

ORIGINAL ARTICLE

A Cross-sectional Study to Compare Merits/Demerits and Effectiveness of Online versus Classroom Learning among Medical Undergraduates in a Private Medical College during COVID-19 Pandemic Lockdown in India

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ABSTRACT

Introduction: The World Health Organization on March 11, 2020 declared COVID-19 as pandemic^[1] and on March 24, 2020, the Indian Government ordered a nationwide lockdown. At present all the medical students have experience in exclusive online learning (11 months) and also, they have experience in only classroom learning that was before lockdown. To actively engage and maintain student's interest in learning, understanding each student preferences and perceptions regarding class room and online learning was important. **Objectives:** The objectives of the study were to know the merits/demerits and effectiveness of online learning in comparison to classroom learning as perceived by medical students. **Materials and Methods:** Type of study – this was a cross-sectional study. Study period – December 15, 2020,–March 5, 2021. Study area – this study was conducted at RVM Institute of Medical Sciences and Research Center, Laxmakkapally village, Siddipet district, Telangana. Study population – study was conducted among undergraduate medical students. Sampling method – Universal sampling method was considered. Sample size – the sample size was 232 students responded out of 450 with Margin of Error 4.5. **Observations and Results:** According to the overall grading of Likert score, 53.5% agree and strongly agree about Merits and 69.4% agree and strongly agree about De merits. Merits identified were flexible timings (63.4%), ability to stay at home (68.1%), record meeting (60.8%), etc. Demerits identified were lack of interaction with patients (82.3%), unable to learn practical skills (93.1%), lack of personal interaction with teacher (75.4%), etc. About 44.4% students experienced health issues during and due to online learning. **Conclusion:** Classroom learning was much more effective over online learning which was statistically significant (χ^2 –168.76).

Key words: Online learning, classroom learning, Likert score, medical undergraduates

INTRODUCTION

The World Health Organization (WHO) on March 11, 2020, declared COVID-19 as pandemic^[1] and on March 24, 2020, Indian Government ordered a nationwide lockdown to mitigate the impact of COVID-19 Pandemic. Following this many state governments ordered suspension of all educational institutions to ensure social distancing. All the undergraduate students of the medical colleges were also sent to safe confinement of their homes until the completion of lockdown. Continuing medical education during this period was a challenge to Institutions, Academicians, Parents, and most importantly students.

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As per the recent guidelines issued by University Grant Commission, the apex body for higher education in India, the educational institutes must strive to provide quality education, ensuring uniformity, equity, and universal accessibility to all the learners.^[2] Considering all the

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requirements, Online/e-learning method has emerged as a new method of teaching to maintain the continuity of medical education.^[3]

The letter “e” in e-learning stands for the word “electronic.” E-learning is internet-enabled learning. It is a store house of education, information, communication, training, knowledge, and performance.^[4] Online learning/e-learning means learning conducted through electronic media, typically on the internet.^[5] Blended learning is thoughtful integration of classroom face-to-face learning experiences with online learning experiences to facilitate an independent, interactive, and collaborative learning among students.^[6]

The knowledge gain and performance of the students as a result of e-learning were shown to be equivalent to that of face-to-face methods.^[7,8] However, challenges to online education reported in the medical literature so far include issues relating to time management, use of technology tools, student’s assessment, communication, and the lack of in-person interaction.^[9,10] The availability of essential infrastructures and efficient institutional strategies represent a major challenge for integrating distance learning in medical education^[11] and India being a highly diverse country, attract students from various socio-economic backgrounds, where access to high speed internet, computer, and smartphone is limited and disproportionate.

This challenge of continuous online education was faced by educational institutions and students since 11 months and now educational institutions are planning to start regular class room teaching as per the government guidelines.

At present all the medical students have experience in exclusive e-learning (11 months) and also, they have experience in only classroom learning that was before lock down. To actively engage and maintain student’s interest in learning, understanding each student preferences and perceptions, regarding class room, and e-learning was important. Hence, understanding the merits and demerits of e-learning as perceived by each student in comparison to classroom learning is important, so that based on the results of the study a new curriculum can be recommended which will be beneficial according to each medical student.

Objectives

The objectives are as follows:

1. To know the merits/demerits of online learning in comparison to classroom learning as perceived by medical students
2. To know the effectiveness of online learning in comparison with class room learning.

MATERIALS AND METHODS

Type of Study

This was a cross-sectional study.

Study Period

The study period was from December 15, 2020, to March 5, 2021.

Study Area

The study was conducted in RVM Institute of Medical sciences and research center, Laxmakapally village, Siddipet district, Telangana.

Study Population

Study was conducted among undergraduate medical students of 1st year, 2nd year, and final year of RVM Institute of Medical Sciences. In each batch, 150 students were present and hence the total students were 450.

Sampling Method

All the students were included in the study. Hence, universal sampling method was considered.

Informed Consent

Before sending the questionnaire, through WhatsApp and Email, consent note was sent to them after explaining them the purpose of the study and assuring them about their confidentiality. One week time was allotted to get the electronic informed consent.

Inclusion Criteria

The following criteria were included in the study:

1. Students with experience of online (>6 months) and classroom learning (>6 months)
2. Students who gave consent to participate in the study.

Sample Size

Out of 450 students, 312 gave consent to participate in the study of which, 15 were excluded as they participated in the pilot study. Out of 297 students, only 232 students gave responses.

$$\text{Sample size} = \frac{\frac{z^2 \times p(100 - p)}{e^2}}{1 + \left(\frac{z^2 \times p(100 - p)}{e^2 N} \right)} \quad (1)$$

Margin of error (e)=Based on the responses, margin of error calculated and found to be 4.5 (<5 is acceptable)

$$N=450$$

Z α is the standard normal deviate, which is equal to 1.96 at 95% confidence interval.

p is the response rate of the students that is 232 students out of 450 students which is 51.55.

$$\text{Sample size (n)} = \frac{\frac{(1.96)^2 \times 51.5(100 - 51.5)}{(4.5)^2}}{1 + \left(\frac{(1.96)^2 \times 51.5(100 - 51.5)}{(4.5)^2 \times 450} \right)}$$

Sample size (n) = 231 (around)

Ethical Clearance

The study was conducted after obtaining ethical clearance from the Institutional Ethics Committee.

Study Tool

Pretested prevalidated semi-structured questionnaire was developed which was divided into five sections,

- Section 1: Identification data, self-grading of computer skills, hours spent on online learning, the type of online learning method they prefer such as interactive or non-interactive.
- Section 2 and Section 3: Perceived merits and demerits of online learning, consisting of 12 and 13 questions, respectively. These were graded under 5-point Likert scale as strongly agree, agree, neutral, disagree, and strongly disagree with score rate as 5, 4, 3, 2, and 1, respectively
- Section 4: Compared the effectiveness of online learning with respect to class room learning and consisted of ten questions on different aspects of learning. These questions were also graded by 5-point Likert scale as much less effective (1), somewhat less effective (2), equally effective (3), somewhat more effective (4), and Much more effective (5)
- Section 5: Regarding health problems faced by students during and due to online learning.

Validity and Reliability of Tool

The study tool was assessed and modified by all the faculty of community medicine for content, appearance, clarity, and construct validity. After validation, the questionnaire was sent to 15 students, five from each batch by simple random sampling. Students were asked to give their opinion by filling the Google form and also check for clarity, significance, and

acceptability. Reliability was also computed by Cronbach's Alpha(r) that is 0.702.

Data Collection

As the lock down process was still continuing in medical colleges, instead of conducting face-to-face interview, the data were collected using Google Form by online survey method. The prepared questionnaire was entered in Google Form Format and the link was sent either by e-mail or WhatsApp group to the students after getting consent from the students. In addition, class representatives for each academic year were involved in distributing the questionnaire link to students directly. The Google Form automatically verified that all questions had to be filled completely before submission and could not be submitted more than once. One month time was given to submit the filled Google Form, with reminder messages and mails every 2 days.

Data Analysis

All data from the Google Form were obtained in Excel Sheet, from the Excel sheet the data were converted to SPSS (version 20) and analyzed. Mean Likert score of each variable with regard to Merits, Demerits, and Effectiveness of E learning was determined. Chi-square test was applied to know the significance of Merits, Demerits, and effectiveness of online versus class room learning with $P < 0.05$ as statistically significant.

OBSERVATIONS AND RESULTS

All the students were in the age range of 18–26 years out of which 54.7%, 43.1%, and only 2.2% were in the age group of 18–20 years, 21–23 years, and 24–26 years, respectively. With respect to gender 38.8% of the students were males and 61.2% were females. Students pursuing 1st year, 2nd year, 3rd year, and 4th year MBBS were 35.8%, 37.4%, 0.9%, and 25.9%, respectively.

Average hours spent by students on online classes was 3.06 h, ranging from 1 to 8 h, out of which 47.4%, 37.9%, and 14.7% were spending 1–2 h, 3–4 h, and more than 5 h, respectively.

With respect to proficiency level of computer skills 47.8%, 39.7%, and 12.5% of the students rated themselves as learner, proficient, and advanced.

As per Figure 1, according to the opinion of students, 56.5%, 40.1%, and only 3.4% prefer class room learning, combined learning (class room and online), and online learning, respectively, as preferable learning mode.

About 81% of the students preferred interactive online learning method over non interactive online learning method.

One hundred and four (44.8%) of students expressed that online learning should be included as a part of MBBS curriculum.

Table 1 describes the students experiences on merits of E learning according to Likert score, and the overall mean Likert score on merits was 3.53 (Range-2.93–3.83). According to the overall rating of Likert score, 53.5% agree and strongly agree, 33.3% were neutral, and only 13.2% disagree and strongly disagree on all the listed merits of online learning.

Table 2 describes the students experiences on demerits of online learning according to Likert score, and the overall mean Likert score on demerits was 3.90 (Range – 3.44–4.57). According to the overall grading of Likert score, 69.4% agree and strongly agree, 22.4% were neutral, and only 8.2% disagree and strongly disagree on all the listed demerits of online learning.

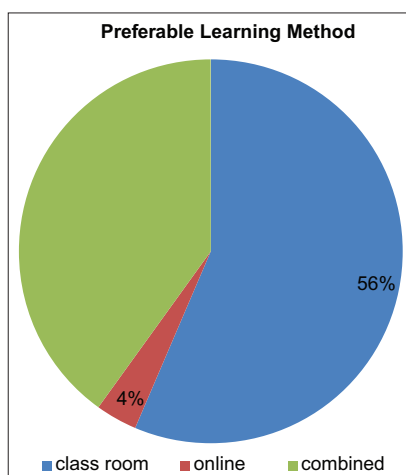


Figure 1: Preferable learning method

In Table 3, As per student's perception mean Likert score on effectiveness of online learning compared to classroom learning was 2.22 (range – 1.52–2.76). About 65.5% of the students felt that online learning was much less and somewhat less effective. About 23% felt equally effective. Only 11.5% felt online learning to be more and somewhat more effective over classroom learning.

According to Table 4 student's perception of Merits (χ^2 –83.88) and Demerits (χ^2 –214.23) of online learning over class room learning was statistically significant. Out of 232 students, only 27 (11.5%) agree (likert score=4) and strongly agree (likert score 5) that online learning was more effective over classroom learning (statistically significant).

As per Figure 2, 103 (44.4%) out of 232 students experienced health issues during and due to online learning. Health problems faced were eye problems by 15 students (which were refractive error-8, photophobia-10, styte-2, and redness of eye-10), mental health problems by 53 students (Stress-53, Insomnia-5, Decreased concentration-4, Depression-2, and Anxiety-1), musculoskeletal problems by 30 students (Back pain-20, Headache-25, Body pains-5, Cervical spondylitis-2), and obesity by five students.

DISCUSSION

There was a sudden shift that has been noticed globally to the methodology of teaching in all fields, from traditional classroom teaching to various forms of online learning, following the COVID19 pandemic.^[12] A similar crisis was faced by the medical fraternity during the SARS outbreak in 2003, and at that time, online learning was introduced in medical education in Hong Kong and found so good

Table 1: Students perception on merits of online learning in comparison with class room learning

Merits of online learning	Mean Likert score	No. of students who agree and strongly agree (Score 4 and 5)=n (%)	No. of students who are neutral (Score 3)=n (%)	No. of students who disagree and strongly disagree (Score 1 and 2)=n (%)
Flexible timings	3.72	147 (63.4)	69 (29.7)	16 (6.9)
Breaks the monotony of classroom teaching	3.56	131 (56.6)	75 (32.3)	26 (11.2)
Helps in better understanding	2.93	51 (22)	117 (50.4)	64 (27.6)
Continuous access to online materials	3.43	114 (49.1)	83 (35.8)	35 (15.1)
Can learn on your own pace	3.64	136 (58.6)	70 (30.2)	26 (11.2)
Ability to stay at home	3.83	158 (68.1)	55 (23.7)	19 (8.2)
Classes interactivity	3.04	60 (25.9)	124 (53.4)	48 (20.7)
Opportunity to learn from wider community of professional	3.51	124 (53.4)	81 (34.9)	27 (11.6)
Ability to record a meeting	3.6	141 (60.8)	58 (25)	33 (14.2)
Comfortable surrounding	3.68	144 (62.1)	54 (23.3)	34 (14.6)
Saves time on travelling	3.78	152 (65.5)	59 (25.4)	21 (9.1)
Cuts cost	3.66	132 (56.9)	81 (34.9)	19 (8.2)
Overall rating on merits	3.53	124 (53.5)	77 (33.3)	31 (13.2)

Values are expressed as frequency and percentage

Table 2: Students perception on de-merits of online learning in comparison with class room learning

Perceived demerits or disadvantages of e learning	Mean Likert score	No. of students who agree and strongly agree (Score 4 and 5) n (%)	No. of students who are neutral (Score 3) n (%)	No. of students who disagree and strongly disagree (Score 1 and 2) n (%)
Lack of personal interaction with the teacher	3.93	175 (75.4)	42 (18.1)	15 (6.5)
Access to high speed internet/technical Problem	3.94	171 (73.7)	48 (20.7)	13 (5.6)
Requirement of laptops/mobile or PCs for accessing the lecture	3.80	161 (69.4)	56 (24.1)	15 (6.5)
Lack of interaction with patients	4.25	191 (82.3)	21 (9.1)	20 (8.6)
Unable to learn practical skills	4.57	216 (93.1)	11 (4.7)	5 (2.2)
Poor learning conditions at home	3.78	149 (64.2)	58 (25)	25 (10.8)
Lack of self-Discipline	3.63	121 (52.2)	88 (37.9)	23 (9.9)
Social Isolation	3.92	166 (71.6)	56 (24.1)	10 (4.3)
Family distractions	3.76	151 (65.1)	54 (23.2)	27 (11.7)
Lack of space	3.44	104 (44.8)	89 (38.4)	39 (16.8)
Lack of motivation	3.80	148 (63.8)	62 (26.7)	22 (9.5)
Difficulty in concentrating and asking questions	3.95	167 (72)	47 (20.2)	18 (7.8)
Lack of contact with colleagues	3.91	169 (72.8)	46 (19.8)	17 (7.4)
Overall rating on demerits	3.90	161 (69.4)	52 (22.4)	19 (8.2)

Values are expressed as frequency and percentage

Table 3: Effectiveness of online learning compared to classroom learning as perceived by students

Effectiveness of online learning compared to classroom learning	Mean Likert score	Much more effective and somewhat more effective (Score 4 and 5) n (%)	Neutral (Score 3) n (%)	Much less effective and somewhat less effective (Score 1 and 2) n (%)
Offering convenience	2.62	49 (21.1)	61 (26.3)	122 (52.6)
Meeting the individual learning needs	2.39	31 (13.4)	63 (27.2)	138 (59.5)
Contributing to effective communication/ social skills	2.17	21 (9.1)	48 (20.7)	163 (70.3)
Building Clinical skills and clinical knowledge	2.28	32 (13.8)	48 (20.7)	152 (65.5)
Understanding	2.34	27 (11.6)	58 (25)	147 (63.4)
Student teacher Interaction level	1.99	12 (5.2)	46 (19.8)	174 (75)
Doubt sessions	2.17	18 (7.8)	64 (27.6)	150 (64.7)
Practical lab experience	1.52	9 (3.9)	16 (6.9)	207 (89.2)
Grooming of Professional Career	2.00	17 (7.3)	41 (17.7)	174 (75)
Assignment submission	2.76	51 (22)	88 (37.9)	93 (40.1)
Overall rating on effectiveness	2.22	27 (11.5)	53 (23.0)	152 (65.5)

Values are expressed as frequency and percentage

that it was subsequently incorporated in their routine curriculum.^[13]

Medicine is a challenging profession and apart from other professions it requires acquisition of clinical skills, social skills, practical/laboratory skills, dissection skills, etc. COVID-19 outbreak created a panic among medical students. During this outbreak online teaching was incorporated and teaching faculty tried to train the medical students with great effort, trying to give an equal challenge to classroom teaching method, but based on student's perception there was difference in both methods and hence in the present study Advantages, disadvantages, and effectiveness of online learning were evaluated based on student's perception.

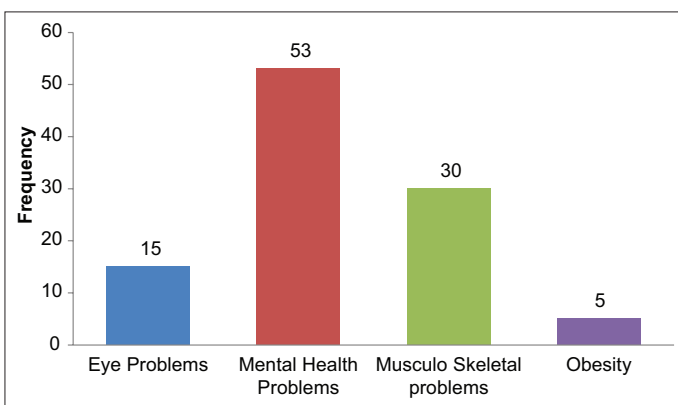
In the present study, the mean age of medical students was 20.59 years (18–26 years), similar to study done on medical students by Kaur *et al.* (20.02 years) in Haryana,^[14] Abbasi *et al.* in Pakistan,^[15] Bączek *et al.*^[16] (22.66 years) in Poland, Amir *et al.* (20.23 years) in Indonesia,^[17] Al-Balas *et al.* (22.7 years) in Jordan,^[3] and Dost *et al.* in United Kingdom.^[18]

About 38.8% of the medical students were males and 61.2% were females in the present study and this proportion does not match with present Indian demographics of males and females; however, the proportion was similar with Kaur *et al.*,^[14] Dost *et al.*,^[18] Al-Balas *et al.*,^[3] Abbasi *et al.*,^[15] Bączek *et al.*,^[16] and Rajab *et al.*^[19] This similarity in proportion of gender might be due to similar gender-based

Table 4: Comparison of merits, demerits, and effectiveness of online learning versus classroom learning

Perceived merits of online learning in comparison with class room learning	Agree and strongly agree	Neutral	Disagree and strongly disagree	χ^2 -test	P-value*
Positive	124 (53.5)	77 (33.3)	31 (13.2)	83.88	P<0.05 (S)
Negative	108 (46.5)	155 (66.7)	201 (86.8)		
Perceived demerits or disadvantages of e learning	Agree and strongly agree	Neutral	Disagree and strongly disagree	χ^2 -test	P-value*
Positive	161 (69.4)	52 (22.4)	19 (8.2)	214.23	P<0.05 (S)
Negative	71 (30.6)	180 (77.6)	213 (91.8)		
Effectiveness of online learning compared to regular classroom settings	Agree and strongly agree	Neutral	Disagree and strongly disagree	χ^2 -test	P-value*
Positive	27 (11.5)	53 (23)	152 (65.5)	168.76	P<0.05 (S)
Negative	205 (88.5)	179 (77)	80 (34.5)		

*By using Chi-square test P<0.05 level of significant, S: Significant, NS: Non-significant

**Figure 2:** Health problems during and due to online learning

admission rate in medical schools. In Amir *et al.* study^[17] done in Indonesia, proportion of females were much more than our study (85.1%).

In the present study, students on an average had spent 3.06 h (range 1–8 h) on online classes, much lesser compared to Dost *et al.*^[18] study (7–10 h). In the present study, students had only 3–4 h online classes per day according to academic schedule.

About 47.8%, 39.7%, and 12.5% of the students rated themselves as learner, proficient, and advanced with respect to proficiency level of computer skills similar to Rajab *et al.*^[19] study (learner-37.4%, Proficient-48.2%, and Advanced-14.4%).

About 56.5% of students preferred class room learning over distance learning similar to Amir *et al.* study^[17] (56.8%), Desai *et al.*^[20] (58%), and Dost *et al.*^[18] study and Abbasi *et al.*^[15] study (77.4%), but higher preference toward e-learning was chosen by Europe and UK Dental students.^[21-23]

About 56.5%, 40.1%, and only 3.4% preferred class room learning, combined learning (class room and online), and online learning, respectively, as preferable learning mode

whereas in Rajab *et al.*^[19] study, the preference was 25.5%, 62.5%, and 12.0%, respectively. In Al-Balas *et al.*^[3] study, 75.5% preferred combined learning.

In effectiveness [Table 3] of online learning, 21.8% felt that assignment submission is less effective in the present study similar to Amir *et al.* study^[17] (30%). In doubt sessions, 52.6% felt less effective similar to Desai *et al.* study^[20] (51.9%) and more number compared to Amir *et al.*^[17] study on Indonesia medical students (24.92%). About 75.4% of students agree that there is lack of interaction with teacher in online sessions, similar to Kaur *et al.*^[14] (62.8%) study, Abbasi *et al.*^[15] (84%), Bączek *et al.*^[16] study (47%), and Bettinger *et al.*^[24] study.

In the present study, in relation to effectiveness student's agree and strongly agree that class room learning is much more effective (Likert Score 1 and 2) over online learning (3 and 4) which was statistically significant (χ^2 -168.76). The results of our study go in accordance with Kaur *et al.*^[14] study and Subramanian *et al.*,^[25] but unlike Amir *et al.*^[17] study where distance learning was found to be effective.

The earliest met analysis of online versus offline learning in health professionals was conducted by Cook *et al.*, concluded, effectiveness was similar when compared to non-internet based training.^[26]

In the present study, 93.1% and 86.2% of students feel that they were unable to learn practical skills and clinical skills, respectively, in online learning similar to Abbasi *et al.* study^[15] in Pakistan, Dost *et al.*^[18] (82.17%) study on UK medical students and other students in China, Singapore, and Malaysia.^[27-29]

In National Twitter discussion, involving representatives from the General Medical Council, National Health Service England and WHO, found that a key concern among students was that remote learning impacted their ability to develop clinical competence.^[30]

Advantages of online learning in the present study was found to be flexible timings (63.4%), breaks the monotony (56.5%), continuous access (49.1%), learning on your own pace (58.6%), ability to stay at home (68.1%), opportunity to learn from wider community (53.4%), record meeting (60.8%), comfortable surroundings (62.1%), saves time (65.5%), and cuts cost (56.9%), similar advantages were identified in a study on Poland medical students^[16] and survey on UK medical students.^[18] Advantage of flexible timing (69.2%), opportunity to learn from wider community (40.5%) and cuts cost (29.9%) was also elicited by Desai *et al.* study^[20] and Al-Balas *et al.*^[3] study (saving time – 79% and flexibility – 63.8%).

Disadvantages of online learning identified in the present study were, lack of interaction with teachers (75.4%), access to high speed internet (73.7%), lack of interaction with patients (82.3%), unable to learn practical/clinical skills (93.1%), poor learning conditions at home (64.2%), family distractions (65.1%), difficulty in concentrating and asking questions (72%), and lack of contact with colleagues (72.8%) similar disadvantages were identified in a study on Poland medical students^[16] and survey done on UK medical students.^[18] Family distractions and poor internet connectivity were also highlighted in Desai *et al.* study^[20] and Al-Balas *et al.*^[3] study.

Although in the present study students perceived online learning to be less effective, still it identified certain advantages and merits of online learning such as flexible timing, continuous access to online material, and saving time. [Table 1] Hence, it will be beneficial if the advantages of online teachings and classroom teachings will be combined called blended learning^[31] and this blended type of teaching was also supported by Kaur *et al.* study,^[14] Dodiya *et al.*^[32] study, and Al-Balas *et al.*^[3] study.

In the present study, 44.4% of students experienced health issues, in which eye problems were 6.46%, mental health problems were 22.84%, musculoskeletal problems were 12.93%, and obesity were 2.2% which was less in number compared to health problems in Desai *et al.*^[20] study (56.1% experienced eyestrain and 38.1% experienced musculoskeletal problems).

Fifty-three (22.84%) experienced mental health issues, similar to study done on UK medical students,^[18] 35.22% in Indonesia students^[17] and 48% in Riyadh,^[19] medical students this can be attributed due to lack of interaction with friends and colleagues.

CONCLUSION

Students experienced both merits and demerits of online learning, according to the overall grading of Likert score,

53.5% agree and strongly agree about Merits and 69.4% agree and strongly agree about Demerits. Merits identified were flexible timing (63.4%), ability to stay at home (68.1%), record meeting (60.8%), etc., and Demerits identified were lack of interaction with patients (82.3%), unable to learn practical skills (93.1%), lack of personal interaction with teacher (75.4%), etc. When effectiveness was compared, student's agreed that class room learning is much more effective over online learning which was statistically significant (χ^2 -168.76). About 44.4% students experienced health issues during and due to online learning. Health problems faced were eye problems (15), mental health problems (53), musculoskeletal problems (30), and obesity (5).

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