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A qualitative study on the impact of COVID-19 on continued medical education in Low to Middle Income Countries (LMICs)

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Abstract

Introduction: COVID-19 pandemic disruptions to medical educational programs have been felt worldwide. However, little is understood about the experience of Low to Middle Income Countries' (LMIC) and the impact of ensuing disruptions on medical education. We aimed to develop a collective understanding of this through the perspectives of individual LMIC educators, exploring how they continued to deliver undergraduate and postgraduate medical education in the context of pandemic barriers, by reflecting on their successes and shortcomings.

Methods: A phenomenological study was conducted with ten purposefully recruited educators involved in medical education from mainly the Asia-Pacific region. In-depth interviews via web-conferencing were conducted, and data analysed using Braun & Clarke's (2006) framework.

Results: Four major themes were identified: 'Navigating Change, 'Altered and Divided Teaching Roles and Spaces', 'Curricula Impact' and 'Challenges and Affordances of Remote Learning'. Educators described major disruptions to delivering medical education, particularly clinical education. Remote learning was the mainstay of facilitating continued education, often requiring investment into infrastructure that was non-existent pre-pandemic.

Conclusion: LMIC educators' pandemic response have been robust in pursuit of continued medical education. Necessary adoption of online teaching approaches has provided avenues to close healthcare education gaps by facilitating improved reach and quality of medical education in these regions. Building on this requires strategies that meet LMICs areas of need, focusing on capacity building that sustains and grows new pedagogical practices. We must ensure educational advances are equitable and accessible for all, identifying and supporting countries and contexts at risk of being left behind.

Keywords: *Low to Middle Income Countries, COVID-19, Medical Education, Remote Learning, Qualitative*

Practice Highlights

- Educational ramifications from COVID-19 were most acutely discernible within the clinical domain.
- LMICs demonstrated resilient responses, despite their comparatively limited resource availability.
- The pandemic necessitated remote learning and heralded investment into infrastructure.
- Remote learning may provide a means of narrowing health disparities.
- COVID-19 practices of remote learning should be leveraged and supported in LMICs.

I. INTRODUCTION

Declared a global pandemic by the World Health Organisation in March 2020, COVID-19 has had significant global influences, impacting the social fabric and operations of everyday living (Cucinotta & Vanelli, 2020). Governments and institutions were required to re-examine and enforce changes to social procedures in light of the need for infection control, whilst also finding ways to minimise the negative impacts of disruptions to healthcare provision and medical education (Kaul et al., 2021).

The United Nations Secretary-General warned that COVID-19 disruptions to education threaten to cause a 'generational catastrophe', widening existing inequalities and stifling what established and evolving progress has been made (UNESCO, 2020). Medical education was not exempt. Indeed, in a global survey of 424 universities and higher education institutes by the International Association of Universities in early 2020, 59% had ceased campus activities and closed, with indications that LMICs were being hit harder, struggling and lagging in their responses and abilities to adapt compared to high income countries (HIC) counterparts (Marinoni et al., 2020).

Adaptations, challenges and impacts to medical education during the pandemic are well described in HICs (Dedeilia et al., 2020; Gallagher & Schleyer, 2020; Gill et al., 2020; Kachra & Brown, 2020; Kaul et al., 2021; Rose, 2020). LMIC narratives in comparison have been relatively isolated, and often represented by single institutions (Adesunkanmi et al., 2021; Aslan & Sayek, 2020; Cecilio-Fernandes et al., 2020; Fiorillo & Javed, 2021; Kalayasiri & Wainipitapong, 2021; Kanmounye & Esene, 2020; Sahi et al., 2020; Sandal et al., 2021; Tokuç & Varol, 2020). Collectively, what has happened to medical education in LMICs, particularly in contexts with fever resources, already stretched healthcare systems and concerns for slower transitions (Aishat et al., 2020; Cecilio-Fernandes et al., 2020; Gill et al., 2020; Sandal et al., 2021)?

This study aimed to answer this question by highlighting the experiences of educators in LMICs during the COVID-19 pandemic, through distilling common themes across various contexts. Through understanding their narratives of successes and shortcomings, we hope to advocate for future needs and highlight opportunities.

II. METHODS

A. Study Design

We conducted a qualitative study using a phenomenological approach involving semi-structured interviews to evaluate the 'lived experience' of medical educators in LMICs as they aimed to change, adapt and sustain the delivery of medical education during the pandemic. Interviews were conducted between 7th July and 21st October 2021. We sought to capture a range of contexts rather than an in-depth experience of a single site.

B. Inclusion and Exclusion

LMIC educators involved in undergraduate and postgraduate medical programs were the target population. We included educators from tertiary (pre-vocational) and clinical (post-graduate) settings in primary roles of teaching, curriculum development and education oversight. We defined LMIC using the economic bands of low, lower-middle or upper-middle as described by The World Bank for the financial years of 2020 and 2021(World Bank Group, 2021).

C. Data Collection and Analysis

Participants were identified using existing professional networks through purposeful (Côté & Turgeon, 2005; Giacomini & Cook, 2000) and convenience sampling (Etikan et al., 2016). Subsequently, snowball sampling was used whereby existing participants identified future participants from their own professional network. Recruitment was ongoing during the analysis phase until data saturation was achieved. Data saturation was determined through continuous analysis of data and iterative development and review of themes until no new concepts were interpreted.

Invitations to participate were sent via email including a written description of the research goals, study design, and a consent form. Ten consenting participants were scheduled for an interview at a time convenient to them.

Consistent with phenomenological research (Van Manen, 2016), data was collected via in-depth semi-structured interviews. Individual interviews were conducted using a guide comprising open ended questions in combination with prompts to ensure consistency of scope while maintaining flexibility to explore experiences raised by participants (Table 1). Key areas of focus included the impacts of the pandemic on medical education at undergraduate and postgraduate levels, strategies used to adapt education, their outcomes and the factors influencing success, and future opportunities.

All interviews were conducted via a password-protected, video-conferencing platform (Zoom, https://zoom.us/) by the principal investigator (EK) who had no pre-existing relationships with participants. Video interviews were conducted and audio-recorded for verbatim transcription. Initial impressions were recorded in the researcher's journal during or immediately after the interview. Participants were given the opportunity to review written copies of their transcripts on request. There were no withdrawals or repeated interviews.

Thematic analysis of data drew upon both essentialist and constructionist approaches described by Braun and Clarke (Braun & Clarke, 2006), illustrating the lived realities whilst also exploring the impact of the COVID-19 pandemic on institutional operations and subsequent educational outcomes. Interview data was coded by the principal investigator and subsequently reviewed by the chief investigator (AG) to enhance reliability and reduce biases. Theme generation occurred using an inductive approach whereby theoretical concepts were derived from data without a pre-existing framework (Braun & Clarke, 2006). Themes were developed, analysed and refined through iterative consensus meetings between the principal and chief investigators. A selection of interviewees (PW, VV, SK) were subsequently invited to peer review findings to ensure their voices were represented. To ensure trustworthiness of findings, actions taken to address credibility, dependability, confirmability, transferability and reflexivity are outlined in Table 2.

Background • What is your current position and educational role? • Do you have any additional qualifications?
COVID-19 Pandemic Background • Can you tell me about the impact of the pandemic where you work?
COVID-19 and Medical Education • How was education delivered prior to the pandemic? What happened to education delivery during COVID?
Educational Initiatives • What changes were made to education delivery? • What worked and did not work? Why?
Impact • One year down the track, what are the impacts of COIVD on education that you see now? • What future problems do you see developing because of this disruption?   ○ Are some of these already being felt?
Now and into the Future • One year down the track are you now still experiencing disruptions in medical education? • What do you think needs to be done now to minimise possible future sequelae that have resulted from the interruptions to medical education? • From the perspective of an educator in a LMIC, what do you think needs to be prioritised/advocated for?

Table 1. Question guide

Trustworthiness Criteria	Actions	How Addressed in this Research
Credibility	Prolonged Engagement	Engagement in long semi-structured interviews to explore participant experiences, perspectives and gain in-depth, reliable insights.
	Triangulation	Investigator triangulation – iterative discussions and analysis of data with a second investigator.
	Member Checking	Feeding back of research findings and transcript to participants to ensure contextually relevant interpretations and representation.
	Persistent Observation	Repeated review and analysis of data which fed into constant revision of codes, concepts and themes.
Dependability	Audit Trail	Explanation of method of data collection, how it was administered and the data analysis process.
	Peer Review	Presentation of methods and results at a public forum with opportunities for reflection, feedback and critique.
	Member Checking	Feeding back of research findings and transcript participants to ensure contextually relevant interpretations and representation.
Confirmability	Audit Trail	Explanation of method of data collection, how it was administered and the data analysis process.
	Triangulation	Investigator triangulation – iterative discussions and analysis of data with a second investigator.
Transferability	Purposeful Sampling	LMIC educators in teaching, curriculum development and education oversight roles suitable to provide insight into the research question.
	Thick Description	Provision of detailed context and participant representation through significant quotes and composite narratives to help the reader assess relevance to their own situation.
Reflexivity	Journal	Reflection of how researcher assumptions, ideas, preconceptions and values affected development of concepts, themes and interpretation through iterative research discussions between principal and chief investigators.

Table 2. Ensuring trustworthiness

III. RESULTS

A total of 10 educators participated, representing perspectives from eight countries: Vietnam, India, Indonesia, Fiji, Solomon Island, Papua New Guinea, People's Democratic Republic (PDR) of Lao and Nigeria. Educators had backgrounds in paediatrics, community medicine, internal medicine, anaesthesiology, public health/hospital management and educational leadership.

Four major themes were identified. These were 'Navigating Change', 'Altered and Divided Teaching Roles and Spaces', 'Curricular Impact' and 'Challenges and Affordances of Remote Learning'.

A. Navigating Change

Educators described operating in a volatile landscape, where the fluctuations of the COVID-19 pandemic forced a dynamic interplay between health policy, health systems and educational institutions. Efforts to control infection rates meant lockdowns, mask wearing, travel restrictions, prevention of mass gatherings, curfews and social distancing precautions were universal experiences. Geographical variability existed in responses within countries to local COVID-19 severity, resulting in a heterogenous distribution of restrictions, and impacts on education.

"Because they [other Pacific Island nations] shut their borders so early, I think most of them have carried on as normal… So don't think it's been such a big impact for the other smaller Pacific Islands."

(Fiji)

Frequent changes in hospital policy, operations and organisational structure meant educators and learners were operating in dynamic environments, at the mercy of redirection of workforce redistributions and space divisions. The dependence of medical curriculum on healthcare environments meant changes invariably

influenced the provision of education, with clinical learning hit hardest. How this occurred varied between LMICs over time waves of the pandemic.

"So what happened is you have less number of inpatients, even the consults that we got called to see reduced... And now our (COVID-19) numbers have started coming down so we are going back to normal. So it's like a cycle as far as numbers and clinical teaching is concerned."

(India)

B. Altered and Divided Teaching Roles and Spaces

Educators described periods of restricted access to university campuses. Continuing face-to-face teaching was difficult, with examples of existing architectural spaces poorly adaptable to COVID-19-safe measures.

"…ventilation is not very good…it's not set up for social distancing. Students are backed up in a room …20 centimetres distance between each other."

(Indonesia)

Clinically, most educators described a spectrum of hospital access, from periods marked by complete cancelation of bedside teaching, to limited access necessitating modified clinical activities, reduced time and crowd limitations.

The move towards remote learning resulted in the delivery of education from home spaces. Here educators described major challenges regarding infrastructure. Successful initiatives included faculty-initiated needs surveys with subsequent provision of required infrastructure for the home. Alternatively, some universities provided spaces fully equipped with remote teaching equipment for use.

"…we have a survey to all of the lecturers, what they need so that they can give the lecture from their home."

(Indonesia)

Social distancing necessitated investment into new infrastructure. In PNG, educators described procuring screens to facilitate telehealth to aid medical practice both internally within hospitals and remotely with peripheral healthcare centres. Such technology would then be used for enhancing educational experiences.

"So we now have screens in all the classrooms where we can connect directly to internet ….So I can honestly tell you, we used to ask for it, it never happened. And when COVID-19 came it forced them to make it happen and we're happy."

(Papua New Guinea)

For educators with clinical responsibilities, pandemic medicine pulled human resources away from education, driven by re-deployment and personal illness. Capacity was impacted further by fatigue and psychological stress. Educators reported the absence of international trainees normally present to buffer workforce. However, educators employed by universities felt at times underused on the clinical side.

"The teaching is still ongoing, but it's not regular …for example, for the Department of Infectious Disease, the teacher has to take responsibility of the COVID-19 ward. So at the time bedside teaching is not that easy to do."

(Lao PDR)

C. *Curricular Impact: Deficiencies in Clinical Content, Assessment and Trusting the New Workforce, and Compensation in Delivery*

1) Deficiencies in clinical content: Theoretical content lent itself well to remote learning approaches and was delivered without much disruption to academic calendars. In contrast, clinical education, dependent on availability of clinical spaces and patients, suffered and often occurred over reduced time frames in settings where the content landscape was different and deficient.

"So by the end of January, we called the students in for clinics, and they had their paediatric posting …. I think we had to cram everything into a period of approximately four weeks …it was a struggle to make sure that we had those cases."

(India)

Cancellation of elective surgical cases resulted in a heavy skew towards emergency cases. Common medical presentations became rare and patient numbers shrank due to travel restrictions and reduced health-seeking behaviour, fostering both clerical and procedure poor environments. At both undergraduate and post-graduate levels, educators lamented this loss of clinical breadth, opportunities and authentic workplace experiences normally afforded to learners. Many expressed concerns about the effects on job-preparedness and skill acquisition of new graduates and those in specialty training.

"…my students couldn't see like severe malnutrition or TB with spondylosis. Actually, we still have a lot, but I don't know where these patients are! They disappeared!"

(Indonesia)

"For the current batch of interns, if someone says there's no spleen, no liver palpable, you don't trust. You know, it's quite possible that they've missed it completely, because the only exposure they've had is anywhere between two to four weeks…"

(India)

The COVID learning environment was not without its own merits. Educators described those at the forefront of COVID-19 care experiencing increased learning opportunities and greater depth of learning via involvement and active management of cases on the clinical floor. Furthermore, it was also viewed by some as a valuable experience for future pandemic preparedness.

"The pandemic will teach the students what we have never taught …they become better clinicians than us when they are exposed to the similar kinds of situations in the future."

(Papua New Guinea)

2) Assessment and trusting the new workforce: The aforementioned impacts of COVID-19 had flow-on effects on assessments resulting in postponement, modification, replacement by other assessment modalities or cancellation. Irrespective of this, ensuring a continued cycle of new graduates or subspecialists was paramount, particularly in areas of need both locally and regionally, and meant that regardless of the quality and quantity of education learners received, transitions (e.g., undergraduate to postgraduate, postgraduate to subspeciality) were pushed through. Whilst this ensured continuity of workforce, educators voiced concerns regarding clinical competencies of COVID-era cohorts.

"…we can't delay graduation because we need interns. We need the workforce. …if we don't conduct exams and we don't take the next batch … after three years, we actually have nobody."

(India)

3) Compensation in delivery: Endeavoring to minimise faced shortcomings, educators compensated by trialing and implementing various low to high resource strategies. Delivering education by aligning judicious use of space, crowd management, session timetabling and utilising windows of 'normality' was commonplace. Collaborative interdisciplinary relationships were fostered to account for reduced patient pools available for clinical learning/interactions and simulation was used in a couple of settings to make up for the paucity in procedural opportunities.

"We were sharing cases between units. If we had one heart disease, that child would have three clinics in a day by three different sets of people."

(India)

Evaluating risk of disease versus the benefits of learning, vaccinated students in Papua New Guinea (PNG) who consented were able to continue clinical clerkship schedules with a degree of normality. Recognising a need for increased senior supervision of the post COVID-era workforce, periods of extended internship were also discussed allowing for a longer period of supervised upskilling.

"So what we've said to the other clinicians is that don't worry, everyone's in the same boat after COVID-19. So the Ministry of Health has said, okay, we're going to make it a two year internship now, so that they get bit more supervision."

(Fiji)

D. Challenges and Affordances of Remote Learning

1) Challenges: Educators described limited pre-COVID-19 experiences with remote learning, with little to no incorporation of online teaching in medical education curricula. Furthermore, pedagogical knowledge was limited, with educators often learning how to teach via process of trial and error and little feedback. Time to self-educate was identified as a limiting factor. For those who received support, utility was mixed from helpful to lacking expert guidance.

"…we don't get any training, on how to use the IT and the tools that can help us teach. This is something that I had to learn on my own, to figure out how to do. So I guess that's the other barrier, not having that support to help with the students' virtual learning."

(Fiji)

Educators describe initial apprehension amongst colleagues with regards to online education, rooted in discomforts around change and pitted against the inertia of entrenched concepts of what constitutes proper teaching. Many had persistent concerns about quality of education provided by online methods and expressed preferences for face-to-face learning – *'…nothing is equal to the human touch'*. Common challenges included limited ability to interact with students, gauge understanding and assess competency. Video cameras were often off due to challenges with bandwidth, and lecture slides were commonly viewed on small smartphone screens.

"But I've definitely got the negative people, you know, the cohort of the negatives who decide this is just too hard, you shouldn't be teaching online …they keep

quoting to me Osler ... 'you can't learn medicine without books, but neither can you learn just from the books, you need to have some patient contact.'"

(Fiji)

Despite most learners having some sort of device that could facilitate e-learning, internet reliability was a constraint, alongside prohibitive costs of required data. Acknowledging existing socioeconomic inequities affecting access, provisions for infrastructure, data and reliable connectivity were provided by some educational institutes for learners and teachers.

2) Affordances: For educators, the ability to rehearse and edit lectures was felt to improve the quality of teaching. Many appreciated flexibilities in scheduling and abilities to extend educational sessions beyond the limitations of time and place normally associated with face-to-face teaching. Increased geographical reach provided opportunities for individuals and communities, particularly those limited by location, to access education and expertise previously not available. Accessibility to both domestic and international expertise also helped improve learner engagement.

"... technology has become something that's sort of changed in our practice ...and still plays a vital role in in medical education in our country. And we are now able to reach people we've never reached before; we could not reach before. And that's a good thing."

(Papua New Guinea)

The ability to bridge international borders provided further opportunities to support and improve programs of domestic education and assessment through international collaboration. Through existing professional relationships, the anaesthetics department in PNG was able to organise fortnightly online teaching sessions to assist with the burden of teaching, as well as invite subspecialty specialists via videoconference to help examine their trainee candidates in viva assessment exams.

IV. DISCUSSION

This qualitative study investigated the impact of COVID-19 on medical education in LMICs from the perspective of medical educators who described how the pandemic transformed their educational landscapes. Curricular impacts were felt most in the clinical domain, and educators conveyed concerns regarding the quality of education during this time and what this meant for the capabilities of future healthcare workers and service provision. In the face of social distancing and contextual barriers unique to LMIC settings, educators looked towards remote learning as a largely successful bridging solution despite some difficulties in establishing and supporting this approach. In recognising remote learning affordances as we emerge from the pandemic, positive changes can be and have been made – how we continue to best support this is currently unclear.

Medical educators early on anticipated challenges related to educational continuity during COVID-19 (Rose, 2020), with narratives from study participants reflecting both the projected impacts and consequential experiences reported by other individual LMICs (Adesunkanmi et al., 2021; Aslan & Sayek, 2020; Cecilio-Fernandes et al., 2020; Connolly & Abdalla, 2022; Fiorillo & Javed, 2021; Kalayasiri & Wainipitapong, 2021; Kanmounye & Esene, 2020; Sahi et al., 2020; Sandal et al., 2021; Tokuç & Varol, 2020). Our study adds by highlighting baseline gaps in pedagogical knowledge of more modern educational techniques, exemplified by the struggles encountered during implementation of remote learning. Where needs for educator instruction were recognised, the extent to which these occurred was heterogeneous, relying on funding and available expertise, connections or partnerships.

Educators without existing collaborations were and continue to be relatively isolated in educational endeavours, whereas those with existing partnerships were enabled to capitalise on opportunity. Collaborations between LMIC educators are powerful initiating tools for grassroots change and for local educators to play leading roles in the development and sustainment of their own competencies and capacities (Al Shorbaji et al., 2015). Common challenges faced by educators are best addressed by connecting, sharing and learning from each other. This can be facilitated by prioritising ongoing investment in communities of practice that ensures sustainability through fostering continued learning, growth and independence (Ramani et al., 2020). We found that despite societal schisms engendered by the pandemic, proximity among individuals and communities traditionally separated have perhaps closed owing to the pronounced emphasis on online interactions, enabling collaborations that otherwise may not have occurred.

Whilst it would be safe to assume that barriers introduced by pandemics are not general considerations in curriculum design, the COVID-19 pandemic has highlighted how deficiencies in the use of modern educational practices and the consequent severer interruptions to medical education in LMICs compared to HICs, have the potential to widen existing gaps in health outcomes (Chahine et al., 2018; Dattani et al., 2013; Hunter & Reddy, 2013; Marinoni et al., 2020; Mossialos et al.; Roser & Ritchie, 2013). The

compensations and affordances – the success stories – described here by LMIC educators serve to highlight how familiarity with technology-assisted education can safeguard education particularly in times of social disorder.

COVID-19 crisis has thus also been a transformative moment for education in LMICs, particularly with the widespread adoption of remote learning, previously under-exploited in many regions (Al Shorbaji et al., 2015). Where the benefits of remote learning have been well described – cost effectiveness, accessibility, portability, coverage, scalability, adaptability and diversity (Al Shorbaji et al., 2015; Barteit et al., 2020; Papapanou et al., 2022) – its potential for 'revolutionary' change for medical education in LMICs depends on how changes are taken forward beyond the pandemic. There is an opportunity to close pre- and post-COVID-19 educational and health gaps through the affordances of remote learning via improving educational equity in regions where access to ongoing professional development and education programs have been limited both in quantity and quality (Barteit et al., 2020; Mack et al., 2017). In doing so we must consider context-specific strategies that foster fidelity, adaptability, longevity and accessibility (McLean et al., 2017).

Momentum is key. We know that attitudes in the broader literature about the longevity of remote learning practices post-COVID 19 are mixed (Adesunkanmi et al., 2021; Motte-Signoret et al., 2021). Indeed, gaps in technology-aided education could widen as countries where remote learning was done well continue to consolidate and innovate such approaches, while those who struggled to adapt may revert to more traditional practices. Nevertheless, there is room for optimism as educators in our study, particularly those of the younger generation, were enthusiastic about the place of remote learning in the future of medical curricula. How then do we support these individuals in capitalising, championing, and sustaining forward momentum? We provide six considerations.

A. Invest in Technology Infrastructure

Prioritise investing in technology infrastructure to ensure reliable and equitable access to remote learning resources. This includes internet connectivity, hardware and spaces, and allocating funds to support remote learning initiatives.

B. *Pedagogical Training*

Pedagogical training and support that meets educators in LMICs to upskill and adapt teaching methods for remote learning practice, emphasising ongoing efforts to enhance local expertise.

C. *Innovating Curriculum*

Develop long-term strategies for integrating technology-assisted education into curricula. Remote learning should not be seen as a temporary solution but as a valuable tool for enhancing educational quality, accessibility and ultimately quality healthcare provision.

D. *Foster Collaboration*

Encourage collaboration and sharing between LMICs, and with HICs on knowledge, resources, and best practices in education. These partnerships can help bridge knowledge gaps and provide mentorship opportunities that link experienced educators with younger generations to champion change.

E. *Communities of Practice*

Development of communities of practice among educators particularly among LMIC counterparts. These groups can serve as platforms for sharing experiences, challenges, and innovative solutions, thus promoting ongoing learning and growth, which in turn promotes self-sustainability, local expertise and resourcefulness.

F. *Stakeholder Engagement*

Engage stakeholders at individual, institutional, national, and international levels to commit to and support remote learning initiatives. Collaboration between governments, educational institutions, and non-governmental organisations is essential.

This study has limitations. Whilst our aim is to provide an initial window of understanding into the collective experience of LMICs, we acknowledge that this study is non-exhaustive in capturing all variations in experience. Educators were recruited via convenience, purposeful and snowballing sampling resulting in an Asia-Pacific sample bias. Furthermore, we appreciate that not all medical educational institutes nor specialty departments are necessarily equal in resources and varied experiences may exist domestically. However, the key themes we identified were broad, recurred across all interviews and may be applicable to other LMIC jurisdictions through reader generalisability, that is, where themes resonate with the others. Another limitation was that student perspectives were not included our study. We acknowledge that educational experiences exist in duality between educator and learner and that understanding both will be paramount in developing high fidelity educational strategies (Kachra & Brown, 2020; Zaharias & Poylymenakou, 2009).

V. CONCLUSION

This study gives insight into the degree and scope of disruptions the COVID-19 pandemic had on the medical education landscape and the adaptive changes to medical educational systems implemented by educators in LMIC settings. Despite reduced capacity and infrastructure, LMICs demonstrated resourcefulness and robustness in continuing medical education in a time of health crisis. Our study brings to light the enthusiasm and commitment educators in LMICs have in improving the education that they provide. With the quality of education intrinsically tied to health outcomes there remains a risk that countries that did not succeed in embedding online learning and teaching approaches will now fall behind on the educational landscape. There is not just an opportunity but an onus to build on educational progress triggered by COVID-19, particularly that of remote learning methods, and ensure it is grown and sustained, but at the same time identify and assist those at risk of falling behind.

Notes on Contributors

Dr. Eugene Kua contributed to study design, interviewing of study participants, coding of data, subsequent thematic analysis and paper write up.

Dr. Sinead Kado contributed by means data analysis through peer review, with supplementary contributions in the form of additional content enhancements to the paper.

Prof. Valsan Philip Verghese contributed by means data analysis through peer review, with supplementary contributions in the form of additional content enhancements to the paper.

Dr. Pauline Wake contributed by means data analysis through peer review, with supplementary contributions in the form of additional content enhancements to the paper.

A/Prof. Amy Gray contributed to study design, subsequent thematic analysis and paper write up and review.

Ethical Approval

This project was approved by The Royal Children's Hospital Melbourne Human Research Ethics Committee (reference number 75258).

Data Availability

No consent was given to share transcript data.

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Declaration of Interest

There is no competing interest to be declared.

References

Adesunkanmi, A. O., Ubom, A. E., Olasehinde, O., Wuraola, F. O., Ijarotimi, O. A., Okon, N. E., Ikimalo, J. I., Fasubaa, O. B., & Adesunkanmi, A. R. K. (2021). Impact of the COVID-19 pandemic on surgical residency training: Perspective from a low-middle income country. *World Journal of Surgery, 45*(1), 10-17. https://doi.org/10.1007/s00268-020-05826-2

Aishat, T. O., Oluwayemisi, T. F., Eniola, I. A., Omolola, O. A., Oluwatobiloba, D. O., & Adeseye, M. A. (2020). Challenges with medical education in Nigeria in the COVID-19 era. *Pan African Medical Journal, 37*(223). https://doi.org/10.11604/pamj.2020.37.223.26418

Al Shorbaji, N., Atun, R., Car, J., Majeed, A., Wheeler, E. L., Beck, D., Belisario, J. M., Cotič, Ž., George, P. P., & Hirvonen, H. (2015). *eLearning for undergraduate health professional education: A systematic review informing a radical transformation of health workforce development*. World Health Organisation.

Aslan, D., & Sayek, İ. (2020). We need to rethink on medical education for pandemic preparedness: lessons learnt from COVID-19. *Balkan Medical Journal, 37*(4), 178-179. https://doi.org/10.4274/balkanmedj.galenos.2020.2020.4.002

Barteit, S., Guzek, D., Jahn, A., Bärnighausen, T., Jorge, M. M., & Neuhann, F. (2020). Evaluation of e-learning for medical education in low- and middle-income countries: A systematic review. *Computers & Education, 145*, Article 103726. https://doi.org/10.1016/j.compedu.2019.103726

Braun, V., & Clarke, V. (2006). Using thematic analysis in pyschology. *Qualitative Health Research in Psychology, 3*(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

Cecilio-Fernandes, D., Parisi, M., Santos, T., & Sandars, J. (2020). The COVID-19 pandemic and the challenge of using technology for medical education in low and middle income countries [version 1]. *MedEdPublish, 9*(74). https://doi.org/10.15694/mep.2020.000074.1

Chahine, S., Kulasegaram, K., Wright, S., Monteiro, S., Grierson, L. E. M., Barber, C., Sebok-Syer, S. S., McConnell, M., Yen, W., De Champlain, A., & Touchie, C. (2018). A call to investigate the relationship between education and health outcomes using big data. *Academic Medicine, 93*(6), 829-832. https://doi.org/10.1097/acm.0000000000002217

Connolly, N., & Abdalla, M. E. (2022). Impact of COVID-19 on medical education in different income countries: a scoping review of the literature. *Medical Education Online, 27*(1), 2040192. https://doi.org/10.1080/10872981.2022.2040192

Côté, L., & Turgeon, J. (2005). Appraising qualitative research articles in medicine and medical education. *Medical Teacher, 27*(1), 71-75. https://doi.org/10.1080/01421590400016308

Cucinotta, D., & Vanelli, M. (2020). WHO declares COVID-19 a pandemic. *Acta bio-medica : Atenei Parmensis, 91*(1), 157-160. https://doi.org/10.23750/abm.v91i1.9397

Dattani, S., Spooner, F., Roser, M., & Ritchie, H. (2013). *Child and Infant Mortality*. Our World in Data. Retrieved January 9, 2023, from https://ourworldindata.org/child-mortality [Online Resource]

Dedeilia, A., Sotiropoulos, M. G., Hanrahan, J. G., Janga, D., Dedeilias, P., & Sideris, M. (2020). Medical and surgical education challenges and innovations in the COVID-19 era: a systematic review. *In Vivo, 34*(3 Suppl), 1603-1611. https://doi.org/10.21873/invivo.11950

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics, 5*(1), 1-4.

Fiorillo, A., & Javed, A. (2021). Education and training in psychiatry in low- and middle-income countries during and after the COVID-19 pandemic. *Asia Pacific Psychiatry, 13*(4), Article e12500. https://doi.org/10.1111/appy.12500

Gallagher, T. H., & Schleyer, A. M. (2020). "We signed up for this!" — student and trainee responses to the Covid-19 pandemic. *New England Journal of Medicine, 382*(25), Article e96. https://doi.org/10.1056/NEJMp2005234

Giacomini, M. K., & Cook, D. J. (2000). Users' guides to the medical literature: XXIII. Qualitative research in health care A. Are the results of the study valid? Evidence-Based Medicine Working Group. *Journal of the American Medical Association, 284*(3), 357-362. https://doi.org/10.1001/jama.284.3.357

Gill, D., Whitehead, C., & Wondimagegn, D. (2020). Challenges to medical education at a time of physical distancing. *Lancet, 396*(10244), 77-79. https://doi.org/10.1016/S0140-6736(20)31368-4

Hunter, D. J., & Reddy, K. S. (2013). Noncommunicable diseases. *New England Journal of Medicine, 369*(14), 1336-1343. https://doi.org/10.1056/NEJMra1109345

Kachra, R., & Brown, A. (2020). The new normal: Medical education during and beyond the COVID-19 pandemic. *Canadian Medical Education Journal, 11*(6), e167-e169. https://doi.org/10.36834/cmej.70317

Kalayasiri, R., & Wainipitapong, S. (2021). Training of psychiatry and mental health in a low- and middle-income country: Experience from Thailand before and after COVID-19 outbreak. *Asia-Pacific Psychiatry, 13*(4), Article e12493. https://doi.org/10.1111/appy.12493

Kanmounye, U. S., & Esene, I. (2020). COVID-19 and neurosurgical education in Africa: Making lemonade from lemons. *World Neurosurgery, 139*, 732-733. https://doi.org/10.1016/j.wneu.2020.05.126

Kaul, V., Gallo de Moraes, A., Khateeb, D., Greenstein, Y., Winter, G., Chae, J., Stewart, N. H., Qadir, N., & Dangayach, N. S. (2021). Medical education during the COVID-19 pandemic. *Chest, 159*(5), 1949-1960. https://doi.org/10.1016/j.chest.2020.12.026

Mack, H. G., Golnik, K. C., Murray, N., & Filipe, H. P. (2017). Models for implementing continuing professional development programs in low-resource countries. *MedEdPublish, 6*(1).

Marinoni, G., Van't Land, H., & Jensen, T. (2020). The impact of COVID-19 on higher education around the world. *IAU global survey report, 23*, 1-17.

McLean, M., McKimm, J., & Gibbs, T. (2017). Medical education in difficult circumstances: A global responsibility to contribute. *Medical Teacher, 39*(1), 4-6.

Motte-Signoret, E., Labbé, A., Benoist, G., Linglart, A., Gajdos, V., & Lapillonne, A. (2021). Perception of medical education by learners and teachers during the COVID-19 pandemic: A cross-sectional survey of online teaching. *Medical Education Online, 26*(1), 1919042. https://doi.org/10.1080/10872981.2021.1919042

Papapanou, M., Routsi, E., Tsamakis, K., Fotis, L., Marinos, G., Lidoriki, I., Karamanou, M., Papaioannou, T. G., Tsiptsios, D., Smyrnis, N., Rizos, E., & Schizas, D. (2022). Medical education challenges and innovations during COVID-19 pandemic. *Postgraduate Medical Journal, 98*(1159), 321. https://doi.org/10.1136/postgradmedj-2021-140032

Ramani, S., McKimm, J., Thampy, H., O'Sullivan, P. S., Rogers, G. D., Turner, T. L., Chisolm, M. S., Kusurkar, R. A., Hays, R., Fornari, A., Kachur, E. K., Wilson, K. W., Filipe, H. P., & Schumacher, D. J. (2020). From clinical educators to educational scholars and leaders: Strategies for developing and advancing a career in health professions education. *The clinical teacher, 17*(5), 477-482.

Rose, S. (2020). Medical student education in the time of COVID-19. *JAMA, 323*(21), 2131-2132. https://doi.org/10.1001/jama.2020.5227

Sahi, P. K., Mishra, D., & Singh, T. (2020). Medical education Amid the COVID-19 pandemic. *Indian Pediatrics, 57*(7), 652-657. https://doi.org/10.1007/s13312-020-1894-7

Sandal, S., Boyarsky, B. J., & Cantarovich, M. (2021). The higher impact of the COVID-19 pandemic on resident/fellow training in low- and middle-income countries. *Transplant International, 34*(5), 988-989. https://doi.org/10.1111/tri.13853

Tokuç, B., & Varol, G. (2020). Medical education in Turkey in time of COVID-19. *Balkan Medical Journal, 37*(4), 180-181. https://doi.org/10.4274/balkanmedj.galenos.2020.2020.4.003

UNESCO. (2020). *Policy brief: education during COVID-19 and beyond*. https://unsdg.un.org/sites/default/files/2020-08/sgpolicy_brief_covid-19_and_education_august_2020.pdf

Van Manen, M. (2016). *Researching lived experience: Human science for an action sensitive pedagogy*. Routledge

World Bank Group. (2021). *World Bank Country and Lending Groups – World Bank Data Help Desk*. Retrieved December 16. 2021 from https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups

Zaharias, P., & Poylymenakou, A. (2009). Developing a usability evaluation method for e-learning applications: beyond functional usability. *International Journal of Human–Computer Interaction, 25*(1), 75-98. https://doi.org/10.1080/10447310802546716

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