Pharmacists' knowledge and practice with respect to coronavirus disease 2019 caused by SARS-CoV-2

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ABSTRACT

Background: The World Health Organisation in December, 2019 declared COVID-19 pandemic a disease of public health importance. It is however predicted by experts that the COVID-19 disease will eventually become an *endemic* disease, once enough people have developed immunity to COVID-19 either through vaccination or infection. The infection caused by the virus produce symptoms which necessitates professional healthcare. Pharmacists are frontline health care workers, often the first port of call by patients when unwell. Knowledge of pharmacists impart on patient care and public health dissemination of information. This study assessed knowledge and practice of pharmacists in Nigeria with regards to COVID-19 disease.

Methods: A nationwide cross-sectional study was conducted among pharmacists in different practice settings in Nigeria using a snowball sampling technique. Pharmacists' demography, knowledge and practice due to COVID-19 pandemic was obtained with the aid of a semi- structured online questionnaire. Data collected were subjected to descriptive analysis. Each correct answer in the different subthemes generated was scored and transformed into ranges and percentiles.

Results: A total of 386 pharmacists were included in the study, majority of whom practiced in the hospital and administrative settings (31.9%). There were more males (50.3%) than females. Over 90% of respondents had good knowledge of COVID-19 disease. The mean knowledge score for mode of transmission of the disease and symptoms produced by the infection were 5.35 0.9 and 11.26 1.9 respectively. Similarly, pharmacists had a good practice towards Covid-19 disease. Mean score for practice towards the disease was 6.43 0.9. Majority (75.9%) however, had to provide their personal protective equipment.

Conclusion: These findings demonstrated that pharmacists had both good knowledge and practice towards the COVID-19 disease. This confirms pharmacists as a good resource for knowledge, which can be disseminated to patients and others during pandemics, or as the need arises.

1. Introduction

COVID-19 disease is a global health threat. The first case was identified in Wuhan, China, in December 2019 [1,2]. The causative pathogen SARS-Cov-2 belongs to a family of viruses which were discovered more than 40 years ago.[3] It is highly infectious and mainly transmitted through the inhalation or ingestion of droplets or aerosols produced when an infected person coughs or sneezes as well as by contact. Contact transmission also takes place after a person

has touched a contaminated surface and with the same hand touches his or her mouth, nose, eyes or face.[4]

More than 80% of the positive cases are mild with minor symptoms such as high fever, dry cough and pharyngitis, the rest are severe with complications that lead to death.[5] In addition, older age, suffering from comorbidities such as diabetes or hypertension have been reported as risk factors for developing the severe form of the infection and consequent death. Presently, the global death toll caused by this pandemic is about 500,000 as at June 29, 2020.[2] The region of Americas has recorded 244,791 deaths, European region has a total of 196, 835, Eastern Mediterranean region has 23,888 and South-East Asia, 21,078. However, the remaining two regions of the world namely, Western Pacific and Africa have, 7,429 and 5879 deaths respectively. Nigeria recorded its index case of coronavirus on February 27th, 2020. Additional cases continued to appear and as at June 30th 2020, the total number of confirmed national cases stood at 25,694 out of which 15,358 are active cases. A total of 9,746 cases had been discharged and the country had recorded 590 deaths.[6]

Currently in Nigeria, 35 states and the Federal Capital Territory (FCT) have at least one confirmed case of COVID-19. In spite of the grey news, COVID-19 can be prevented and the pandemic stopped if all stakeholders collectively do the needful.

As the coronavirus spreads throughout the globe, pharmacists are at the front-line providing essential patient care services in many countries, Nigeria inclusive.[7] Pharmacists are the most accessible healthcare providers and the first touchpoint for most patient engagement with the healthcare system.[8] They are highly trusted and trained healthcare professionals, who play critical roles in patient care and public health. They are thus most easily positioned to helping patients cope with this pandemic.

As experts in medications, they provide services of pharmaceutical care to the public in various settings including the community pharmacies, the clinics/hospitals as well as in public health awareness and research. However, these indispensable roles can only be performed optimally if they are well informed about the ongoing pandemic. The International Pharmaceutical Federation (FIP) and the American Pharmacist Association (APhA) have recently issued guidelines and documents to guide the preparedness of pharmacists as front-line health care workers in the global health crisis.[7,9]

The knowledge these group of health professionals possess can go a long way to affect the impact of services rendered to patients positively or otherwise. Currently, there is paucity of data on the knowledge of pharmacists and their attitudes towards COVID-19 in relation to their patients. Therefore, we carried out this survey with the aim of evaluating Nigerian Pharmacists' knowledge regarding COVID-19 with respect to its route of transmission, symptoms and the recommended protective measures against the spread. Performing such a survey will evidence their level of preparedness to embark on adequate public health education in addition to pharmaceutical care for the prevention and treatment of the infection.

2. METHODS

2.1 Study design and participants

The study was a nationwide cross-sectional one among pharmacists across the different practice areas in Nigeria. The data was collected through the Snowball sampling technique. The researchers posted the questionnaire on their various Pharmacists' WhatsApp® chat groups and in turn, these prospective respondents were encouraged to send to their own contacts and online platforms. Sample size of 384 study participants was calculated for this study at 95% level of confidence, 5% margin of error and estimated percentage at 50% (Raosoft Sample size calculator).[10]

2.2 Data collection

As the pandemic is raging with the third wave and additional strains are being identified, the research group agreed that the study should be conducted online. A semi-structured online questionnaire was designed using google forms and a respondent's consent form was attached to it. The questionnaire was developed based on currently available information about COVID-19 as at the time the research was being carried out.[4,11,12,13]

The tool was previewed and pretested among 15 pharmacists to validate its internal consistency and was consequently modified to accommodate the inconsistencies identified. The questionnaire has 4-four components: the demographic data of the respondents, the knowledge of COVID-19, (disease, route of transmission, symptoms and prevention) and the practice of COVID-19 disease.

Survey tool was deployed on various pharmacists' WhatsApp® groups for one days to enable willing pharmacists participate in the study. Reminders were sent weekly via WhatsApp to get as many respondents as possible in the survey period. Data collected was checked for completeness and pre-analysed using the Gooledoc® tool.

The entire database was then exported to Microsoft Excel for further analysis. Descriptive analysis (frequency, percentages, means and mode) were employed to describe the perception of pharmacists of their roles, involvement and training in pandemics and emergencies. Results were presented as charts and tables. Ethical approval was obtained from the Health and Research Ethics Committee of the Lagos University Teaching Hospital, Idiaraba, (ADM/DCST/HREC/APP/4109)

Scoring: Each correct answer in a subtheme was given a score of one (1) giving a total of 6, 7, 15, 9, 12, 7 respectively for knowledge of risk of getting Covid-19, routes of transmission, symptoms, recommended means of protecting yourself, Covid-19 disease, and treatment. Scores were transformed into percentages, and score ranges divided into percentiles to grade the knowledge: greater than 75 - Very Good, 50-74.99 – Good, 25-49.99 - Poor, below 25 –Very Poor.

3.   Results

A total of 386 pharmacists participated in this online survey. There were more males, 50.3% (194), than females and majority were between ages 25–34 years, 32.4% (125). The mean age was 41.72 ± 11.343. Majority of the respondents were from the South-West 50.5% (195) and practised in either Hospital and administrative pharmacy 31.9% (123) or Community pharmacy 17.6% (68) (Table 1).

Table 2 presents respondents knowledge of COVID-19 disease. Almost all the respondents, 369 (95.6%) knew that the main transmission route of coronavirus is via droplets. In addition, about a quarter, 293 (75.9%) believed that droplet transmission can only occur when a person is in in close contact of 1metre or less, and about half, 169 (46.8%) agreed that infected people will experience nothing worse than seasonal flu symptoms.

Over three-quarters of respondents, 286 (77.1%) knew that the virus has a protein molecule covered by a protective layer of lipid which can be destroyed by anything which destroys the lipid layer. On the other hand, less than half of the respondents 117 (30.3%) knew that Covid-19 is only dangerous in persons with comorbidities, and that it was more likely to affect those who usually travel, 107 (27.7%).

Table 1: Socio-demographic Characteristics of Respondents

	Frequency	Percent
Sex		
Female	192	49.7
Male	194	50.3
Age		
	14	3.6
25-34	125	32.4
35-44	95	24.6
45-54	104	26.9
	48	12.4
Practice Area		
Academia	68	17.6
Community	68	17.6
Hospital and administrative	123	31.9
Industry	25	6.5
Other	25	6.5
State of Practice		
North Central	79	20.5
North - East	13	3.4
North - West	31	8.0
South - East	20	5.2
South - South	48	12.4
South - West	195	50.5

Table 2: Knowledge about Coronavirus disease

Item	Frequency	Percentage
The virus has a protein molecule covered by a protective layer of lipid so can be destroyed by anything which destroys the lipid layer	286	77.1
The main transmission route of coronavirus is droplets	369	95.6
Covid-19 can mutate over time	263	68.1
Many individuals who get coronavirus will experience nothing worse than seasonal flu symptoms	169	46.8
Covid-19 is only dangerous in persons with comorbidities	117	30.3
It only kills the elderly, so younger people can relax	2	0.5
A vaccine has been developed to cure the coronavirus	29	7.5
You need to be with an infected person for at least 10 minutes to get the virus	34	8.8
Thermal scanners are effective in detecting people who have been infected by the virus	104	26.9
The incubation period for the virus is between 2 and 10 days	226	58.5
Droplet transmission can only occur when a person is in in close contact of 1metre or less	293	75.9
Corona virus is more likely to affect those that usually travel abroad	107	27.7

Table 3 presents respondents source of information for Corona-virus disease. Majority of the respondents got their information from the internet, 325 (84.6%), journal articles, 301 (78%), and the mass media, 293 (75.9%). Lesser numbers got information from health authorities 25 (6.5%), trainings 25 (4.4%) and professional groups 12 (3.1%).

Almost all respondents knew that coughing, 370 (95.9%), sneezing, 371 (96.1%), and contacts with infected hands 368 (95.3%) and door handles 366 (94.8%) were routes of transmission of COVID-19.

Mean Score for knowledge of route of transmission was 5.35 ± 0.864, variance 0.747 (Range 1- 7).

Majority also identified fever 378 (97.9%), shortness of breath 368 (95.3%) and continuous dry cough 360 (93.3%) as symptoms of the disease. About half of the respondents additionally identified loss of sense of taste 217 (56.2%) and loss of sense of smell 211 (54.7%) as symptoms (Table 4). Loss of sensation, 36 (9.3%) and loss of hearing, 14 (3.6%) were less commonly identified. Mean knowledge score for symptoms of COVID-19 was 11.26 ± 1.883, variance 3.544 (Range 6 – 15).

With respect to means of protection, almost all the respondents knew that using an alcohol-based sanitizer, 385 (99.7%), observing social distancing 385 (99.7%) and washing of hands with soap and water 384 (99.5%) were recommended. Over half, 264 (68.4%) also agreed to knowing wearing of hand gloves as a means of protection. Mean knowledge Score for recommended ways of protecting oneself was 6.4326 ± 0.86302, variance 0.745 (Range 4 – 9).

Table 3: Sources of Information Covid-19 disease

	Frequency	Percentage
Articles in journals	301	78
Health Authority (NCDC, CDC, WHO)	25	6.5
Trainings	17	4.4
Mass media	293	75.9
Social Media	252	65.3
Internet	325	84.6
Friends and family	122	31.6
Professional groups	12	3.1
Survivors	3	0.8

Table 4: Knowledge of Route of Transmission, Symptoms and Protection

Route of transmission	Frequency	Percent
Coughing	370	95.9
Sneezing	371	96.1
Contact e.g. hand touching	368	95.3
Contact e.g. door handles	366	94.8
Through the air	250	64.8
Crowded areas	351	90.9
Sexual intercourse	88	22.8
Symptoms of Coronavirus		
Body aches	242	62.7
Chest pain	240	62.2
Continuous dry cough	360	93.3
Diarrhoea	157	40.7
Fatigue	286	74.1
Fever	378	97.9
Headaches	265	68.7
Loss of the sense of taste	217	56.2
Loss of the sense of smell	211	54.7
Loss of sensation	36	9.3
Loss of hearing	14	3.6
Nausea	112	29
Shortness of breath	368	95.3
Stomach pains	81	21
Vomiting	111	28.8
Recommended means of protection		
Washing of hands with soap and water	384	99.5
Using alcohol- based sanitizer	385	99.7
Observing social distancing	385	99.7
Wearing face mask	367	95.1
Wearing hand gloves	264	68.4
Using bleach to clean surfaces	336	87
Avoid going out to crowded places	377	97.7
Staying at home with social distancing	282	73.1
Staying at home	307	79.5

Table 5 presents respondents provision and practice of protection at work.
Majority of the Pharmacists (293, 75.9%) had to provide their own PPE in part or fully. Majority, also subscribed to use of alcohol-based hand sanitizer, 372 (97.9%), observing social distancing from other staff, 327 (86.1%) and washing of hands with soap and water 326 (85.8%).

Table 5: Provision and Practice of Pharmacists' Protection at work

	Frequency	Percent
Personal provision of protective equipment	293	75.9
Continuous washing of hands with soap and water	326	85.8
Using alcohol-based sanitizer	372	97.9
Observing social distancing with other staff	327	86.1
Wearing face mask	318	83.7
Wearing hand gloves	158	41.6
Using bleach to clean surfaces	254	66.8
Avoid touching your patients/clients	253	66.6

4. Discussion

Pharmacists, as healthcare practitioners are easily accessible and play important and visible roles in healthcare settings. They are a valuable resource of knowledge and drug information emanating from them are key to controlling outbreaks of infections and prevent panic.[8,14] Several educational materials have been rolled out on the recent COVID-19 outbreak to update pharmacist's knowledge for common patient good, while at the same time encouraging personal preventive practices.[7,15] This study was carried out to determine the level of knowledge of pharmacists on COVID-19 infection and their preventive practices with respect to protection against the virus. In this study, about half, 50.3% of the respondents were male, and majority, 31.9% and 50.5% were hospital and administrative pharmacists practicing in the south-western part of Nigeria respectively.

89.9% of the respondents had good overall knowledge of COVID-19 disease, majorly having a score of 8 on a scale of 10 knowledge questions. Similar high levels of knowledge were reported in studies conducted among pharmacists in Lebanon and Pakistan.[16,17] Likewise, a study among health care workers (physicians, pharmacists and nurses) in Pakistan revealed good knowledge of COVID-19 disease, with pharmacists having slightly higher knowledge than other health care workers.[18] This is of great importance and inspires confidence considering that one of the main professional responsibilities of pharmacists is providing drug information and education to patients.[19] A recent study to determine pharmacists' perception of their roles and involvement in COVID-19 disease corroborated this assertion, as pharmacists identified health education and counselling as part of their key roles, especially in a pandemic.[20] In contrast, studies from Addis Ababa and Gondar region of Ethiopia reported lower knowledge values of 53.2% and 63% among pharmacists.[21,22] These differences could be as a result of different exposures to information, educational materials and self-development.

Respondents in this study identified majorly internet sources, article in journals, mass media and social media as sources of information regarding COVID-19 disease. This was also the case for the Ethiopian studies. However, healthcare workers in Pakistan in addition also obtained information on COVID-19 disease from radio and television sources.[18] Care should be taken to seek information from verified scientific sources to avoid the acquisition of false information. This study also revealed that majority of respondents had good knowledge of the transmission routes for COVID-19, symptoms exhibited and means of protecting oneself. Over 90% of respondents knew that possible routes of transmission occurs when in a crowded place or through air droplets when people cough, sneeze or have close contact with infected droplets on hands or door handles. Not many people agreed that sexual intercourse could be a route of transmission. Similar high knowledge of routes of transmission was obtained in Addis Ababa and Lebanon.[17,21] However, only about 40% of

pharmacists in Lebanon knew that transmission could be airborne. On the contrary, fairly lower percentages of correct responses to knowledge questions were recorded among healthcare workers globally.[23] The difference could have been as a result of time difference in when the study was carried out and the continuously evolving facts about the virus over time which led to better understanding and knowledge of the disease.

Practices regarding COVID-19 often determine safety of individuals and the community in which they live. The findings from this study indicate that majority of respondents reported good practices in the areas of continuous washing of hands with soap and water, using alcohol-based sanitizers, wearing face masks and observing social distancing from other colleagues. Lower proportions of respondents reported avoiding touching of patients and use of cleaning agents such as bleach to clean surfaces. Wearing of gloves was not a common practice. This finding is consistent with many studies that surveyed practices of pharmacists and health care workers towards COVID-19 disease in different countries where pharmacists were found to have followed adequate preventive practices,[16,21] reported high level of adequate practice[24] and demonstrated better practices than other health care workers[18], but contrary to reports by Yimenu *et al*[22] from Ethiopia where only about a third of study participants were found to have a good practice towards the prevention of COVID-19. Over 40% of respondents from this study also had to provide their own personal protective equipment when their workplace did not make adequate provision for it, same with pharmacists in Addis Ababa. This could have been as a result of scarcity or inadequate supply of PPEs at the time they were needed, especially as the pandemic raged on. It is imperative for pharmacists to have access to adequate provision of PPEs in order to be adequately protected from the virus when they inadvertently come in contact with suspected or confirmed cases in the course of their duties, and at the same time be able to counsel clients on the use of PPE's for protection and breaking the chain of transmission. This was recently demonstrated by Joda *et al.*[20], where pharmacists advised their clients to use the same protective measures, they also used themselves. Adequate provision of PPE's coupled with good preventive measures will also allay the fears of respondent's getting infected when exposed, as about 40% admitted to moderate risks of exposure while at work, and as such reported being anxious going to work during the pandemic.

Regarding the management and treatment risks for COVID-19, almost all, 97.9% of respondents in our study acknowledged older adults and people living with chronic medical conditions as being at greater risks for COVID-19. This was also reported in Ethiopia where over 90% of respondents identified elderly people as a high-risk group.[21] Currently, possible drug targets, effective therapeutic agents, and vaccines are being considered as potential drug targets for COVID-19.[25] Pharmacists should keep familiarizing themselves with drug information that may be required which may involve proposed dugs, dosing requirements, drug interactions, adverse effects, monitoring parameters and the pharmacokinetics of all drugs that may be used.[15,26] Potential treatments against COVID-19 need either appropriate drug development or clinical trial to be suitable for clinical use.[27]

CONCLUSION

The findings from this study demonstrated that pharmacists had both good knowledge of Coronavirus disease, including the route of transmission as well as the symptoms of disease. They also displayed good practice towards the disease, even when they had to provide protection equipment's personally. In a rapidly and evolving health landscape, primary health care especially in community pharmacies is central to the efforts of fighting health crisis like pandemics and maintaining the effective delivery of essential and routine health services. Hence, pharmacists are a good resource for knowledge which can be disseminated to patients and other people within the community during pandemics, or as the need arises.

REFERENCES

1. Wu Y, Chen C, Chan Y (2020). The outbreak of COVID-19: An overview, Journal of the Chinese Medical Association. 83 (3) 217-220 https://doi.org/10.1097/JCMA.00000000000002 70

2. World Health Organization (2020). Coronavirus disease 2019 (COVID-19) Situation Report-161. Retrieved 29 June 2020, from https://www.who.int/docs/default-

source/coronaviruse/situation-reports/20200629-covid-19-sitrep-161.pdf?sfvrsn=74fde64e_2

3. Weis SR. (2020). Forty years with coronaviruses. *Journal of Experimental Medicine*, 217 (5), Article e20200537. https://doi.org/10.1084/jem.20200537

4. World Health Organization (2020). Coronavirus disease 2019 (COVID-19) Situation Report-161. Retrieved 29 June 2020, from https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200629-covid-19-sitrep-161.pdf?sfvrsn=74fde64e_2

5. Nigeria Centre for Disease Control. (2020). National interim guidelines for clinical management of COVID-19 version 1. Retrieved 16 April 2020 https://www.ncdc.gov.ng

6. Sohrabi C, Alsafi Z, O'Neill N, Khan M, Kerwan A, Al-Jabir A, Iosifidis C, Agha R. (2020). World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19). International Journal of Surgery, 76, 71-76. https://doi.org/10.1016/j.ijsu.2020.02.034

7. Nigeria Centre for Disease Control (2020) COVID-19 situation report 122. Retrieved 29 June 2020, from https://www.ncdc.gov.ng/diseases/sitreps

8. International Pharmaceutical Federation (FIP). (2020). Coronavirus/COVID-19 preparedness. Retrieved 05 April 2020, from Available on: https://www.fip.org/coronavirus

9. Bukhari N, Rasheed H, Nayyer B, and Babar Z. (2020). Pharmacists at the frontline beating the COVID-19 pandemic. Journal of Pharmaceutical Policy and Practice 13, 8-8.

10. American Pharmacist Association. (2020). Pharmacists' Guide to Coronavirus. Retrieved 2020, July 02, from https://www.pharmacist.com/coronavirus

11. Raosoft (2004). Raosoft Sample Size Calculator. Raosoft, Inc., Seattle. http://www.raosoft.com/samplesize.html

FIP (International Pharmaceutical Federation). (2020) COVID-19: Guidelines for Pharmacists and the Pharmacy workforce. Available at: https://www.fip.org/files/content/priority-areas/coronavirus/COVID-19-_Guidelines-for-pharmacists-and-thepharmacy-workforce.pdf

Accessed 24/8/20.

12. UpToDate. Clinical Effectiveness COVID-19 Resources Available to All. Available at: www.uptodate.com. Accessed 11/5/2020

13. World Health Organization. Coronavirus disease (COVID-19) pandemic. https://www.who.int/emergencies/diseases/novel-coronavirus-2019 Accessed 11/05/2020

14. Guerci C, Maffioli A, Bondurri AA, Ferrario L, Lazzarin F, Danelli P. (2020). COVID-19: How can a department of general surgery survive in a pandemic? Surgery 167(6):909-911

15. Al-Quteimat OM and Amer AM. (2020). SARS-CoV-2 outbreak: how can pharmacists help? Research in Social and Administrative Pharmacy 17 (2); 480-482

16. Hussain I, Majeed A, Saeed H, Hashmi FK, Imran I, Akbar M. (2020) A national study to assess pharmacists' preparedness against COVID-19 during its rapid rise period in Pakistan. PLoS ONE 15(11): e0241467.

17. Zeenny RM, Ramia E, Akiki Y, Salameh P. (2020). Assessing knowledge, attitude, practice, and preparedness of hospital pharmacists in Lebanon towards COVID-19 pandemic: a cross-sectional study. Journal of Pharmaceutical Policy and Practice 13, 54

18. Saqlain M, Munir MM, Rehman SU, Gulzar A, Naz S, Ahmed Z, Tahir AH, Mashhood M. (2020). Knowledge, attitude, practice and perceived barriers among healthcare professionals regarding COVID-19: a cross-sectional survey from Pakistan. Journal of Hospital Infection 105(3):419-423. https://doi.org/10.1016/j.jhin.2020.05.007

19. Ghaibi S, Ipema H, Gabay M (2015). American Society of Health System P. ASHP guidelines on the pharmacist's role in providing drug information. American Journal of Health System Pharmacists 72(7):573–7

20. Joda AE, Olugbake OA, Oyetunde OO, Awofisayo O, Ibrahim M, Williams FE, Ayeni FA, Mosanya AU and Ologunagba MO. Pharmacists' Perception of their Roles and Involvement in Coronavirus Disease 2019 (COVID-19). Journal

of Basic and Social Pharmacy Research, 2020;1(Supplement 1): S68-S82

21. Tesfaye ZT, Yismaw MB, Negash Z, Ayele AG. (2020). COVID-19-related knowledge, attitude and practice among hospital and community pharmacists in Addis Ababa, Ethiopia. Integrated Pharmacy Research and Practice **(9)**:105–112

22. Yimenu DK, Demeke CA, Kasahun AE, Asrade S, Mekuria AB. (2020). COVID-19: What should health professionals know? Assessment of Knowledge, attitude, and practice of community pharmacists in a developing country. SAGE Open Medicine Nov 16;8:2050312120973498. https://doi.org/10.1177/2050312120973498

23. Bhagavathula AS, Aldhaleei WA, Rahmani J, Mahabadi MA, Bandari DK. (2020). Knowledge and Perceptions of COVID-19 Among Health Care Workers: Cross-Sectional Study. JMIR public health and surveillance, 6(2), e19160. https://doi.org/10.2196/19160

24. Mbachu CNP, Azubuike CM, Mbachu II, Ndukwu CI, Ezeuko AY, Udigwe IB, Nnamani CP, Umeh UM, Ezeagwuna DA, Onah SK, Eze HO, Okereke UC, Orji-Ifeanyi EN. (2020). COVID-19 infection: Knowledge, attitude, practices, and impact among healthcare workers in a South-Eastern Nigerian state. J Infect Dev Ctries.;14(9):943-952.

25. Wondmkun YT and Mohammed OA. (2020). A Review on Novel Drug Targets and Future Directions for COVID-19 Treatment. Biologics: Targets & Therapy. 14:77-82. https://doi.org/10.2147/BTT.S266487

26. Sanders JM, Monogue ML, Jodlowski TZ, Cutrell JB. (2020) Pharmacologic Treatments for Coronavirus Disease (2019) (COVID-19): A Review. JAMA. 323(18):1824–1836. https://doi.org/10.1001/jama.2020.6019

27. Rabby, MII. (2020). Current drugs with potential for treatment of COVID-19: A literature review. Journal of Pharmacy & Pharmaceutical Sciences, 23(1), 58–64.