Original Article

Impact of COVID-19 on Postgraduate Surgical Education: A Cross-Sectional Study

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ABSTRACT

Background: The surgical education is different than other disciplines of medical training because the education requires transfer of knowledge along with the surgical skills. Due to COVID-19 pandemic, the conventional method of teaching learning activities had been affected. The aim of this study was to analyze the impact of COVID-19 on post graduate surgical education during the pandemic.

Methods: A prospective cross sectional analytical study was conducted at National Academy of Medical Sciences from February 2021 till June 2023. The study population were residents in General Surgery, Orthopaedics and Trauma Surgery, Dental and maxillofacial surgery and Ear, Nose Throat (ENT) /Head and Neck SurgeryPost Graduate programs who required skills training at National Academy of Medical Sciences. The data was collected by structured questionnaire and the data analysis was done using Microsoft Excel program and SPSS software for proportion of impact in different domains compared with Likert scale values. The P value <0.05 was considered statistically significant.

Result: There was total 66 residents which included 29 from General surgery, 16 from Orthopedics and trauma, 10 from Maxillofacial surgery and 11 from ENT Head and neck surgery. The residents who felt that their elective surgical skills learning was affected was 57(86%) and the residents who felt that their emergency surgical skills learning were affected by COVID-19 pandemic was 43(65%). The residents of general surgery, orthopedic/ trauma surgery and ENT / Head and Neck surgery felt that most that their elective surgical skills learning was affected. The emergency surgical skills learning was affected most in ENT/Head and Neck surgery program.

Conclusion: There was a an impact of COVID-19 on learning elective skills. The learning of elective surgical skills was affected most during COVID-19 pandemic and felt most in general surgery, orthopedics/trauma surgery and ENT/head and neck training programs.

Keywords: Telemedicine, Remote Learning, Simulation-Based Training, Virtual Mentorship, Clinical Competence Assessment, Digital Health Education

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INTRODUCTION

The World Health Organization declared an outbreak of a novel corona virus COVID-19 as a public health emergency of international concern and was followed by the declaration of a pandemic on March 11, 2020 [1,2]. Due to COVID-19 pandemic all the academic activities including examination and trainings had to be suspended at National Academy of Medical Sciences for a short duration [3]. The academic activities of three year post graduate surgical training programs which run with a standard and structured curriculum had been affected due to the COVID-19 pandemic. In order to address the surgical resident education during the COVID-19 pandemic, the training of surgery residents was continued by following the safety guidelines for safety of residents and faculties. The different modalities of training which have not been described in the surgical curriculum were also adopted to continue the surgical training process. This can have a major impact on post graduate surgery students' knowledge and skills which subsequently will have an impact in the quality of surgical education.

There was an impact of COVID- 19 on the academic neurosurgery [4] due to decrease in adult and pediatric surgery numbers during COVID-19 pandemic and cancellation of surgery than delayed ($P<0.0001$). The research gap identified here is whether the online training courses and training programs can be applied to surgical education without compromising the quality of surgical education. Furthermore, the impact of change in the surgery education modality to online and virtual sessions also needs to be assessed. The aim of this study is to analyze the impact of COVID-19 pandemic on post graduate surgical education at National Academy of Medical Sciences.

METHOD

The National Academy of Medical Sciences (NAMS) Kathmandu, Nepal has objective to develop trained health human resources, make available high-quality health services and expand research [5]. A cross-sectional analytical study was conducted at National Academy of Medical Sciences from February 2021 till June 2023. The sample size was done using census method with total number of residents in all programs of surgical disciplines. The study population was the residents in post graduate programs at National Academy of Medical Sciences. The list of residents in different programs requiring surgical skills learning such as General Surgery, Orthopedics and Trauma Surgery, Dental and maxillofacial surgery and Ear, Nose Throat (ENT) /Head and Neck Surgery in National Academy of Medical Sciences were used as the sampling frame. The inclusion criteria were the residents requiring surgical skills learning at National Academy of Medical Sciences and the residents who provide written informed consent and the exclusion criteria were the residents who were on leave during COVID-19 pandemic and the international residents who were not present during COVID-19 pandemic. The data was collected using structured questionnaire and the data analysis was done using Microsoft Excel program and SPSS software for proportion of impact in different domains compared with Likert scale values. The P value<0.05 was considered statistically significant. The study approval was taken from Institutional Review Board of National Academy of Medical Sciences (No-13-16-7-2020).

RESULTS

The residents that felt their elective surgical skills learning was affected was 86% and 65% residents felt that their emergency surgical skills learning was affected by COVID-19 pandemic (Figure 1). Most of the residents (70%) faced some sort of technical difficulties with on-line class rooms. The total respondents agreed upon learning being impacted on switching journal clubs and topic presentation to online modality were 57% and 58% respectively. More than two third (77%) of the respondents had their thesis project affected by COVID-19 pandemic.

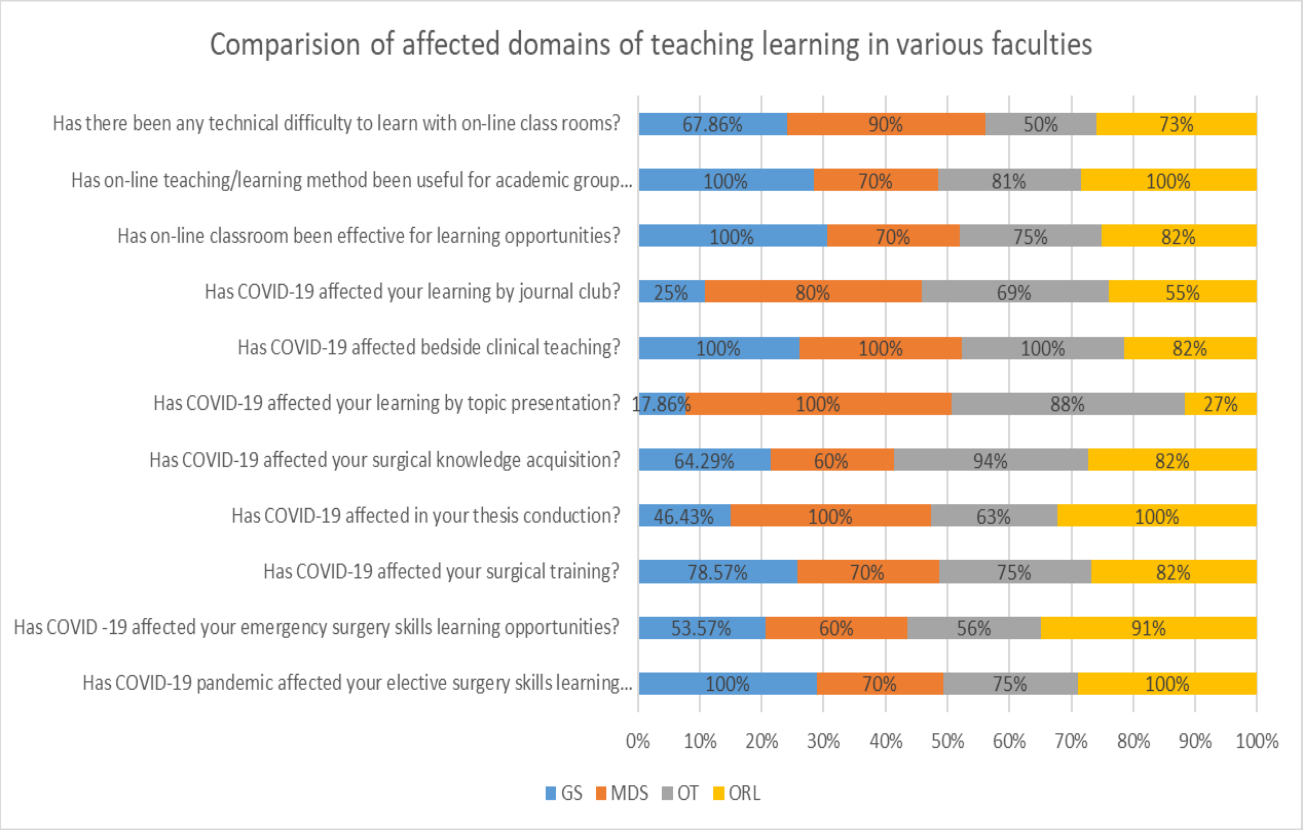

Figure 1. The affected teaching learning domains among General Surgery(GS), Orthopaedics and Trauma Surgery (OT), Dental and Maxillofacial surgery(MDS) and Otorhinolangology surgery(ORL) during COVID-19 pandemic

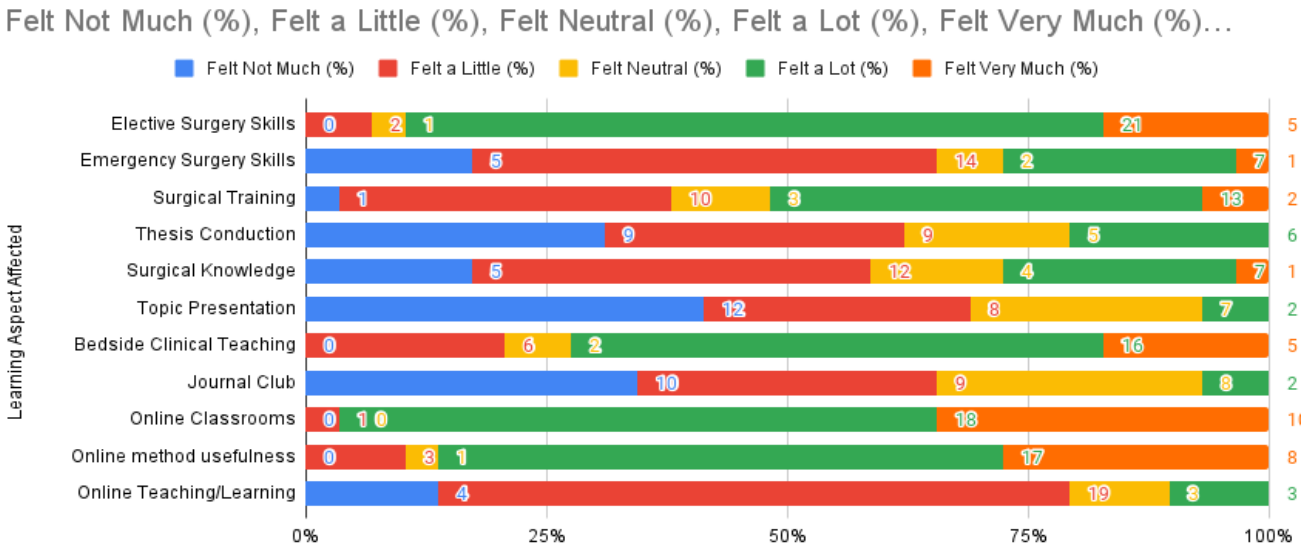

Figure 2: Bar graph showing the impact of COVID 19 on various learning aspects among residents of General Surgery

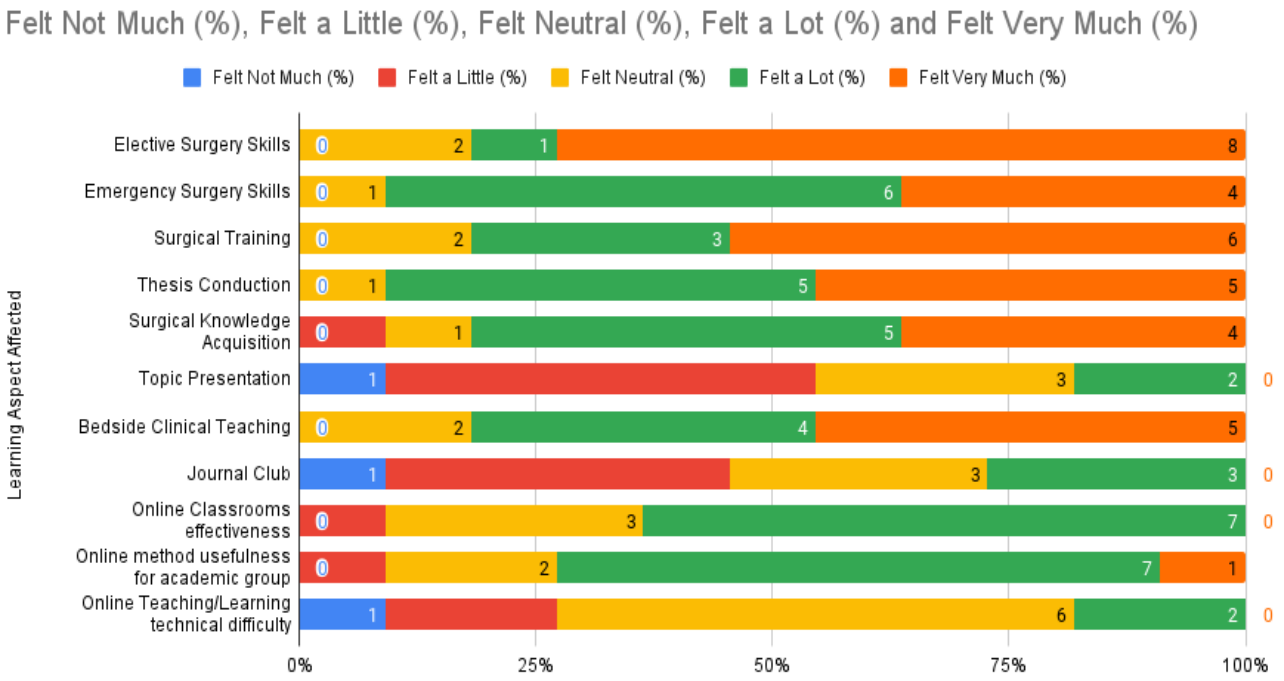

Figure 3: Bar graph showing the impact of COVID 19 on various learning aspects among residents of Ear, Nose Throat /Head and Neck surgery(Otorhinolaryngology)

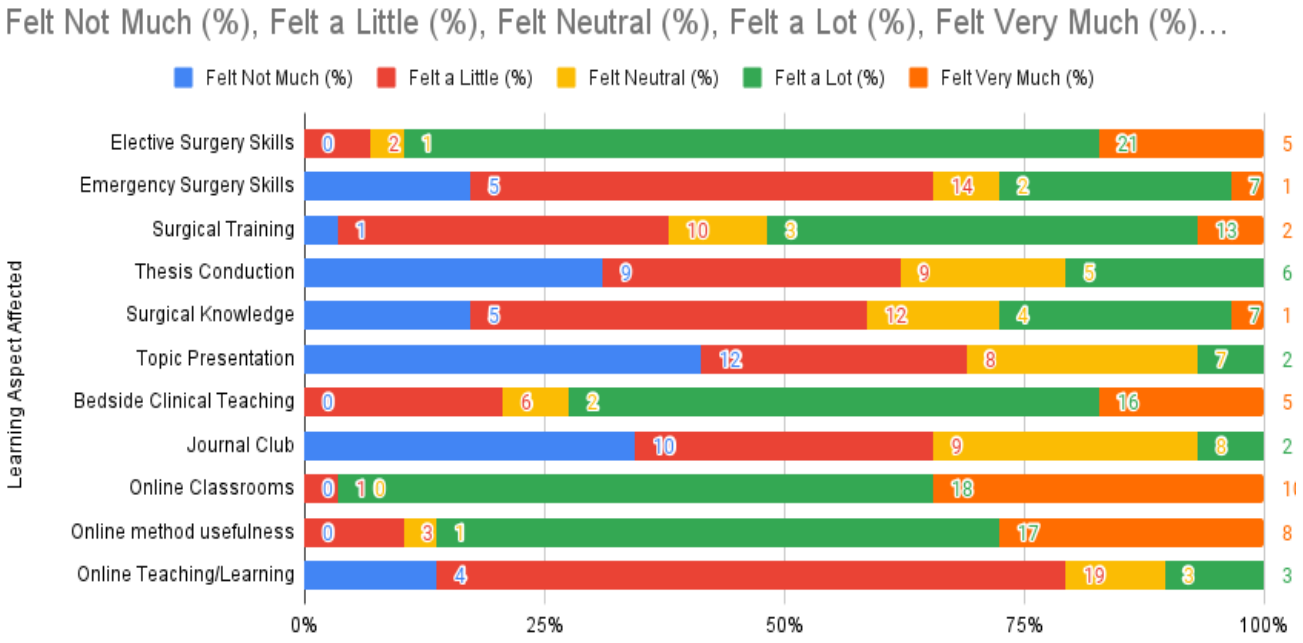

Figure 4: Bar graph showing the impact of COVID 19 on various learning aspects among residents of Orthopedic and Trauma surgery

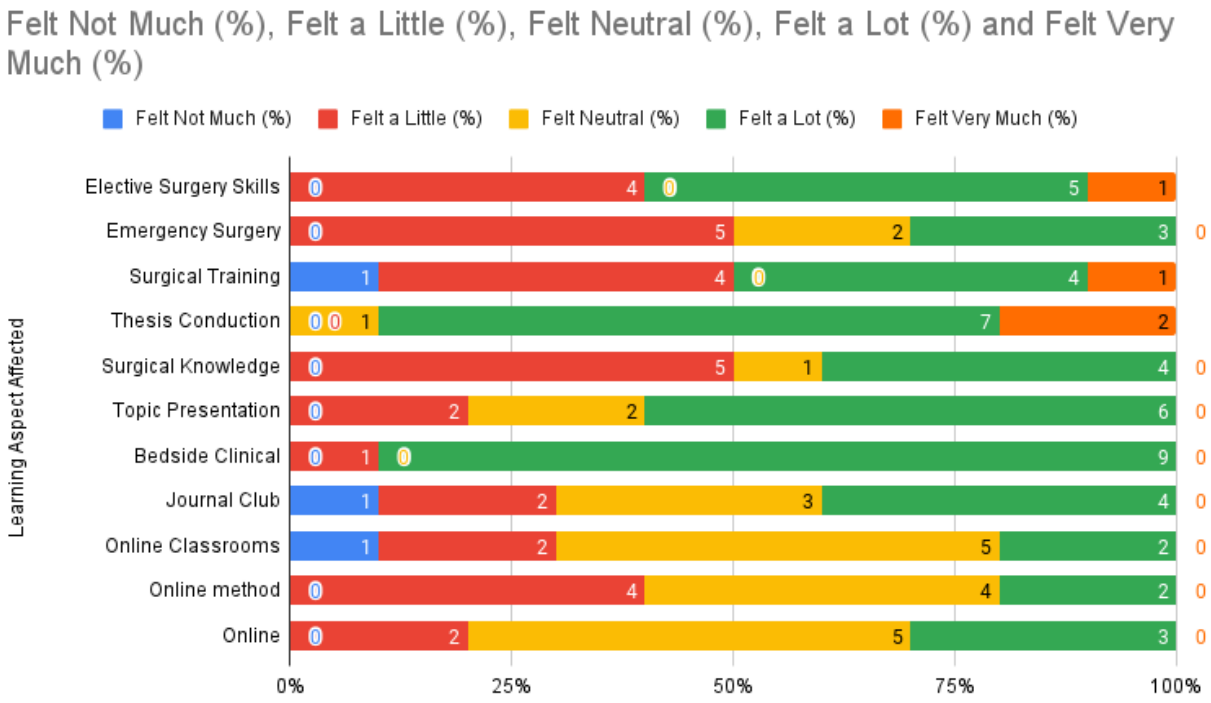

Figure 5: Bar graph showing the impact of COVID 19 on various learning aspects among residents of Dental and maxillofacial surgery

The elective surgery skills learning was most affected for general surgery residents (Figure 2) and similar findings for ENT Head and Neck residents (Figure 3) and Orthopedics and Trauma surgery residents (Figure 4). The bed side clinical teachings were most affected for maxillofacial residents (Figure 5). The mean impact on learning of elective surgery skills was 3.72, indicating a significant impact whereas the mean impact on learning of emergency surgery skills was affected to a considerable extent, with a mean of 2.98. Surgical training experienced a notable impact, with an average score of 3.38. The ability to conduct theses was also influenced, as reflected by an average score of 3.37. Surgical knowledge acquisition faced challenges, with an average score of 2.70. Topic presentation was moderately affected, scoring 3.33. Bedside clinical teaching encountered a substantial impact, garnering an average score of 3.91. Journal Club activities were influenced to a certain degree, with an average score of 2.76. Online Classrooms' effectiveness scored 3.53, highlighting a significant shift in the learning environment. The usefulness of online methods for academic group discussion received an average score of 3.56, while online teaching/learning technical difficulty was noted with an average score of 2.74. These scores collectively reveal the multifaceted challenges posed by the pandemic on the surgical training landscape during COVID-19. (Figure 2-5)

DISCUSSION

The COVID-19 pandemic has undeniably left a notable imprint on surgical education and training. However, there has been limited exploration in the literature regarding the enduring effects of the COVID-19 pandemic on surgical education in Nepal. Ahmad H et al from University of Southhampton, UK has raised concerns regarding the ingenuities for medical education that will emerge in the face of the COVID-19 pandemic [6]. The concern is more in the surgical education where there is need of hands-on exposure to surgical procedures for the surgical skills transfer for the training of surgical

residents. Joshi et al. has also highlighted the status of surgical education in low- and middle-income countries and areas for improvement for better quality surgical education which showed the need of virtual simulation trainings in surgical education in low- and middle-income countries [7]. In countries like Nepal, the use of simulation and virtual trainings will improve patient safety during training of surgeons. In the time as COVID-19 pandemic, the use of online teaching modality and virtual simulation training kept the surgical training programs meet their goals.

Transition to virtual education for surgical trainee was global during pandemic [8]. There have been many academic surgical programs where the emergency Surgery Residency programs were restructured during COVID-19 pandemic [9]. The shift to telemedicine has been accelerated due to COVID-19 [10] and telesurgery has also been shown to be effective for remote education. Surgical training programs faced considerable challenges, suggesting a need for innovative approaches to maintain the quality of training programs.

Elective surgery skills learning opportunity have been significantly affected, pointing towards the challenges in maintaining a comprehensive training experience. Similarly, emergency surgery skills learning opportunity encountered notable difficulties, emphasizing the disruptions caused by the pandemic on hands-on emergency procedures. Clements JM [11] and Coleman JR [12] also showed similar impact on surgical training in the United Kingdom and the USA. Gómez-Barrena E et al have reported abrupt stoppage of scheduled surgery and clinics in department of orthopaedic surgery and traumatology for hospital resource reorganization during COVID-19 pandemic in Spain had direct impact on surgical training [13]. Contrary to a study by Muhammad et al which showed that there has been positive impact where the number of emergency surgical procedures attended by residents were reportedly increased during the pandemic,[14] more than half of our residents (65%) believe their emergency surgical skills to be affected by COVID-19, and similarly in a scoping review focusing on neurosurgical practices by Dokponou et al , despite increment in emergency workload , marked reduction in surgical training of resident is reported [15].

In a study by Qaedir et al, challenges in developing clinical skills and operative skills due the COVID-19 pandemic was faced by 70 % and 40% of the participants respectively [16] which aligns with our study where 76% of residents believe to have their surgical training affected by COVID -19 pandemic with maximum effect (82%) on Otolaryngology residents surgical training. It was notable that the mean scores reflecting the impact of COVID-19 on various training activities were consistently higher for the otorhinolaryngology department. This may be due to the fact that they were the one most exposed to the droplet contamination. Another plausible explanation for this trend could be the stringent personal protective equipment (PPE) precautions and the reduced handling of causes related to Otorhinolaryngology during the COVID-19 pandemic. Given the nature of respiratory-related concerns and the potential for virus transmission through aerosolized particles, Otorhinolaryngologists likely had to adhere to strict safety protocols, impacting their ability to conduct certain procedures and engage in hands-on training. The direct impact of this can be seen over surgical skills and confidence of surgical residents, and also has contributed to skill decay of the surgical trainees [17,18]. Comer B T et al from University of Kentucky, University Hospitals Cleveland Medical Center and Georgetown University in the United States have highlighted the current and future implications of otolaryngology – head and neck surgery education in the setting of COVID-19[19].

Additionally, while operative experience is only one aspect of surgical training, other areas of training such as thesis conduction, surgical knowledge acquisition, learning by topic

presentation, and bedside clinical teaching have also been affected, showcasing the diverse effects of the pandemic on different aspects of surgical education. The thesis project of more than two thirds (77%) of the residents have been affected by COVID-19 pandemic, which is comparable to study by Keswani et al where 70 % of the respondents agree upon COVID-19 affecting their research projects [20].The residents felt that the bed side teaching in groups could not be done during the pandemic due to risk of COVID-19 transmission emphasizing the difficulties in providing hands-on clinical skills learning and bed side clinical learning experiences during the pandemic. Journal club activities were affected to a certain degree but in magnitude was the least affected.

Despite the overwhelming negative impact of COVID-19 on surgical training, on a positive note, the transition to online learning, as seen in the evaluation of the effectiveness of virtual classrooms and the utility of online methods for academic group discussions [21,22]. As in our study, where all respondents from general surgery agreed upon online classrooms being effective for academic group discussion and learning opportunities, most of the respondents from general surgery in a study from Wise et al considered online classes to be similar or better than in person instructions [23]. In an experience of Plastic and Reconstructive surgery training at Guy and St. Thomas Hospital, London, UK, Sleiwah A et al. [24]. have concluded that the virtual learning utilizing webinars has enabled continuous professional development. In Nepalese context, the technical difficulty with online classrooms felt by the residents may be due to lack of prior exposure to remote teaching learning experience, poor internet connection and lack of adequate training on platforms like Zoom and Microsoft Teams which also aligns with the statement by Spencer et al. [25]. The technical difficulties associated with online teaching/learning highlight the learning curve and infrastructure gaps that need to be addressed to ensure a smooth transition to online teaching/learning platforms.

Although there is no substitute for hands-on learning through operative experience and direct patient care, the innovative techniques like the flipped classroom model, online practice questions, teleconferencing instead of in-person lectures, involving residents in telemedicine clinics, procedural simulation, and the facilitated use of surgical videos for maintaining surgical resident education [26] may be ways to mitigate the loss of learning exposure during pandemic as COVID-19. These innovative solutions utilizing technology may help to bridge the educational gap for surgical residents during this unprecedented circumstance. Ehrlich H et al has concluded that the spread of COVID-19 will decline but the use of virtual learning in surgical education should continue to grow [27]. The recommendations to incorporate virtual learning at each level of surgical education creates a constant flow of technological exposure and at present, virtual learning serves as a means to improve surgical education by creating easily accessible platforms for distributing knowledge and practicing skills, not as a full replacement for hands-on clinical experiences.

CONCLUSION

The learning of elective surgical skills was affected most and emergency surgical skills to some extent during COVID-19 pandemic, however felt most in general surgery, orthopedics/trauma surgery and ENT/head and neck training programs. The COVID-19 pandemic has necessitated a reevaluation of traditional teaching methods and the implementation of innovative strategies to ensure the continued excellence of surgical training programs in the face of unprecedented challenges. The academic programs requiring hands on training for skills transfer should also use virtual and simulation training strategies.

Study Limitation: The use of data on elective and emergency operative case volume would have provided additional findings on impact of

COVID-19 on surgical skills acquisition opportunity for residents. In addition, the experience from multiple institutions would have provided stronger evidence for recommendation.

Author Contributions:

AJ reviewed the literature, conceptualized and designed the research; AJ did data collection, AJ,PL,SP did further literature review, data analysis and prepare result, AJ, PL , SP drafted the manuscript; and all authors reviewed the manuscript and approved the final version of the manuscript. All authors agreed to be accountable for all aspects of the research work. Note: AJ, PL and SP are abbreviated name authors of Anip Joshi, Prajjwal Luitel and Sujan Paudel.

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Ethical Approval: This research was approved by IRB of National Academy of Medical Sciences with the reference number of 13 on 14 July, 2020.

Consent/Assent: 1: Informed written consent was obtained from the all the participants before data collection.

Data Availability Statement: Data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest: Author(s) declare no conflict of interest

Source of Funding:

The author(s) received no external fund for this research)

Layman summary: As COVID-19 pandemic had impacted the surgical training programs globally, we aimed to document this unique scenario where the restrictions measures for COVID-19 had impacted surgical training program including various teaching/learning domains at our institution. This article evaluated the perspectives of surgical residents from 4 programs which required hands-on skill learning opportunities - General surgery, Orthopaedics, Otorhinolaryngology and Dental & Maxillofacial surgery. Furthermore, the research aims to identify gaps that have surfaced in various aspects of surgical training in our context, shedding light on the specific challenges and possible solutions.

This research clearly highlights the possible changes to be adopted in surgical training programs for similar situations in the future which can be utilized to maintain the quality of surgical training programs.

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