Research Article

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Evaluation of the Impact of COVID-19 Pandemic on Delivery of Paediatric Cardiac Services in Nigeria

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ABSTRACT

Background: *The coronavirus disease 2019 (COVID-19), a highly contagious infection first diagnosed in China has rapidly spread worldwide. The resultant pandemic has witnessed over one million deaths with unprecedented and severe disruption of socioeconomic activities and healthcare services globally. Hitherto, paediatric cardiac services in Nigeria were underdeveloped and the impact of this disease remains unexamined.*

Objectives: *To evaluate the impact of COVID-19 pandemic on the paediatric cardiac services in Nigeria.*

Methods: *Self-administered digital questionnaires were sent directly into the private accounts of Paediatric Cardiologists and Paediatric Cardiac Surgeons in Nigeria using the Nigerian Cardiac Society and the Association of Cardiovascular and Thoracic Surgeons of Nigeria Register. Thereafter, each person was contacted personally and requested to fill the questionnaires.*

Results: *There were 31 (51.7%) respondents; 23 Paediatric Cardiologist and 8 Cardiac Surgeons, 28 (90.3%) practice in the public sector and the remaining practice privately. About a third reported temporary outpatient clinic closures. Others' weekly clinic attendance dropped from an average of 17.55 ± 12.6 patients before to 3.90 ± 4.37 during the pandemic. Over 90% of respondents had instituted use of personal protective equipment in their centres. Over 70% of respondents reported suspension of procedures including echocardiography, pericardiocentesis, and partial exchange transfusion. Only one centre performed open-heart surgery during this period.*

Conclusions: *Paediatric cardiac services in Nigeria are grossly inadequate and the COVID-19 pandemic has further worsened the plight of Nigerian children with heart disease.*

Keywords

COVID-19, Paediatric cardiac services, Paediatric cardiologist, Paediatric cardiac surgeons.

Introduction

The coronavirus disease 2019 (COVID-19) is a highly contagious infection caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) first reported from Wuhan, China [1]. At the close of 2019, the World Health Organization (WHO) first notified the world of the novel corona virus following a report of a cluster of cases of pneumonia in the city [2]. By the end of January 2020, WHO declared COVID-19 a public health emergency of international concern (PHEIC) and in March 2020; a pandemic, citing the over 118,000 cases in over a hundred

countries and territories globally [2]. As at the time of writing, the infection has been confirmed in over 127 million people with 2.7 million deaths in 219 countries and territories all over the world [3]. Currently, there are over 160,000 confirmed cases with over 2,000 deaths in Nigeria [4].

Information available on the COVID-19 reveals that human-to-human transmission is essentially through three main routes: i) droplets transmission, ii) contact transmission, and iii) aerosol transmission [5,6].

Transmission through droplets occurs when an individual (in proximity usually within 1 meter) inhales or ingests respiratory droplets produced by an infected person who has respiratory symptoms such as coughing or sneezing. The individual is exposed to potentially infective respiratory droplets and can be infected through the mucosae of the mouth, nose or the conjunctiva. Contact transmission occurs through contact with fomites in the immediate surroundings of infected persons [5,6]. Consequently, COVID-19 transmission occurs either by direct contact with infected persons or by indirect contact with contaminated objects or surfaces in their immediate surroundings [5]. Aerosol transmission is another route of acquiring the infection. This refers to the presence of the organism within droplet nuclei, usually less than 5 μm in diameter, which can remain suspended in the air for extended periods of time. This may cause infection when inhaled in high doses and can be transmitted to other persons at distances more than 100 cm [5]. It is noteworthy that COVID- 19 has a high transmission efficiency, and many infected persons are contagious before being symptomatic [7,8].

Access to healthcare is an essential right of everyone, however the COVID-19 pandemic has placed remarkable strain on healthcare systems all over the world and this has negatively impacted provision of primary health care for many people [9]. A conservative estimate shows that the health needs created by the coronavirus pandemic go well beyond the capacity of hospitals, even in the United States [10,11]. Due to fears of contracting and spreading the coronavirus, healthcare workers are minimizing in-person contact with patients [9]. The COVID-19 pandemic has brought untold hardships on clinics and hospitals around the world, ranging from an insufficient testing and medical supplies to challenges in accessing healthcare among urban and rural populations [12]. The disease has brought to the fore the inequities, in the healthcare delivery system [12]. It is known that health services have been partially or completely disrupted in many nations around the world. In a survey of 155 nations, WHO reported that about half of the countries had partial or complete disruption of services for the treatment of non- communicable diseases such as hypertension, diabetes, and cancer [13].

It is well documented that paediatric cardiac services in developing countries is grossly inadequate [14]. The poor provision and unequal distribution of paediatric cardiac services in Nigeria poses a huge challenge [15]. Currently, most children needing cardiac surgery must travel outside the country for corrective surgery, with only a small number of affected children receiving their interventions in the country [15]. The number of paediatric cardiac practitioners and the facilities available for paediatric cardiac care in Nigeria is grossly insufficient to meet the huge demand for such services. In the wake of the COVID-19 pandemic, as with children with other non-infectious diseases, the situation of children with congenital and acquired heart diseases has further worsened. This study reports the outcome of a survey among paediatric cardiologists and paediatric cardiac surgeons on the effect of the COVID-19 pandemic on paediatric cardiac services.

Materials and Methods

This study was a cross- sectional study, which was conducted with the aid of self – administered questionnaires. Participants were paediatric cardiologists and paediatric cardiac surgeons in Nigeria using the Nigeria Cardiac Society and the Association of Cardiovascular and Thoracic Surgeons of Nigeria register. The questionnaire (Appendix I) was designed on Google Form™ which was sent directly into the private accounts of all paediatric cardiologists and paediatric cardiothoracic surgeons in Nigeria. Everyone to whom the Google forms were sent, were also contacted personally by phone calls to enlist their participation in the study. Of the sixty (60) persons contacted, 31 participated, giving a response rate of 51.7%. The data from their responses were retrieved and anonymised into a personal computer and analysed using the Statistical Package for Social Sciences, version 22.

Results

A total number of 31 respondents participated in this study. The age and sex distribution of all the participants is shown in Table 1. There were 16 males and 15 females who participated in the study. The age of the respondents ranged between 35 and 68 years. The mean age was 46 ± 7.5 years while the modal age was 47 years. There were 16 (51.6%) males and 15 (48.4) females in the group, giving a male to female ratio of 1.1: 1. Participants included 23 Paediatric Cardiologist and 8 Cardiac Surgeons. Of the 31 participants, 28 had a practice in the public sector while 3 practiced in the private sector.

Table 1: Demographics of respondents.

		Frequency	Percentage (%)
Sex	Male	16	51.6
	Female	15	48.4
Age	Mean age 46.7 ± 7.5 years (Range= 35- 68years)		
	Modal age: 47 years		
Specialty	Paediatric cardiology	23	74.2
	Cardiac surgery	8	25.8
Practice	Public institution	28	90.3
	Private institution	3	9.7

The impact of COVID- 19 on Paediatric cardiac services is shown in Table 2. Ten (10) of the respondents reported that out- patient clinic in their centres had been temporarily closed, while the rest 21 respondents were still running out- patient clinics.

Table 2: Impact of Covid-19 on paediatric cardiac services.

	Frequency	%
Outpatient clinics		
Opened	21	67.7
Closed	10	32.3
Protective measures in Outpatient clinics		
Face mask	30	96.8
Social distancing	29	93.5
Hand washing	29	93.5
Hand sanitizers	30	96.8
Latex gloves	28	90.3
Suspended procedures		
Nil	5	16.1
TTE	22	71.1
Elective Surgery	4	12.9
New in-patient admissions		
Yes	25	80.6
No	6	19.4
Virtual clinical presentations		
Yes	18	58.1
No	13	41.9
Confirmed Covid-19 case(s)		
Yes	1	3.2
No	30	96.8
Closed heart surgery		
Yes	7	22.6
No	24	77.4
Open heart surgery		
Yes	1	3.2
No	30	96.8

* TTE= Transthoracic echo

More than 90% of the clinics had instituted protective measures against COVID-19 and these measures included use of face mask, social distancing, hand washing, use of hand sanitizers and latex gloves.

Five centres had suspended procedures, which included but are not limited to the following: Transthoracic echocardiography (TTE), transoesophageal echocardiography (TOE), electrocardiogram, cardiac computerized tomography, cardiac magnetic resonance imaging, blood chemistry, exchange blood transfusion, and pericardiocentensis. Four centres had suspended elective cardiac surgeries in the wake of the pandemic.

There were twenty-five centres with new in-patient admissions with cardiac disease, while six centres had not admitted any patient with cardiac condition since the outbreak of COVID- 19. Eighteen (18) centres were still having virtual presentations while 13 centres had suspended virtual presentations. One of the centres reported a confirmed case of COVID- 19 infection while the other centres did not report any. Seven centres had closed heart surgery during this period while only one centre had open-heart surgery.

The clinic attendance before and during the COVID-19 pandemic is shown in Table 3. Before the pandemic, an average of 18 ± 13 patients were seen on a weekly basis in the various centres. However, during the pandemic clinic attendance dropped to an average of 4 ± 4 per week. So in some cases there were no patients at all.

Table 3: Clinic attendance before and during Covid-19 pandemic.

Clinic attendance	Mean ± SD	95% CI	t	P
Before covid-19	17.55 ± 12.6			
During covid-19	3.90 ± 4.37			
		9.71 – 17.58	7.085	0.000*

P * ≤ 0.05

t= Paired Sample t Test; CI = Confidence Interval; SD = Standard Deviation.

The willingness to perform procedures on confirmed COVID-19 patients is shown in Table 4. More than half of the respondents [17 (54.8%)] were undecided on whether they would be willing to perform procedures on confirmed COVID-19 positive patients. Six [6 (19.4%)] persons were willing while 8 persons were unwilling to do procedures on patients who tested positive for the COVID-19 virus. These procedures included transthoracic echocardiography, transoesophageal echocardiography, computerized tomography, pericardiocentesis, and closed and open-heart surgeries.

Table 4: Willingness to Perform Procedures or Surgery on Confirmed COVID-19 patients.

Response	Frequency	Percentage (%)
Yes	6	19.4
No	8	25.8
May be	17	54.8
Total	31	100

Discussion

The health sectors of most nations have undoubtedly been rattled by the on-going COVID-19 pandemic. This study set out to assess the impact of the COVID-19 pandemic on the delivery of paediatric cardiac services (paediatric cardiology and paediatric cardiac surgery) in Nigeria.

In Nigeria, the pandemic started toward the end of March 2020, with the Federal Government imposing an initial four-week lockdown in Nigeria to curtail spread of the virus, this was subsequently followed by varied degrees of regionalized lockdown periods across the nation. Interstate travel restrictions were also imposed [16]. By June 2020, most of the states in Nigeria had reported community transmission of COVID-19 [17].

From this study, it is quite evident that paediatric cardiac services suffered significantly under the burden of the COVID-19 pandemic. During the intense phase of the lockdown, about third of the paediatric cardiac clinics were temporarily shut with others functioning albeit below half of their pre-COVID capacity. The services available were mostly in the public sector. There have been concerns by both physicians and parents of children with congenital heart diseases regarding how to manage children with CHD during this pandemic. Clinic attendance also dropped for the clinics that were opened to about a fourth of the usual population. This was most likely due to the lockdown and inter-state travel restrictions. The ensuing acute unplanned and unmitigated financial constraints may also have been contributory.

The healthcare system of most countries of the world has been strained with the responsibility of managing the COVID-19 pandemic [16,17]. In Nigeria and other resource-constrained nations with very fragile healthcare systems, the situation is precarious. The healthcare system in Nigeria is characterised by inadequate manpower, poor funding, collapsing infrastructures which may ultimately worsen with the additional burden of managing COVID-19 related health problems [18]. This may leave little or no room for the management of other non-COVID illnesses should the pandemic persist long enough.

While many other conditions can wait during this period of crisis, children with CHD have need of continuing care, especially neonates and infants who are in immediate need of surgical intervention to circumvent death and achieve optimal outcomes [19].

From this study, over 90% of the centres instituted protective measures against the transmission of COVID-19 during the pandemic. These measures included use of facemasks, maintenance of social distance, frequent hand washing, use of hand sanitizers and use of latex gloves. The use of facemasks and hand sanitizers were the most common preventive measures used.

When it comes to children, social distancing can be quite a challenge for the physician/ surgeon of children with CHD; this is so because of the age of the patients and the fact that one or both parents [19] would always accompany patients.

Therefore, the use of appropriate personal protection equipment (PPE) by the healthcare workers is of topmost priority. Testing of patients as well as parents to prevent spread of COVID-19 within the hospital setting has been strongly advocated [19].

A positive test would impact decisions regarding both admission and surgical intervention for the patient, use of limited PPE, and interaction with family members of the patient. Under such circumstances, maximum cooperation between the cardiologist and cardiac surgeons is essential to evaluate the impact of comorbidities, complexity of the procedure, risk of delaying surgery [19].

In this study, more than three quarters of the centres had new admissions during this period. Children with CHD are born daily with the prevalence of CHD being 8-10 per thousand [20]. Older patients still have acute episodes of illnesses that continue to require admission.

In this study, only five centres did not suspend procedures, in most centres procedures including transthoracic echocardiography (TTE), transoesophageal echocardiography (TOE), closed and open-heart surgeries were suspended. These procedures were suspended in an effort to prevent transmission of possible COVID-19 infection from patient to health care workers. Only a quarter of the respondents were willing to perform procedures or surgery on patients who were confirmed to be COVID- 19 positive. Such procedures included echocardiography (both TOE and TTE).

Even though children appear less vulnerable to the COVID-19 virus compared to adults, the mechanism of the reduced susceptibility to severe infections in children is not fully understood. It is thought that the ACE 2 (the binding protein for SARS-CoV-2) is less effective in children than in adults and for a reason COVID-19 is less infectious in children [21]. There are very few studies describing the effect of the COVID-19 virus on children with congenital heart disease and these effects are not quite clear [19].

Sanna *et al.* in a systematic review, concluded even though COVID-19 infection in children is less common and less severe than in adult patients, it is not without the risk of cardiac involvement, particularly in patients with underlying congenital heart disease [22].

Nigeria has a huge burden of congenital heart disease with an estimated 70,000 new births annually [15]. It is well documented that the paediatric cardiac services available in Nigeria are grossly insufficient to meet the huge demand for such services [15,23]. The COVID-19 has further worsened the situation.

Conclusion

The impact of the COVID-19 pandemic on paediatric cardiac services in Nigeria continues to unfold. There are backlogs of patients on the surgical list awaiting surgery and very few centres offering paediatric cardiac surgery services. The situation is precarious because cardiac surgery missions have become impossible with the pandemic. Doubtless to say, the pandemic has adversely impacted the healthcare system and in particular the delivery of paediatric cardiac services in Nigeria. Children with congenital heart disease in Nigeria may withstand the worst of this pandemic for a good while to come.

Recommendations

We recommend that the government of Nigeria should invest in Paediatric cardiac care services and establish at least one paediatric cardiac centre each in all the six geopolitical zones of the country to ensure that these children have access to paediatric cardiac care services. One of the goals of the National Health Insurance Scheme (NHIS) in Nigeria is to ensure that every Nigerian has access to good health services. We therefore recommend that the NHIS should include paediatric cardiac services in her coverage to ensure that parents of Nigerian children with heart diseases are relieved of the financial burden of these disease.

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