

## ORIGINAL ARTICLE

Volume 15 Issue 3 2023

DOI: 10.21315/eimj2023.15.3.5

### ARTICLE INFO

Received: 14-05-2022

Accepted: 01-02-2023

Online: 28-09-2023

# Challenges and Adaptation in Conducting Health Research During the COVID-19 Pandemic: A Qualitative Study Among Undergraduate Medical Students

Mila Nu Nu Htay<sup>1</sup>, Htoo Htoo Kyaw Soe<sup>1</sup>, Lin Phyto Phyto San<sup>2</sup>, Zay Yar Naing<sup>3</sup>, Htay Lwin<sup>1</sup>, Sujata Khobragade<sup>1</sup>, Soe Moe<sup>1</sup>, Adinegara Lutfi Abas<sup>1</sup>

<sup>1</sup>*Department of Community Medicine, Faculty of Medicine, Manipal University College Malaysia, Melaka, MALAYSIA*

<sup>2</sup>*Department of Medicine, Faculty of Medicine and Health Sciences, Universiti Tunku Abdul Rahman, Kuala Lumpur, MALAYSIA*

<sup>3</sup>*Department of Population Medicine, Faculty of Medicine and Health Sciences, Universiti Tunku Abdul Rahman, Kuala Lumpur, MALAYSIA*

**To cite this article:** Htay MNN, Soe HHK, San LPP, Naing ZY, Lwin H, Khobragade S, Moe S, Abas AL. Challenges and adaptation in conducting health research during the COVID-19 pandemic: a qualitative study among undergraduate medical students. *Education in Medicine Journal*. 2023;15(3):55–69. <https://doi.org/10.21315/eimj2023.15.3.5>

**To link to this article:** <https://doi.org/10.21315/eimj2023.15.3.5>

## ABSTRACT

During the COVID-19 pandemic, regular teaching–learning activities have been replaced with online education strategies. This study aimed to explore undergraduate medical students' experiences in conducting research projects during the COVID-19 pandemic in Malaysia. In the study institution, undergraduate medical students had a rotation at the community medicine posting during their Semesters 6 and 7, and they needed to conduct health research projects. Upon completion of the posting, students were asked to reflect on their project using Gibbs' reflective cycle. The inclusion criteria were reflective writings of undergraduate medical students in the study institution, who conducted online research projects during the COVID-19 pandemic. The secondary qualitative data from the reflections of 40 students were included until the data were saturated and analysed with thematic analysis. The R-based Qualitative Data Analysis (RQDA) software was used for data analysis. Seven salient themes emerged from the qualitative reflections: (a) sudden changes due to the COVID-19 pandemic, (b) challenges, (c) feelings of students, (d) support, (e) adaptation to the online learning process, (f) perceived benefits of online research projects, and (g) self-reflection and way forward. Although there were various challenges, the students were able to overcome and develop adaptation to conduct health research projects. The educational sector should provide support to students in terms of technology and clear guidance on the project process and encourage communication and teamwork to overcome challenges. From a positive perspective, the COVID-19 pandemic situation could have a beneficial impact on implementing e-learning and conducting online surveys and research projects.

**Keywords:** COVID-19, Qualitative research, Reflective writing, Online, Education

**CORRESPONDING AUTHOR**

Mila Nu Nu Htay, Department of Community Medicine, Faculty of Medicine, Manipal University College Malaysia, Jalan Batu Hampar, 75150 Bukit Baru, Melaka, Malaysia

Email: drmlnnh@gmail.com

## INTRODUCTION

In early 2020, the rapid spread of the COVID-19 pandemic led to the disruption of regular teaching–learning activities worldwide (1, 2). Similar to other programmes, medical education and health research faced unprecedented times due to the COVID-19 pandemic (3). Because social distancing is an effective measure to control the spread of COVID-19, teaching large classes, clinical rotations, and face-to-face research activities were replaced with online education strategies. As a positive impact, the COVID-19 pandemic led to the improvement and advancement of telehealth, which is an adaptive and flexible approach to health research and trials (3).

In the midst of the COVID-19 pandemic, the rapid transition of the situation is challenging for both learners and educators. Pre-existing knowledge about technologies, inadequate training at the early phase of transition, limited or inconsistent internet connectivity, and student engagement were well-known challenges (2). From the students' perspective, flexibility is an asset; however, taking responsibility, self-directed learning, practicing, and participating are essential for effective learning (1, 4).

Medical students also reported experiencing stress due to the COVID-19 pandemic and changes in the educational process (5). They felt emotional because of quarantine, and being detached from their family and classmates, which in turn affected their study time and academic performance at the beginning of the COVID-19 pandemic (6). Online study and assessment were also associated with changes in their dietary

pattern, reduction of sleep duration, and mental stress (7).

Developing resilience is considered having positive adaptation to challenges over time and in maintaining mental health (8). During the COVID-19 pandemic, nursing students reflected on their learning journey, challenges, emotions, and way forward to be more confident in engaging with online learning (9). However, little is known about the medical students' experiences, challenges, and adaptation while conducting research projects during the COVID-19 pandemic. Reflection of the learning journey is essential to learn from experience, prioritise strategic ways forward, and develop a practical solution to be implemented in the future. Although the COVID-19 pandemic is considered endemic these days (10), online learning has been established in medical education practice to meet the necessity of flexible learning in a dynamic workplace. Therefore, developing digital literacy is essential among students (11). An integrated review of online learning revealed that study time constraints, unfamiliarity with technology, and lack of support and strategies were barriers for the students (12). Previous studies explored the experiences, challenges, and process of e-portfolio development (13), anatomy course (14), family medicine posting (15) and oncology (16). However, the challenges in conducting online research projects among medical students are still limited and need to be explored. Therefore, our study aimed to explore undergraduate medical students' experiences in conducting research projects during the COVID-19 pandemic in Malaysia.

## METHODS

### Study Context and Sample

This qualitative study was conducted in a private medical institution, Manipal University College Malaysia. The undergraduate medical students in Semesters 6 and 7 had rotations at the community medicine posting for six weeks. During this period, theory lectures about research methodology were delivered; furthermore, the student-led group research projects were conducted on their preferred topics with the ultimate aim of publication in peer-reviewed scientific journals. Upon completion of their research project, the students were asked to reflect on the experience of conducting research using online platforms during the COVID-19 pandemic. The students were guided with the proper way of writing their reflection using Gibbs' reflective cycle, which was commonly used in the medical field to reflect about learning experiences using a framework. There are six steps in Gibbs' reflective cycle, namely, description, feelings, evaluation, analysis, conclusion, and action plan (17).

### Qualitative Data Collection

Phenomenology is well-known and widely used to understand the phenomena in human beings (18). To describe the experiences and phenomena of conducting online research learning and projects, a descriptive phenomenology approach is considered suitable for this study (19). This approach originated from Husserl (20), which is theoretically founded on the human being life experience, understanding of that experience connecting to the consciousness and meaning of the person that could be described. To have a proper understanding of their challenges and adaptation during the research process in the midst of the pandemic, the reflections of the students were retrieved, and documentary analysis was conducted. A total of 40 reflective

writing documents of students who conducted the projects between March and July 2020 were included in the analysis.

Trustworthiness in conducting qualitative research is crucial. To ascertain trustworthiness, four criteria have been proposed by Guba (21): credibility, transferability, dependability, and confirmability. In this study, continuous online discussion and support were provided to students, which helped the researchers to observe the challenges that students faced. Students' reflection was asked to encourage their reflective learning process in conducting research projects; they were informed that the reflective writing was not intended for assessment to improve the transparency and honesty of expression. Different methods of assessing the learning experience of students could enhance the credibility of the study.

This study was conducted in a single institution; hence, the findings of this study might have limited transferability in different settings. However, the data were included from the reflective writing till the data was situated. An adequate number of the students' reflections and data collection from different student groups might enhance the capture of the students' perspectives on conducting online research projects.

For further analysis, secondary data from the students' reflective writing were collected. The data were extracted from the reflective writings until data saturation was reached. The inclusion criteria of reflective writings were that it must be from the undergraduate medical students and the students who underwent the experience of conducting online research projects during COVID-19 pandemic.

During data extraction, confidentiality was maintained, and anonymous data were extracted from the students' reflections. In terms of risk and benefit consideration in this study, it was considered that benefits outweigh the risks for the conduct of this

study, as the knowledge gained from this study could apply for the improvement in future research training.

### **Data Analysis**

Data analysis was conducted using computer-assisted qualitative data analysis software, R-based Qualitative Data Analysis (RQDA), R package version 3.2.0. The reflective writing documents were imported to the RQDA software. Thematic analysis was conducted using six phases: (a) data familiarisation by thoroughly reading their reflections; (b) initial coding using an inductive approach, which was performed by two independent researchers; (c) theme searching by grouping the similarities and differences; (d) reviewing themes by the group of researchers; (e) defining and naming themes upon agreement; and (f) producing the report (22).

The secondary data that expressed and revealed students' experiences and feelings in conducting health research during the COVID-19 pandemic were used in this study. To ascertain the reliability and dependability of qualitative data, two independent researchers analysed the data and generated the initial coding. Finally, salient themes were inducted, discussed, reviewed, and finalised by the group of researchers.

## **RESULTS**

Thematic analysis of the students' experience in conducting research during the COVID-19 pandemic revealed seven salient themes: (a) sudden changes due to the COVID-19 pandemic; (b) challenges; (c) feelings of students; (d) support; (e) adaptation to the online learning process; (f) perceived benefits of online research projects; and (g) self-reflection and way forward. The details of themes, subthemes, coding, and sample quotes of the participants are presented in Appendix.

### **Sudden Changes Due to the COVID-19 Pandemic**

The COVID-19 pandemic caused sudden changes in the social situation and teaching-learning process worldwide. In Malaysia, the first case of COVID-19 was detected on 25 January 2020, and a subsequent nationwide movement control order (MCO) was announced on 18 March 2020 (23). The students faced sudden changes in social life and the learning process just before they initiated their research project. Unprecedented changes led to changes in the study design and the need to proceed with an online research project.

Since our topic for Randomized Controlled Trial (RCT) require participants to present physically to receive intervention, we had no choice but to change our research project to observational study which was more feasible. (P11)

Since using online platforms for research projects was the first time, the students had to learn the new process.

At the initial part of the research, it was difficult as we were not used to using online platforms. We had to learn from the basics before being able to use them efficiently. (P3)

### **Various Challenges Faced by Students**

#### ***Emotional challenges***

Because of the risk of infection, the students' concern for their families made it difficult to concentrate on their studies.

On the side of worrying about my education, I was also very anxious thinking about my family's safety during these difficult times. My mental health wasn't very cooperative for me to put all my attention into my online classes at that time. (P32)



Learning from home could easily distract their study process. Sometimes they felt a lack of motivation to discuss the research project with their teammates. Moreover, the lack of social intimacy with classmates and bonding with the faculty made them face emotional challenges during the COVID-19 pandemic.

The disadvantage of the research was that it was done through online and it was sometimes difficult to bond and connect with the lecturers like how we used to be when facing each other. (P10)

### **Physical challenges**

Online teaching–learning has the benefit of learning at one’s own pace; however, prolonged usage of computers and electronic devices causes physical strain among the students.

The only drawback I found is its quite hard to conduct research through online because I had to trained myself to an unusual circumstance where I had to sit in front of laptop for long hours which was actually caused some physical strain such as headache, eye strain, backache and so on. (P31)

### **Technical challenges**

Students reported that they were not familiar with online platforms initially. Furthermore, some were living in areas with unstable internet connection and in different time zones.

Some of the students which are in the rural area have poor internet connection which hinders this process more. (P5)

Furthermore, online recruitment of respondents for their projects was difficult and led to a low response rate during the initial data collection period.

Sadly, the research can only be done through online, and it is hard to collect questionnaires. (P8)

### **Experiencing Emotions in Conducting Research During the COVID-19 Pandemic**

Students reflected on various emotions before conducting their online research projects. This students group felt excited and anxious about their first online project. They revealed their emotions as anxious, awkward, bedazzled, excited, frustrating, nervous, panic, scared, stress and struggle, just before the initiation of the research.

As we were briefed on the technique of doing our research paper, naturally a sense of fear and a little anxiousness cropped up as it was my first attempt on a research paper. (P35)

However, they were energised by the achievements of previous groups. Their motivation to conduct the research and dedication towards the project had driven them as an internal asset to overcome these challenges.

To see all my batch mates to publish their very own research project made me feel so excited about it. (P37)

The most important is not to give up halfway and the need to be strong to persist through any challenges. (P4)

### **Support**

#### **Support from family**

Although they had negative emotions and worries before conducting their research, their tension was eased by the support of their families, team members, and faculties. Since they worked on their project from their homes, family support helped them overcome various challenges.

Being at home, surrounded by the support and help of my loved ones definitely took the edge off while doing the research paper. (P35)

### **Support from faculty**

The guidance of the faculty was essential to maintain the right path and to achieve answers to their research questions. In the midst of the pandemic and sudden changes in online learning, support from lecturers was essential to overcome challenges and to remain motivated throughout the project.

Throughout the posting, all the lecturers were very kind and supportive to me. (P16)

### **Support from teammates**

The reflective writing data highlighted the importance of teamwork, communication and collaboration in conducting the research projects of students. Mutual understanding, empathy, trust, help and support each other's issues made the project run smoothly. The students appreciated their team spirit and support throughout the project and reflected on it as follows:

Our groupmates were really understanding and empathetic of the situation everyone was in. Although the MCO took us by surprise, the research had been conducted without much hassle, and the joint effort from college and students were absolutely noteworthy. (P1)

### **Adaptation to the Online Learning Process**

Adaptation is the ability to live, work, or study harmoniously according to demands and circumstances. Although the situation was perplexing at the beginning, the students adapted to the changes; were well equipped with research knowledge; gained familiarity with online learning; and adjusted to new normal ways of living, learning and

conducting research. The students revealed their psychological adaptation to cope with the changes as follows:

Finally, my inner self however felt that it was worth a good challenge to all of us as it taught lessons like how to make quick adaptations in life in the midst of a sudden unfortunate event I do not expect even in the near future. This challenge provided multiple effective learning experiences which is definitely vast as mentioned above. (P15)

Online projects are different from traditional research and must be conducted effectively and efficiently using online platforms. With the technical support from friends and the faculty, the students gained adequate technological knowledge, skills, and abilities to integrate into their project.

As the modern generation of students however, we are expected to adapt to this new style of learning as best as we can. I learnt how to use the software available to me to help me in carrying our study. (P2)

### **Students' Perceived Benefits of Online Research Projects**

#### ***Benefits of improving confidence and soft skills***

Upon reflecting on their learning journey, the students reported perceived benefits of conducting online projects. This process boosted their self-confidence and hard and soft skills, which shaped their positive experience in the community medicine posting.

There were some difficulties in the starting, but eventually it gone out and my self-confidence improved. (P39)

Despite some disagreement and confusion in the team, effective communication and discussion helped overcome these obstacles and accomplish the assigned project.

The good point in this is that I have learned how to deal with this and also learned that communication is the key for someone to help us and to accomplish tasks. (P37)

Some students committed that they developed leadership skills while organising the team and conducting research.

I have learned more or less some leadership skills. (P19)

**Benefits of technical skills**

Using the collaborative online learning tools, the team members could share their work, documents and resources, and simultaneously edit them. This method was effective in brainstorming for projects, reporting the results, and writing the report.

I also started mastering some new computer programmes which allowed my group and I to do our detailed study report together simultaneously through the online platform. (P9)

**Self-reflection and Way Forward**

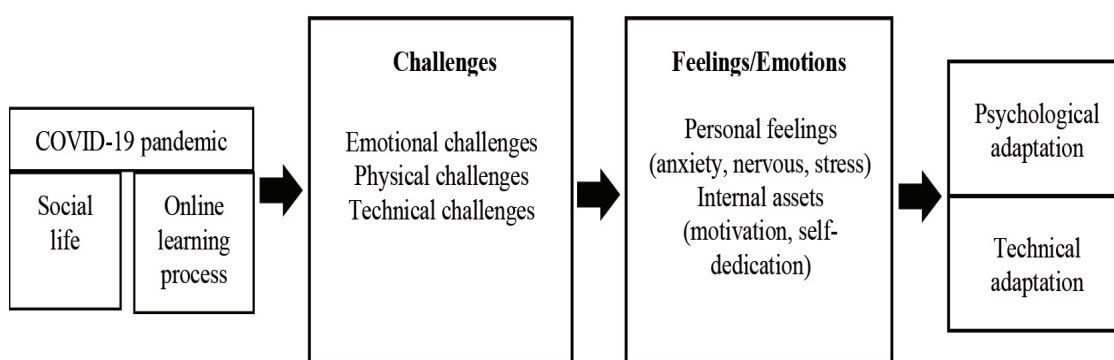
Medical students are encouraged to be reflective as part of the learning process, which leads to the conscious recognition of their experiences, learn the lessons, and make improvements for their future. Because the community medicine posting and research training equipped them with knowledge and skills, the students aimed to develop and apply them in the future.

In future, I will aim to develop my teamwork skills which is extremely useful when working with colleagues. (P5)

In the future, I will aim to be more encouraging and supportive to my group members and learn to work better as a team. (P30)

In the future, I will have to train myself on how to use the digital platform as a tool of communication for effective online learning as well as doing research studies online if needed. (P15)

The conceptual framework of this study is presented in Figure 1.



**Figure 1:** Conceptual framework of challenges and adaptation in conducting health research during COVID-19 pandemic.

## DISCUSSION

This study explored the undergraduate medical students' experiences in conducting health research during the COVID-19 pandemic. The research project is an exciting opportunity for medical students to get involved in health research, develop teamwork and evidence-based practice in medicine, and improve their knowledge and skills in conducting research and their career prospects (24). Moreover, preparing the research report and submitting the report for publication could improve their scientific writing and critical appraisal skills. Being involved in medical research provides them with an opportunity to explore areas that they are interested in (24). In this study, students' reflection thoroughly revealed their emotions, challenges, adaptations and experiences, which navigate the strategies that can be potentially applied in students' research projects in the future.

Students started with the unprecedented changes due to COVID-19, and they faced various challenges in initiating online learning and research. Similarly, students from different healthcare programmes had a significant impact on their learning journey and reported in their reflections (9, 25). In the present study, the students had technical challenges due to unfamiliarity with online education, time zone differences, and communication and internet connection issues. These challenges are reported in the transition to the online teaching-learning process even in a non-pandemic situation (26). Providing the prerequisite training in online teaching platforms and software may help the students in a smooth transition. Both the faculty and students should have effective, clear, concise communication and discussion to overcome communication challenges (27). Furthermore, the faculty and institutions could provide accessible and useful online learning resources or websites to enhance their learning process (28). Because the situation was changed to online, the study designs were changed in some groups with topics requiring face-

to-face intervention. Research questions should be answerable and completed within the specific time (29). The participants in this study went back to their homes in different regions across the country during the MCO period. All medical students in this study owned electronic gadgets; however, internet connectivity might vary. To address these issues, the online meeting time was scheduled in advance to suit all student research team members. Furthermore, a WhatsApp group was created for each research team to facilitate communication. The educators used different online platforms to ascertain effective communication and support the students. Therefore, adaptation to the current situation with guidance from the faculty is essential to achieve the target of completing the project.

Emotional challenges due to the current pandemic crisis were reported by a majority of the students in this study. Likewise, stress and anxiety were reported in the student population in Jordan (30), Saudi Arabia (31), China (32) and France (33). A surge of online communication, classes and discussion led to increased exposure to electronic devices, which has been reported to be associated with stress, anxiety and burnout (34). Therefore, providing coping strategies, online training, and counseling services in the institution, and support from friends and the faculties are essential to overcome psychological challenges.

During the reflective writings, the students revealed that they developed psychological and technical adaptation skills despite having various challenges. Similar findings were reported by the undergraduate students in Singapore where they developed resilience through the dynamic changes of the situation (25). Adaptation and resilience were developed by numerous factors among the participants, such as interpersonal factors including support from family, friends, and faculties, and intrapersonal factors including motivation and dedication. These findings could be correlated with a



study conducted among medical students in Asia, which reported that adaptation and resilience were internal processes, and it was necessary to provide appropriate support from the institution (35).

The undergraduate research project gave the students an opportunity to apply their knowledge and prepare their own projects. Therefore, the knowledge and skills gained in this community medicine posting will be carried forward on further specialisation and medical careers (36). The students appreciated the benefits of conducting research and planned to continue to develop their teamwork and leadership skills. It is a positive perspective for evidence-based practice and research in the healthcare sector.

The COVID-19 pandemic has exposed students and faculty to unanticipated challenges and opportunities in research training and projects. Implementing the research project via digital platforms could help in recruiting participants who might be unable to attend the face-to-face data collection process and address disparities. On the contrary, this innovative online data collection process may be prone to other concerns related to digital literacy and internet accessibility (37). Therefore, the researchers should consider the benefits and limitations of online research projects before initiating the study.

### Strengths and Limitations

To the best of our knowledge, this study was the first qualitative study in Malaysia that explored the students' perspectives and experiences in conducting health research during the COVID-19 pandemic. It suggested strategies to improve the online research training process.

There are some limitations in our study. The data were the reflection of their research projects at the beginning of the COVID-19 pandemic; therefore, we may not be able to observe the changes in their experiences over a long period. The

participants were only from the community medicine (research methodology) posting, and therefore, the challenges and adaptation in other settings could not be captured in this study.

### Recommendations

As the future direction for conducting online research projects in medical education, an adaptation of research protocols for digital platforms is necessary to continue the study. Ethical consideration and approval are needed for remote (online) recruitment, electronic consent, and enrolment processes. Measurement tools in data collection should be suitable and feasible for online data collection, and ownership and copyright to the study instrument should be clarified for application to online methods. The researchers must be assuring privacy, confidentiality, and data protection measures for the study materials and data. Regular meetings via online platforms or videoconferencing are essential to support the student team members in each step of health research projects. From a positive perspective, the COVID-19 pandemic situation could have a beneficial impact on the implementation of e-learning and conducting online surveys and research projects.

### CONCLUSION

This study explored the undergraduate medical students' experiences in conducting research projects during the COVID-19 pandemic. The students faced emotional, physical, and technical challenges while conducting online research projects. Furthermore, they revealed how they developed adaptation during the COVID-19 pandemic. The important implications derived from the students' reflection are that technological support, clear guidance on the project process, encouragement for communication, and development of team spirit are essential for the students to overcome the challenges. Therefore,

training for online data collection, regular meetings among the faculties and students, monitoring the progress and support to students by the supervisors and the faculties are important to conduct online research projects.

## ACKNOWLEDGEMENTS

We would like to express our appreciation to the Manipal University College Malaysia higher management for the support to conduct this study. We also would like to express our gratitude to the Research Ethics Committee, Faculty of Medicine, Manipal University College Malaysia for granting ethics approval to conduct this study.

## ETHICAL CONSIDERATION

Ethical approval was granted by the Medical Research Ethics Committee, Manipal University College Malaysia (Reference number: MUCM/FOM/Research Ethics Committee – 10/2021).

## REFERENCES

1. Nyachwaya JM. Teaching general chemistry (I) online during COVID-19. Process, outcomes, and lessons learned: a reflection. *J Chem Educ.* 2020;97(9):2935–9. <https://doi.org/10.1021/acs.jchemed.0c00891>
2. Zalat MM, Hamed MS, Bolbol SA. The experiences, challenges, and acceptance of e-learning as a tool for teaching during the COVID-19 pandemic among university medical staff. *PLoS ONE.* 2021;16(3):e0248758. <https://doi.org/10.1371/journal.pone.0248758>
3. Rose S. Medical student education in the time of COVID-19. *JAMA.* 2020;323(21):2131–<https://doi.org/10.1001/jama.2020.5227>
4. Stoehr F, Müller L, Brady A, Trilla A, Mähringer-Kunz A, Hahn F, et al. How COVID-19 kick-started online learning in medical education: the DigiMed study. *PLoS ONE.* 2021;16(9):e0257394. <https://doi.org/10.1371/journal.pone.0257394>
5. Abdulghani HM, Sattar K, Ahmad T, Akram A. Association of COVID-19 pandemic with undergraduate medical students' perceived stress and coping. *Psychol Res Behav Manag.* 2020;13:871–81. <https://doi.org/10.1016/j.amsu.2020.10.058>
6. Meo SA, Abukhalaf AA, Alomar AA, Sattar K, Klonoff DC. COVID-19 pandemic: impact of quarantine on medical students' mental wellbeing and learning behaviors. *Pak J Med Sci.* 2020;36(COVID19-S4):S43–8. <https://doi.org/10.12669/pjms.36.COVID19-S4.2809>
7. Elsalem L, Al-Azzam N, Jum'ah AA, Obeidat N, Sindiani AM, Kheirallah KA. Stress and behavioral changes with remote E-exams during the COVID-19 pandemic: a cross-sectional study among undergraduates of medical sciences. *Ann Med Surg (Lond).* 2020;60:271–9. <https://doi.org/10.1016/j.amsu.2020.10.058>
8. Herrman H, Stewart DE, Diaz-Granados N, Berger EL, Jackson B, Yuen T. What is resilience? *Can J Psychiatry.* 2011;56(5):258–65. <https://doi.org/10.1177/070674371105600504>
9. Hill K, Fitzgerald R. Student perspectives of the impact of COVID-19 on learning. *AISHE-J.* 2020;12(2).
10. Katzourakis A. COVID-19: endemic doesn't mean harmless. *Nature.* 24 January 2022 [cited 12 Nov 2022]. Available from: <https://www.nature.com/articles/d41586-022-00155-x>

11. Fortuna C. The importance of digital media literacy [Internet]. [cited 24 Aug 2023]. Available from: <https://idigitmedia.com/what-is-digital-and-media-literacy/>
12. O'Doherty D, Dromey M, Loughheed J, Hannigan A, Last J, McGrath D. Barriers and solutions to online learning in medical education – an integrative review. *BMC Med Educ.* 2018;18:130. <https://doi.org/10.1186/s12909-018-1240-0>
13. Perlman R, Christner J, Ross P, Lypson M. A successful faculty development program for implementing a sociocultural ePortfolio assessment tool. *Acad Med.* 2014;89(2):257–62. <https://doi.org/10.1097/ACM.000000000000120>
14. Attardi S, Rogers K. Design and implementation of an online systemic human anatomy course with laboratory. *Anat Sci Educ.* 2015;8:53–62. <https://doi.org/10.1002/ase.1465>
15. Skye E, Wimsatt L, Master-Hunter T. Developing online learning modules in a family medicine residency. *Fam Med.* 2011;43(3):185–92.
16. Mayer B, Ring C, Muche R, Rothenbacher D, Schmidt-Strasburger U. Creating a blended learning module in an online master study programme in oncology. *Edu Health.* 2015;28(1):101–5. <https://doi.org/10.4103/1357-6283.161951>
17. University of Edinburgh. Gibbs' reflective cycle: reflectors' toolkit. 2020 November 11 [cited 2021 June 7]. Available from: <https://www.ed.ac.uk/reflection/reflectors-toolkit/reflecting-on-experience/gibbs-reflective-cycle>
18. Matua GA, Van Der Wal DM. Differentiating between descriptive and interpretive phenomenological research approaches. *Nurse Res.* 2015;22(6):22–7. <https://doi.org/10.7748/nr.22.6.22.e1344>
19. Norlyk A, Harder I. What makes a phenomenological study phenomenological? An analysis of peer-reviewed empirical nursing studies. *Qual Health Res.* 2010;20(3):420–31. <https://doi.org/10.1177/1049732309357435>
20. Sundler AJ, Lindberg E, Nilsson C, Palmér L. Qualitative thematic analysis based on descriptive phenomenology. *Nurs Open.* 2019;6(3):733–9. <https://doi.org/10.1002/nop2.275>
21. Guba EG. Criteria for assessing the trustworthiness of naturalistic inquiries. *ECTJ.* 1981;29: 75–91. <https://doi.org/10.1007/BF02766777>
22. Kiger ME, Varpio L. Thematic analysis of qualitative data: AMEE Guide No. 131. *Med Teach.* 2020;42(8):846–54. <https://doi.org/10.1080/0142159X.2020.1755030>
23. Elengoe A. COVID-19 outbreak in Malaysia. *Osong Public Health Res Perspect.* 2020;11(3):93–100. <https://doi.org/10.24171/j.phrp.2020.11.3.08>
24. Taylor AK, Purdy S. How to get involved in research as a medical student. *BMJ.* 2017;356:i6593. <https://doi.org/10.1136/sbmj.i6593>
25. Ang WHD, Shorey S, Lopez V, Chew HSJ, Lau Y. Generation Z undergraduate students' resilience during the COVID-19 pandemic: a qualitative study. *Curr Psychol.* 2021;1–15. <https://doi.org/10.1007/s12144-021-01830-4>
26. Esani M. Moving from face-to-face to online teaching. *Clin Lab Sci.* 2010;23(3):187–90. <https://doi.org/10.29074/ascls.23.3.187>
27. Harries AJ, Lee C, Jones L, Rodriguez RM, Davis JA, Boysen-Osborn M, et al. Effects of the COVID-19 pandemic on medical students: a multicenter quantitative study. *BMC Med Educ.* 2021;21(1):14. <https://doi.org/10.1186/s12909-020-02462-1>

28. Alsoufi A, Alsuyihili A, Msherghi A, Elhadi A, Atiyah H, Ashini A, et al. Impact of the COVID-19 pandemic on medical education: medical students' knowledge, attitudes, and practices regarding electronic learning. *PLoS ONE*. 2020;15(11):e0242905. <https://doi.org/10.1371/journal.pone.0242905>
29. Detsky ME, Detsky AS. Encouraging medical students to do research and write papers. *CMAJ*. 2007;176(12):1719–21. <https://doi.org/10.1503/cmaj.061628>
30. Seetan K, Al-Zubi M, Rubbai Y, Athamneh M, Khamees A, Radaideh T. Impact of COVID-19 on medical students' mental wellbeing in Jordan. *PLoS ONE*. 2021;16(6):e0253295. <https://doi.org/10.1371/journal.pone.0253295>
31. Rajab MH, Gazal AM, Alkattan K. Challenges to online medical education during the COVID-19 pandemic. *Cureus*. 2020;12(7):e8966. <https://doi.org/10.7759/cureus.8966>
32. Xiong P, Ming WK, Zhang C, Bai J, Luo C, Cao W, et al. Factors influencing mental health among Chinese medical and non-medical students in the early stage of the COVID-19 pandemic. *Front Public Health*. 2021;9:603331. <https://doi.org/10.3389/fpubh.2021.603331>
33. Husky MM, Kovess-Masfety V, Swendsen JD. Stress and anxiety among university students in France during COVID-19 mandatory confinement. *Compr Psychiatry*. 2020;102:152191. <https://doi.org/10.1016/j.comppsy.2020.152191>
34. Mheidly N, Fares MY, Fares J. Coping with stress and burnout associated with telecommunication and online learning. *Front Public Health*. 2020;8:574969. <https://doi.org/10.3389/fpubh.2020.574969>
35. Farquhar J, Kamei R, Vidyarthi A. Strategies for enhancing medical student resilience: student and faculty member perspectives. *Int J Med Educ*. 2018;9:1–6. <https://doi.org/10.5116/ijme.5a46.1ccc>
36. Murdoch-Eaton D, Drewery S, Elton S, Emmerson C, Marshall M, Smith JA, et al. What do medical students understand by research and research skills? Identifying research opportunities within undergraduate projects. *Med Teach*. 2010;32(3):e152–60. <https://doi.org/10.3109/01421591003657493>
37. Stiles-Shields C, Plevinsky JM, Psihogios AM, Holmbeck GN. Considerations and future directions for conducting clinical research with pediatric populations during the COVID-19 pandemic. *J Pediatr Psychol*. 2020;45(7):720–4. <https://doi.org/10.1093/jpepsy/jsaa055>

## APPENDIX

**Table 1:** Themes, sub-themes, coding and sample quotes of undergraduate medical students' experiences on conducting research during COVID-19 pandemic

Theme	Sub-theme	Coding	Sample quotes
Sudden changes due to COVID-19 pandemic	Changes in social life	Movement control order (MCO) in COVID-19	When we were about to start planning our study, a sudden rise in COVID-19 cases in Malaysia surged and this led to the start of MCO in Malaysia on 18 March 2020. (P11)
	Changes in learning process	Online communication	Communication is key in order for the group to work together as a team. Multiple online platforms were used in order to communicate with each other such as Microsoft Teams, and Skype. (P25)
		Changes of research process	Since our topic for RCT require participants to present physically to receive intervention, we had no choice but to change our research project to observational study which was more feasible. (P11)
		Learn online platforms	At the initial part of the research, it was difficult as we were not used to using online platforms. We had to learn from basics before being able to use them efficiently. (P3)
Challenges	Emotional	Anxious for family	On the side of worrying about my education, I was also very anxious thinking about my family's safety during these difficult times. My mental health wasn't very cooperative for me to put all my attention into my online classes at that time. (P32)
		Bond with lecturers	The disadvantage of the research was that it was done through online and it was sometimes difficult to bond and connect with the lecturers like how we used to be when facing each other. (P10)
		Lack of social intimacy	The only downside of doing this research project is we have to do this fully online. There is no face-to-face communication between teammate and also our lecturer. (P27)
		Distraction	The comforts of home could easily distract one from concentrating on the research paper. (P35)
		Lack of motivation	Sometimes, I felt lazy and had no motivations to participate in my group discussion. (P11)
	Physical	Physical strain	The only drawback I found is its quite hard to conduct research through online because i had to trained myself to an unusual circumstance where I had to sit in front of laptop for long hours which was actually caused some physical strain such as headache, eye strain, backache and so on. (P31)
		Stuck at home	I personally felt that having done a research project whilst being stuck at home during the MCO lockdown was slightly more challenging. (P28)
	Technical	Unfamiliar with online platforms	I have never gone through any online lessons before. It was very challenging to accommodate to everything as nothing was in our control. (P32)
		Internet connection	Some of the students which are in the rural area have poor internet connection which hinders this process more. (P5)
		Participant recruitment	Sadly, the research can only be done through online, and it is hard to collect questionnaires. (P8) It was hard to reach everyone than we expected since it is an online survey form. (P34)

*(Continued on next page)*



**Table 1:** (Continued)

Theme	Sub-theme	Coding	Sample quotes
Feelings of students	Personal feelings while conducting research projects	Anxious	As we were briefed on the technique of doing our research paper, naturally a sense of fear and a little anxiousness cropped up as it was my first attempt on a research paper. (P35)
		Awkward	All group discussions were done online and this was quite awkward for me as we used to have group discussion face to face. (P11)
		Bedazzled	I was actually bedazzled by the sudden change in the way we conducted learning. (P18)
		Excited	I was feeling very excited and curious to conduct the research project. (P40)
		Frustrating	Throughout the research project, I was slightly frustrated as we had a few communication issues since we could not meet face to face and therefore it was hard to explain things over the phone or skype. (P30)
		Nervous	When we were first told about the research programme, I was nervous and unsure of how we were going to complete this research as we were not able to meet each other or the lecturer and all the communication had to be done using online platform. (P29)
		Panic	At that moment, many of us went panic as it never occurs before. (P6)
		Scared	Prior to our research work, I was feeling very scared and anxious. (P22)
		Stress	At first, I felt a bit stress by the amount of work I thought we had to finish. (P7)
		Struggling	Truth to be told, I was having some hard time trying to cope with all the new standard operation procedure (SOP) and the sudden changes in my daily life. (P18)
	Internal assets	Motivation	To see all my batch mates to publish their very own research project made me feel so excited about it. (P37)
		Self-dedication	The most important is not to give up half way and the need to be strong to persist through any challenges. (P4)
Support	Support from family	Being at home, surrounded by the support and help of my loved ones definitely took the edge off while doing the research paper. (P35)	
	Support from faculty	Throughout the posting, all the lecturers were very kind and supportive to me. (P16) I believe things went well because we were able face the problems together with the help from our lecturers. (40)	
	Support from teammates	Our groupmates were really understanding and empathetic of the situation everyone was in. Although the MCO took us by surprise, the research had been conducted without much hassle, and the joint effort from college and students were absolutely noteworthy. (P1)	
Adaptation to the online learning process	Adaptation lessons and experiences	Finally, my inner self however felt that it was worth a good challenge to all of us as it taught lessons like how to make quick adaptations in life in the midst of a sudden unfortunate event I do not expect even in the near future. This challenge provided multiple effective learning experiences which is definitely vast as mentioned above. (P15)	
	Adaptation of new learning style	As the modern generation of students however, we are expected to adapt to this new style of learning as best as we can. I learnt how to use the software available to me to help me in carrying our study. (P2)	

(Continued on next page)

**Table 1:** (Continued)

Theme	Sub-theme	Coding	Sample quotes
Perceived benefits of online research projects	Improving confidence and soft skills	Gain self-confidence	There were some difficulties in the starting, but eventually it gone out and my self-confidence improved. (P39)
		Better communication	The good point in this is that I have learned how to deal with this and also learned that communication is the key for someone to help us and to accomplish tasks. (37)
		Leadership	I have learned more or less some leadership skills. (P19)
	Technical benefits	Gain new skills for online platforms	I also started mastering some new computer programmes which allowed my group and I to do our detailed study report together simultaneously through the online platform. (P9)
Self-reflection and a way forward	Future plan	Teamwork	In future, I will aim to develop my teamwork skills which is extremely useful when working with colleagues. (P5)
		Leadership	In the future, I will aim to be more encouraging and supportive to my group members and learn to work better as a team. (P30)
		Usage of digital platform	In the future, I will have to train myself on how to use the digital platform as a tool of communication for effective online learning as well as doing research studies online if needed. (P15)