Impact of COVID-19 Pandemic on Dental Education: Experience sharing from a Malaysian Public University

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Abstract

Coronavirus Disease 2019 (COVID-19) is an acute infectious disease that causes global outbreaks. The COVID-19 outbreak has forced various sectors to change their approach and daily practice to new alternatives. Dental education is no exception to the effects of this pandemic, which has
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severely disrupted teaching, learning and clinical activities. The impact of this pandemic on dental education can be classified into different aspects, including academic, practical, research and clinical services. Teaching and learning activities have been transformed into distance learning methods. However, dental educators are still struggling with psychomotor components, including practical and clinical sessions, which are the main course components that are severely affected. This sharing of experience focuses on the effects of the pandemic on the delivery of dental education and the actions taken by the Faculty of Dentistry, Universiti Sains Islam Malaysia (USIM) to ensure continuous learning. The challenges faced by the faculty are overcome with careful planning and discussion through the establishment of specific committees related to various issues, such as online learning and clinical COVID-19 committees. The committees identify any issues, plan the strategies and monitor the implementation of the plan. All actions during the pandemic are closely monitored by managing the faculty and university to ensure implementation of organised and smooth work, good record keeping, and compliance with instructions and guidelines by the authority.

**Keywords**: Covid-19, pandemic, dental education, online learning, dentistry

1. Introduction

Coronavirus disease 2019 (COVID-19), which emerged as an unknown respiratory disease in Wuhan City, China in December 2019, continues to spread and cause outbreaks in many countries across the globe (World Health Organization, 2020). Human transmission is via respiratory droplets and direct contact, and the infected person may present with a spectrum of respiratory signs and symptoms together with several radiological findings (Huang et al., 2020).

Due to the persistent increase in the number of COVID-19 cases, on 18th March 2020, Malaysia implemented a partial lockdown known as Movement Control Order (MCO). This policy was implemented by the government of Malaysia as a preventive measure to avoid further spreading of COVID-19. During the MCO period, all public institutions and skills training institutes were instructed to close their operations, and only essential workers were allowed to go out.

Dental faculty was also required to make timely modifications in the curriculum, teaching strategies, and clinical requirements of the students because face-to-face (F2F) academic activities and clinical sessions were not allowed during the MCO. Continuity of the learning process during the pandemic was ensured by incorporating online learning for cognitive components, virtual case-based discussions into specific courses to meet the psychomotor needs and self-directed learning with innovative approaches. New dental guidelines and standard operating procedures for dental clinics have been published by the government and other associations that provide guidance on how to resume dental practice during the pandemic (American Dental Association, 2020; Ministry of Health Malaysia, 2020). Dental institutions must comply with the guidelines to conduct F2F sessions, which include practical and clinical training as students need to fulfil requirements.

Dental programmes in Malaysia are closely monitored by the professional body, Malaysian Dental Council (MDC) and Malaysian Qualifications Agency (MQA), which have the authority to accredit academic programs provided by educational institutions in the country. Input from the agencies is needed to certify that the graduate students during the COVID-19 era are qualified and skilful. This sharing of experience article aims to discuss on the impact of the COVID-19 pandemic and how the
Faculty of Dentistry, Universiti Sains Islam Malaysia (USIM) formulates strategies and planning in facing COVID-19 challenges for dental education.

2. Discussion

During the early stage of MCO, the closure of the dental faculty has made F2F learning impossible. This scenario impacts the dental faculty in terms of academic, practical and research (Chang et al., 2021). Therefore, contingency plans were made to accommodate the current COVID-19 situation to ensure the continuity of the teaching and learning activities of the students.

Impact on Academic

The dental curriculum comprises cognitive, psychomotor and affective components that are introduced throughout the program. Teaching learning activities (TLA) are designed based on the outcome-based education approach and fully monitored by the MDC and MQA. All these components are performed in F2F mode. However, the pandemic has made F2F learning impossible, which forced the curriculum to be shifted into virtual options. The unexpected switching causes many difficulties at various levels, including administrative, faculty members and students.

All dental educators are aware that online education is inevitable during the pandemic and is currently the best way of teaching during the COVID-19 pandemic (Ghai, 2020). Online platforms must be maximised to ensure continuity of dental education. Recognising this situation, USIM through the Centre for Quality Assurance, Policy and Academic Excellence (QAPEX) and System Development and Engineering Centre (SDEC) started the move by providing an intensive training platform to all lecturers and students and produced brief guidelines on e-teaching and learning (Universiti Sains Islam Malaysia, 2020a). Educational online learning platforms and trainings in USIM include Global Open Access Learning System (GOALS), Microsoft Teams® and Zoom®. In addition, an e-learning committee was established at the faculty level to explore and assist faculty members in empowering the delivery of online education. Committee members joined relevant seminars and courses in online learning prior to conducting training sessions at the department level to ensure all academic staff had proper training sessions prior to their online teachings.

Surveys on online learning were also conducted to assess the readiness of lecturers and students in terms of Internet access, device and knowledge. The findings of the survey showed that only 46.2% of the lecturers were initially confident to conduct online learning sessions and that Internet coverage was the main difficulty experienced by students. Following the survey, a train run of training sessions for teaching and learning during the MCO period was conducted in USIM at the faculty level to evaluate the readiness and Internet access of students. From the trial run, attendance record for dental faculty was 99.61%, and only two students faced Internet access problems. Further improvement in terms of technical, device and coverage issues was made based on feedback received. The faculty took proactive steps by lending laptops to a number of students identified as in need of this support device. In addition, the communication company, in collaboration with the Ministry of Higher Education, offered a data plan package to help students overcome Internet access problems at a minimum price.

MQA released implementation guidelines for the higher education program during the COVID-19 pandemic on 29th March 2020 (Malaysian Qualification Agency, 2020). In the guidelines, all the
actions and temporary measures taken by the university are fully under the responsibility and autonomy of the Senate or academic board. The academic board will decide based on their respective constitutional provisions and suitability of resources. Other modifications to shift F2F sessions to fully online methods were made in teaching and learning activities, including practical activities. Modifications and changes to student learning time (SLT) and assessment must be at least 70%–80% of the total SLT requirements to be considered as having met the credit requirements by the university and MQA. For student assessment, final examinations were replaced with other methods of assessment, such as online examinations and assignments, depending on the suitability of the program. The university was allowed to replace final assessments with assignments, take home exams, open book exams and online exams depending on the suitability of the field.

In this regard, QAPEX has been mandated by USIM to monitor the course framework changes carried out by the faculty in accordance with the guidelines issued by the MQA. Coordination at the university level was made by asking the subject coordinator to list the amendment in TLA and assessment of the students in the course outline (CO) amendment appendix, which consists of SLT changes, assessment and teaching strategy. This amendment tabulated the total and percentage of SLT affected for each course offered in a program. In the Faculty of Dentistry, 40 CO amendments were done by the course coordinators in every department. All CO amendments were checked by the head of departments and Deputy Dean of Academic before they were endorsed at the faculty meeting. In summary, the total SLT for basic science subjects remained while the SLT for clinical subjects achieved more than 80%. The SLT was affected by the inability to perform simulation and clinical sessions during the MCO period. The amended CO paperwork was endorsed in USIM’s Senate meeting in June 2020. A brief summary of the academic planning workflow is shown in Figure 1.

In July 2020, the MCO was replaced with the Recovery Movement Control Order, and students were allowed to return to campus and resume their studies. By this time, the confidence level of the lecturers to perform online sessions improved, and they preferred to conduct the TLA online rather than F2F. Lecturers and students started to enjoy the flexibility of online learning through the synchronous and asynchronous lectures and activities. Lecturers also became creative and began exploring other online learning platforms, such as Quizzes® and Kahoot®, to make their sessions interactive.

**Impact on Practical session**

Practical sessions, which consist of simulations and clinical practice, are the psychomotor components of the curriculum and represent 45%–50% of the total SLT. These components can only be conducted via F2F and are part of the assessment for pre-clinical and clinical courses. Unlike students of other programmes which are offered by semester, students of the dental programme cannot postpone their studies because the courses are designed on a yearly basis. Recognising this fact, the Dental Dean’s Council Malaysia (DDCM) and the university management requested permission from the government to allow dental students to return to the faculty to perform practical and clinical sessions. Fifth-year students started with their F2F sessions on 1st July 2020, followed by first year to fourth-year students starting 20th July 2020.
All dental students in Malaysia are expected to perform certain dental procedures in the clinic and simulation labs throughout their clinical years. Guidelines on the expected clinical experiences (ECE) and minimum clinical experiences (MCE) were provided by the DDCM to standardise the clinical experiences of dental graduates in Malaysia prior to graduation. Understanding the difficulties of the students to complete the existing ECE and MCE dental requirements within reduced clinical time, the DDCM has revised and proposed Minimum Clinical Experience/Competency Special Edition COVID-19 Situation. This proposal was presented and endorsed by MDC as a professional body that monitors the implementation of the dental curriculum in Malaysia (Dental Deans’ Caucus of Malaysia, 2020). The revised MCE and ECE were discussed in each faculty department to assess the students’ clinical performance. Clinical requirements and competency tests were revised and carefully planned to ensure that the students’ clinical competencies are not jeopardised. Planning and implementation of clinical sessions were thoroughly carried out to ensure the sessions are sufficient for every student. Prioritisation was given to final-year students to complete MCE and ECE requirements. For other clinical-year students, the clinical sessions provided are mainly to complete the competency test, which are part of the continuous assessment.

**Background on the new norm in simulation and dental clinical practice.**

The virus causing COVID-19 is transmitted through airborne or indirectly through saliva, especially during aerosol-generating procedures (AGPs), such as scaling and tooth restoration (To et al., 2020).
Hence, dentists and dental supporting staff are at risk of transmitting and contracting COVID-19. The many uncertainties surrounding this disease have created fear and anxiety among dentists to provide treatment during the COVID-19 pandemic (Ahmed et al., 2020). Pre-clinical and clinical training for dental students also had to be discontinued. As time progressed, many guidelines have been developed by the Dental Division, Ministry of Health Malaysia for dental clinics to resume operation (Ministry of Health Malaysia, 2020).

At the faculty level, the COVID-19 committee was formed to develop specific dental guidelines for the Faculty of Dentistry USIM in organising the teaching facilities and clinics for re-opening, preparing personal protective equipment (PPE) and auditing the dental facilities for compliance to the guidelines. The dental guideline content was made consistent with the Ministry of Health recommendations and also dependent on the human resource, existing facilities, PPE supply available (Faculty of Dentistry USIM, 2020). In the guideline, specific instructions for students and lecturers during clinical and academic activities were explained. After endorsement of the guideline at the faculty meeting, online briefing was given to all clinical staff and students. Soft copy of the guideline was distributed through emails.

**Preparedness of dental facilities**

Dental facilities must be under optimal conditions to accommodate students and staff while working in a safe environment. Several factors must be considered, such as in and out routes, dental treatment room, dental simulation and laboratory, human resource, availability of PPE, additional measures to prevent spreading of COVID-19 and facilities of Information and Communication Technology. The first step to be taken was considering the suitability of the facilities in the faculty. Marking and labelling were carried out to ensure physical distancing is implemented and important notices related to notifications and instructions contained in the guidelines are displayed around the facility. Equipment facilities such as temperature gauges and hand sanitisers are provided in identified areas. The second step involved the renovation of students’ polyclinics to comply with the guideline where all AGPs must be performed in an isolated room. Some innovations were needed because the dental chairs are positioned next to each other and only separated with a divider, hence increasing the risk of spreading the virus during AGPs (Ministry of Health Malaysia, 2020). As a short-term measure while waiting for the polyclinic renovation, students were allowed to use the specialist clinics for their clinical sessions because these clinics are in separate rooms, unlike the students’ polyclinics. In the polyclinics, renovation was carried out by placing a separator in between treatment cubicles made from materials that can be disinfected. The third step was performing an inventory process to ensure adequate supply of dental materials before the clinical session begins. The availability of PPE, which includes non-woven gown, face shield, goggle, surgical mask, shoe cover, head cover, and KN95 masks, was the most important aspect to prepare. Current PPE recommendations are enough to reduce the risk of COVID-19 transmission in the dental setting (Chen, 2020; Estrich et al., 2020). The faculty’s PPE stocks originated from two sources: by purchasing and from donation. The donation was given from a non-governmental organisation, institution, alumni and personal individual.

The clinic schedule was rearranged to accommodate the needed special precautions, such as limitation in the number of patients in the waiting room, extra time needed for the operator to perform doffing and air change time after AGP dental treatment where disinfection can only be performed after 20 min (Ministry of Health Malaysia, 2020). One-way routes with arrows for patients were made to reduce infection spread. This route needs outlets and separate entrances,
ranging from patient start to finish business at the dental clinic. An extra trolley for dental materials and a runner was made available in the polyclinics to ease operators and assistants because they are not allowed to go outside of the isolated cubicle while giving treatment. This step was taken to reduce the spread of any infection outside the cubicle. Detailed briefing was made to all clinical staff and students, and each received a soft copy of the dental guideline for reference.

**Students’ Clinical Session**

The university management allowed final-year students for courses with clinical and practical teaching to return to faculty in stages (Universiti Sains Islam Malaysia, 2020b). All final-year-course coordinators were required to identify students’ current achievement. Due to limited area for AGPs, priorities were given to students who were lacking in their clinical requirement. Conservative dentistry and prosthodontics were identified as the courses that need attention and more clinical sessions as compared with other courses. Critical sessions were carefully counted to ensure maximum use of the facilities and human resources, and all final-year students achieved the minimum requirements set by the Dental Deans’ Caucus of Malaysia. Then, careful planning on the development of a booking system was performed by members of faculty management (Dental Deans’ Caucus of Malaysia, 2020). For the first stage, only final-year students were allowed to return to the faculty for clinical work, followed by fourth-year and third-year clinical students. Priority was given to final-year students as they were about to finish their study and graduate. A brief summary of the student’s clinical and practical planning workflow is shown in Figure 2.

During the development of the Dental Guideline Post COVID-19, a new flow for patient’s booking and instrument’s request was included in detail. An online clinical booking system was created on multiple platforms for the students to book the patients and instruments. This system was developed
to reduce unnecessary exposure of students to the clinic setting because the procedures were performed manually before the pandemic, where the students must be in the clinic to request for the patient’s folder and instrument. Final-year students, course coordinators and Deputy Dean (Academic and International) were included in all platforms involved in the clinical booking system. The Deputy Dean was included to monitor the whole process to ensure students were following the instruction. A lecturer in charge was appointed to monitor the progress and to conduct the whole system. An online briefing with students was conducted explaining the online booking system. Students were required to arrange a schedule among themselves according to their clinical achievement and advised by each course coordinator.

The first online system was booking for clinical sessions through MS Teams platform for final-year clinical management. MS Teams was chosen for the patient booking system because the students can fill up the form interactively via online, whereas the course coordinators were able to monitor the form concurrently. Two weeks before the actual clinical session, students were required to fill in the patient's details, details of the procedure and the name of the assistant involved during the clinical session. After the due date, the lecturer in charge will download the form and inform the registration counter for the folder request. The same form was also used by the lecturer in charge to assign a specific cubicle and clinical supervisor for every session, which later will be shared with students and lecturers. The clinical session booking flow is shown in Figure 3.

![Clinical session booking flow diagram]

**Figure 3: Clinical session booking flow.**

The second online form was MS Form for instrument request. A specific form was developed for each discipline to avoid confusion in the central sterile services department (CSSD). During the
development of the form, discussions were done with course coordinators to identify instruments and materials needed for each procedure. Students filled in the form before the closing date, which was 2 weeks prior to the booked clinical session for the CSSD staff to have ample time in preparing the requested instruments. After the due date, the lecturer in charge will download the responses and arrange the list of instruments according to the specific cubicle as arranged before. The list of instruments according to the cubicle was then emailed to CSSD staff for preparation of the requested instruments. It will be distributed to each cubicle on the day of the clinical session. With this current booking system, students were more disciplined in terms of preparing patients for their clinical session because they need to plan their clinical session as early as 2 weeks prior. The booking of the clinical sessions was cancelled if the students involved did not follow the predetermined time and plan. This measure, wherein available sessions are limited due to the COVID-19 pandemic, was taken to avoid the clinical sessions from not being utilised properly. The instrument request flow is shown in Figure 4.

Another platform used for communication medium was WhatsApp group. It was used to inform students on form availability, link for MS Form and closing date for each form. It was also used as the medium to remind the students during monitoring by the lecturer in charge. Although the students have planned their schedule and patients, patients were sometimes unable to commit with the appointment given. Two days prior to the clinical session, students should remind the patient
about the appointment and ask if their patients experience any COVID-19 symptoms or if they have been in contact with a COVID-19 patient. Patients who were unable or prohibited to come due to health causes (fever, cough or runny nose) may be replaced or transferred to other students performing the same procedure. They must communicate with the lecturer via WhatsApp group for prompt notification.

Two weeks after final-year students started their clinical session, the fourth-year and third-year students who need to fulfil their clinical requirements were allowed to start the clinical session. Priority was given to those who need to sit for a clinical competency test, which will contribute marks for the final assessment. A similar procedure for an online booking system was implemented for fourth-year and third-year students. Changes in patient’s bookings and instrument requests from manual to an online system gives positive impact to the students and staff. Clinical operations are more organized in terms of adherence to established rules, patient planning is made in advance and clinical work is more structured. In addition, the percentage of patient attendance through appointments is also increased.

**Impact on Research**

The students’ research program during the MCO period involved fourth-year students who prepared a research proposal for their final year project. Later, the proposals need to be submitted to the ethical committee for ethical proposals. Due to time constraint, the course must be conducted through online sessions, including preparation and presentation. An online research progress form that needs to be submitted every 2 weeks was created by the course coordinator as part of the monitoring process to ensure all projects comply with the coursework flow. The supervisors must update their latest research progress to evaluate whether or not the research can be completed according to the original plan.

Research during this pandemic definitely has significant impact because most on-going clinical research must make tough decisions whether or not to continue or reschedule the research (Padala et al., 2020). Research projects that need laboratory testing were also affected throughout the MCO period. Supply of some of the research materials was also difficult to obtain because the supplier’s company suspended their business, especially those involved with imported materials, during the MCO period. USIM has allowed most of the research grants to extend their research duration to 3 months from the previous expected duration. If more extension was needed, the project leader must apply for an extension with solid justification.

In addition, USIM also advised lecturers to take advantage of work-from-home opportunities to increase the universities’ publications and apply for grants to meet the annual key performance index. USIM and faculty organised and encouraged lecturers to participate in grant and article writing workshops. Many research and popular articles were also submitted by lecturers during the MCO period through different journal publishers, USIM’s publisher and to USIM Writers’ Pool. About five proposals were produced by lecturers for internal grant applications, and the fundamental research grants scheme (FRGS) was requested from the Ministry of Higher Education. The faculty managed to secure internal and FRGS grants, and the number of articles published also increased following these efforts.
**Impact on Clinical Services and Laboratory**

Faculty of Dentistry, USIM provided dental treatments to the public under outpatient and specialist clinics. During the lift of the first CMCO, the clinical services were only open for emergency cases only and triage counters to screen for COVID-19 were set up at the main lobby to help screen patients to limit the numbers of patients coming into the premises. After the MCO period was lifted, the services started to operate as usual but with strict adherence to MOH and USIM dental guidelines. All staff and academicians were updated of any changes in the guidelines and advised to follow strict protocols to minimise risks of spreading the infection. Clinical staff were divided into groups to limit the number of staff working while the others continued the PPE project in Nilai Campus. Patients were given emergency treatment only for out-patients and appointments for elective procedures. Follow-up calls were made to all patients who came to the premise at day 7 and day 14 post-treatment to ensure patients do not develop any sign and symptom and as a precaution on our side (Faculty of Dentistry USIM, 2020). Appointments for specialist services were reduced to prevent crowding at the waiting area, and more time should be allocated for disinfection of the clinic after AGPs (Ministry of Health Malaysia, 2020).

Weekly audits by the COVID-19 Committee also helped in monitoring the adherence of all staff and students to the clinical guidelines. Audit is an essential component in monitoring the adherence of students and staff to the guideline given; good compliance to the guidelines will result in good clinical outcome, especially during an outbreak (Wee et al., 2020). Focus of the audit was directed to PPE and facilities preparedness at a clinical setting. This is important as the new recommended PPE is efficient to reduce the risk of spreading infection to healthcare workers (Chen, 2020; Estrich et al., 2020). The audit conducted reported that all clinical staff & students at the faculty complied with the guidelines except for compliance in wearing goggles and face shields which recorded 92.3% and 97.9% respectively. Staff and students felt that wearing both goggles and face shield is a hassle as it disturbs their sight, hence they tend to wear either one only. Reminders to adhere to the guidelines are given from time to time and the use of anti-fog goggles are strongly encouraged.

3. Conclusions

Dental school management plays an important role in planning and coordinating tasks while monitoring changes in the environment and local or national policy and ensuring continuous dental education. Dealing with pandemic situations requires good teamwork, immediate planning and implementation and interaction with those involved, including academic and support staff, students and patients. This step is important in ensuring that the learning activities and clinical services in dental schools run smoothly. Embarking in online teaching should also be recognised as an opportunity during the pandemic.

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