 0–7) n_1=75		Low stress (PSS: 8–11) n_2=107		Average stress (PSS: 12–15) n_3=192		High stress PSS: 16–20) n_4=0		Very high stress (PSS≥21) n_5=0	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
<20	14	9	31	19	33	47	0	0	0	0
21–25	30	20	35	16	53	52	0	0	0	0
26–30	2	0	4	1	3	1	0	0	0	0
>30	0	0	1	0	3	0	0	0	0	0
Total	46	29	71	36	92	100	0	0	0	0

PSS: Perceived stress scale

Table 4: PSS 10 score comparison between male and female of same age group

Age	Group II (students with no e-learning), n_2=550									
	Very low stress (PSS=0–7) n_1=0		Low stress (PSS=8–11) n_2=0		Average stress (PSS=12–15) n_3=53		High stress (PSS=16–20) n_4=244		Very high stress (PSS≥21) n_5=253	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
<20	0	0	0	0	6	20	31	70	42	90
21–25	0	0	0	0	15	9	75	56	52	58
26–30	0	0	0	0	1	2	7	2	2	6
>30	0	0	0	0	0	0	2	1	1	2
Total	0	0	0	0	22	31	115	129	97	156

PSS: Perceived stress scale

Table 5: PSS 10 comparison of responses in Group I and Group II

Questions	Group I (n_1=374)					Group II (n_2=550)				
	Never	Occasionally	Sometimes	Often	Always	Never	Occasionally	Sometimes	Often	Always
In the last month, how often have you been upset because of something that happened unexpectedly	114 (30.5)	143 (38.2)	112 (30)	5 (1.3)	0 (0)	24 (4.4)	115 (20.9)	276 (50.2)	104 (18.9)	31 (5.6)
In the last month, how often have you felt that you were unable to control the important things in your life	166 (44.4)	107 (28.6)	89 (23.8)	9 (2.4)	3 (0.8)	42 (7.64)	109 (19.8)	229 (41.64)	131 (23.82)	39 (7.1)
In the last month, how often have you felt nervous and "stressed"	171 (45.72)	120 (32.08)	74 (19.8)	8 (2.14)	1 (0.26)	42 (7.64)	115 (20.91)	233 (42.36)	124 (22.55)	36 (6.54)
In the last month, how often have you felt confident about your ability to handle your personal problems	11 (2.94)	9 (2.41)	30 (8.02)	136 (36.36)	188 (50.27)	56 (10.18)	102 (18.55)	182 (33.09)	138 (25.09)	72 (13.09)
In the last month, how often have you felt that things were going your way	17 (4.55)	21 (5.62)	129 (34.49)	144 (38.50)	63 (16.84)	107 (19.45)	160 (29.09)	209 (38)	60 (10.91)	14 (2.55)
In the last month, how often have you found that you could not cope with all the things that you had to do	143 (38.24)	103 (27.54)	104 (27.81)	20 (5.34)	4 (1.07)	45 (8.18)	120 (21.82)	235 (42.73)	107 (19.46)	43 (7.81)
In the last month, how often have you been able to control irritations in your life	10 (2.67)	26 (6.95)	75 (20.05)	142 (37.97)	121 (32.36)	53 (9.63)	122 (22.18)	224 (40.73)	114 (20.73)	37 (6.73)
In the last month, how often have you felt that you were on tops of thing?	42 (11.23)	53 (14.18)	151 (40.37)	86 (22.99)	42 (11.23)	142 (25.81)	136 (24.73)	206 (37.44)	59 (10.72)	7 (1.3)
In the last month, how often have you been angered because of things that were outside of your control	108 (28.88)	126 (33.69)	120 (32.09)	16 (4.27)	4 (1.07)	39 (7.09)	112 (20.36)	191 (34.73)	160 (29.09)	48 (8.73)
In the last month, how often have you felt difficulties were piling up so high that you could not overcome them	200 (53.48)	99 (26.47)	66 (17.65)	7 (1.87)	2 (0.53)	56 (10.18)	136 (24.73)	233 (42.36)	92 (16.73)	33 (6)

PSS: Perceived stress scale

students due to sudden shutdown of conventional teaching method and communication with their teachers. We also found the significant difference in level of stress among two groups of students. The students who continued learning by digital e-learning ways were having less level of perceived stress in comparison to those who had no exposure of digital e-learning ways. The mean PSS score of the group who was exposed to digital e-learning is 10.70±3.65, indicating a low stress level. The 95.5% responders in this group were of age <25 years, the mean score of PSS of group who was not exposed to e-learning is 21.02±4.90, indicating a high stress level. The 95.27% responders in this group were of age <25 years [Tables 3 and 4]. In both groups, the percentage of females having high stress score is more than that of percentage of males in the same age group [Tables 3 and 4]. Statistical analysis by Z test between two groups, it was found that the difference between the mean was statistically highly significant with $P < 0.0001$. This indicates that the medical students in Group II were much more stressed in comparison to the Group I statistically. On examining, the individual responses of every question, in the Group I response of students was more variable as compared to Group II. The maximum percentage of students responded with sometimes as answer in Group II [Table 5].

A study by Al-Hariri and Al-Hattami *et al*. done on a group of medical students of five colleges in Saudi Arabia, showed that digital learning methods had positive impact on learning which is going along with our study results.[10] Among all the medical students, in our study, of total females in each group, percentage of females in higher stress is more than percentage of females in the lower level of stress in comparison to males of the same age which goes in accordance with the previous study on medical students by Methre *et al*.[11] According to another study done by Qiu *et al*., on study population of more than 52,000 respondents across Hong Kong Macau and Taiwan showed that there was significant psychological distress due to COVID 19 pandemic using a novel Career and Personal Development Institute scoring which is also related with our study concept.[12] Chen *et al*. study on progress testing in the medical curriculum the students' approaches to learning and perceived stress has shown that the surface learner has high stress and lower results, so during the time like this, the digital e-learning methods, and communication with teachers has shown that there is positive approach than surface learning by self which is reflected in the perceived stress score of e-learning users. The score was very low in students exposed to e-learning methods as compared to those who were not given any systematic e-learning ways.[13] Our findings suggest that, while students are strongly supportive of digital online e-learning in this present lockdown scenario the possible explanation of the above phenomenon is due to the ability of e-learning methods to open channels of communication between students and teachers. The previous study on medical undergraduate for online lab experience has also shown that the students were liking the online lab class more than in person because of better understanding with the teacher.[14]

This study has several strengths and limitations. To the best of our knowledge, this is the first study linking perceived stress to medical student online digital e-learning in COVID 19 lockdown. Further strengths of our study are its design, single attempt survey; the collection was done on same time duration and the high response rate by medical students. This allowed us to analyze the PSS score of large medical student's cohort. At this stage, students with high PSS scores still have time to learn and practice stress-management by opting for various online learning approaches. The high response rate makes any selection bias unlikely.

Due to the selected sample of medical student, the analyses were not powered to control for multiple potential confounders. Physical and mental health, as well as already poor academic performance, could have an influence both on the predictor and the outcome. However, we did not control for age and gender but the maximum responders were in same age group.

Hence, our study finding concludes that students are in favor of this digital e-learning in such a sudden unprecedented event of outbreak as a stress buster.

CONCLUSION

Our findings suggest that students are strongly supportive of digital online e-learning in this present lockdown scenario e-learning approach has acted as major key to relieve the stress among medical students who were away from conventional teaching methods of medical college due to nationwide lockdown in India. It had decreased the academic performance based perceived stress level markedly and has given a positive hope and motivation to the medical students. In the long run, interventional studies should be conducted to show the effects of e-learning interventions on not only perceived stress but also on academic performance.

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