

Impact of Covid-19 on Residency Training in Tertiary Health Institutions in Nigeria: A National Survey

*Kelechi E. Okonta¹, Daprim S. Ogaji², Okechukwu S. Ogah³, Oladimeji Adebayo³, Ugo U. Enebeli⁴, Musliu Adetola Tolani⁵, Ayokunmi Sowade⁶, Tope E. Adeyemi⁷, Oluwaseyi Ogunsuji⁸, Olayinka Atilola⁹, Olusegun Olaopa¹⁰, Charles P Okpani¹, Emeka M. Okonta¹¹, Aliyu Sokomba¹², King-David T Yawe¹³

¹Department of Surgery, University of Port Harcourt Teaching Hospital, Nigeria. ²Department of Preventive and Social Medicine, University of Port Harcourt, Choba, Nigeria. ³Department of Medicine, University College Hospital, Ibadan, Nigeria. ⁴Department of Community Medicine, University of Port Harcourt Teaching Hospital, Nigeria. ⁵Department of Surgery, Ahmadu Bello University Teaching Hospital, Zaira, Kaduna State, Nigeria. ⁶Department of Family Medicine, Federal Medical Centre, Ebute-Metta, Lagos state, Nigeria. ⁷Department of Child Dental Health, Aminu Kano Teaching Hospital, Kano, Nigeria. ⁸Department of Periodontology and Community Dentistry, University College Hospital, Ibadan, Nigeria. ⁹Department of Behavioral Medicine, Lagos State University College of Medicine Ikeja, Lagos, Nigeria. ¹⁰Department of Oral and Maxillofacial Surgery, University College Hospital, Ibadan, Nigeria. ¹¹Department of Human Anatomy, College of Basic Medical Sciences, Bingham University, Karu, Nasarawa State, Nigeria. ¹²Department of Community Medicine, Ahmadu Bello University Teaching Hospital, Zaria, Nigeria. ¹³Division of General Surgery, University of Abuja Teaching Hospital, Abuja, Nigeria.

Abstract

Background: The emergence of COVID-19 had a massive impact on the health system globally. While there are many kinds of literature reporting the impact on postgraduate medical training in other parts of the world, this cannot be said about Nigeria.

Methodology: This was a national cross-sectional study among Resident doctors via an online google form survey for 8-months. Stratified cluster design where the entire country was stratified into the six geopolitical zones, and Tertiary Health Institutions (THI) were randomly selected from each of these zones. Data from the 47-item google form were analysed with Statistical Package for Social Science (SPSS) version 23, and internal consistency reliability was measured by Cronbach's alpha coefficient. Categorical variables were compared using chi-square, and the p-value was <0.05.

Results: A total of 239 residents from THI in all six geopolitical zones completed the survey. The mean± standard deviation of the age of respondents, years in practice, and years in residency were 36.3±4.4; 10.2±7.6 years, and 4.2±2.6 years, respectively. The Cronbach's alpha coefficient was 0.95. Less than half had delayed the progression of residency (44.4%). The least strongly positive impacts were related to recruitments (4.2%), laboratory testing (4.2%), and ward rounds (4.2%); and the more strongly positive disruptive impact was on postgraduate seminars (9.2%), research (8.4%), professional examinations (8.0%) and residents' clinical schedules (8.0%).

Conclusion: COVID-19 has caused a considerable delay in residents' training programs, and resident doctors have great concerns regarding the pandemic. This impact is perceived by them in almost all aspects of the training.

Keywords: COVID-19; Nigeria; National Survey; Residency Training.

Corresponding Author: *Kelechi E. Okonta

Department of Surgery, University of Port Harcourt Teaching Hospital, Nigeria
kelechi.okonta@uniport.edu.ng

Access this article online

Quick Response Code:



Website:

www.nigerianmedjournal.org

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

How to cite this article: Okonta KE, Ogaji DS, Ogah OS, Adebayo O, Enebeli UU, Tolani MA, et al. Impact of Covid-19 on Residency Training in Tertiary Health Institutions in Nigeria: A National Survey. Niger Med J 2022; 63(4):267-274

Introduction

The emergence of COVID-19 created a particular challenge in the practice of medicine in the world and Nigeria in particular. The tertiary health institution (THI) was particularly involved in the management of COVID-19 patients because of the evolving nature of the disease, the experts paraded by these tertiary centres, and the presence of the needed equipment.

The COVID-19 pandemic caused by severe acute respiratory syndrome coronavirus ², since the first case was reported in Wuhan, Hubei Province, China, in December 2019, has been the most disruptive of socioeconomic and health activities in recent times, and with diverse implications on multiple sectors globally.^{1,2} The impact on the critical human resources in the health sectors is also not left out, including resident doctors who are feeder stock for the specialist workforce globally.³

Studies in many countries highlighted the impact of the COVID-19 infection on training exposure and involvement in core clinical activities; and with reports that there was a reduction to complete cessation of clinical activities, distortion of training schedules, restriction of training activities, and impeded career progression, among other challenges in many countries⁴⁻⁷

Meanwhile, effective and efficient provision of health services in which resident doctors play a prominent role is cardinal to achieving the goals of a country's health system.⁸ Incidentally, Nigeria has been grappling with a critical shortage of health human resources in the background of an unrelenting brain drain and industrial actions.⁹⁻¹¹

While the impact of the pandemic on postgraduate doctors or the training itself is better reported in the literature for many counties, this cannot be said of Nigeria. Also, the direct implication of postgraduate medical training has been poorly studied in Nigeria. All these deficits highlight the gaps in understanding the viral pandemic's implications on residency training and education in Nigeria. Although previous studies have highlighted psychological and biological impacts on resident doctors, there is a need to study the implication of the vital process for producing specialist manpower

for the health sector.^{12,13}

Understanding the impact of the pandemic on residency training in Nigeria would aid planning by the various stakeholders and policymakers. This will also lead to mitigating the unprecedented and unanticipated implications on postgraduate medical training in Nigeria. The knowledge gained from the study will help in the enforcement of certain policies like the embracing of virtual learning and examination for the resident doctors

Therefore, this study was designed to determine the impacts of COVID-19 on residency training in This in Nigeria, and specifically to determine the perceived impact and concerns for residency training by resident doctors as a result of the persisting COVID-19 pandemic

Methodology

This study was a national cross-sectional study among Nigerian resident doctors via an online google form survey between 14th September 2020 and 10th April 2021.

Nigeria shares land borders with the Republic of Benin in the West, Chad, and Cameroon in the east, and the Niger Republic in the north. Nigeria is a republic comprising 36 states and the federal capital territory. The study was conducted in accredited residency training centres, which are University-affiliated teaching hospitals, tertiary medical centres, and specialist hospitals in the 36 states of the federation of Nigeria.¹⁴

Most of these facilities admit postgraduate doctors on a structured residency program in various subspecialties of medicine, including general surgery, burns & plastics, ophthalmology, otorhinolaryngology, orthopaedics, urology, psychiatry, internal medicine, paediatrics, obstetrics & gynaecology, radiology, anesthesiology, dentistry, radiotherapy, microbiology, chemical pathology, haematology, morbid anatomy, community medicine, and family medicine.¹⁴

The resident doctors are medical or dental doctors undergoing training under the supervision of certified specialists and in accredited centres for about 4 to 7 years.¹⁴ Proficiencies developed during

the period of training include clinical, research, and pedagogical skills. The structured assessments are undertaken as professional examinations (Primary, Part I, and Part II) at specified times before certification as specialists conducted by the three postgraduate medical colleges in Nigeria.¹⁴ Resident doctors also undertake several courses administered by these postgraduate colleges periodically.

The employment of resident doctors in public health services is in line with existing civil services laws in the country, and the Nigerian Association of Resident Doctors – an affiliate of the Nigerian Medical Association serves the interest of resident doctors in Nigeria.⁽¹⁴⁾

This study involved resident doctors who have been in training for at least one year in an accredited training institution. Participation was voluntary, and those on leave (annual, study, maternity, or casual) or who were busy during the period of data collection were excluded.

As this is a novel study, the sample size was derived on the assumption that 50% of residents will not have their residency training impacted by the COVID-19 pandemic in Nigeria. The sample size was calculated using the formula

$$n = \frac{pq}{\left(\frac{e}{z}\right)^2} \quad (14)$$

Where: n = Sample size; z = Standard normal deviate = 1.96 (at 95% confidence interval); p = Proportion of resident doctors who do not think Covid-19 has had any impact on their residency training programme 50% (0.50); q = 1-p; e = Error of 5% allowed = 0.05

Sampling was designed to achieve a nationally representative sample to enhance the external validity of this research. A stratified cluster design where the entire country is stratified into the six geopolitical zones and a tertiary health facility was randomly selected from each of these zones was used. All residents in the selected hospital are eligible for inclusion in the survey if they had been in the hospital's employ for at least a year and gave their consent to participate in the survey.

Data were collected electronically using a 47-item

google form and computer-assisted data extraction sheet. There were three sections. The first section of the questionnaire contained information on the socio-demographic and training status of respondents. (14 questions) The second section collected data on the perceived impact of the Covid-19 pandemic on the recruitment of resident doctors, clinical activities, training activities, and examinations designed for career progression. (20 questions) The third section of the questionnaire examined the critical concerns of the resident doctor in this era. (13 questions) The internal consistency reliability of the scale used in this study measured by Cronbach's alpha coefficient was 0.95.

The electronic data pool was downloaded in excel and uploaded into the Statistical Package for Social Science (SPSS) version 23 software. The entries were cleaned up, and duplications were removed. The internal consistency reliability of the latent constructs was determined using Cronbach's alpha. Data analyses involved descriptive statistics (such as frequency distributions, percentages, and means). Categorical variables were compared using chi-square, and the p-value was <0.05.

Ethics

Ethical approval was obtained and participation in the study was voluntary, and participants were informed of their rights to withdraw their participation at any point. All participants were provided adequate information about the research and assurance of the confidentiality of their responses when their consent for participation was sought. (UPTH/ADM/90/S.II/VOL.XI/1180).

Results

A total of 239 residents from the THIs in all six geopolitical zones completed the survey. The mean ± standard deviation of the age of the respondents, years in practice, and years in residency were 36.3 ± 4.4; 10.2 ± 7.6 years, and 4.2 ± 2.6 years, respectively (Table 1). The internal consistency reliability of the scale used in this study measured by Cronbach's alpha coefficient was 0.95.

There were more males (64.4%), married (80.3%), and senior residents (61.1%) among the respondents. Less than half (44.4%) of these respondents reported having suffered delays in the

progress of their residency because of the COVID 19 pandemic (Table 1).

The perceived impacts of the pandemic on routine clinical, research, and pedagogical activities reported in Table 2 shows that the least strongly positive impact was related to recruitments (4.2%), laboratory testing (4.2%), and ward rounds (4.2%). The more strongly positive impact of the COVID-19-related disruption on the activities of residents were postgraduate seminars (9.2%), research (8.4%), participation in professional examinations (8.0%), and disruptions in the residents' clinical schedules (8.0%) (Table 2).

Priority concerns among the residents were issues bordering on professional hazards, family wellbeing, critical facilities for hand washing, and personal protection. The residents were least concerned about job security and the availability of clinical guidelines for managing COVID-19 infections (Table 3).

Table 1: Background characteristics of respondents

Variable	Frequency (%)
Gender	
Male	154 (64.4)
Female	84 (35.1)
Marital status	
Single	47 (19.7)
Married	192 (80.3)
Religion	
Christian	199 (84.0)
Islam	35 (14.8)
Others	3 (1.3)
Years of medical practice	10.2 7.6
Years in Residency training	4.2 2.6
Self-reported delay in undertaking a professional examination	106(44.4)
Training level	
Junior	93 (38.9)
Senior	146 (61.1)
Progress delayed by COVID 19	
No	133 (55.6)
Yes	106 (44.4)

Table 2: Perceived impact of COVID 19 on residency

The aspect of residency training	Level of impact – Freq (%)					p-value
	Strongly negative	Negative	Neutral	Positive	Strongly positive	
Recruitment of residents	37 (15.5)	71 (29.7)	92 (38.5)	29 (12.1)	10 (4.2)	<0.0001
Conduct laboratory tests	8 (3.4)	69 (29.2)	99 (41.9)	50 (21.2)	10 (4.2)	<0.0001
Ward rounds	21 (8.9)	91 (38.6)	73 (30.9)	41 (17.4)	10 (4.2)	<0.0001
Mortality/morbidity reviews	31 (13.1)	99 (41.8)	62 (26.2)	34 (14.3)	11 (4.6)	<0.0001
Mentorship	17 (7.1)	73 (30.5)	109 (45.6)	28 (11.7)	12 (5.0)	<0.0001
Surgical procedures	35 (15)	97 (41.5)	51 (21.8)	39 (16.7)	12 (5.1)	<0.0001
Conduct radiological tests	15 (6.4)	70 (29.7)	93 (39.4)	46 (19.5)	12 (5.1)	<0.0001
Rural posting	32 (13.4)	95 (39.9)	70 (29.4)	28 (11.8)	13 (5.5)	<0.0001
Reflective practice	20 (8.4)	102 (43.0)	65 (27.4)	36 (15.2)	14 (5.9)	<0.0001
Admission into wards	31 (13.1)	88 (37.3)	69 (29.2)	33 (14.0)	15 (6.4)	<0.0001
Bedside teaching	46 (19.5)	101 (42.8)	46 (19.5)	28 (11.9)	15 (6.4)	<0.0001
Clerking	29 (12.1)	93 (38.9)	57 (23.8)	44 (18.4)	16 (6.7)	<0.0001
Journal clubs	30 (12.6)	101 (42.3)	65 (27.2)	27 (11.3)	16 (6.7)	<0.0001
Grand rounds	45 (19.1)	86 (36.4)	49 (20.8)	40 (16.9)	16 (6.8)	<0.0001
Clinical examination	64 (27.0)	83 (35.0)	35 (14.8)	38 (16.0)	17 (7.2)	<0.0001
Emergency care	27 (11.4)	97 (40.9)	53 (22.4)	43 (18.1)	17 (7.2)	<0.0001
Clinic schedules	45 (18.8)	95 (39.7)	26 (10.9)	54 (22.6)	19 (7.9)	<0.0001
Professional examination	44 (18.5)	102 (42.9)	49 (20.6)	24 (10.1)	19 (8.0)	<0.0001
Research	24 (10.0)	85 (35.6)	65 (27.2)	45 (18.8)	20 (8.4)	<0.0001
Postgraduate seminars	29 (12.2)	97 (40.8)	45 (18.9)	45 (18.2)	22 (9.2)	<0.0001

Table 3: Concern and how much priority over COVID 19 by resident doctors

Area of concern	Level of concern (least important → very important)					p-value
	1	2	3	4	5	
Job security	31 (13.0)	31 (13.0)	44 (18.4)	56 (23.4)	77 (32.2)	<0.0001
Availability of clinical guidelines	13 (5.4)	20 (8.4)	40 (16.7)	77 (32.2)	89 (37.2)	<0.0001
Availability of full PPE gear	23 (9.6)	21 (8.8)	44 (18.4)	51 (21.3)	100 (41.8)	<0.0001
Remuneration	16 (6.7)	26 (10.9)	54 (22.6)	42 (17.6)	101 (42.3)	<0.0001
Availability of hospital IPC policy	16 (6.7)	23 (9.6)	44 (18.4)	53 (22.2)	103 (43.1)	<0.0001
Training on IPC	15 (6.3)	23 (9.6)	45 (18.8)	51 (21.3)	105 (43.9)	<0.0001
Availability of hand gloves at work	17 (7.1)	23 (9.6)	35 (14.6)	42 (17.6)	122 (51.0)	<0.0001
Availability of face mask at work	17 (7.1)	18 (7.5)	29 (12.1)	45 (18.8)	130 (54.4)	<0.0001
Availability of hand washing facility	21 (8.8)	19 (7.9)	39 (16.3)	29 (12.1)	131 (54.8)	<0.0001
Family wellbeing	12 (5.0)	17 (7.1)	38 (15.9)	33 (13.8)	139 (58.2)	<0.0001
Professional hazards	13 (5.4)	13 (5.4)	16 (6.7)	39 (16.3)	158 (66.1)	<0.0001

Discussion

This national survey of the impact of this novel pandemic on residency training essentially highlighted the enormous self-reported effect of the pandemic on the various components of the resident doctors' training in Nigeria. Furthermore, it showed a high proportion of concern for factors that can predispose them to the risk of acquiring the COVID-19 infection and general wellbeing. Other surveys have also shown a similar significant reduction in core training activities since the onset of the pandemic.^{5,12} This is unusual considering the untoward effect on human activities due to the novel outbreak, which led to a reduction of outpatient volume, suspension of non-urgent outpatient clinic appointments, markedly reduced in-patient volume, cancellation of surgical lists and non-emergency procedures due to widespread enforcement of non-pharmacological approach to the virus

containment.^{3,5,16} The spread of infection and activities such as social distancing led to decreased volume of patients available for training and decreased diversity of disease pathologies/cases exposed to early-career doctors in training.^{3,6,17} Also, the mobilisation of residents into the COVID-19 intervention team meant truncation of training and more involvement in service delivery.¹⁷

Residency training is a tripod of clinical service delivery, research, and training and a pivotal contributor to excellent training outcomes.^{14,18} All these were observed to be affected by these study cohorts. The majority of the respondents considered core and specific clinical activities such as ward rounds, mortality/morbidity reviews, admission into wards, emergency care, clinic schedules, and clinical examination as those affected most. All these are vital activities required for residency training, and residents are expected to actively participate during training by the relevant postgraduate medical colleges in Nigeria.¹⁴ This effect is not unusual and has been reported in other countries and across various subspecialties.^{4,7}

Similarly, many considered core training activities such as bedside teaching, clerking, journal clubs, grand rounds, professional examinations, and seminars were adversely affected, and even postgraduate examinations were rescheduled then. Each of these components is essentially affected by the response to the pandemic, which includes social distancing measures and, in some places, clinical scaling down to only essential procedures.^{19,20} These effects are likely to be further compounded by the low utilisation of virtual tools until the pandemic in the Nigerian postgraduate medical training environment. The utilisation of remote desktop software such as Zoom™ (Zoom, San Jose, California) and Microsoft team™ (Microsoft, Redmond, Washington) was rare before the pandemic.^{21,23}

The majority were indifferent to the implication of the pandemic on administrative issues of job recruitment and, interestingly, also laboratory and radiological procedures. This study cohort is middle-level health managers who are not primarily involved in the recruitment in the Nigerian tertiary health system. There is also the possibility that

international travel restrictions during the heat of the pandemics due to the pandemic restricted international job migration, thus ensuring retention of this staff category. It also impeded career progression and the exit of resident doctors from the training program, which equally aided staff retention. The postgraduate Colleges canceled one of their twice-a-year diets the exit examinations in 2020. However, the low level of expression of impact on laboratory and radiological procedures may be because less than five percent of participants in this survey are in the laboratory and radiological residency specialties.

Structured mentorship may not be considered adversely affected due to the not-so-high level of this practice in Nigeria's residency program and the non-physical requirement for implementation where such practice is entrenched.²⁴ The ease of continuing a mentor-mentee relationship with compliance with social distancing may be an explanation for this observation. Furthermore, the practice in Nigeria is usually informal.^{24,25}

The respondents prioritised concerns over COVID 19 infection to be professional hazards, family wellbeing, availability of handwashing facilities, and face mask availability at work in decreasing order. The necessary personal protective equipment has been in shortfall, especially in the early part of the pandemic, and the poor investments in health infrastructures in Nigeria have impaired the availability of a regular water supply.^{3,26} Furthermore, a previous study reported a high level of seropositivity for SARS-CoV-2 virus causing COVID 19 infection among asymptomatic health workers in Nigeria, resident doctors inclusive.¹³

It is recommended that more use of telemedicine and virtual training tools be deployed to train resident doctors in Nigeria. Furthermore, the postgraduate medical institutions in Nigeria should develop a conceptual framework to mitigate the impact of the pandemic on the training of resident doctors and their general well-being in line with other international bodies such as the Accreditation Council for Graduate Medical Education.^{3,27} One of the Colleges, WACS, amid the pandemic successfully run a virtual clinical and revision course attracting nearly 300 participants from 30th

August to 12th September 2020(Personal account) Also, training institutions and regulatory bodies need to develop strategies and guidelines expected to mitigate the effect of the pandemic on educational outcomes among resident doctors and also mitigate the implication on specialist supply in the nearest future.

Bedside teaching is the bedrock of residency training. The result from this study however showed that more than 3 in 5 of the respondents (62.3%) perceived that bedside teaching was adversely affected by the pandemic. This could be related to the restrictions on social interaction as an epidemiological control measure for SARS-CoV-2 infection and the poor supply of personal protective equipment that may be worn during the process. Notwithstanding this challenge, the realisation of the importance of interaction with real patients for surgical training is important. Alameer et al suggested the use of innovative technologies such as virtual reality during bedside teaching to guarantee the key aspects of patient-to-surgeon clerkship.²⁸

Similarly, it was clear that more than half of the residents, 132 (56.5%), perceived that surgical procedure requirements were negatively impacted by this pandemic. This could be attributed to a possible reduction in the volume of cases being performed since the onset of the pandemic as a previous study observed that 95.8% of their respondents perceived a decrease in the volume of patients presenting for elective surgeries during this pandemic.²⁹ This could have a negative effect not just on continuous practice before the automation of surgical skills is achieved, but also on supervised learning and logbook requirements amidst concerns by trainers to balance the need for speed and surgical safety with the requirements for training.³⁰ However, the clearance of the backlog of patients after the restoration of normalcy could be a silver lining in terms of acquiring the necessary technical competency by the trainees.³¹

Regarding the conduct of the radiological tests, a higher proportion of residents, 93 (39.4%), were neutral regarding its perceived impact on residency training. This could be explained by the wide spectrum of the specialty of resident doctors included in this study. Nevertheless, more than one-

third of respondents, 85 (36.1%) still reported that the pandemic negatively affected the performance of this investigation. This finding is however in contrast to a study in the United Kingdom which observed that 70% of the respondents reported a decrease in subspecialty experience, and another 19% reported a total dearth of training. Unlike our study, their study focused on only radiological trainees and this could have accounted for the disparity in the results.³² This perception could however change with a reduction in the local burden of disease during the pandemic, improvement in the economic status of patients who rely on an out-of-pocket health financing system, and the policy of local centres regarding the conduct of elective and emergency radiological investigations.³³

While this study explored the impact of the pandemics on resident training and concerns regarding the infection, it did not assess the predictors of the impact of this pandemic among resident doctors. These are significant gaps that need to be explored in the nearest future.

In conclusion, COVID 19 has produced a significant impact on residency training, and resident doctors have great concerns regarding the pandemics in Nigeria. It is, therefore, imperative that the relevant stakeholders provide the necessary means to mitigate the various challenges to reduce the implications on the Nigerian health system.

Acknowledgment

We are grateful to the research team for their assistance during the period of data collection in this study.

Declaration of Interest

None declared

Reference

1. Ciotti M, Angeletti S, Minieri M, Giovannetti M, Benvenuto D, Pascarella S, et al. COVID-19 outbreak: an overview. *Chemotherapy*. 2019;**64**:215-23.
2. King JS. Covid-19 and the need for health care reform. *N Engl J Med*. 2020;**382**:e104.
3. Adebayo O, Obazenu LO, Eze U, Hassan F, Olalekan TA-R. Counting the effects of COVID-19 on early career doctors and call for

- sustained mitigation. *NigJMed*. 2020;**29**:539.
4. Wong CS, Tay WC, Hap XF, Chia FL-A. Love in the time of coronavirus: training and service during COVID-19. *Singapore Med J*. 2020; **61**:384-386.
 5. Amparore D, Claps F, Cacciamani GE, Esperto F, Fiori C, Liguori G, et al. Impact of the COVID-19 pandemic on urology residency training in Italy. *Minerva Urol Nefrol*. 2020;**72**:505-9.
 6. Edigin E, Eseaton PO, Shaka H, Ojemolon PE, Asemota IR, Akuna E. Impact of COVID-19 pandemic on medical postgraduate training in the United States. *Med Educ Online*. 2020; **25**:1774318.
 7. Balhareth A, AlDuhileb MA, Aldulaijan FA, Aldossary MY. Impact of COVID-19 pandemic on residency and fellowship training programs in Saudi Arabia: A nationwide cross-sectional study. *AnnMed Surg(Lond)*. 2020; **57**:127-32.
 8. Organization WH. The world health report 2000: health systems: improving performance: World Health Organization; 2000.[source and link and WHO text reference]
 9. Adebayo O, Labiran A, Emerenini CF, Omoruyi L. Health workforce for 2016–2030: Will Nigeria have enough. *Inter J Inn Heal Res*. 2016;**4**:9-16.
 10. Okonta KE, Okonta OC Industrial Crises in a Health Care Center in Nigeria: The perspective of Resident Doctors. *Int J Health Manage*-2017; **11**:269-275
 11. Adebayo O, Adufe I, Ayanfe O, Buowari D, Onwuabuchi E, Efosa I. Whitecoat drain; A monograph on the migration of Nigerian doctors. Whitecoat drain; a monograph for migration of Nigerian doctors Abuja, Nigeria: National Association of Resident Doctors. 2019
 12. Isiekwe IG, Umeizudike KA, Daramola OO, Akeredolu MO, Leo-Olagbaye AA. The COVID-19 pandemic and dental residency training in Nigeria. *Eur J Dent Educ*. 2021;**25**:753-761
 13. Olayanju O, Bamidele O, Edem F, Eseile B, Amoo A, Nwaokenye J, et al. SARS-CoV-2 Seropositivity in Asymptomatic Frontline Health Workers in Ibadan, Nigeria. *Am J Trop Med Hyg*. 2021;**104**:91-94
 14. Adebayo O, Fagbule O, Omololu A, Ibrahim Y, Isibor E, Olaopa O, et al. We are NARD We are Early Career Doctors. Abuja: National Association of Resident Doctors of Nigeria; 2019.
 15. Araoye MO. Research methodology with statistics for health and social sciences. Ilorin: *Nathadex Publisher*. 2003;**115**:25-120.
 16. Chang D-G, Park J-B, Baek GH, Kim HJ, Bosco A, Hey HWD, et al. The impact of COVID-19 pandemic on orthopaedic resident education: a nationwide survey study in South Korea. *Int Orthop*. 2020 Nov; **44**:2203-2210.
 17. Potts JR. Residency and fellowship program accreditation: effects of the novel coronavirus (COVID-19) pandemic. *J Am Coll Surg*. 2020; **230**:1094-7.
 18. Ogaji D, Brisibe S. The Nigerian Health Care System: Evolution, contradictions, and proposal for future debates. *Port Harcourt Med J*. 2015; **9**:S79-S88.
 19. Ayowole D, Ogbonna V, Amoo A, Babarinde T, Nwafor J, Enebeli U, et al. COVID-19 at the community level: What are the countermeasures? *Niger J Med*. 2020; **29**:362.-367
 20. Amzat J, Aminu K, Kolo VI, Akinyele AA, Ogundairo JA, Danjibo MC. Coronavirus outbreak in Nigeria: Burden and socio-medical response during the first 100 days. *Int J Infect Dis*. 2020 Sep; **98**:218-224.
 21. Chertoff JD, Zarzour JG, Morgan DE, Lewis PJ, Canon CL, Harvey JA. The early influence and effects of the coronavirus disease 2019 (COVID-19) pandemic on resident education and adaptations. *J Am Coll Radiol*. 2020;**17**:1322-8.
 22. Giordano L, Cipollaro L, Migliorini F, Maffulli N. Impact of Covid-19 on undergraduate and residency training. *Surgeon*. 2021;**19**:e199-e206
 23. Pourmand A, Ghassemi M, Sumon K, Amini SB, Hood C, Sikka N. Lack of telemedicine training in academic medicine: are we preparing the next generation? *Telemed J E Health*. 2021 Jan; **27**:62-67
 24. Iloh GUP, Chukwuonye ME, Onya ON, Godswill-Uko EU. Mentoring in a resource-

- constrained context: A single-institutional cross-sectional study of the prevalence, benefits, barriers, and predictors among post-graduate medical college fellows and members in South-Eastern Nigeria. *Nig Postgraduate MedJ*. 2019;**26**:38.
25. Salami A, Kanmodi K. Translational medical research in Nigeria: challenges, prospects, and recommendations for the future. *Eur J Transl Clin Med*. 2021;**4**:0-.
 26. Onigbinde O, Babatunde O, Ajagbe A. The Welfare of Healthcare Workers amidst COVID-19 pandemic in Sub-Sahara Africa: A call for concern. *Ethics Med Public Health*. 2020 ; **15** : 100555 . DOI : 10.1016/j.jemep.2020.100555
 27. DT FC, Alan N, Agarwal N, Lunsford D, Monaco 3rd E. COVID-19, and Neurosurgery Residency Action Plan: An Institutional Experience from the United States of America. *World Neurosurg*. 2021;**151**:e395-e398.
 28. Alameer A, Offiah G, Hill ADK. The Impact of COVID-19 Pandemic on Clinical Teaching : A Clinical Educator's Perspective. *Ir Med J*. 2020;**114**:343.
 29. Tolani MA, Fidelis L, Oyelowo N, Mustapha A, Adebayo WO, Okeke CJ, et al. Impact of the COVID-19 pandemic on surgical practice, training, and research in Nigeria. *Pan Afr Med J*. 2021 ; **21** ; 39 : 59 . DOI 10.11604/pamj.2021.39.59.2367
 30. Soltany A, Hamouda M, Ghzawi A, Sharaq A, Negida A, Soliman S, et al. A scoping review of the impact of COVID-19 pandemic on surgical practice. *Ann Med Surg* 2020; **57**:24–36.
 31. Al-Benna S. Impact of COVID-19 on surgical registrars' education and training. *SAfr J Surg*. 2020; **58**:55–8.
 32. Veerasuri S, Vekeria M, Davies SE, Graham R, Rodrigues JCL. Impact of COVID-19 on UK radiology training: a questionnaire study. *Clin Radiol*. 2020; **75**:877.e7-877.e14.
 33. Madhuripan N, Cheung HMC, Alicia Cheong LH, Jawahar A, Willis MH, Larson DB. Variables Influencing Radiology Volume Recovery During the Next Phase of the Coronavirus Disease 2019 (COVID-19) Pandemic. *J Am Coll Radiol*. 2020;**17**:855–64.