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ORIGINAL ARTICLE

IMPACT OF COVID-19 PANDEMIC ON RADIOLOGY RESIDENCY TRAINING IN ETHIOPIA

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ABSTRACT

Introduction: *Radiology practices are facing unprecedented challenges during COVID-19 pandemic not only in how they are providing care to patients, but also in how to continue to educate the next generation of radiologists. Education is one of the areas challenged markedly by the pandemic. This study mainly analyzed the impact of COVID 19 on radiology residency in Ethiopia and look into alternative, innovative options that radiology departments were using in order to maintain the training program.*

Methods*: This is a survey done during the month of May and June 2020. A questionnaire was prepared using a google forms application and link was sent to all radiology residents using a telegram messenger group. Questionnaire contains learning and teaching activities before and after COVID 19 pandemic.*

Result: *Of the total 211 radiology residents who were in training in the radiology residency in Ethiopia 119 residents fulfilled the inclusion criteria, of which 93 (78.2%) were males and 26 (21.8%) are females. Nearly one-half, 52 (43.3%). of residents were in their third year while 45 (37.5%) and 21(17.5%) in their second and first year of residency training respectively. Seminar and daily image viewing sessions were the most common ways of radiology teaching activities, accounting for 93.3% and 91.6%, respectively. More than half (50.4%) of respondents stated that the activities were compromised as some activities had to be replaced by alternative models. Use of open source video conferencing (74.4%) was the most commonly used alternative method.*

Conclusion: *The COVID-19 pandemic disrupts radiology residency training as the traditional models of teaching and learning, which mainly employs face-to-face encounters and discussions will no more be effectively implemented. The use of alternative methods helps in overcoming the challenges and is an opportunity to explore online teaching models which other parts of the world were implementing even before the pandemic.*

Key words: *COVID-19, pandemic, radiology, residency training, Ethiopia*

INTRODUCTION

An unprecedented outbreak of pneumonia of unknown etiology in Wuhan City, Hubei province in China emerged in December of 2019. Coronavirus was found as the causative agent and the World Health Organization (WHO) named it COVID-19 on 11 February 2020 (1). The coronavirus disease 2019 (COVID-19) outbreak rapidly expanded to Europe, America, and the African continent and progressed to a worldwide pandemic.

This development caused serious implications for public health institutions and raises particular questions for medical schools (1). The effect can be devastating in the case of Africa as there are already complex challenges in the continent such as rapid population growth and increased movement of people, high burden of endemic diseases, and an increasing incidence of non-communicable diseases (2).

Ethiopia is one of the countries with a very low health care workforce density of about 0.96 per 1000 population. There are inadequate number of hospitals, shortages in transportation facilities, and lack of personal protective equipment for health care providers. These constitute the major driving factors making Ethiopia one of developing countries heavily challenged by the unprecedented COVID-19 pandemic (3).

Education is one of the heavily impacted social sectors by the COVID 19 pandemic in Ethiopia. Schools have been closed following the declaration of the disease as a pandemic by the World Health Organization on 12 March 2020. As a result, around 25 million pre-primary, primary, secondary, and tertiary-level students are staying at home. One of the changes introduced includes canceling of in-person medical classes and replacing them with recorded lectures or live-video conferencing.

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This may eventually result in loss of collaborative experiences that could negatively affect education, but the actual impact needs to be studied (5).

Many schools and faculties have canceled clinical clerkships for different reasons. One such reason is that this measure will decrease the risk of exposure of medical students to the COVID 19, which is an understandable concern, although many students are willing to put themselves at risk and as such can be frustrated by these decisions. The COVID-19 pandemic has also affected medical education as a result of cancellation of medical conferences. The conferences involve presentations by medical students, which contribute to students' credentials supporting their residency applications.

As for the other residency programs, the radiology program has also been affected by the pandemic. Radiology practices have encountered unprecedented challenges not only in how they are providing care to patients, but also in how to continue to educate the next generation of radiologists (4). Even though many teaching and learning activities like seminars, interdepartmental joint sessions, and daily image viewing sessions have severely compromised, the true impact of the pandemic on radiology residents is not known.

The impact of COVID-19 on tertiary education in general and medical education in particular is largely unknown. Already, faculty, medical students, and residents are impacted by the pandemic and are forced to change and reschedule their regular working activities. This study is primarily aimed to analyze the impact of COVID 19 on Ethiopian Radiology residency programs and also describe alternative innovative options the program is using to maintain the teaching-learning activities during the pandemic.

PARTICIPANTS AND METHODS

The study was conducted in Ethiopian institutions of higher education which are currently running radiology residency program - Addis Ababa University (AAU), Saint Paul Hospital Milleneum medical College (SPMMC), Gondar University, Bahirdar University, and Mekelle University). An online survey using a google forms application was prepared, then the form link was sent to all radiology residents using a telegram messenger group. The form contains variables on demographic characteristic, year of residency, learning and teaching activities before and after COVID 19 pandemic, access to internet service at home, and infection prevention methods they practice in their departments.

The responses were collected in a google spread sheet which was then uploaded on SPSS version 25 and data cleaned. Descriptive statistics was used to analyze the data and the results were summarized using tables and figures.

Ethical review to conduct the study was obtained from the ethical review committees of the Department of Radiology, Tikur Anbessa Specialized Hsopital (TASH) of AAU. There were no personal information identifiers in the questionnaire and all pieces of information were kept confidential. Informed consent was obtained from each study participant before they fill the questionnaire

RESULTS

Of total 211 radiology residents who were in training during the study period. 63 were in SPMMC, 58 in Addis Ababa University, 34 in Mekelle, 30 in Gondor and 26 in Bahirdar. All were invited to the online survey and 131of the 211 (60%) of residents in training participated in the survey. Twelve (9.1%) of the response were excluded from the study due incomplete data they provided and 119 residents fulfilled the inclusion criteria for the study. Of the 119 residents, 93 (78.2%) were male and 26 (21.8%) are female residents. A majority (42.5%) of responpondants were from AAU, while the rest were from SPMMC (18.3%), Bahirdar University (16.7%), Mekelle University (11.7%), and Gondar University (10%). Nearly one-half 52 (43.3%) of respondents were in their third year, while 45 (37.5%) were in their second year and the rest 21(17.5%) in their first year of residency training.

According to the response, seminar and daily image viewing sessions were the most common ways of radiology teaching activities at their respective institutions, each accounting for 93.3% and 91.6%, respectively. Others teaching activities included small group discussion (71.4%) interdepartmental joint session (67.2%) and case review which is practiced in 63.9% of the time. Journal club is the least way of teaching activity which only practiced in 2.5% of the time. One-half of the respondents stated that the activities are compromised with some activities replaced by alternative models,l while 35.3% of the respondents said the activities were completely interrupted (Figure 1). Some 53.4% (N=103) of the residents had internet access outside their institutions and most were the institutions Addis Ababa, while 70.5% of the residents outside Addis Ababa responded as having no internet access outside their institutions.

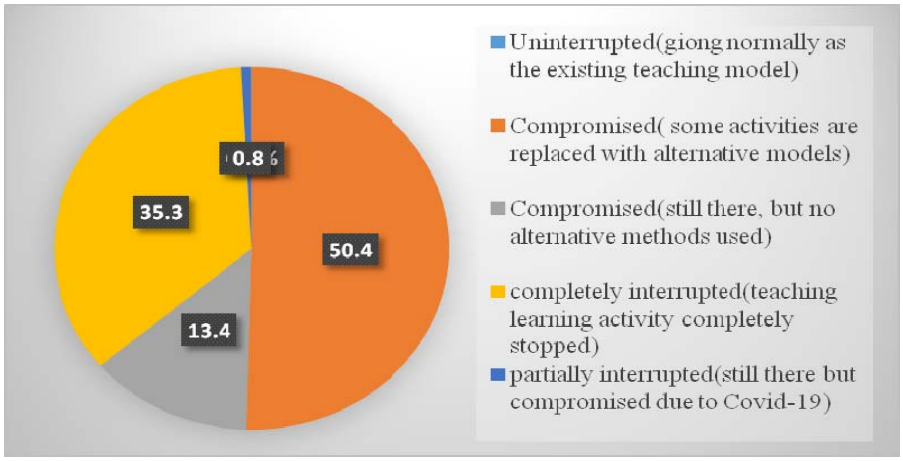

Figure 1: Responses for the current radiology residency teaching-learning activities in institution of higher education, Ethiopia, 2020

When we see alternative methods that were being used to maintain the teaching-learning activity, 79 residents responded and who indicated that using open source video conferencing is the most commonly used (74.4%) alternative method followed by use of social media groups for case discussion (57%) Continuing activities in small groups and providing residents with online teaching materials were the third common alternative methods (44%).

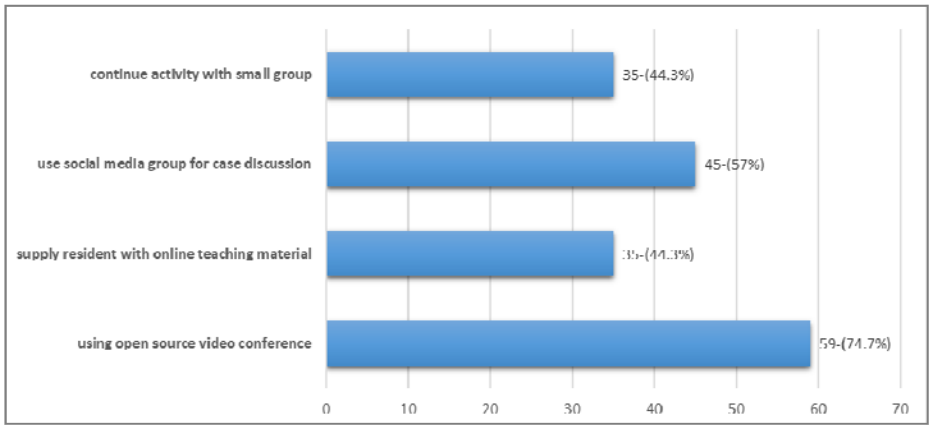

Figure 2: Bar graph showing alternative models being used to continue teaching-learning activities

When we compare the number of radiological examinations that were undertaken and interpreted by radiology residents, there is a significant difference before and after the COVID-19 pandemic. Before COVID-19, the mean (SD) number of x-rays interpreted/performed or observed in a week by 91 (75.8%) of respondent residents was 156 (±150), ranging from 0 to 700. The number of x-rays interpreted and or observed after COVID-19 pandemic Similarly, the number of ultrasound performed/observed reduced from 72.8 (±52) 28.7 (±29.3), after COVID-19 (Figure 3).

When we compare the number of computerized tomography (CT) scan interpreted/performed or observed, the mean 9SD) is 22 (±20), ranging from 0 to 80 cases in 90 (75.6%) of resident responses before COVID-19 and mean (SD) of 9.5 (±11.5)

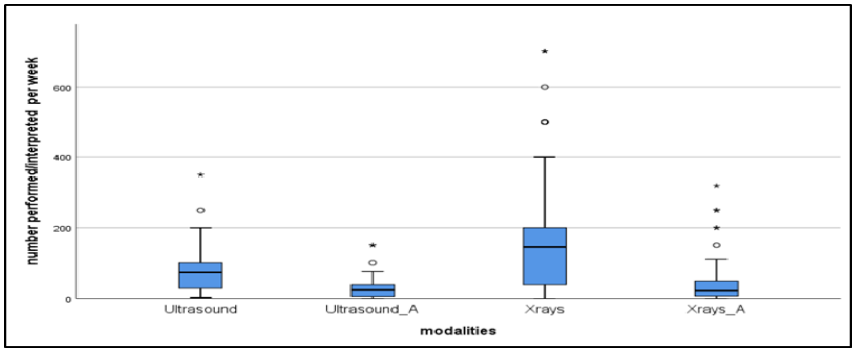

Figure 3: Boxplot comparing the number of ultrasound performed before and after COVID-19 pandemic per week. Ultrasound (ultrasound before covid-19, Ultrasound_A (ultrasound after COVID -19), X-ray (X-ray before covid19), Xray_A(X-ray after covid-19).
*= Extreme outliner numbers.
=Outliners.

Before COVID-19, the mean (SD) magenric resonance imaging (MRI) interpreted/ performed/observed is 8 (±18) cases, ranging; from 0 to 80 cases among 67 residents who responded, while the mean (SD) after COVID-19 is 5.4 (±8.5) cases, range inging from 0 to 40 cases among 48 respondant residents (Figure 4). the mean fluoroscopy interpreted/performed/observed before COVID-19, the mean (SD) is 4 (±5.5) cases, ranging from 0 to 15 cases among 70 (58.8%) residents who responded. After the COVID-19 pandemic, the mean (sd) is 0.6 (±1.7) cases., ranging from 0 to 10 cases among 53 (44.5%) of the residents who responded (Figure 4). Image-guided procedures performed/observed before COVID-19, the mean (SD) is 3.5 (±4.2) cases, ranging 0 to 15 cases in 64 residents who responsd and, after COVID-19, the mean (SD) is 0.7 (±1.5) cases, ranging from 0 to 8 cases among 44 residents who responded.

Regarding infection prevention activities that are being practiced in the radiology department after COVID-19 pandemic, 111 residents responded and 95 (85.6%) of them had sanitizer available, 83 (74.8%) residents had gloves available, and 79 (71.2%) residents had facemask available. As an infection prevention method, nearly one-half, 49 (44.1%), and 48 (43.2%) of residents practice Re-appointment of non-emergency imaging and remote teaching using video conferences respectively. Training on infection prevention and control, imaging equipment disinfecting facility available, and personal protective (PP)-gowns available if needed are among the least available infection prevention methods that are only available/ practiced by 15 (13.5%), 8 (7.2%) and 2 (1.8%) radiology residents, respectively (Figure 5).

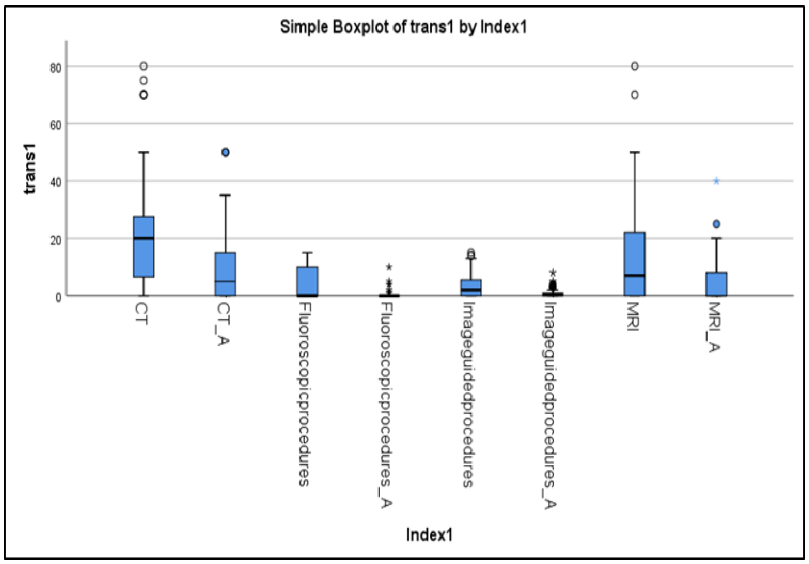

Figure 4: Boxplot comparing the number of CT, MRI, fluoroscopy, and procedures performed before and after covid-19 pandemic per week. CT(CT before covid-19), CT_A(CT after COVID-19), Fluoroscopies(Fluoroscopies before covid-19), Fluoroscopy_A (Fluoroscopy after covid-19), Image-guided procedures(Image-guided procedures before covid-19), Image-guided procedures_A (Image-guided procedures after covid-19), MRI (MRI before covid-19), MRI_A (MRI after covid-19). *= Extreme outliner numbers. =Outliners.

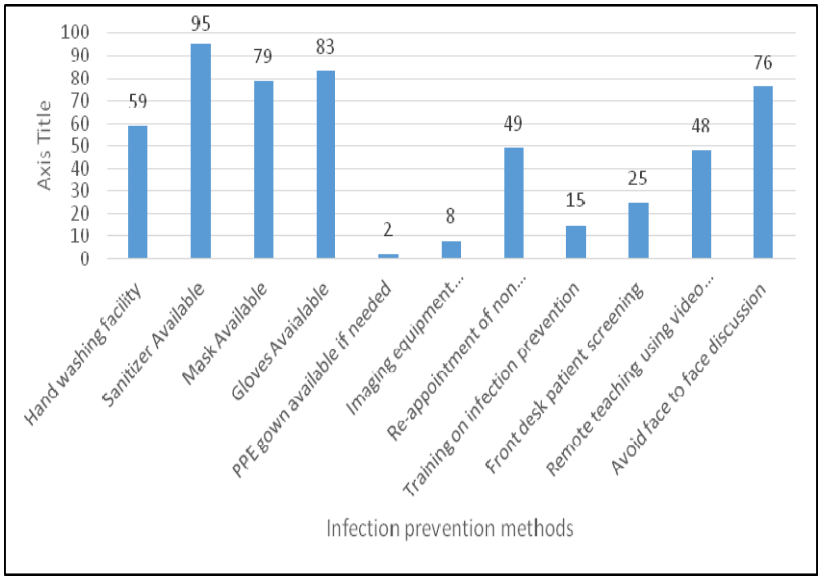

Figure 5: Column showing infection prevention methods being used in radiology departments

Among 112 residents who responded regarding the continuation of resident teaching-learning activities around 83.3% voted to continue with alternative models (Figure 6). If teaching-learning activity is completely interrupted, more than half (53.6%) of residents answered that reason is due to covid-19 and its impact.

Another 26.8% of residents states that it is due to poor motivation from the department while rest (19.5%) said it is due to the inability to use alternative models due to lack of internet access outside institutions.

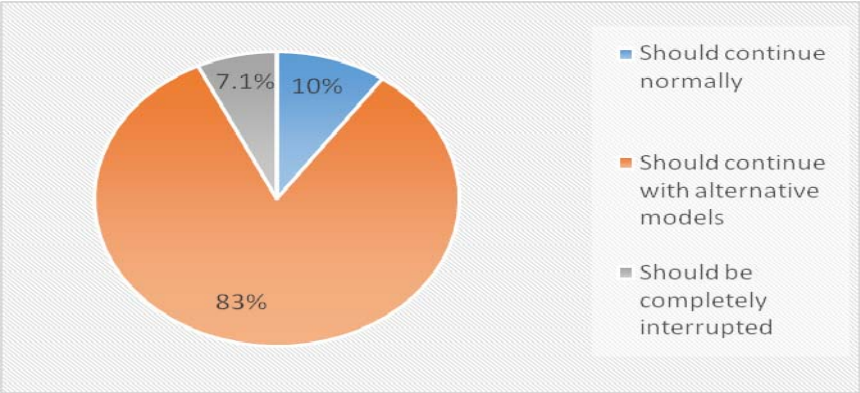

Figure 6: Pie chart showing resident's opinion regarding the continuation of resident teaching-learning activities.

DISCUSSION

The COVID-19 pandemic is evolving rapidly and widely all over the world disrupting personal and professional life, including that of medical students and radiology trainees. Even if some postgraduate programs have continued, primary and secondary schools as well as higher education institutes including universities have been closed due to the COVID-19 pandemic in Ethiopia. This study revealed that radiology teaching-learning activities are compromised in all teaching schools in the country. It has also shown that radiology departments are employing alternative teaching methods replacing the face-to-face teaching models, which were uniformly used in all schools.

This study showed that more than half (57.3%) of radiology trainees are in the capital city of Ethiopia Addis Ababa training in AAU and SPMMC. This is likely due to the comprehensive and specialized nature of these institutes with multiple subspecialty services they provide. Besides, AAU is one of the pioneer universities in Ethiopia with an experience of more than a century.

As we clearly see from this study, almost all major models of teachings were similar across the whole radiology teaching institutions, which included; daily image viewing sessions, interdepartmental joint sessions, seminars, small group discussions and case reviews. Based on the response in the study, daily image viewing sessions and seminars were the most common ways of radiology teaching activities, each accounting for 91.6% and 93.3%, respectively.

The introduction of COVID-19 infection prevention strategies, particularly physical distancing and avoiding of face-to-face activities significantly affected most teaching-learning activities.

Moreover, marked reduction in case load in relation to the pandemic together with appointing of non-emergent imaging have a significant impact in individual exposure during their training period. Such strategies of reducing patient crowed was also practiced in other radiology institutions and also endorsed by the American College of radiology (ACR)(6).

Due to the nature of the traditional teaching models, which need gathering of residents and staffs in conference rooms and face-to-face discussions, as well as the need of physical contact during teaching of procedural skills, using alternative methods of teaching is mandatory. This is essential if we need to maintain the teaching models, which were practiced in only 50% of our institutions. Almost all of the institutions which have already made a shift from the traditional teaching model to alternative methods during this study period were in the capital city, Addis Ababa, partly due to better access to the Internet. All institutions which are currently running radiology training programs have Internet access, but only 53.4% of respondents had Internet access outside the campus. Even if videoconferencing is shown to be cost effective in residents' teaching and learning process (7), it incurs the residents more cost to travel all the way to the campus to get access to the Internet.

Tele-radiology and videoconferencing are practiced worldwide in most continents and is being used for remote service delivery before the pandemic (8-11), it is also known that it is used to improve training in radiology including in isolated regions. The use of videoconferencing enables successful completion of an educational program dealing with non-interpretative competencies for radiology trainees located considerable distances away from a main teaching institution (8). Despite the availability of alternative methods of teaching, some activities should continue with traditional models. For institutions which have never practiced this alternative model of teaching, this is encouraging and strategies should be designed to fully maintain such alternative methods.

Even though face mask, gloves and sanitizers are available to majority of residents, the absence of adequate, PP-gowns and equipment disinfecting facility in radiology departments especially in areas where there is direct contact with patients, like ultrasound examinations and image guided procedures, will impose additional mental stress to residents which may have an impact on the teaching learning.

In the author's opinion, COVID-19 is not only be a treat to the radiology training but is also an opportunity to introduce online teaching methods, which were practiced and shown to be effective even before the pandemic.

with due consideration of infection prevention and physical distancing, avoidance of staff and resident crowding, and other patient safety considerations.

Conclusion

The COVID-19 pandemic has widely disrupted professional life, and medical students, including radiology training. In spite of this disruption, the pandemic should also be taken as an opportunity to explore alternative methods of teaching like implementing teleradiology to continue with radiology teaching. Institutions should look for alternate solutions for residents to have access to the Internet on their living compounds. In addition, optimal infection prevention strategies should be implemented in the radiology departments to boost resident's confidence and avoid stress during practice and learning.

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Competing Interest

The authors declare that this manuscript was approved by all authors in its current form and that no competing interest exists.

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