

Radiologic Practice in the Face of COVID-19. The Impact on Private Radiologic Facilities in South-South Nigeria.

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Abbreviation

CT:	Computed tomography
HSG:	Hysterosalpingography
MAMMO:	Mammography
MRI:	Magnetic resonance imaging
PPE:	Personal protective equipment
RSUTH:	Rivers State University Teaching Hospital.
USS:	Ultrasonography
WHO:	World Health Organization

ABSTRACT

Background: CoronaVirus Disease (Covid-19) is a highly contagious disease that has spread to many countries all over the globe and the index case in Nigeria was confirmed on 27th February 2020. The study is aimed at evaluating the impact of the COVID-19 pandemic on private radiologic facilities in south-south Nigeria. **Methodology:** This was a retrospective survey of 5 private radiologic facilities in Port Harcourt, south-south Nigeria from November 2019 to April 2020 using the facilities monthly statistics. The statistics were evaluated to assess the attendance of patients to radiologic investigation before and during the pandemic. The inclusion criteria are the availability of personal protective equipment (PPE) and radiologic practise guideline in accordance with the COVID-19 pandemic. Records concerning patient's attendance to Plain radiography, Ultrasonography, Computed tomography, hysterosalpingography, mammography and Magnetic resonance imaging were reviewed. The data collated were analyzed and presented in tables, charts and graphs. **Results:** The highest number of patients was observed in November 2019 with 2.6% decrease in January, 82.9% and 90.1% decrease in March 2020 and April 2020 respectively. All the centres had a significant reduction in the use of radiologic facilities within this period of the pandemic. The negative economic impact was estimated to be huge drawing an inference from the very poor patient's turnout. **Conclusion:** In conclusion, the COVID-19 pandemic was a global catastrophe in radiologic investigation and its impact in private radiologic facilities in Port Harcourt was enormous.

Keyword: COVID-19, COVID-19 impact, Radiologic practise, Private Radiologic Facilities, South-South Nigeria.

1 Introduction

Coronavirus dates back to 1960 when it was first discovered by a group of virologist [1], but has been quiescent until December 2019 when it was confirmed in Wuhan, China [2,3]. Coronavirus Disease-2019 (COVID-19) is a highly contagious disease that is increasing with every sunrise and has spread rapidly to many countries all over the globe infecting millions of people [1]. The International Committee on Taxonomy of Viruses named the virus as SARS-CoV2 [1,2], and on February 11th, 2020 the World Health Organization (WHO) gave the virus the acronym of COVID-19 [1, 3].

The index case of COVID-19 which is caused by the SARS-CoV-2 virus was first confirmed in Nigeria on 27th February 2020 [4,5]. A Nigerian national who had contact with the index case was reported on the 9th of March 2020 at Ewekoro, Ogun State [4,6]. About three months down the line the country have recorded 7,261 confirmed cases, 5,034 active cases, 2,007 recovered and 221 deaths as at 22nd May 2020 [4]. The 8th of May 2020 recorded the highest number of confirmed cases. On that day three hundred and eighty-six new cases were confirmed [4 ,7]. Within this period Rivers State has recoded 89 confirmed cases, of which 59 are active cases, while 23 have recovered and 7 deaths as at 22nd May 2020 [7].

The government has been proactive in the fight against COVID-19 [4 and 5]. This gesture is not different from other countries with the stay at home order, banning all public gatherings, including weddings, funerals, seminars and conferences. Notwithstanding, the bans hospitals and diagnostic centres were opened to patients with other chronic and acute diseases outside COVID-19 that require prompt medical attention. That is why the lockdown did not affect hospitals and medical personnel being categorised as essential workers or essential care providers.

With advances in medical sciences and the introduction of new imaging modalities, radiology has played a pivotal role in the Management of patients. Most patients require radiologic investigation to Confirm diagnosis, Rule out complications, Aids in-patient management/follow –up and radiologic management and interventions. This has made radiology to be the eyes of modern medical practice. Radiologic investigations require a close contact between the radiologist, sonologist or radiographer with the patient. Making the personnel vulnerable to contracting the disease or the other way round whereby the patient becomes also vulnerable. The imaging modalities available include plain radiography, ultrasonography (USS), mammography (mammo), fluoroscopy. computed tomography (CT) and magnetic resonance imaging (MRI).

The Novel coronavirus pandemic has disrupted the routine everyday life around the world. According to Theresa Pablos [8] an AuntiMinnie staff writer reported that the COVID -19 pandemic may paralyze medical imaging. The report stated that findings from the imaging medical information division showed that greater than 90% of medical imaging centers observed a major decrease in the volume of work including COVID-19 related imaging investigations [8]. According to the survey radiologic facilities were negatively affected by the pandemic on all the 11 surveyed imaging modalities in the USA. The report further expressed pessimism that things may not return to normal until the pandemic is over [8]. The negative effect of the pandemic will also impact on cancer treatment and medical research [9]. According to Drs. Howard Forman and Joseph Cavallo, the challenges of radiologic practice (in the US) have become enormous in the face of the pandemic [9]. The study is aimed at evaluating the impact of the COVID -19 pandemic on private radiologic facilities in south-south Nigeria.

2 Methodology

This is a retrospective survey of 5 private radiologic facilities in Port Harcourt south-south Nigeria from November 2019 to April 2020 using the facilities monthly statistics. The statistics were evaluated to assess the attendance of patients to radiologic investigation before and during the pandemic. Port Harcourt is the capital and largest city of Rivers State, Nigeria. It lies along the Bonny River and is located in the Niger Delta. As of 2016, the Port Harcourt urban area had an estimated population of 1,865,000 inhabitants, up from 1,382,592 as of 2006 [10].

The inclusion criteria are the availability of personal protective equipment (PPE) and radiologic practise guideline in accordance with the COVID-19 pandemic. Daily facility records concerning patient's attendance to plain radiography, ultrasonography, mammography, fluoroscopy, computed tomography and magnetic resonance imaging were reviewed. The data collated were analyzed and presented in tables, charts and graphs. The percentage decrease was calculated using the online calculator derived from the formula; $\text{Percentage Decrease} = \frac{\text{Starting Value} - \text{Final Value}}{\text{Starting Value}} \times 100$ [11].

3 Result/ Discussion

Response from Center 1 shows that the highest number of patients were in December 2019 followed by a progressive decline in patient's presentation for radiologic investigation from February through April 2020 (figure 1a). Ultrasonography was the most common investigation throughout the months of November 2019 to April 2020 (figure 1a), whereas MRI, mammography and computed tomography had the lowest patients participation having 2 patients each (figure 1a). There was 85.10% decrease in patients inflow in center 1 from December 2019 (772) to April 2020 (115) as shown in figure 1b.

In centre 2, the highest patient attendance was observed in January 2020 with 1071 patient's presenting for radiologic investigation (table 1) and ultrasonography was the most common requested investigation from November 2019 to April 2020. This observation was similar to the findings in centre 1, however there was 91.50% decrease between November 2019 and April 2020 (table 1).

The experience in centre 3 was not completely different from that observed in other centre. Computed tomography and MRI were not functioning during the period of the survey (figure 2a). However concerning other investigations centre 3 had the highest patient presentation in January 2020 (figure 2a). HSG (98) was highest in December 2019 while mammography (30) was highest in February 2020. The total number of patient attendance was highest in January 2020 (figure 2a).

It was observed in centre 4 that, Computed tomography and MRI were also not functioning however, plain radiography and ultrasonography were the highest investigation with 486 patients each. Total number of patient's attendance was highest (1262) in November 2019 with 92.63% decrease (table 2). There was a 100 % decline in computed tomography investigation between November 2019 and April 2020 whereas MRI documented about 90% declines in centre 5 (table 3). Plain radiography was highest in November 2019 (260). The highest number of total patient was 1193 in January 2020 (table 3).

Elad Walad [12] reported that COVID-19 had negatively impacted on the global CT volume, noting that the pandemic has unleashed an overall global catastrophe beyond radiology. The report also noted specifically that there was decline of computed tomography investigation at the beginning of February by 30% [12]. Meanwhile there was about 39% decline in global CT from 16th March to 22nd March 2020 [12]. The report further documented a significant reduction of 32% in Australia and 46% reduction in South

Africa [12]. The percentage reduction in the present study was more than that reported in Australia and South Africa. Similar decline as noted with CT was also observed in other radiologic investigation.

Another report by Joseph J. Cavallo and Howard P Forman [13], revealed that there was a great impact of the pandemic on radiologic screening services like mammography, lung cancer screening as well as interventional radiologic services [14]. The observed reduction was also in consonance with the reports in other developed economies as evident by the publication by Theresa Pablos [8] on April 30th, 2020, where it was documented that above 90% of radiologic centres had a significant decrease in radiologic procedures amidst huge investment.

Cumulative record of all the five centers from November 2019 to April 2020 revealed that the highest number of patients were seen in November 2019 (pre COVID-19 pandemic) while the lowest was seen in within the pandemic with a 2.6% decrease in January, 82.9% and 90.1% decrease in March 2020 and April 2020 respectively (table 4). All the centres had a significant reduction in the use of radiologic facilities within this period of the pandemic. The negative economic impact can be estimated to be huge drawing inference from the very poor patient turnout. In conclusion, the COVID-19 pandemic is a global catastrophe in radiologic investigation and its impact in private radiologic facilities in Port Harcourt is enormous.

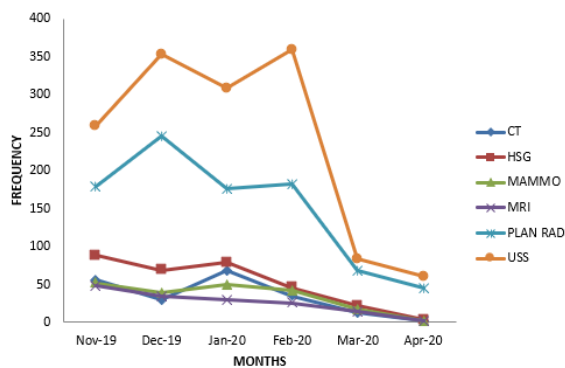


Figure 1a. Showing Centre 1 Monthly Statistics

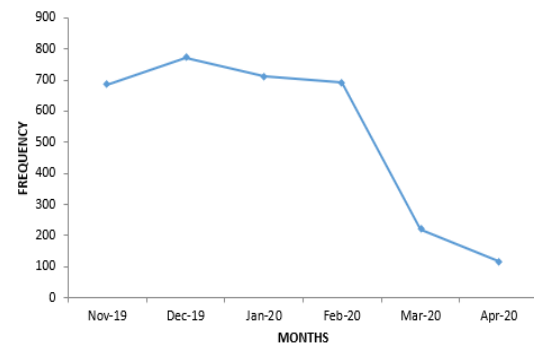


Figure 1b . Cumulative monthly data of Center 1

Table 1: Centre 2 Monthly Statistics

	CT	HSG	MAMMO	X-RAY	USS	Total
NOVEMBER 2019	143	186	88	260	386	1063
DECEMBER 2019	126	149	69	186	424	954
JANUARY 2020	167	198	110	228	368	1071
FEBRUARY 2020	85	86	64	148	188	571
MARCH 2020	21	14	13	36	44	128
APRIL 2020	1	1	1	28	60	91

91.50% decrease between November 2019 and April 2020 .

MAMMO: Mammography, HSG: Hysterosalpingography; CT: Computed tomography

USS: Ultrasonography ; MRI Magnetic resonance imaging

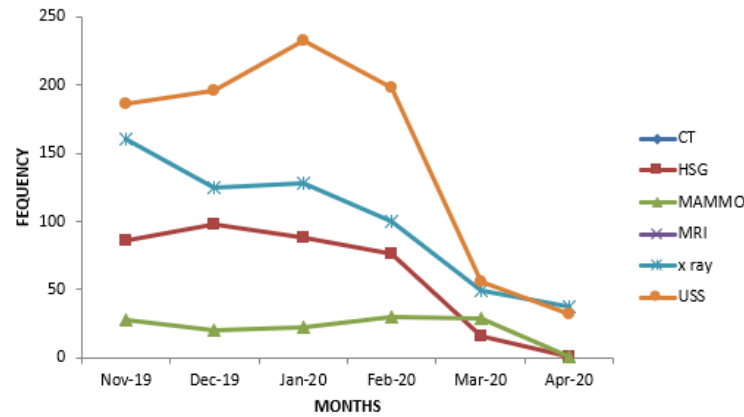


Figure 2a Showing Centre 3 Monthly Statistics

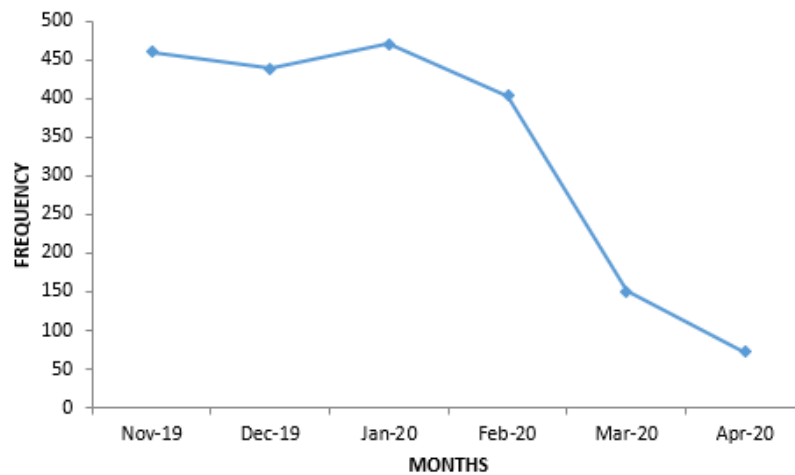


FIGURE 2b . Cumulative Monthly Data of Center 3

Table 2 Showing Centre 4 Monthly Statistics

Imaging Modalities	Nov 2019	Dec 2019	Jan 2020	Feb 2020	March 2020	April 2020
Computed Tomography	-	-	-	-	-	-
Hysteroslapingography	188	198	156	176	39	1
Mammography	128	122	98	136	4	4
MRI	-	-	-	-	-	-
Plan Radiography	460	424	388	486	26	52
Ultrasonography	486	499	439	448	24	48
Total	1262	1243	1081	1246	93	105
92.63% decrease between November 2019 and April 2020						

Table 3 Showing Centre 5 Monthly Statistics

Imaging modalities	Nov 2019	Dec 2019	Jan 2020	Feb 2020	March 2020	April 2020
Computed Tomography	184	186	166	124	47	0
Hysteroslappingography	168	146	187	169	54	1
Mammography	-	-	-	-	-	-
MRI	180	142	188	186	24	18
Plan Radiography	260	186	228	148	36	38
Ultrasonography	386	390	424	188	44	22
TOTAL	1178	1050	1193	815	205	79

93.37% decrease between January and April 2020

MRI Magnetic resonance imaging

Table 4 Showing cumulative record of the five centers

Months Centre	Nov 2019	Dec 2019	Jan 2020	Feb 2020	March 2020	April 2020
Centre 1	685	772	711	691	219	115
Centre 2	1063	954	1071	571	128	91
Centre 3	460	439	470	404	150	72
Centre 4	1262	1243	1081	1246	93	105
Centre 5	1178	1050	1193	815	205	79
Total	4648	4458	4526	3727	795	462

2.6%, 82.9% and 90.1% decrease in January, March and April 2020 respectively

REFERENCE

- [1] Shazia Fatima and Zaheer Chiragh. Nuclear medicine practices in Pakistan in the times of COVID-19: steps to move forward. Pakistan Journal of Nuclear Medicine, Volume 10(1):1–6
- [2] Gorbalenya AE, Baker SC, Baric RS, de Groot RJ, Drosten C, Gulyaeva AA, et al. The species Severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. Nat Microbiol. 2020;5(4):536–44. <https://doi.org/10.1038/s41564-020-0695-z>
- [3] World Health Organization. Novel Coronavirus (2019-nCoV) Situation Report—22; 2020 [cited 2020 Apr 20]. Available from: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200211-sitrep-22-ncov.pdf?sfvrsn=fb6d49b1_2&fbclid=IwAR0wvAWUxxQqYTvNcsUr3s5USzj7C-kFuf2CmjZVeuo-_5UxBaT94YDDZs
- [4] COVID 19 pandemic in Nigeria. https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Nigeria. Retrieved 22nd May 2020
- [5] "FIRST CASE OF CORONA VIRUS DISEASE CONFIRMED IN NIGERIA". [Nigeria Centre for Disease Control](#). 28 February 2020. Retrieved 10 March 2020

- [6] [Nigeria records second case of Coronavirus". *P.M. News*](#). 9 March 2020. Retrieved 10 March 2020
- [7] Oyeleke, Sodi (9 May 2020). ["UPDATED: Nigeria records 386 new COVID-19 cases, total now 3, 912". *The Punch Newspaper*](#). Retrieved 9 May 2020.
- [8] Theresa Pablos. Pandemic paralysis: COVID-19 has major impact on imaging. <https://www.auntminnie.com/index.aspx?sec=sup&sub=imc&pag=dis&ItemID=128865>
- [9] Kate Madden Yee. Radiology volume, research will take COVID-19 hit. <https://www.auntminnie.com/index.aspx?sec=sup&sub=adv&pag=dis&ItemID=128734>
- [10] Wikipedia. https://en.wikipedia.org/wiki/Port_Harcourt
- [11] Furey Edward ["Percentage Decrease Calculator"](#); CalculatorSoup, <https://www.calculatorsoup.com> - Online Calculators
- [12] Elad Walad April 24th 2020 <https://www.aidoc.com/blog/ct-imaging-volumes-covid19/> Retrieved 1st June 2020.
- [13] Joseph J. Cavallo , Howard P. Forman. The economic impact of the covid-19 pandemic on radiology practices. Apr 15 2020 <https://doi.org/10.1148/radiol.2020201495>. <https://pubs.rsna.org/doi/10.1148/radiol.2020201495>
- [14] [Society of Interventional radiology; https://www.sirweb.org/globalassets/aasociety-of-interventional-radiology-home-page/practice-resource/covid-19-toolkit.pdf](#); Published Mar 16, 2020. Accessed Apr 4, 2020. Google Scholar.